



# **KITAGAWA**

## **GAS DETECTOR TUBE SYSTEM**

**An Hygienic Aspirating Pump  
with Antibacterial Treatment**

**Shatterproof Detector Tubes  
for Safety Purposes**

- Certified to SEI (Safety Equipment Institute)
- Certified to ISO9001:2008 (Quality Management System)
- Japan Design Registration No.1131898
- United States Design Patent No.US D467,334 S
- The Model AP-20 aspirating pump is certified  
in conformity to the European standard **EN1231**



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## Whenever

No chemical reagents to prepare - it is ready for immediate use.

## Wherever

Light weight and compact, KITAGAWA's system is easy to carry in the most difficult situations.

## Whoever

The system is simple and straightforward to operate and no academic knowledge is required - all personnel can operate it with ease.

## Speedy

An accurate reading can be obtained within a few minutes and many sample points can be tested in a very short period of time.

## Safety

As no electricity or heat is required, tests can be taken without risk of explosion, even in the most flammable atmospheres.



# WE CONTRIBUTE TO PUBLIC SAFETY AND SECURITY

**KITAGAWA GAS DETECTOR TUBES HAVE BEEN IMPROVED WITH A CLEAR LAYER OF FILM FOR EXTRA SAFETY.**

If a tube is broken by accident, the glass pieces will not scatter. Please read the instruction sheet provided in each box of tubes before use.

We have been manufacturing and distributing the "KITAGAWA GAS DETECTOR TUBE SYSTEM" since our establishment in 1947.

By using KITAGAWA's experience and state-of-the-art technology, the gas detector tube system has been fully developed to ensure the maximization of accuracy, operation and safety in the field of gas detection and analysis.

"KITAGAWA GAS DETECTOR TUBE SYSTEM" is noted with above excellent features in analysis of gas concentration and is therefore widely used throughout the world.

## KITAGAWA MODEL AP-20

with Model AP-20 aspirating pump and standard accessories which are composed of a carrying case, 2 pcs of rubber tube connector, 1 pce of grease and an instruction sheet.



Certified in conformity with the European standard **EN 1231**

## APPLICATIONS

Tube data and typical applications detailed on page 31



**Industrial Hygiene**

Gas detector tubes are successfully used for the quick measurement of harmful gases and vapours in the atmosphere and also the distribution of their concentration in the working area.



**Fire/Explosion Prevention**

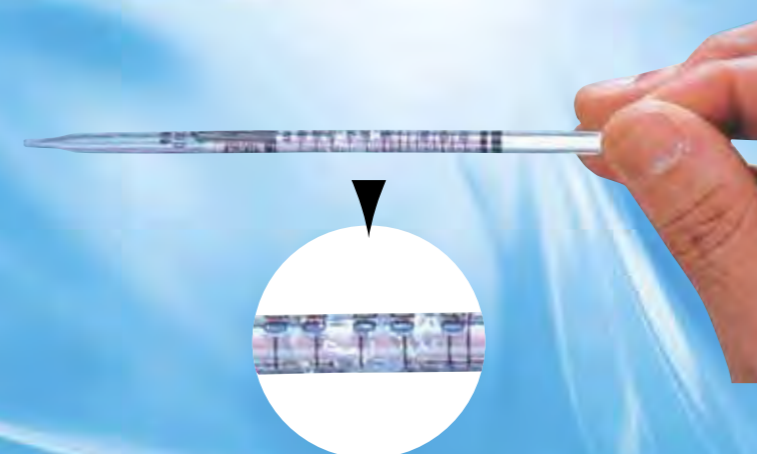
Available to prevent fire and explosion by detecting combustible gases leaked or generated in workplaces, and by foreseeing spontaneous combustion in coal mines.



**Process Control**

Where gases are used as raw material or intermediates in various industries, impurities in the gas can be measured by gas detector tubes. This ensures high product quality and production efficiency by preventing deterioration of catalysts.

## A Shatterproof Structure for Safety Purpose



**Air pollution Control**

The Model P-10FG Flue gas sampler for air pollution control economically measures a range of flue gases such as Nitrogen compounds, SO<sub>2</sub>, CO, CO<sub>2</sub>, HCl and O<sub>2</sub>.



**Industrial Waste Water**

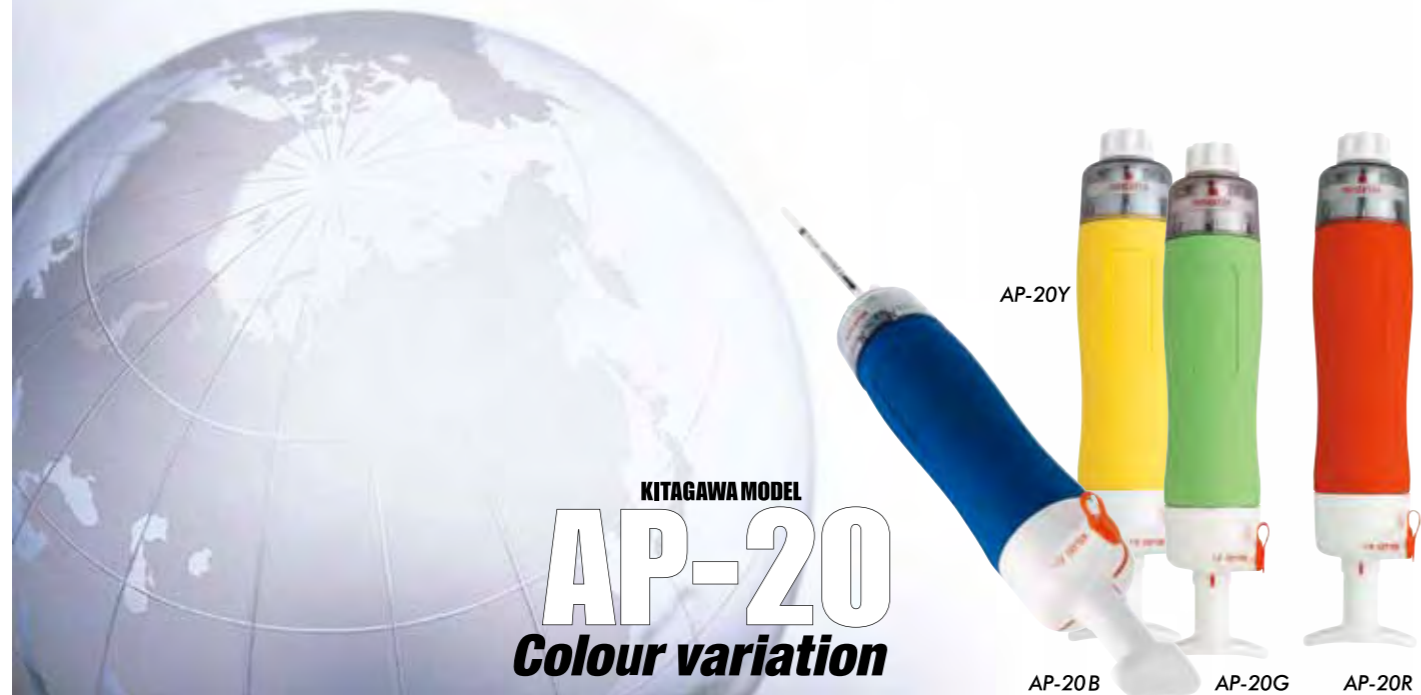
Effluent can be analysed for certain types of pollution simply and quickly. Instant checks can be made almost anywhere.



We are dedicated to the development of innovative products that support a safe and healthy environment, and prevent injury in the workplace.

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### Certificate of ISO 9001:2008

We KOMYO RIKAGAKU KOGYO K.K., have been assessed and certified as meeting the requirements of ISO 9001:2008, for the following activities.

#### The scope of registration:

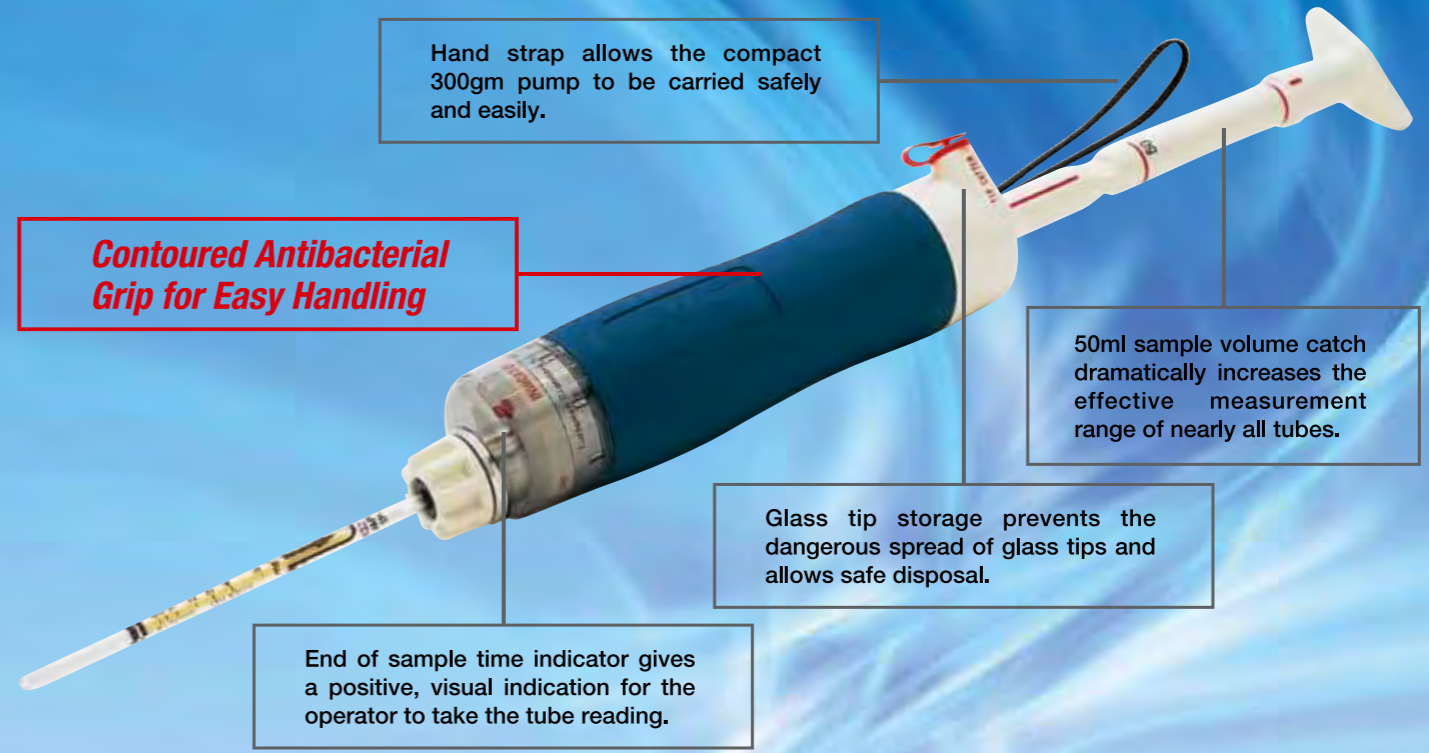
1. The development, design, manufacture, sales and in-house maintenance services of detector tubes and pumps, gas sampling tubes and air flow indicators
2. The development, design, manufacture, sales of gas sensors
3. The development, design, manufacture, sales and in-house maintenance services of standard products (Portable, Transportable and Fixed type) of gas measuring instruments, gas detectors and gas alarm apparatus
4. The development, design, manufacture, sales and in-house maintenance services of specially ordered products
5. Maintenance services of products

#### The site details:

<b>Head Office</b>	1-8-28 Shimonoge, Takatsu-ku, Kawasaki-shi, Kanagawa, Japan
<b>Aizu Komyo K.K. Bange Factory</b>	380 Aza Kunema, Ooaza Niidate, Aizubange-machi, Kawanuma-gun, Fukushima, Japan
<b>Aizu Komyo K.K. Misato Factory</b>	2-8 Aza Shimizu, Kubo Ozawa, Aizumisato-machi, Oonuma-gun, Fukushima, Japan
<b>Osaka Branch</b>	1-38 Enoki-cho, Suita-shi, Osaka, Japan
<b>Fukuoka Sales Office</b>	3-27-1 Higashihie, Hakata-ku, Fukuoka-shi, Fukuoka, Japan
<b>Kitakanto Sales Office</b>	217-3 Ooaza kawa, Ageo-shi, Saitama, Japan

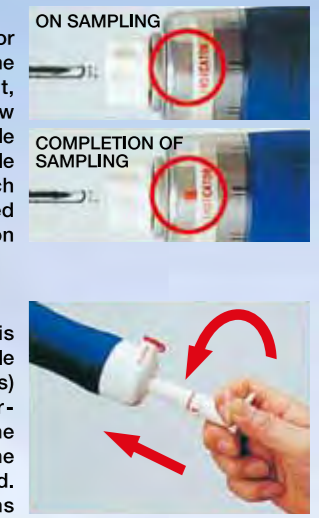


## OPERATION KITAGAWA MODEL AP-20 ASPIRATING PUMP FOR GAS DETECTOR TUBES



- 1 Prepare aspirating pump.**  
Check the pump for leaks in accordance with "CHECKING PRIOR TO USE" in the instruction sheet.
- 2 Cut both ends of the gas detector tube.**  
Insert the tip of the gas detector tube into the tip cutter and scratch the tip of tube by rotating it for one revolution, then pull it toward you. (The glass tip can be thrown away by removing the tip cutter cap.)
- 3 Connect the gas detector tube to the aspirating pump.**  
The sample gas must be drawn through the gas detector tube in the correct direction. Insert the gas detector tube into the rubber tube connector with the tube's directional arrow pointing toward the pump.
- 4 Pull the handle.**  
Align the red line on the bottom case and that on the shaft and pull the pump handle to its full 100ml locking position. If the sample calls for a half stroke, pull out pump handle until 50ml line appears, and shaft will be locked at 50ml.

- 5 Draw the sample gas.**  
Draw the sample gas for the specified time at the desired sampling point, and confirm with the flow indicator that the sample is completed. The sample time required for each detector tube is stated clearly in the instruction sheet.
- 6 Return the handle.**  
When the sample is completed, turn the handle 1/4 turn (90 degrees) clockwise or counter-clockwise to unlock the handle. Confirm that the handle remains extended. (If the handle returns part way, the sample is incomplete, and this will cause a low reading). Some detector tubes require extra pump strokes (i.e., more than 100ml of air). In this case, push back the handle and repeat the operation.
- 7 Read the concentration.**  
Remove the gas detector tube from the aspirating pump after the prescribed sample volume has been drawn. Read the concentration of gas at the maximum end of the stain against the printed scale on the detector tube. Some detector tubes require a temperature correction using a table or correction coefficient provided in the instructions.



# LIST OF "KITAGAWA" PRECISION DETECTOR TUBES

## NOTICE 1

1. In cases where the detector tubes have more than one measuring range, the scale range printed on each detector tube and the number of pump strokes is marked by a circle (○).

Example: Tube No. 102SD    Measuring Range (ppm)    No. of Pump Strokes  
 125~5,000    1/2  
 50~2,000    ①  
 20~800    2

2. The range printed on the tube box shows the range of the minimum and maximum detectable concentrations.  
 Example: Tube No.102SD    20~5,000

## NOTICE 2

In cases where the gas concentration is read by using a conversion chart, as shown in the tube instruction sheet, a © mark is shown after the tube number in this brochure, for example: 190U ©. However, this © mark is shown only in the brochure and does not appear on the printed tube box or in the instruction sheet. When ordering such tubes, it is unnecessary to include the © mark on your purchase order.

## NOTICE 3

A constant colour stain is produced which varies in length according to the concentration of the substance being measured. The reading can be obtained directly from the scale printed on the tube (Direct reading method) or by using the concentration chart furnished in each box (Concentration chart method). All tubes suffixed "S" and "U" on the tube No. have direct reading scales.

Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Acetaldehyde CH <sub>3</sub> CHO Concentration chart method	133A ‡	0.004~1.0%	1	Yellow	Pink	Mfg. synthetic rubber, plastics; various organics mfg, perfume, flavors, fragrances	1	10	Acetone (1,400), Acrolein (35), Methyl ethyl ketone (900), Methyl isobutyl ketone (2,900), SO <sub>2</sub> (10)	50 (J) 20 (B)
Acetaldehyde CH <sub>3</sub> CHO	133SB ‡	5~140	1	Yellow	Pink	Mfg. synthetic rubber, plastics, various organics	2	10	Other aldehydes, Ethanol	
Acetic acid CH <sub>3</sub> COOH	216S	1~50	1	Pale pink	Yellow	Mfg. cellulose acetate rayon, vinyl acetate, a seasoning	3	10	SO <sub>2</sub> (1/20 × Acetic acid *), NO <sub>2</sub> (10), HCl (2 × Acetic acid *), Cl <sub>2</sub> (5)	10 (J.A.B)
Acetic anhydride (CH <sub>3</sub> CO) <sub>2</sub> O	216S©	1~15	1	Pale pink	Yellow	Acetylating agent	3	10	SO <sub>2</sub> (1/20 × Acetic acid *), NO <sub>2</sub> (10), HCl(2 × Acetic acid *), Cl <sub>2</sub> (5)	5 (J) 1 (A) 0.5 (B)
Acetone CH <sub>3</sub> COCH <sub>3</sub>	102SA	1.0~5.0% 0.1~2.0%	1/2 ①	Orange	Dark brown	Leakage & file hazard detection in acetate rayon industry, paints industry & pharmaceutical industry	3	10	Alcohols, Other Ketones, Aromatic hydrocarbons, Esters, Halogenated hydrocarbons (0.5%)	
	102SC ‡	0.01~4.0%	1	Yellow	Pink		1	10	Acetaldehyde (30), Acrolein (20), Methyl ethyl ketone (150), Methyl isobutyl ketone (400)	200 (J.A) 500 (B)
	102SD	125~5,000 50~2,000 20~800	1/2 ① 2	Yellow	Dark brown	Industrial hygiene for both plant and laboratory	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	

‡ This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).

\* Interfered by coexistence more than parenthesized rate.

Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Acetylene HC ≡ CH	101S	50~1,000	1	Pale yellow	Brownish blue	Process control & leakage detection in synthetic ammonia plant, cuprammonium rayon process	3	10	Olefins (10), H <sub>2</sub> S (10), CO (50), NH <sub>3</sub> , Butadiene (25), HCH, Cl <sub>2</sub> , NO <sub>2</sub> , CS <sub>2</sub> , Benzene	
Acetylene · Ethylene -separation measurement C <sub>2</sub> H <sub>2</sub> & C <sub>2</sub> H <sub>4</sub>	280S	C <sub>2</sub> H <sub>2</sub> ; 20~300	1	Yellow	Dark brown		1	2 × 5	Tube for C <sub>2</sub> H <sub>2</sub> ; CO (10), H <sub>2</sub> (5,000), Ethylene (2,000) Tube for C <sub>2</sub> H <sub>4</sub> ; CO (1,350), Acetylene (370), Propylene (20)	
		C <sub>2</sub> H <sub>4</sub> ; 200~2,000		Pale yellow	Blue					
Acrolein (Acryl aldehyde) CH <sub>2</sub> =CHCHO Concentration chart method	136 ‡	0.005~1.8%	1	Yellow	Pink	Leakage & fire hazard detection in plastics industry	1	10	Acetylene (20), Acetaldehyde (70), Methyl ethyl ketone (60), Methyl isobutyl ketone (500)	0.1 (J.B)
Acrylic acid CH <sub>2</sub> =CHCOOH	216S©	1~50	1	Pale pink	Yellow	Material of acrylic resin	3	10	SO <sub>2</sub> (1/20 × Acetic acid *), NO <sub>2</sub> (10), HCl (2 × Acetic acid *), Cl <sub>2</sub> (5)	2 (A)
Acrylonitrile (Vinyl cyanide) CH <sub>2</sub> =CHCN	128SA	0.1~3.5%	1	Orange	Dark green	Leakage & fire hazard detection in synthetic rubber & plastics industry	3	10	Acetylene (3%), Propane (0.2%), Other organic gases or vapours except Halogenated hydrocarbons (50)	2 (J.A.B)
	128SB	10~500	1	Yellow	Pale blue	Leakage detection	2	10		
	128SC ‡	1~120	2	Yellow	Pink	Industrial hygiene, human carcinogen: recognized to have carcinogenic potential	1	2 × 5	Methyl ethyl ketone (600), Styrene (250), HCN (2), Butadiene (200)	
	128SD ‡	1~20 0.5~10 0.25~5 0.2~4	① 2 4 5	Yellow	Red		1	2 × 5	HCN	
Allyl alcohol CH <sub>2</sub> =CHCH <sub>2</sub> OH	184S©	20~500	1	Yellow	Pale blue	Leakage detection	2	10	Esters, Ketones, Alcohols, Aromatic hydrocarbons, Halogenated hydrocarbons	1 (J) 0.5 (A) 2 (B)
Ammonia NH <sub>3</sub>	105SA	0.5~10%	1	Pink	Grey or Yellow	Process control & leakage detection in synthetic ammonia plant, cuprammonium rayon process; fertilizer mfg.	3	10	Amines	25 (J.A.B)
	105SB	50~900	1	Pale purple	Pale yellow	Process control	3	10	SO <sub>2</sub> (1/4 × NH <sub>3</sub> *), Cl <sub>2</sub> (2), Amines	
	105SC	10~260 5~130	① 2	Pale purple	Pale yellow		3	10	SO <sub>2</sub> (1/5 × NH <sub>3</sub> *), Cl <sub>2</sub> (2), Amines	
	105SD	1~20 0.5~10 0.2~4	① 2 5	Pale purple	Pale yellow	Synthetic ammonia plant, leakage detection of refrigerant in ice plant, Industrial hygiene	3	10	Amines	
	105SE	10~200 5~100 1~20	1/2 ① 5	Pale purple	Pale yellow		3	10	Sulphur dioxide, Chlorine, Amines	
	105SH	0.5~30%	1	Pink	Blue · Brownish green	Process control & leakage detection in synthetic ammonia plant, cuprammonium rayon process, fertilizer mfg.	3	10	H <sub>2</sub> S (3,000)	
	105SM	0.1~1.0%	1	Pale purple	Pale yellow	Process control	2	10	Amines	
Aniline (Aminobenzene) C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub>	181S	2~30 1~15	① 2	White	Yellow	Industrial hygiene	3	10	Toluidine (1/3 × Aniline *), NH <sub>3</sub> , Aliphatic amines or Aromatic amines (the same conc. of Aniline)	1 (J.B) 2 (A)

‡ This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).

\* Interfered by coexistence more than parenthesized rate.



Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Arsine AsH <sub>3</sub>	140SA	5~160	1	White	Dark brown	Doping gas analysis in semiconductor industry, waste gas analysis in metal refinery	2	10	H <sub>2</sub> S (5), Hydrogen selenide (5), Phosphine (5)	0.01 (J) 0.005 (A) 0.05 (B)
	121U	0.1~2.0 0.05~1.0	① 2	Pale yellow	Pink	Industrial hygiene, semiconductor manufacturing process	2	10	Hydrogen selenide, Mercaptans, H <sub>2</sub> S, HCN, SO <sub>2</sub>	
Benzene-in the presence of Gasoline and/or other Aromatic hydrocarbons C <sub>6</sub> H <sub>6</sub>	118SB	5~300	1	White	Greenish brown	Industrial hygiene (suspected carcinogen in humans)	2	2 × 5	Toluene (over 150), Hexane (200), Xylene (over 300)	0.5 (A) 1 (B)
	118SE	1~80 0.2~1	① 5	White	Greenish brown			2	2 × 5	Toluene (1,000), Xylene (1,000), Ethyl benzene (1,000), CO (2), Hexane (2)
Benzene C <sub>6</sub> H <sub>6</sub>	118SC	4~100 2~50 1~25	1 ② 4	White	Greenish brown	Industrial hygiene (suspected carcinogen in humans)	2	10	Toluene, Xylene, CO (50), Hexane (100)	0.5 (A) 1 (B)
	118SD	1~75 0.2~15 0.1~7.5	1 ⑤ 10	White	Greenish brown			2	2 × 5	Toluene, Xylene, CO (2.0), Hexane (2.0)
Bromine Concentration chart method Br <sub>2</sub>	114	1~20	1	White	Orange	Industrial hygiene	2	10	Cl <sub>2</sub> (1), ClO <sub>2</sub> , NO <sub>2</sub>	0.1 (J.A.B)
Bromochloromethane CH <sub>2</sub> BrCl	157SB③ ‡	2~80 20~400	① 1/2	White	Yellow		3	2 × 5		200 (A)
Bromoform CHBr <sub>3</sub>	157SB③ ‡	1~20 0.5~9	① 2	White	Yellow		3	2 × 5		1 (J) 0.5 (A)
1-Bromopropane CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> Br	157SB③ ‡	5~80	1	White	Yellow		3	2 × 5		10 (A)
2-Bromopropane (CH <sub>3</sub> ) <sub>2</sub> CHBr	157SB③ ‡	5~80	1	White	Yellow		3	2 × 5		1 (J)
1,3-Butadiene CH <sub>2</sub> =CHCH=CH <sub>2</sub>	168SA	0.03~2.6%	1	Brownish orange	Dark brown	Process control & fire hazard detection in synthetic rubber industry. mfg. synthetic rubber	3	10	Other organic gases or vapours except Halogenated hydrocarbons (50), Propane (0.2%), Acetylene (3%)	2 (A) 10 (B)
	168SB	30~600	1	Pale yellow	White	Leakage detection in synthetic rubber industry	3	10	CO, Butane, Pentane, Ethylene, Propylene, Butylene, H <sub>2</sub> S, Benzene, NH <sub>3</sub> , HCN	
	168SC	5~100 2.5~50	① 2	Pale yellow	Pale blue			1	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons
	168SE	0.5~10.0 0.1~2.0	1 ④	Pink	White		3	2 × 5	H <sub>2</sub> S, Isobutylene, NH <sub>3</sub>	
n-Butane CH <sub>3</sub> (CH <sub>2</sub> ) <sub>2</sub> CH <sub>3</sub>	221SA	0.05~0.6%	1	Orange	Brown	Combustible gas detection	3	10	Toluene, Hexane, Trichloroethylene	500 (J) 1,000 (A) 600 (B)
1-Butanol (n-Butyl alcohol) CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> OH	190U③	5~100	3	Yellow	Pale blue	Mfg. flotation reagent, stabilizer for solvent, industrial hygiene	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	50 (J) 20 (A)
2-Butanol (sec-Butyl alcohol) CH <sub>3</sub> CH <sub>2</sub> CH(OH)CH <sub>3</sub>	189U	10~300 4~120	② 4	Yellow	Pale blue	Organic solvent treating, industrial hygiene	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	100 (J.A.B)

‡ This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).

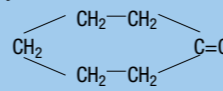
Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
tert-Butanol (CH <sub>3</sub> ) <sub>3</sub> COH	111U③	20~500	1	Yellow	Brown	Organic solvent treating, industrial hygiene	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	100(A)
Butyl acetate CH <sub>3</sub> CO <sub>2</sub> C <sub>4</sub> H <sub>9</sub>	139SB③	0.01~1.0%	2	Orange	Brownish green	Leakage & fire hazard detection in paints industry & painting; printing inks, artificial leather synthetic dyes, drugs & perfumes	3	10	Acetylene (3%), Propane (0.2%), Other organic gases or vapours except Halogenated hydrocarbons (50)	100 (J) 150 (A.B)
	138U	10~400	1	Pale yellow	Pale blue		industrial hygiene	1	10	Other organic gases or vapours
Butyl acrylate CH <sub>2</sub> =CHCO <sub>2</sub> (CH <sub>2</sub> ) <sub>3</sub> CH <sub>3</sub>	211U	2~60	2	Yellow	Pale blue	Material of acrylic resin	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	2 (A) 1 (B)
Butyl amine C <sub>4</sub> H <sub>9</sub> NH <sub>2</sub>	105SD③	1~20	1	Pale purple	Pale yellow	Organic synthesis intermediate; mfg. insecticide, emulsifying agent, medicine	3	10	Amines	5 (J)
Butyl cellosolve (Ethylene glycol monobutyl ether/2-Butoxyethanol) C <sub>4</sub> H <sub>9</sub> OCH <sub>2</sub> CH <sub>2</sub> OH	190U③	10~1,000	3	Yellow	Pale blue	Organic solvent treating Industrial hygiene	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	20 (A) 25 (B)
Butyl ether (CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> ) <sub>2</sub> O	111U③	10~1,200	1	Yellow	Brown			2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons
tert-Butyl mercaptan (CH <sub>3</sub> ) <sub>3</sub> CSH	130U	1~10 0.5~5	1/2 ①	Pale yellow	Pink	Industrial hygiene	2	10	Arsine, Hydrogen selenide, H <sub>2</sub> S, HCN	0.5 (A)
	165SB	5~80 2.5~40	①/2 1	Yellow	Pink			2	10	H <sub>2</sub> S, PH <sub>3</sub> , Arsine, Hydrogen selenide, HCN, NO <sub>2</sub> , NH <sub>3</sub> , SO <sub>2</sub> , Other Amines
Butyl methacrylate CH <sub>2</sub> =C(CH <sub>3</sub> )CO <sub>2</sub> C <sub>4</sub> H <sub>9</sub>	111U③	20~1,000	1	Yellow	Brown	Organic synthesis intermediate; mfg. synthetic resin, lubricant additive, rust-proof for metal, paper coating agent	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
tert-Butyl methyl ether (MTBE) CH <sub>3</sub> OC(CH <sub>3</sub> ) <sub>3</sub>	111U③	25~500	1	Yellow	Brown	Fuel, powder, blast cell, etc; antiknock, solvent, abstergent	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	50(A)
Butyric acid CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> COOH	216S③	3~60	1	Pale pink	Yellow	Conflate artificial flavour; medicine; emulsifying agent	3	10	SO <sub>2</sub> (1/20 × Acetic acid *), NO <sub>2</sub> (10), HCl (2 × Acetic acid *), Cl <sub>2</sub> (5)	
Carbon dioxide CO <sub>2</sub>	126SA	0.2~5.2% 0.1~2.6%	1/2 ①	Purplish blue	Pale pink	Air contamination test in buildings, closed vessels, tunnels, other confined spaces, CO <sub>2</sub> concentration control in green houses, poultry farm, fruit storage	2	10	HCN (200), Cl <sub>2</sub> (100), SO <sub>2</sub> (500), H <sub>2</sub> S (100)	
	126B	0.03~0.7% 100~1,500	① 3	Purplish blue	Pale pink		Industrial hygiene	2	10	HCN (100), Cl <sub>2</sub> (200), SO <sub>2</sub> , H <sub>2</sub> S (150), NO <sub>2</sub>

\* Interfered by coexistence more than parenthesized rate.

Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Carbon dioxide CO <sub>2</sub>	126SB	0.05~1.0%	1	Purplish blue	Pale pink	Industrial hygiene	2	10	HCN (100), Cl <sub>2</sub> (200), SO <sub>2</sub> , H <sub>2</sub> S (150), NO <sub>2</sub>	5,000 (J.A.B)
	126SF	200~4,000 100~2,000	1/2 ①	Pink	Yellow		2	10	NO <sub>2</sub> , H <sub>2</sub> S, HCl, SO <sub>2</sub> , HCN, Cl <sub>2</sub>	
	126SG	0.04~1.4% 0.02~0.7%	1/2 ①	Pink	Yellow		2	10	HCN	
Carbon dioxide -extra high range CO <sub>2</sub>	126SH	1~20%	1	Pink	Yellow	Combustion gas analysis	2	10	SO <sub>2</sub> (3,000), H <sub>2</sub> S (3,000), NO <sub>2</sub> (50)	
Carbon dioxide -ultra high range CO <sub>2</sub>	126UH	5~50%	1/2	White	Purple	Industrial hygiene	2	10		
Carbon disulphide CS <sub>2</sub>	141SA ‡	30~500	1	Pink	Yellow	Recovery control in viscose rayon & cellophane plant, mfg. viscose rayon & cellophane	2	2 × 5	H <sub>2</sub> S (400), SO <sub>2</sub> , Cl <sub>2</sub>	1 (J) 1 (A) 10 (B)
	141SB ‡	2~50 0.8~2.0	② 4	Pink	Yellow	Industrial hygiene	3	2 × 5	H <sub>2</sub> S (120), SO <sub>2</sub> , Cl <sub>2</sub>	
	141SC ‡	0.1~3.0 0.2~6.4	④ 2	Pale purple	Pale yellow		1	2 × 5	Sulphur dioxide, Hydrogen sulphide, Chlorine	
Carbon monoxide CO Concentration chart method	100	25~1,000 5~300	1 3	Yellow	Dark brown	Gas manufacture blast furnace, garage, car park, tunnel; atmospheric pollution survey, combustion of coal gas	3	10	Ethylene (5,000), H <sub>2</sub> (5,000), Acetylene, SO <sub>2</sub> or NO <sub>2</sub> (1/5 × CO *)	
Carbon monoxide-in presence of Ethylene, colour intensity CO	106B	Measurement for 30~300 seconds 10~1,000	1	Pale yellow	Green to Blue	Prediction of underground spontaneous combustion of coal	3	10	H <sub>2</sub> S (1,000), NO <sub>2</sub> (1), H <sub>2</sub> (10%)	
Carbon monoxide-in presence of Ethylene and Nitrogen oxides, colour intensity CO	106C	Measurement for 30~300 seconds 10~1,000	1	Pale yellow	Green to Blue	Gas manufacture blast furnace, garage, car park, tunnel; atmospheric pollution survey, prediction of underground spontaneous combustion of coal, leakage detection of coal gas, combustible gas analysis; organic syntheses	2	10	H <sub>2</sub> (10%), H <sub>2</sub> S (1,000)	50 (J) 25 (A) 30 (B)
Carbon monoxide CO	106S	10~250	3	Yellow	Dark brown	Gas manufacture blast furnace, garage, car park, tunnel; atmospheric pollution survey, combustion of coal gas	2	10	Ethylene (5,000), H <sub>2</sub> (5,000), C <sub>2</sub> H <sub>2</sub> (1/5 × CO *), SO <sub>2</sub> (1/5 × CO *), NO <sub>2</sub> (1/5 × CO *)	
	106SA	40~2,000 20~1,000	1/2 ①	Yellow	Dark brown	Gas manufacture blast furnace, garage, car park, tunnel; atmospheric pollution survey, prediction of underground spontaneous combustion of coal, leakage detection of coal gas, combustible gas analysis; organic syntheses	3	10	Ethylene or H <sub>2</sub> (5,000), Acetylene (1/5 × CO *), SO <sub>2</sub> (1/5 × CO *), NO <sub>2</sub> (1/5 × CO *)	
	106SC	1~50	1	Orange	Reddish purple		Formic acid, SO <sub>2</sub> , C <sub>2</sub> H <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> S	1	10	
	106SH	0.1~2.0%	1	White	Brown	Propane (0.15%), iso-Butane (0.2%), Hexane (0.1%), Acetylene (0.3%), Ethylene (0.15%)	1	10		
	106SS	30~500	1	Yellow	Dark brown	Acetylene (1/20 × CO *), SO <sub>2</sub> (1/2 × CO *), NH <sub>3</sub> (100 × CO *), H <sub>2</sub> S (1/2 × CO *)	1.5	10		

‡ This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).

\* Interfered by coexistence more than parenthesized rate.

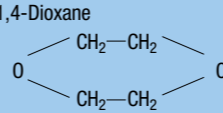
Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Carbon monoxide -ultra high range CO	106UH	0.2~20% 0.1~10%	1/2 ①	White	Dark brown	Insect control	3	10	Propane, iso-Butane, Acetylene, Ethylene, Hexane	50 (J) 25 (A) 30 (B)
Carbon tetrachloride (Tetrachloromethane) CCl <sub>4</sub>	147S ‡	5~60	1	White	Red	Paint manufacture, fire extinguishers waxes, polishes	1	2 × 5	Phosgene, Halogens, Cl <sub>2</sub> , Trichloroethylene, Halogenated hydrocarbons	5 (J.A) 2 (B)
Carbonyl sulphide COS	239S	5~60	1	Pink	Yellow	Process control in chemicals mfg.	3	2 × 5	SO <sub>2</sub> , CS <sub>2</sub> , H <sub>2</sub> S, n-Butane(0.1%)	5 (A)
Chlorine Cl <sub>2</sub>	109SA	1~40	1	White	Yellowish orange	Leakage detection in electrolytic soda plant; leakage detection & concentration control in synthetic rubber & plastics industry, refinery of titanium & aluminum; chlorinated hydrocarbons, synthetic chemistry, industrial hygiene	2	10	Br <sub>2</sub> (1), Cl <sub>2</sub> O (1), NO <sub>2</sub> (1/2 × Cl <sub>2</sub> *)	0.5 (J.A.B)
	109SB	0.5~10.0 0.125~2.5 0.1~2.0	① 4 5	White	Pale orange		2	10	Br <sub>2</sub> (1), ClO <sub>2</sub> (1), NO <sub>2</sub> (1/5 × Cl <sub>2</sub> *), NCl <sub>3</sub> (5)	
	109U	0.1~2 0.05~1	① 2	White	Pale purple	2	10	HCl (20 × Cl <sub>2</sub> *), NO <sub>2</sub>		
Chlorine dioxide ClO <sub>2</sub> Concentration chart method	116	1~20	1	White	Reddish orange	Leakage defection in textile & paper bleaching plant; water treatment	2	10	Br <sub>2</sub> , Cl <sub>2</sub> or NO <sub>2</sub> (1)	0.1 (A.B)
Chlorobenzene C <sub>6</sub> H <sub>5</sub> Cl	178SB	5~140 1~5	① 5	White	Pale brown	Industrial hygiene	2	2 × 5	Toluene, Xylene, CO (50), n-Hexane (100), Benzene, Ethyl benzene	10 (J.A) 1 (B)
Chloroform (Trichloromethane) CHCl <sub>3</sub>	152S ‡	70~500 35~250 23~167	② 3 4	White	Yellowish orange	Industrial hygiene (suspected carcinogen in humans)	2	2 × 5	Halogens, Halogenated hydrocarbons, n-Hexane (200)	3 (J) 10 (A) 2 (B)
Chloropicrin (Nitrotrichloromethane) Cl <sub>3</sub> CNO <sub>2</sub>	172S ‡	0.1~16.0 0.05~8.0	① 2	White	Pink	Industrial hygiene	1	2 × 5	Carbon tetrachloride, Phosgene	0.1 (J.A)
Chloroprene (2-Chlorobutadiene) CH <sub>2</sub> =CClCH=CH <sub>2</sub>	169S	1.0~20 0.5~10	1 ②	Greenish yellow	Pink		3	2 × 5	Cl <sub>2</sub> , HCl (2,000), Vinyl chloride, Acetylene, Ethylene	10 (A)
Cresol C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> )OH	183U	0.5~25.0	2	Pale yellow	Pale brown		2	10	NH <sub>3</sub> (200), Aliphatic amines (50), Aromatic hydrocarbons (50), Phenols (2.5)	5 (J) 20mg/m <sup>3</sup> (A)
Crotonaldehyde CH <sub>3</sub> CH=CHCHO	190U©	2~40	3	Yellow	Pale blue	Compound materials	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	
Cumene (Isopropylbenzene) C <sub>6</sub> H <sub>5</sub> CH(CH <sub>3</sub> ) <sub>2</sub>	111U©	20~140	1	Yellow	Brown	Organic synthesis intermediate; Fuel	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	50 (A) 25 (B)
Cyclohexane C <sub>6</sub> H <sub>12</sub>	115S	0.01~0.6%	1	Orange	Dark green	Fire hazard detection in paints industry & painting, extraction process of oils, fats, waxes	3	10	Paraffin hydrocarbons, Acetylene, Ethylene, Benzene (400), Toluene (800), Xylene (2,000)	150 (J) 100 (A.B)
Cyclohexanol C <sub>6</sub> H <sub>11</sub> OH	206U	5~500	2	Yellow	Pale blue	Process control in synthetic rubber industry	2	10	Other alcohols	25 (J) 50 (A.B)
Cyclohexanone 	197U	2~100	3	Yellow	Pale blue	Organic solvent treating, Industrial hygiene	3	10	Alcohols	20 (J.A) 10 (B)
Cyclohexene C <sub>6</sub> H <sub>10</sub>	111U©	20~300	1	Yellow	Brown	Medicament, synthetic intermediate	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	100(A)

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				Original	Stain					
Cyclohexyl amine C <sub>6</sub> H <sub>11</sub> NH <sub>2</sub>	105SD	1~20	1	Pale purple	Pale yellow	Organic synthesis; plasticizer; rubber processing; corrosion inhibitor; dye; dry-clean detergent; mfg. emulsifying agent	3	10	Amines	10 (A,B)
Decahydronaphthalene C <sub>10</sub> H <sub>18</sub>	111U©	20~200	1	Yellow	Brown	Solvent, adstergent, wax for floor	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
n-Decane CH <sub>3</sub> (CH <sub>2</sub> ) <sub>8</sub> CH <sub>3</sub>	111U©	5~90	1	Yellow	Brown	Organic synthesis intermediate; solvent, abstergent	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
Diacetone alcohol (4-Hydroxy-4-methyl-2-pentanone) (CH <sub>3</sub> ) <sub>2</sub> C(OH)CH <sub>2</sub> COCH <sub>3</sub>	190U©	10~250	3	Yellow	Pale blue	Fire hazard detection in paints Industry, industrial hygiene	2	10	Alcohols, Halogenated hydrocarbons, Paraffin hydrocarbons, Aromatic hydrocarbons, Esters	50 (A,B)
Diborane B <sub>2</sub> H <sub>6</sub>	242S	0.1~5.0 0.05~2.5 0.02~1.0	① 2 5	Pale yellow	Reddish purple	Industrial hygiene, semiconductor manufacturing process	2	10	Arsine, Phosphine, Silane, Disilane	0.01 (J) 0.1 (A)
Dibromomethane	157SB© ‡	2.5~40	1	White	Yellow		3	2 × 5		
Dibutyl amine (C <sub>4</sub> H <sub>9</sub> ) <sub>2</sub> NH	105SD©	2~20	1	Pale purple	Pale yellow	Mfg. dye	3	10	Amines	
o-Dichlorobenzene C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub>	214S	5~100	1	White	Yellow	Solvent insecticide, industrial hygiene	2	10	Alcohols, Praffin hydrocarbons, Halogenated hydrocarbons, Esters, Aromatic hydrocarbons	25 (J.A.B)
p-Dichlorobenzene C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub>	215S ‡	10~150	1	White	Purplish brown		1	10	Benzene, Toluene, Hexane	10 (J.A) 25 (B)
1,1-Dichloroethane (Ethylidene chloride) CH <sub>3</sub> CHCl <sub>2</sub>	235SA ‡	10~160	1	White	Purple	Industrial hygiene	1	3 × 5	Nitrogen oxides, Halogens, Halogenated hydrocarbons, Hexane (20), Alcohols (400), Toluene (20)	100(J.A.B)
1,2-Dichloroethane (Ethylidene dichloride) ClCH <sub>2</sub> CH <sub>2</sub> Cl	230SA ‡	5~50	1	White	Purple		1	3 × 5	Nitrogen oxides, Halogens, Halogenated hydrocarbons, Hexane (100)	10 (J.A) 5 (B)
2,2-Dichloroethyl ether (ClCH <sub>2</sub> CH <sub>2</sub> ) <sub>2</sub> O	223S	2~30	1	Yellowish green	Pink		1	2 × 5	Halogenated hydrocarbons	15 (J) 5 (A)
1,2-Dichloroethylene (Acetylene dichloride) CHCl=CHCl	145SA ‡	42~840 20~400 9.2~184 4.2~84	1/2 ① 2 4	Yellow	Red	Extraction of natural dyes; mfg. perfumes; paints industry & painting; ferment retardation, industrial hygiene	1	10	Vinyl chloride, Hydrogen chloride, Trichloroethylene, Cl <sub>2</sub>	150 (J) 200 (A,B)
Dichloromethane (Methylene chloride) CH <sub>2</sub> Cl <sub>2</sub>	180S ‡	30~1,000 10~200	② 4	White	Reddish orange	Industrial hygiene	2	2 × 5	Halogens, Halogenated hydrocarbons	50 (J.A) 100 (B)
1,2-Dichloropropane CH <sub>3</sub> CHClCH <sub>2</sub> Cl	157SB© ‡	20~250	1	White	yellow		3	2 × 5		10(A)
1,3-Dichloropropane ClCH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> Cl	194S ‡	10~500	1	White	Purple		1	2 × 5	Halogenated hydrocarbons	
1,3-Dichloropropene ClCH <sub>2</sub> CH=CHCl	249S	0.5~10	1	Greenish yellow	Pink	Fumigation in soil by the name of D-D	3	2 × 5	Chloropicrin (1,800), MITC (600)	1(A)
Dicyclopentadiene C <sub>10</sub> H <sub>12</sub>	190U©	2~60	3	Yellow	Pale blue	Mfg. EP rubber, unsaturated polyester resins, coating materials and perfume	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	5 (A)
Diethyl amine (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> NH	222S	1~20	1	Pale purple	Pale yellow	Industrial hygiene	3	10	NH <sub>3</sub> , Other amines	10 (J) 5 (A,B)

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				Original	Stain					
Diethylbenzene C <sub>6</sub> H <sub>4</sub> (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub>	111U©	10~180	1	Yellow	Brown	Organic synthesis intermediate; solvent, abstergent	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
Ethyl ether (Diethyl ether) C <sub>2</sub> H <sub>5</sub> OC <sub>2</sub> H <sub>5</sub>	107SA	0.04~1.4%	1	Orange	Dark green	Fire hazard detection in solvent extraction process, hospital, laboratory, organic syntheses, clinical laboratories, explosive mfg.	3	10	Acetylene (3%), Propane (0.2%), Other organic gases or vapours except Halogenated hydrocarbons (50)	400 (J.A) 100 (B)
	107U	20~400	1	Pale yellow	Pale blue		2	10	Alcohols, Ketones, Esters, Aromatic hydrocarbons	
Diisobutyl ketone [(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> ] <sub>2</sub> CO	139U©	20~1,000	1	Yellow	Pale blue		2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons, Halogenated hydrocarbons, Paraffin hydrocarbons	25 (A)
Diisopropyl amine [(CH <sub>3</sub> ) <sub>2</sub> CH] <sub>2</sub> NH	105SD©	1~16	1	Pale purple	Pale yellow	Dyestuffs, surfactant, herbicide	3	10	Amines	5 (A,B)
N,N-Dimethylacetamide CH <sub>3</sub> CON(CH <sub>3</sub> ) <sub>2</sub>	229S	5~70	2	Pale purple	Pale yellow	Solvents for chemical reaction, refinery and resins paint remover	1	10	CO <sub>2</sub> , NH <sub>3</sub> , Amines, Hydrazine	10 (J.A.B)
Dimethyl amine (CH <sub>3</sub> ) <sub>2</sub> NH	227S	1~20	1	Pale purple	Pale yellow	Industrial hygiene	3	10	NH <sub>3</sub> , Other amines	10 (J) 5 (A) 2 (B)
N,N-Dimethylaniline C <sub>6</sub> H <sub>5</sub> N(CH <sub>3</sub> ) <sub>2</sub>	105SD©	0.5~9	1	Pale purple	Pale yellow	Mfg. Vanillin; dye	3	10	Amines	5 (J.A.B)
Dimethyl ether (Methyl ether) CH <sub>3</sub> OCH <sub>3</sub>	123S	0.01~1.2%	1	Orange	Dark brown	Impurity test of Methyl chloride, process control, refrigeration	3	10	Acetylene (3%), Propane (0.2%), Other organic gases or vapours except Halogenated hydrocarbons	400 (B)
N,N-Dimethylformamide HCON(CH <sub>3</sub> ) <sub>2</sub>	196S	2~30 1~15	① 2	Pale purple	Pale yellow	Stationary phase of chromatography	2	10	SO <sub>2</sub> (200), CO <sub>2</sub> (0.1%), NH <sub>3</sub> , Amines, Hydrazine	10 (J.A.B)
1,4-Dioxane 	139SB©	0.05~2.5%	2	Orange	Brownish green	Fire hazard detection in paints industry & painting industry, industrial hygiene	3	10	Acetylene (3%), Propane (0.2%), Other organic gases or vapours except Halogenated hydrocarbons (50)	10 (J) 20 (A) 25 (B)
	119U©	20~500	1	Yellow	Pale blue		2	10	Alcohols, Toluene (500)	
Dipropyl amine [CH <sub>3</sub> (CH <sub>2</sub> ) <sub>2</sub> ] <sub>2</sub> NH	105SD©	1~14	1	Pale purple	Pale yellow	Synthesis intermediate	3	10	Amines	
Divinyl benzene C <sub>6</sub> H <sub>4</sub> (CHCH <sub>2</sub> ) <sub>2</sub>	158S©	5~50	1	White	Yellow	Ion exchange resin and membrane, synthetic rubber, etc.	3	10	Methanol (0.35%), Ethanol (0.18%), Ethyl acetate (700), Butyl acetate (700), Butadiene (5), Formaldehyde (15), Acetaldehyde (350), Acrylonitrile (400)	10 (A)
Epichlorohydrine (1-Chloro-2,3-epoxypropane) C <sub>3</sub> H <sub>5</sub> OCl	192S	5~50	3	Greenish yellow	Pink	Mfg. Epoxy resin, Chlorinated rubber, Glycerin	1	2 × 5	Halogenated hydrocarbons	0.5 (A,B)
Ethyl acetate CH <sub>3</sub> CO <sub>2</sub> C <sub>2</sub> H <sub>5</sub>	111SA	0.1~5.0%	1	Orange	Brownish green	Fire hazard detection in paints industry & painting, mfg, artificial leather artificial silk, perfumes & flavours, photographic films & plates	3	10	Acetylene (3%), Propane (0.2%), Other organic gases or vapours except Halogenated hydrocarbons (50)	200 (J.B) 400 (A)
	111U	10~1,000	1	Yellow	Brown		2	10	Other esters, Ketones, Alcohols, Aromatic hydrocarbons, Halogenated hydrocarbons	
Ethyl acrylate CH <sub>2</sub> =CHCO <sub>2</sub> C <sub>2</sub> H <sub>5</sub>	211U©	5~60	2	Yellow	Pale blue	Material of Acrylic resin	2	10	Alcohols, Paraffin hydrocarbons, Esters, Halogenated hydrocarbons, Aromatic hydrocarbons	5 (A,B)



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				Original	Stain					
Ethyl alcohol (Ethanol) C <sub>2</sub> H <sub>5</sub> OH	104SA	0.05~5.0%	1	Yellowish orange	Pale green	Fire hazard detection in hospital, laboratory, pharmaceutical industry, mfg. perfumes & cosmetics	3	10	Paraffin hydrocarbons, Alcohols, Esters, Ketones, Aromatic hydrocarbons, Halogenated hydrocarbons	1,000 (A,B)
Ethyl amine C <sub>2</sub> H <sub>5</sub> NH <sub>2</sub>	227S	1~20	1	Pale purple	Pale yellow	Industrial hygiene	3	10	Ammonia, Other Amines	10 (J) 5 (A) 2 (B)
Ethyl benzene C <sub>6</sub> H <sub>5</sub> C <sub>2</sub> H <sub>5</sub>	179S	10~500	1	White	Brown		1.5	10	Toluene (25), Xylene (50), Benzene (10), Methanol (1%), Hexane (0.1%)	50 (J) 20 (A) 100 (B)
Ethyl bromide C <sub>2</sub> H <sub>5</sub> Br	157SB <sup>‡</sup>	②~80 20~400	① 1/2	White	Yellow		3	2 × 5		5 (A)
Ethyl-tert-Butyl Ether (ETBE) C <sub>2</sub> H <sub>5</sub> O(CH <sub>3</sub> ) <sub>3</sub>	248U	1~60	3	Yellow	Pale Blue	Used for automobile fuel adding the ETBE in Gasoline	1	10	Ethanol	5 (A)
Ethyl cellosolve (Ethylene glycol monoethyl ether) (2-Ethoxyethanol) C <sub>2</sub> H <sub>5</sub> OCH <sub>2</sub> CH <sub>2</sub> OH	190U	5~500	3	Yellow	Pale blue	Organic solvent treating	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	5 (J) 10 (B)
Ethyl cellosolve acetate (Ethylene glycol ethyl ether acetate) CH <sub>3</sub> CO <sub>2</sub> CH <sub>2</sub> OC <sub>2</sub> H <sub>5</sub>	190U <sup>‡</sup>	5~150	3	Yellow	Pale blue		2	10		5 (J.A) 10 (B)
Ethylene -colour intensity H <sub>2</sub> C=CH <sub>2</sub>	108B	①0.5~100 0.1~20	① 5	Pale yellow	Blue	Coal mining safety; concentration control in ripening fruits; organics, mfg. plastics	3	10	CO, NO <sub>2</sub> (1), Cl <sub>2</sub> , Butane, Pentane, Acetylene, H <sub>2</sub> S (1,000), HCN, CS <sub>2</sub> , NH <sub>3</sub> , H <sub>2</sub> (10%)	200 (A)
Ethylene H <sub>2</sub> C=CH <sub>2</sub>	108SA	20~1,200	1	Yellow	Blue		2	10	CO, H <sub>2</sub> S, Acetylene, Propylene	
Ethylene H <sub>2</sub> C=CH <sub>2</sub>	108SC	1~200	4	Yellow	Blue	Used for fruits ripening control	2	2 × 5	Acetylene, CO, Propylene, H <sub>2</sub> S	
Ethylene dibromide (1, 2-Dibromoethane) BrCH <sub>2</sub> CH <sub>2</sub> Br	166S <sup>‡</sup>	1~50	1	White	Yellow	Concentration control in granary fumigation process	1	2 × 5	Halogens or Halogenated hydrocarbons, Hexane (200)	0.5 (B)
Ethylene glycol (Monoethylene glycol) HOCH <sub>2</sub> CH <sub>2</sub> OH	232SA	20~250 mg/m <sup>3</sup>	2	Pink	Yellow	Industrial hygiene	1.5	2 × 5	Ethylene oxide, SO <sub>2</sub> , Aldehydes, H <sub>2</sub> S	
	232SB	3~40 mg/m <sup>3</sup>	3	Pale pink	Yellow		2	2 × 5	Aldehydes, SO <sub>2</sub> , H <sub>2</sub> S	
Ethylene oxide CH <sub>2</sub> CH <sub>2</sub> O	122SA	1.0~4.0% ①0.01~1.8%	1/2 ①	Orange	Dark brown	Concentration control in fumigation of foodstuffs & textiles, fire hazard detection in ethylene glycol plant, sterilization	3	10	Alcohols, Ketones, Aromatic hydrocarbons, Esters, Halogenated hydrocarbons (0.5%)	1 (J.A) 5 (B)
	122SM	5~100	3	Pink	Yellow		3	10	Alcohols, Esters, Aromatic hydrocarbons	
	122SC	1~15	3	Pale pink	Yellow	Concentration control in fumigation & textiles	2	2 × 5	Aldehydes, SO <sub>2</sub> , H <sub>2</sub> S	
	122SD <sup>‡</sup>	0.7~14.0 ④0.1~2.0	1 ④	Yellow	Pale pink	Atmospheric pollution surveys in hospitals	1	2 × 5	Formaldehyde (0.5)	
	122SL	130~2,600 ①50~1,000	1/2 ①	Yellow	Pale blue	Concentration control in fumigation of foodstuffs & textiles, fire hazard detection in ethylene glycol plant, sterilization	3	10	Alcohols, Esters, Ethers, Ketones, Aromatic hydrocarbons, Aliphatic hydrocarbons(over C <sub>3</sub> ), Halogenated hydrocarbons	

<sup>‡</sup> This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).

Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Ethyl mercaptan (Ethanethiol) C <sub>2</sub> H <sub>5</sub> SH	165SA	4~160 ②2~80 1~40	1 ② 4	White	Yellow	Atmospheric pollution survey, concentration control of odorant, plastics manufactures	2	10	Methyl sulphide (1), NO <sub>2</sub> (1), Cl <sub>2</sub> (0.2)	0.5 (A,B)
	165SB	⑤~80 2.5~40	①/2 1	Yellow	Pink	In LP gas	2	10	H <sub>2</sub> S, PH <sub>3</sub> , Arsine, Hydrogen selenide, HCN, NO <sub>2</sub> , NH <sub>3</sub> , SO <sub>2</sub> , Other Amines	
	130U	1~10 ①0.5~5	1/2 ①	Pale Yellow	Pink	Industrial hygiene	2	10	Arsine, Hydrogen selenide, H <sub>2</sub> S, HCN	
Ethyl methacrylate CH <sub>2</sub> =C(CH <sub>3</sub> )CO <sub>2</sub> C <sub>2</sub> H <sub>5</sub>	111U <sup>‡</sup>	20~500	1	Yellow	Brown	Organic synthesis intermediate; mfg. synthetic resin, lubricant additive, rust-proof for metal, paper coating agent	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
Formaldehyde HCHO	171SA <sup>‡</sup>	20~1,500	1	Yellow	Pink	Atmospheric pollution survey, germicide, fungicide organic mfg. Industrial hygiene	2	2 × 5	Other aldehydes	0.1 (J) 2 (B)
	171SB	1~35	3	White	Brownish orange		3	2 × 5	Other aldehydes (1), Styrene, Ether (1,000), Ethyl acetate (1,000), Trichloroethylene (500)	
	171SC <sup>‡</sup>	⑤0.1~4.0 0.05~2.0	⑤ 10	Yellow	Pink		1	10	Acetaldehyde, NH <sub>3</sub> (10), NO <sub>2</sub> (3)	
Formic acid HCOOH	216S	1~50	1	Pale pink	Yellow	Mfg. organic medicine, industrial hygiene	3	10	SO <sub>2</sub> (1/20 × HCOOH), NO <sub>2</sub> (10), HCl (2 × HCOOH), Cl <sub>2</sub> (5), Acetic acid	5 (J.A,B)
Furan (Furfuran) HC=CH   > O HC=CH	122SA <sup>‡</sup>	0.2~2.0% ①0.01~0.9%	1/2 ①	Orange	Dark brown	Fire hazard detection in paints industry & painting	3	10	Aromatic hydrocarbons, Esters, Ketones, Alcohols, Halogenated hydrocarbons	
Furfural (2-Furaldehyde) HC=CH   > O HC=C — CHO	190U <sup>‡</sup>	2~60	3	Yellow	Pale blue	Materials of Nylon 66, insecticide	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	2.5 (J) 2 (A,B)
Furfuryl alcohol C <sub>4</sub> H <sub>3</sub> OCH <sub>2</sub> OH	238S	5~25	5	White	Black	Material of furan resin, resin denaturant, solvent, industrial hygiene	1	10		5 (J.B) 10 (A)
Gasoline (Petrol) C <sub>n</sub> H <sub>m</sub>	110S	0.05~0.6%	1	Orange	Dark green	Process control, industrial hygiene	3	10	Paraffin hydrocarbons, Acetylene, Ethylene, Cyclohexane, Benzene (400) Toluene (800), Xylene (2,000)	100 (J) 300 (A)
General hydrocarbons iso-C <sub>4</sub> H <sub>10</sub> , n-C <sub>5</sub> H <sub>12</sub> , n-C <sub>8</sub> H <sub>18</sub> , n-C <sub>6</sub> H <sub>14</sub>	187S	50~1,400	1	Orange	Yellowish green		2	10	Aromatic hydrocarbons	
Mineral turpentine										
Heptane CH <sub>3</sub> (CH <sub>2</sub> ) <sub>5</sub> CH <sub>3</sub>	113SB <sup>‡</sup>	100~2,000	1	Orange	Yellowish green	Industrial hygiene	2	10	Paraffin hydrocarbons, Aromatic hydrocarbons, Alcohols (6%), Ketones (6%), Esters (6%)	200 (J) 400 (A) 500 (B)
n-Hexane CH <sub>3</sub> (CH <sub>2</sub> ) <sub>4</sub> CH <sub>3</sub>	113SA	0.11~1.32% ①0.05~0.6%	1/2 ①	Orange	Dark green	Solvent recovery control & fire hazard detection in extraction of oils & fats, paints industry & painting	3	10	Paraffin hydrocarbons, Acetylene, Ethylene, Cyclohexane, Benzene (400) Toluene (800), Xylene (2,000)	40 (J) 50 (A) 20 (B)
	113SB	50~1,400	1	Orange	Yellowish green		2	10	Paraffin hydrocarbons, Aromatic hydrocarbons	
	113SC	20~800 ③5~200	1 ③	Yellow	Pale blue		2	10	Toluene	
Hydrazine (Amidrazone) NH <sub>2</sub> · NH <sub>2</sub>	219S	0.2~10 ④0.1~5 0.05~2.5	2 ④ 8	Yellow	Blue	Rocket fuel, corrosion protection of boiler, antioxidant	2	10	NH <sub>3</sub> , Amines	0.01 (A) 0.02 (B)

<sup>‡</sup> This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).



Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.	
				Original	Stain						
Hydrogen H <sub>2</sub>	137U	0.05~0.8%	1/2	Yellow	Green	Industrial hygiene	3	5	Ethanol (0.4%), CO (500)		
Hydrogen chloride HCl	173SA	40~1,200 ① 20~600	1/2	Purple	Pink	Industrial hygiene, process control, leakage detection, fire hazard detection; pharmaceuticals organics mfg.	2	2 × 5	SO <sub>2</sub> , Cl <sub>2</sub>	5 (J) 1 (B)	
	173SB	4~40 ① 2~20 0.4~4	1/2 5	Yellowish green	Pink		Cl <sub>2</sub>	3	2 × 5		
Hydrogen cyanide HCN	112SA	0.01~3.0%	1	Yellow	Brownish red	Concentration control in fumigation process	3	10	Acetone, CS <sub>2</sub> , SO <sub>2</sub> (200), H <sub>2</sub> S (100), Dicyanide	5 (J) 10 (B)	
	112SB	① 2~100 0.5~25	① 4	Yellow	Red	Electro-plating, metal hardening fumigation process, industrial hygiene	2	10	SO <sub>2</sub> (1), H <sub>2</sub> S (3), NH <sub>3</sub> (5)		
	112SC	① 0.3~8	① 3	Yellow	Red		2 × 5	SO <sub>2</sub> (1), PH <sub>3</sub> , H <sub>2</sub> S, NH <sub>3</sub> (2)			
Hydrogen fluoride HF	156S	③ 0.5~30 0.25~15 0.17~2	③ 6 9	Greenish yellow	Pink	Dehydrator, mfg. of Hydrofluoric acid, and Freon, industrial hygiene	3	10	Cl <sub>2</sub> , HCl	0.5 (J.A) 1.8 (B)	
Hydrogen peroxide H <sub>2</sub> O <sub>2</sub>	247S	‡ 0.5~10.0	5	White	Yellow	Mfg. bleach, industrial chemicals and medicine	1	10	HCHO (10)	1 (A.B)	
Hydrogen selenide H <sub>2</sub> Se	167S	① 5~600 1~120	① 5	Pale yellow	Dark brown	Doping gas analysis in mfg. semiconductor, industrial hygiene	1	10	Arsine (10), H <sub>2</sub> S, Iron carbonyl (10), SO <sub>2</sub> , Hg <sub>2</sub> , Acetylene (3%), CO (0.1%), Nickel carbonyl (10)	0.005 (J) 0.05 (A) 0.02 (B)	
	242S	① 1~20 0.5~10	① 2	Pale yellow	Reddish purple		2	10			
Hydrogen sulphide H <sub>2</sub> S	120SB	① 6~300 ③ 3~150 1~50 0.75~37.5	1/2 ① 3 4	White	Dark brown	Mfg. viscose rayon, oil refinery, metal refinery, gas manufacture, chemical laboratory, process control	3	10	SO <sub>2</sub> (12), Mercaptans (550), NO <sub>2</sub> (2)	5 (B) 1 (A),J	
	120SC	50~1,600	1	Pale yellow	Dark blue		Process control in sulphur recovery plant in petroleum refinery	3	10		CO (10), Ethylene, Propylene, Butylene, Acetylene or Methyl mercaptan (5), HCN, NH <sub>3</sub>
	120SD	① 2~60 ① 1~30	1/2 ①	White	Pale brown			3	10		SO <sub>2</sub> (10), Mercaptans (300), NO <sub>2</sub> (2)
	120SE	① 2~40 ① 1~20 0.5~10	1/2 ① 2	Yellow	Pink	2	10	PH <sub>3</sub> , Mercaptans, NH <sub>3</sub> , NO <sub>2</sub>			
	120SF	① 100~2,000 ① 50~1,000 25~500	1/2 ① 2	White	Black	Impurity test of industrial raw gases, chemicals mfg; metallurgy.	3	10	SO <sub>2</sub> (5,000), Mercaptans		
	120SH	① 0.1~4.0%	1	Pale blue	Black		3	10	SO <sub>2</sub> (0.5%)		
	120SM	① 0.1~1.2% ① 0.05~0.6%	1/2 ①	White	Dark brown	Process control in sulphur recovery plant in petroleum refinery	2	10	SO <sub>2</sub> (0.3%)		
	120U	① 0.2~6.0 ① 0.1~3.0	1/2 ①	Pale yellow	Pink	Industrial hygiene	2	10	Arsine, Hydrogen selenide, Mercaptans, PH <sub>3</sub> , HCN, SO <sub>2</sub>		
	Hydrogen sulphide -ultra high range H <sub>2</sub> S	120UH	2~20%	1/2	Pale blue	Black	Oil field (esp. oil well)	3	10		SO <sub>2</sub>
		120UT	① 5~40% ① 2.5~5%	1/2 1	Pale blue	Black		3	5		SO <sub>2</sub> (8%)

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				Original	Stain					
Hydrogen sulphide-Mercaptans -separation measurement H <sub>2</sub> S & R-SH	282S	H <sub>2</sub> S; 1~30 R-SH; 0.5~5	1	White	Pale brown		2	2 × 5	Tube for H <sub>2</sub> S; SO <sub>2</sub> (1/3 × H <sub>2</sub> S * ), NO <sub>2</sub> (1/5 × H <sub>2</sub> S * ) Tube for R-SH; NO <sub>2</sub> (2), NH <sub>3</sub> , H <sub>2</sub> S (30)	
				Pale yellow	Pink					
Isobutane (CH <sub>3</sub> ) <sub>3</sub> CH	113SB	50~1,200	1	Orange	Yellowish green	Industrial hygiene	2	10	Alcohols, Ketones or Esters (60%), Aromatic hydrocarbons, Paraffin hydrocarbons	
Isobutyl acetate CH <sub>3</sub> CO <sub>2</sub> CH <sub>2</sub> CH(CH <sub>3</sub> ) <sub>2</sub>	139SB	0.01~1.4%	2	Orange	Brownish green	Fire hazard detection in paints industry & painting; mfg. artificial leather, textile sizing compounds, printing inks	3	10	Acetylene (3%), Propane (0.2%), Other organic gases or vapours except Halogenated hydrocarbons (50)	150 (A.B)
	153U	10~400	1	Pale yellow	Pale blue		Industrial hygiene	1	10	
Isobutyl acrylate CH <sub>2</sub> CHCO <sub>2</sub> CH <sub>2</sub> CH(CH <sub>3</sub> ) <sub>2</sub>	211U	5~60	2	Yellow	Pale blue	Industrial hygiene	2	10	Alcohols, Paraffin hydrocarbons, Esters, Halogenated hydrocarbons, Aromatic hydrocarbons	
Isobutyl alcohol (Isobutanol) (CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> OH	208U	5~100	3	Yellow	Pale blue	Detergent of paint and varnish, mfg. Esters for fruit essence, industrial hygiene	2	10	Alcohols, Toluene	50 (J.A.B)
Isobutylene (CH <sub>3</sub> ) <sub>2</sub> C=CH <sub>2</sub>	113SB	0.03~2.0%	1	Orange	Yellowish green	Mfg. Butyl-rubber	2	10	Paraffin, Aromatic hydrocarbons, Alcohols (6%), Ketones (6%), Esters (6%)	
Isobutyric acid CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> COOH	216S	3~50	1	Pale pink	Yellow	Disinfectant; artificial flavour; substrate for perfume; tan processing	3	10	SO <sub>2</sub> (1/20 × Acetic acid * ), NO <sub>2</sub> (10), HCL (2 × Acetic acid * ), Cl <sub>2</sub> (5)	
Isopentyl acetate (Isoamyl acetate) CH <sub>3</sub> CO <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> (CH <sub>3</sub> ) <sub>2</sub>	188U	10~400	1	Pale yellow	Pale blue	Industrial hygiene	1	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	100 (J.B) 50 (A)
Isopentyl alcohol (Isoamyl alcohol) (CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> CH <sub>2</sub> OH	209U	5~100	3	Yellow	Pale blue	Stabilizer for Sodium thiosulphate hypo, industrial hygiene	2	10	Alcohols, Toluene	100 (J.A.B)
Isophorone C <sub>9</sub> H <sub>14</sub> O	197U	5~80	3	Yellow	Pale blue	Solvent; ink, paint, lacquer, adhesive, copolymer, lag, finish and biocide	3	10	Alcohols	
Isoprene CH <sub>2</sub> =C(CH <sub>3</sub> )CH=CH <sub>2</sub>	190U	1~16	3	Yellow	Pale blue	Industrial hygiene	2	10	Alcohols, Esters, Aliphatic hydrocarbons (over C <sub>3</sub> ), Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	
Isopropyl acetate CH <sub>3</sub> CO <sub>2</sub> CH(CH <sub>3</sub> ) <sub>2</sub>	139SB	0.01~1.2%	2	Orange	Brownish green	Fire hazard detection in paints industry & painting; mfg. artificial leather, plastic films, adhesives; recovery of acetic acid, industrial hygiene	3	10	Acetylene (3%), Propane (0.2%), Other organic gases or vapours except Halogenated hydrocarbons (50)	100 (J.A)
	111U	10~1,000	1	Yellow	Brown		File hazard detection in paints industry & painting	2	10	
Isopropyl alcohol (2-Propanol) CH <sub>3</sub> CH(OH)CH <sub>3</sub>	122SA	0.05~2.5%	1	Orange	Dark brown	Fire hazard detection in paints industry & painting; mfg. pharmaceuticals, cosmetics, perfumes, inks, leather dyes, antifreezes, hydraulic brake fluids; metal decreasing & drying: hospitals, laboratories	3	10	Other Alcohols, Ketones, Esters, Aromatic hydrocarbons, Halogenated hydrocarbons (0.5%)	400 (J) 200 (A)
	150U	① 50~1,200 ① 20~480	① 2	Yellow	Pale blue		Industrial hygiene	2	10	

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				Original	Stain					
Isopropyl cellosolve (CH <sub>3</sub> ) <sub>2</sub> HCO(CH <sub>2</sub> ) <sub>2</sub> COH	190U©	5~350	3	Yellow	Pale blue		2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	25 (A)
Isopropyl ether [(CH <sub>3</sub> ) <sub>2</sub> CH] <sub>2</sub> O	111U©	30~800	1	Yellow	Brown	Gunpowder, blast, dyestuff, solvent, abstergent, mfg. rubber cement, lens	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	250(A)
Isopropyl mercaptan (CH <sub>3</sub> ) <sub>2</sub> CHSH	130U	1~10 (0.5~5)	1/2 ①	Pale Yellow	Pink		2	10	Arsine, Hydrogen selenide, H <sub>2</sub> S, HCN	
Isopropylamine (CH <sub>3</sub> ) <sub>2</sub> CHNH <sub>2</sub>	222S©	1~12	1	Pale purple	Pale yellow		3	10		5 (A)
Isovaleric acid (CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> COOH	216S©	3~50	1	Pale pink	Yellow	Artificial flavour, perfume and medical uses	3	10	SO <sub>2</sub> (1/20 × Acetic acid *), NO <sub>2</sub> (10), HCL (2 × Acetic acid *), Cl <sub>2</sub> (5)	
Maleic anhydride C <sub>4</sub> H <sub>2</sub> O <sub>3</sub>	216S	0.2~10	4	Pale pink	Yellow	Material of polyester resin	3	10	SO <sub>2</sub> (1/20 × Acetic acid *), NO <sub>2</sub> (10), HCL (2 × Acetic acid *), Cl <sub>2</sub> (5)	0.1 (J) 0.01 mg/m <sup>3</sup> (A)
Mercury vapour Hg	142S	0.5~10 mg/m <sup>3</sup> 0.1~2.0 mg/m <sup>3</sup>	1 ⑤	Grey	Pale orange	Electrolytic soda industry; mfg. thermometer, fluorescent lamp	3	10	HCl (0.5), NO <sub>2</sub> (0.1), Cl <sub>2</sub> (0.1), H <sub>2</sub> S (0.5)	0.025 mg/m <sub>3</sub> (J.A)
Mesityl oxide (4-Methyl-3-penten-2-one) CH <sub>3</sub> COCH=C(CH <sub>3</sub> ) <sub>2</sub>	190U©	5~100	2	Yellow	Pale blue	Industrial hygiene	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	15 (A) 50 (B)
Methacrylic acid CH <sub>2</sub> =C(CH <sub>3</sub> )COOH	216S©	1~50	1	Pale pink	Yellow	Mfg. soluble polymer	3	10	SO <sub>2</sub> (1/20 × Acetic acid *), NO <sub>2</sub> (10), HCL (2 × Acetic acid *), Cl <sub>2</sub> (5)	20 (A.B)
1-Methoxy-2-propanol CH <sub>2</sub> CHOHCHOCH <sub>3</sub>	197U©	10~500	1	Yellow	Pale blue	Solvent; ink, lacquer, cellulose, dye, etc	3	10	Alcohols	100 (A)
Methyl acetate CH <sub>3</sub> CO <sub>2</sub> CH <sub>3</sub>	111SA©	0.1~3.0%	1	Orange	Dark green	Fire hazard deflection in paints industry & painting; mfg. perfumes dyes, synthetic finishes	3	10	Acetylene (3%), Propane (0.2%), Other organic gases or vapours, except Halogenated hydrocarbons	200 (J.A.B)
Methyl acrylate CH <sub>2</sub> =CHCO <sub>2</sub> CH <sub>3</sub>	211U	2~60	2	Yellow	Pale blue	Material of Acrylic resin, industrial hygiene	2	10	Alcohols, Esters, Paraffin hydrocarbons (over C <sub>3</sub> ), Aromatic hydrocarbons, Halogenated hydrocarbons	2 (A)
Methyl alcohol (Methanol) CH <sub>3</sub> OH	119SA	0.05~6.0%	1	Yellowish orange	Pale green	Fire hazard detection in hospital & laboratory; pharmaceutical industry; paints industry & painting; mfg. printing inks, denatured-alcohol, antifreezes, perfumes & cosmetics, industrial hygiene	3	10	Paraffin hydrocarbons (over C <sub>3</sub> ), Alcohols, Esters, Aromatic hydrocarbons, Halogenated hydrocarbons	200 (J.A.B)
	119U	20~1,000	1	Yellow	Pale blue		2	10	Alcohols, Esters, Aromatic hydrocarbons, Paraffin hydrocarbons, Halogenated hydrocarbons	
Methanol in LPG	119LPG	100~1,000 ppmv	1/2	Yellow	Blue or Yellowish green	For use of antifreezing agent in LP gas	3	10		

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				Original	Stain					
Methyl amine CH <sub>3</sub> NH <sub>2</sub>	227S	1~20	1	Pale purple	Pale yellow	Industrial hygiene	3	10	NH <sub>3</sub> , Other amines	10 (J) 5 (A)
N-Methyl aniline C <sub>6</sub> H <sub>5</sub> NHCH <sub>3</sub>	105SD©	0.5~6	2	Pale purple	Pale yellow	Acid acceptor; solvent	3	10	Amines	0.5 (A)
Methyl bromide (Bromomethane) CH <sub>3</sub> Br	157SA ‡	10~500	1	White	Reddish orange	Insect fumigation for mills, warehouses, ships, vaults, freight cars; concentration control in granary fumigation	3	2 × 5	Ethylene dibromide, Trichloroethylene, Tetrachloroethylene or Chloroform (50), Cl <sub>2</sub> , Br <sub>2</sub> or NO <sub>2</sub> (1), Dichloromethane (500)	1 (J.A) 5 (B)
	157SB ‡	2~80 1~25 0.4~10	① 2 4	White	Yellow		3	2 × 5	Halogens, Halogenated hydrocarbons, Hexane (200)	
	157SD	8.8~22 0.5~10 0.1~0.5	1/2 ① 3	White	Purple		1	2 × 5		
	157JS	3~70 g/m <sup>3</sup>	1/2	Yellow	Brown		2	2 × 10		
Methyl butyl ketone CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> COCH <sub>3</sub>	237S©	5~80	2	Yellow	Pale blue		2	10		5 (A)
Methyl cellosolve (Ethylene glycol monomethyl ether) (2-Methoxyethanol) CH <sub>3</sub> OCH <sub>2</sub> CH <sub>2</sub> OH	190U	5~500	3	Yellow	Pale blue	Organic solvent treating	2	10	Paraffin hydrocarbons (over C <sub>3</sub> ), Alcohols, Ketones, Aromatic hydrocarbons, Halogenated hydrocarbons, Esters	5 (J.B) 0.1 (A)
Methyl cellosolve acetate CH <sub>3</sub> CO <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> OCH <sub>3</sub>	190U©	3~120	3	Yellow	Pale blue		2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	5 (J.A)
Methyl chloroform (1,1,1-Trichloroethane) CH <sub>3</sub> CCl <sub>3</sub>	160S ‡	30~400 15~200	① 2	White	Reddish orange	Metal decreasing & cleaning, extraction of oils & fats, paints industry, industrial hygiene	3	2 × 5	Halogens, Halogenated hydrocarbons	200 (J) 350 (A) 100 (B)
Methyl cyclohexane C <sub>6</sub> H <sub>11</sub> CH <sub>3</sub>	113SB©	100~1,600	1	Orange	Yellowish green	Cellulose solvent	2	10	Paraffin, Aromatic hydrocarbons, Alcohols (6%), Ketones (6%), Esters (6%)	400 (J.A)
Methyl cyclohexanol CH <sub>3</sub> C <sub>6</sub> H <sub>10</sub> OH	199U	5~200	3	Yellow	Pale blue	Mfg. Imbricating oil & liquor, industrial hygiene	2	10	Alcohols	50 (J.A.B)
Methyl cyclohexanone CH <sub>3</sub> C <sub>6</sub> H <sub>9</sub> O	198U	2~100	3	Yellow	Pale blue	Industrial hygiene	2	10	Alcohols	50 (J.A.B)
Methyl ethyl ketone (2-Butanone) CH <sub>3</sub> COC <sub>2</sub> H <sub>5</sub>	122SA©	1.0~5.0% 0.05~2.2%	1/2 ①	Orange	Dark brown	Process control, synthetic resins, solvent; solvent recovery control & fire hazard detection in paint industry & extraction of oils, fats, natural resins, waxes; cleaning & decreasing of metal surface, denaturization of alcohol	3	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons, Halogenated hydrocarbons (0.5%)	200 (J.A.B)
	139SB	0.01~1.4%	2	Orange	Brownish green		3	10	Other organic gases or vapours except Halogenated hydrocarbons (50), Acetylene (3%), Propane (0.2%)	
	139U	20~1,500	1	Yellow	Pale blue	Process control, fire hazard detection in paints industry, esp. industrial hygiene	2	10	Other Esters, Ketones, Alcohols, Aromatic hydrocarbons, Halogenated hydrocarbons, Paraffin hydrocarbons	
Methyl iodide (Iodomethane) CH <sub>3</sub> I	176SC ‡	0.4~8 1~20 2.5~50	2 ① 1/2	White	Gray	Wood fumigation	1	10	1, 3-Dichloropropene, Hydrogen sulphide, Toluene	2 (A.B)
	176UH	500~15,000	1/2	Yellowish orange	Brownish green	Used for wood fumigation	3	10		

‡ This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).



Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Methyl isobutyl ketone (Isopropyl acetone) CH <sub>3</sub> COCH <sub>2</sub> CH(CH <sub>3</sub> ) <sub>2</sub>	122SAⒸ	0.01~0.6%	3	Orange	Dark brown	Solvent for gums, resins, nitrocellulose	3	10	Alcohols, Other Ketones, Aromatic hydrocarbons, Esters, Halogenated hydrocarbons	50 (J.B) 20 (A)
	155U	5~300	1	Yellow	Pale blue	Industrial hygiene	2	10	Alcohols, Esters, Aliphatic hydrocarbons (over C <sub>3</sub> ), Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	
Methyl isothiocyanate (MITC) CH <sub>3</sub> NCS	245UH	200~10,000	1	Yellowish orange	Pale green	Used for wood fumigation	3	10		
	245UL ‡	0.3~10 0.66~22	① 1/2	Pink	Yellowish orange	Soil fumigation	1	10	Carbon dioxide	
	245UM	25~1,500 10~600	1/2 ①	Pale yellow	Pale blue	Used for wood fumigation	1	10		
Methyl mercaptan (Methanethiol) CH <sub>3</sub> SH	164SA	5~140	1	White	Reddish yellow	Pesticides, fungicides, plastics, Atmospheric pollution survey, concentration control of odorant	2	10	Cl <sub>2</sub> (0.2), Methyl sulphide (1), Ethyl mercaptan, Acetylene, CO, Acetylene, H <sub>2</sub> S	0.5 (A.B)
	164SH	50~1,000	1	Pale yellow	Orange		3	10	H <sub>2</sub> S (650), NO <sub>2</sub> (1,000), Cl <sub>2</sub> (1/3 × CH <sub>3</sub> SH *)	
	130U	1~10 0.5~5	1/2 ①	Pale yellow	Pink		2	10	Arsine, Hydrogen selenide, H <sub>2</sub> S, HCN	
Methyl methacrylate CH <sub>2</sub> =C(CH <sub>3</sub> )CO <sub>2</sub> CH <sub>3</sub>	184S	10~160	1	Yellow	Pale blue	Pigment, adhesive, paintings	2	10	Esters, Ketones, Alcohols, Aromatic hydrocarbons	50 (A.B)
Methyl propyl ketone CH <sub>3</sub> CO(CH <sub>2</sub> ) <sub>2</sub> CH <sub>3</sub>	139U	20~1,500	1		Pale blue	Industrial hygiene	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons, Halogenated hydrocarbons, Paraffin hydrocarbons	
Methyl styrene CH <sub>3</sub> C <sub>6</sub> H <sub>4</sub> CH=CH <sub>2</sub>	193S	10~500	1	White	Yellow	Synthetic resin	3	10	Styrene	50 (A)
Monoethanol amine (2-Aminoethanol) HOC <sub>2</sub> H <sub>4</sub> NH <sub>2</sub>	224SA	1~50 0.5~25	① 2	Pink	Pale purple	Pesticide, solvent, abstergent	2	10	Other Amines, NH <sub>3</sub> , Hydrazine	3 (J.A) 1 (B)
Morpholine C <sub>4</sub> H <sub>9</sub> NO	105SDⒸ	2~22	1	Pale purple	Pale yellow	Solvent; rubber accelerator	3	10	Amines	20 (A) 10 (B)
Naphthalene C <sub>10</sub> H <sub>8</sub>	153UⒸ	10~100	1	Pale yellow	Pale blue	Industrial hygiene	1	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	2 (A)
Nickel carbonyl (Nickel tetracarbonyl) Ni(CO) <sub>4</sub> Concentration chart method	129	20~700	1	Pale yellow	Dark purple	Waste gas analysis	1/2	10	Arsine, Iron carbonyl, Mercury vapour, H <sub>2</sub> S or SO <sub>2</sub> (10), CO (1,000)	0.001 (J) 0.05 (A)
Nitric acid vapour HNO <sub>3</sub> ‡	233S	2~20 1~10	① 2	Pale yellow	Purple	Industrial hygiene	1	10	HF (8) or NO <sub>2</sub> (50), HCl	2 (J.A)
Nitrogen dioxide NO <sub>2</sub>	117SA	20~1,000	1	White	Yellowish orange	Arc welding, acid dipping, garage (diesel exhaust): waste gas analysis in sulphuric & nitric acid dipping of metal products	3	10	Cl <sub>2</sub> , Br <sub>2</sub> , I <sub>2</sub> or Ozone (5), NO (10)	0.2 (A)
	117SB	0.5~30.0	2	White	Yellowish orange		1	10	Cl <sub>2</sub> , Br <sub>2</sub> , or I <sub>2</sub> (2), NO (15)	
	117SD	0.1~1.0	3	White	Pale purple		1.5	2 × 5	O <sub>3</sub> (2), SO <sub>2</sub> (7), Cl <sub>2</sub> (3)	
Nitrogen oxide and dioxide -separately measurable NO & NO <sub>2</sub> Concentration chart method	174A	NO; 10~300	1	White	Yellowish orange	Exhaust gas analysis	2	5	Cl <sub>2</sub> (1)	25 (NO) (A) 3 (NO <sub>2</sub> ) (A)
	174B	NO <sub>2</sub> ; 1~40			Pale yellowish orange	Flue gas analysis (with hollow glass tubes)	2	2 × 5		
Nitrogen oxides NO + NO <sub>2</sub>	175SA	20~250	1	White	Yellow	Exhaust gas analysis	1	10	SO <sub>2</sub> (100), HCl (1,000)	
	175U	1~30 0.5~15	1/2 ①	White	Pale purple	Industrial hygiene	3	10	H <sub>2</sub> S (5), HCl (500)	
	175SH	100~2,500	1	White	Yellow	Exhaust gas analysis	2	10	HCl (500)	

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Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.	
				Original	Stain						
n-Nonane CH <sub>3</sub> (CH <sub>2</sub> ) <sub>7</sub> CH <sub>3</sub>	111UⒸ	10~160 5~80	1/2 ①	Yellow	Brown		2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	200(A)	
Organic gas checker	186		1	Orange	Black or Dark green		3	10	H <sub>2</sub> S (10)		
Oxygen O <sub>2</sub>	159SA	2~24%	1/2	White	Brown	Oxygen deficiency in underground or closed vessel, tunnels, mines	2	5	CO <sub>2</sub> (5%), H <sub>2</sub> S (2%), NO <sub>2</sub> (2%), SO <sub>2</sub> (2%)		
	159SB	2~24%	1/2	White	Brown	In the area where the danger of gas explosion exists	2	5			
Oxygen-Non-heating Type O <sub>2</sub>	159SC	3~24% 1.5~3%	①/2 1	Black	White	Oxygen deficiency in underground or closed vessels, tunnels and mines	2	2 × 5			
Oxygen - Carbon dioxide -separation measurement O <sub>2</sub> & CO <sub>2</sub>	281S	O <sub>2</sub> ; 2~10%	1	White	Brown	Combustion control	1.5	2 × 5		(CO <sub>2</sub> ) 5000 (J.A.B)	
		CO <sub>2</sub> ; 1~20%		Pink	Yellow						
Ozone O <sub>3</sub>	182SA	100~1,000 50~500	1/2 ①	Dark blue	Yellow	Process control	2	10	Cl <sub>2</sub> , NO <sub>2</sub>	0.1 (J) 0.05 (A)	
	182SB	10~100 5~50	1/2 ①	Blue	Pale yellow		2	10	NO <sub>2</sub> (10)		
	182U	0.15~3.0	1	Blue	White		Air pollution analysis, industrial hygiene	2	10		NO <sub>2</sub> (0.5), Cl <sub>2</sub> (10), Oxidant
		0.05~1.0 0.025~0.5	③ 6								
Pentane CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> CH <sub>3</sub>	113SBⒸ	50~1,000	1	Orange	Yellowish green	Industrial hygiene	2	10	Paraffin hydrocarbons, Aromatic hydrocarbons (over C <sub>3</sub> ), Alcohols (6%), Ketones (6%), Esters (6%)	300 (J) 600 (A.B)	
Pentyl acetate (Amyl acetate) CH <sub>3</sub> CO <sub>2</sub> (CH <sub>2</sub> ) <sub>4</sub> CH <sub>3</sub>	210U	10~200	3	Pale yellow	Pale blue (over 20ppm) Dark brown (less than 20ppm)	Material of Acrylic resin, industrial hygiene	2	10	Alcohols, Esters, Ketones, Aliphatic hydrocarbons, Aromatic hydrocarbons	100 (J) 50 (A.B)	
Pentyl amine CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> CH <sub>2</sub> NH <sub>2</sub>	105SDⒸ	2~22	1	Pale purple	Pale yellow	Dye; insecticide; synthetic detergent; corrosion inhibitor; medicine; petrol additive	3	10	Amines		
Phenol C <sub>6</sub> H <sub>5</sub> OH	183U	0.5~25.0	2	Pale yellow	Pale light brown Pale brown	Industrial hygiene	2	10	NH <sub>3</sub> (200), Aliphatic amines (50), Phenols (2.5), Aromatic amines (50)	5 (J.A) 2 (B)	
Phosgene (Carbonyl chloride) COCl <sub>2</sub> ‡	146S	0.5~20 0.1~4.0	① 5	White	Red	Leakage detection in mfg. dyes, chemicals, industrial hygiene	1	10	Cl <sub>2</sub> (5), HCl (10), NO <sub>2</sub> (100), SO <sub>2</sub> (0.2%)	0.1 (J.A) 0.02 (B)	
Phosphine in acetylene PH <sub>3</sub>	121SA †	20~800	1	Pale blue	Reddish purple	Impurity test of calcium carbide & acetylene	3	10	Arsine or H <sub>2</sub> S (10)	0.3 (J.A) 0.1 (B)	
	121SB †	5~90	1	Pale blue	Yellowish brown		3	10			

‡ This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).

† Air flow control orifice is required.

Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Phosphine PH <sub>3</sub>	121SC	40~1,400 20~700	1/2 ①	White	Yellow	Concentration control in fumigation of tobacco leaves & cereals, doping gas analysis in mfg. semiconductor, industrial hygiene	3	10	Arsine (30), Hydrogen selenide (50), H <sub>2</sub> S (40)	0.3 (J.A) 0.1 (B)
	121SD	1~20.0 0.5~10.0 0.25~5.0	1/2 ① 2	Pale orange	Brownish purple		1	10	NH <sub>3</sub> (20), Mercaptans, Hydrogen sulphide (50)	
	121SG	5~150	1	White	Yellow		3	10	H <sub>2</sub> S (5), H <sub>2</sub> Se (5)	
	121SH	200~3,200 100~1,600	1/2 ①	White	Orange		3	10	NO <sub>2</sub> , H <sub>2</sub> S, SO <sub>2</sub>	
	121SS	400~6,000 200~3,000	1/2 ①	White	Orange		3	10	Hydrogen cyanide (3%), Ammonia (0.6%)	
	121U	0.1~2.0 0.05~1.0	① 2	Pale yellow	Pink		2	10	Hydrogen selenide, Mercaptans, H <sub>2</sub> S, HCN, SO <sub>2</sub> , Arsine	
$\alpha$ -Pinene C <sub>10</sub> H <sub>16</sub>	158S <sup>⊕</sup>	20~300	1	White	Yellow	Materials for perfume and materia medica	3	10	Methanol (0.35%), Ethanol (0.18%), Ethyl acetate (700), Butyl acetate (700), Butadiene (5), Formaldehyde (15), Acetaldehyde (350), Acrylonitrile (400)	
1-Propanol CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> OH	190U <sup>⊕</sup>	20~300	3	Yellow	Pale blue		2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	100 (A)
Propane C <sub>3</sub> H <sub>8</sub>	125SA	0.02~0.50%	1	Orange	Brown	Mfg. city gas, fire hazard detection	2	10	Toluene, Hexane, Trichloroethylene	1,000 (A)
Propionic acid CH <sub>3</sub> CH <sub>2</sub> COOH	216S <sup>⊕</sup>	3~50	1	Pale pink	Yellow	Mfg. propionate and ester; Nickel-electro plating solution; ester perfume; artificial flavour; medicine; cellulose solvent	3	10	SO <sub>2</sub> (1/20 × Acetic acid *), NO <sub>2</sub> (10), HCL (2 × Acetic acid *), Cl <sub>2</sub> (5)	10 (A.B)
Propyl acetate CH <sub>3</sub> CO <sub>2</sub> (CH <sub>2</sub> ) <sub>2</sub> CH <sub>3</sub>	139SB <sup>⊕</sup>	0.01~1.4%	2	Orange	Brownish green	Fire hazard detection in paints industry & painting, mfg. flavours & perfumes	3	10	Other organic gases or vapours except Halogenated hydrocarbons, Acetylene (3%), Propane (0.2%)	200 (J.A.B)
	151U	20~1,000	1	Pale yellow	Dark brown	Paints industry & painting, mfg. flavours & perfumes, industrial hygiene	2	10	Alcohols, Esters, Ketones, Paraffin hydrocarbons, Aromatic hydrocarbons	
Propyl amine CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> NH <sub>2</sub>	105SD <sup>⊕</sup>	1~20	1	Pale purple	Pale yellow	Analgesic	3	10	Amines	
Propylene CH <sub>2</sub> =CHCH <sub>3</sub>	185S	50~1,000	1	Yellow	Dark blue	Leakage detection	2	10	CO (200), Acetylene (50), Ethylene, H <sub>2</sub> S (50)	500 (A)
Propylene glycol CH <sub>3</sub> CHOHCH <sub>2</sub> OH	122SC <sup>⊕</sup>	5~50	1	Pale pink	Yellow	Mfg. moisturizer, lubricant, emulsify, anti-freeze	2	10	Aldehydes, SO <sub>2</sub> , H <sub>2</sub> S	
Propylene oxide (1,2-Epoxypropane) CH <sub>3</sub> CHCH <sub>2</sub> / 0 /	122SC <sup>⊕</sup>	3~70	1	Pale pink	Yellow	Leakage detection in preparation of propylene oxide	2	2 × 5	Aldehydes, SO <sub>2</sub> , H <sub>2</sub> S	2 (J.A) 5 (B)
	163SA	1.0~5.0% 0.05~3.0%	1/2 ①	Orange	Dark brown		Aromatic hydrocarbons, Esters, Ketones, Alcohols, Halogenated hydrocarbons			
Propylene oxide	163SD <sup>‡</sup>	0.2~5.0	2	Yellow	Pale pink		1	2 × 5	Formaldehyde	

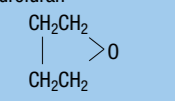
\* Interfered by coexistence more than parenthesized rate.

Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
n-Propyl mercaptan CH <sub>2</sub> CH <sub>2</sub> OH <sub>2</sub> SH	130U	1~10 0.5~5	1/2 ①	Pale yellow	Pink	Industrial hygiene	2	10	Arsine, Hydrogen selenide, H <sub>2</sub> S, HCN	
Pyridine C <sub>5</sub> H <sub>5</sub> N	105SD <sup>⊕</sup>	0.5~10	1	Pale purple	Pale yellow	Alcohol denaturant; solvent; paint; medical care; dye of fiber	3	10	Amines	1 (A) 5 (B)
Silane SiH <sub>4</sub>	240S <sup>‡</sup>	1~50 0.5~25	① 2	Yellow	Red	Industrial hygiene, semiconductor manufacturing process	1	10	PH <sub>3</sub> (20), Arsine (50), Disilane (2), Diborane (20)	100 (J) 0.5 (B)
	158S	5~300 2.5~150	① 2	White	Yellow		Fire hazard detection in synthetic rubber, resin & plastic industry	3	10	Methanol (0.35%), Ethanol (0.18%), Ethyl acetate (700), Butyl acetate (700), Butadiene (5), Formaldehyde (15), Acetaldehyde (350), Acrylonitrile (400)
Styrene (Vinyl benzene) C <sub>6</sub> H <sub>5</sub> CH=CH <sub>2</sub>	158SB	2~100 1~50	② 4	White	Yellow			3	2 × 5	
	103SA	0.1~3.0%	1	Yellow	Blue		Process control in sulphuric acid paint (chemical mfg.)	3	10	H <sub>2</sub> S (400)
Sulphur dioxide SO <sub>2</sub>	103SB	0.02~0.3%	1	White	Orange	Process control in sulphuric ore calcination	3	10	H <sub>2</sub> S (100)	
	103SC	20~300	1	Purple	Yellow	Metal refining, mfg. sulphuric acid & nitric acid; waste gas analysis	2	10	Cl <sub>2</sub> (1/5 × SO <sub>2</sub> *), NO <sub>2</sub> (100), H <sub>2</sub> S (100 × SO <sub>2</sub> *)	
	103SD	1~60	1	Pink	Yellow	Metal refining, mfg. sulphuric acid & nitric acid, industrial hygiene	3	10	NO <sub>2</sub> (1 × SO <sub>2</sub> *), Cl <sub>2</sub> (2 × SO <sub>2</sub> *)	2 (A)
	103SE <sup>‡</sup>	0.5~10 0.25~5	① 2	Pink	Yellow	Metal refining, mfg. sulphuric acid & nitric acid; waste gas analysis	1	10	NO <sub>2</sub> , HCl	
	103SF	0.02~0.3%	1	White	Orange	Flue gas analysis in heat power plant (with moisture control tube)	3	2 × 5	H <sub>2</sub> S (100)	
Sulphur dioxide-in carbondioxide SO <sub>2</sub>	103SG	0.5~25 0.1~3	① 4	Blue purple	White	Process control in beverage industry	3	10	NO <sub>2</sub> (0.5), H <sub>2</sub> S (0.5), NH <sub>3</sub> (1)	
Sulphuric acid H <sub>2</sub> SO <sub>4</sub>	244U	0.5~5 mg/m <sup>3</sup>	5	Yellow	Pink	Petrochemical industry, industrial hygiene	2	10	HCl, HF, NO <sub>2</sub> , Nitric acid, C <sub>12</sub>	0.2mg/m <sup>3</sup> (A)
Tetrachloroethylene (Perchloroethylene) Cl <sub>2</sub> C=CCl <sub>2</sub>	135SA <sup>‡</sup>	10~300 5~150	1/2 ①	White	Red	Dry cleaning, metal decreasing, paints industry & painting; solvent recovery control	2	10	Vinyl chloride, HCl, 1, 2-Dichloroethylene, Trichloroethylene, Cl <sub>2</sub>	25 (A) 50 (B)
	135SB <sup>‡</sup>	1~10 0.2~2.0	① 4	Pale orange	Blueish purple		1	10	Trichloroethylene, 1, 2-Dichloroethylene or HCl (2), Vinyl chloride (40)	
	135SG	0.2~2.0% 0.1~0.2%	① 2	White	Dark brown		2	2 × 5	Trichloroethylene, 1, 1, 1-Trichloroethane, 1, 2-Dichloroethylene, Vinyl chloride, CO, Aromatic hydrocarbons	
	135SM <sup>‡</sup>	125~1,250 50~500	1/2 ①	Yellow	Red		1	10	1,2-Dichloroethylene (10), Trichloroethylene (10)	
Tetraethoxysilane Si(OC <sub>2</sub> H <sub>5</sub> ) <sub>4</sub>	243U	12.5~200 5~80	1 ②	Yellow	Pale blue	Industrial hygiene	3	10	Silane, Phosphine (5), Isopropyl alcohol (7), Trichloroethylene, Tetrachloroethylene, Ethanol (10)	10 (J)

‡ This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).

\* Interfered by coexistence more than parenthesized rate.



Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Tetrahydrofuran 	102SA <sup>⊕</sup>	2.0~5.0% 0.2~3.0%	1/2 ①	Orange	Dark brown	Fire hazard detection in paints industry & painting petrochemical industry, Industrial hygiene	3	10	Alcohols, Esters, Ketones, Aromatic hydrocarbon	50 (J.A.B)
	162U	20~400	1	Pale Yellow	Pale blue		2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons, Halogenated hydrocarbons	
Tetrahydrothiophen C <sub>4</sub> H <sub>6</sub> S	190U <sup>⊕</sup>	4~100	3	Yellow	Pale blue	Odorant	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	
Toluene (Methyl benzene) C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>	124SA	10~500	1	White	Brown	Solvent recovery control & fire hazard detection in paints industry & painting; rubber & plastics industry; mfg. dyes, printing inks, adhesives, industrial hygiene	3	10	Benzene (10), Xylene (50), Methanol (1%), Hexane (0.1%), Ethyl benzene (10)	20 (J.A) 50 (B)
	124SB	2~100	1	White	Brown	Solvent recovery control	3	10	Aromatic hydrocarbons, Hexane (high conc.)	
	124SH	100~3,000	1	White	Dark brown	Solvent recovery control	2	10	Benzene, Xylene, Ethyl benzene, Hexane, Methanol	
o-Toluidine C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> )(NH <sub>2</sub> )	105SD <sup>⊕</sup>	2~22	1	Pale purple	Pale yellow	Dye; printing	3	10	Amines	1 (J) 2 (A)
p-Toluidine C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> )(NH <sub>2</sub> )	105SD <sup>⊕</sup>	2~20	1	Pale purple	Pale yellow	Analytical reagent; dye	3	10	Amines	2 (A)
1, 1, 2-Trichloroethane Cl <sub>2</sub> CHCH <sub>2</sub> Cl	236SA ‡	10~100	1	White	Purple	Industrial hygiene	1	3 × 5	Nitrogen oxides, Halogens, Halogenated hydrocarbons, Hexane (100)	10 (J.A)
Trichloroethylene Cl <sub>2</sub> C=CHCl	134SA ‡	10~300 5~150	1/2 ①	White	Red		2	10	Vinyl chloride, HCl, 1, 2-Dichloroethylene, Tetrachloroethylene, Cl <sub>2</sub>	10 (J.A) 100 (B)
	134SB ‡	2.3~36.8 1~16 0.2~3.2	1/2 ① 4	Pale orange	Blueish purple	Metal decreasing & cleaning; dry cleaning & insect fumigation of clothes; mfg. printing inks, industrial hygiene	1	10	Tetrachloroethylene, 1, 2-Dichloroethylene or HCl (2), Vinyl chloride (20)	
	134SG	0.05~2.0%	1	White	Yellow		2	10	Tetrachloroethylene, 1, 1, 1-Trichloroethane, 1, 2-Dichloroethylene, Vinyl chloride, CO, Aromatic hydrocarbons	
Triethyl amine (C <sub>2</sub> H <sub>5</sub> ) <sub>3</sub> N	213S	2~20 1~10	1/2 ①	Pale purple	Pale yellow	Mfg. emulsifier, organic solvent, waterproofing agent, dyestuff, surface activator and agricultural chemicals etc. industrial hygiene	3	10	NH <sub>3</sub> , Other Amines	1 (A) 2 (B)
Trimethyl amine (CH <sub>3</sub> ) <sub>3</sub> N	222S	1~20	1	Pale purple	Pale yellow	Industrial hygiene	3	10	NH <sub>3</sub> , Other Amines	5 (A) 2 (B)
	105SE	5~100 2.5~50 0.5~10	1/2 ① 5	Pale purple	Pale yellow		3	10	Sulphur dioxide, Chlorine, Amines	
1, 2, 4-Trimethyl benzene C <sub>6</sub> H <sub>3</sub> (CH <sub>3</sub> ) <sub>3</sub>	111U <sup>⊕</sup>	20~250	1	Yellow	Brown		2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	25 (J.A.B)
2, 2, 4-Trimethyl pentane (CH <sub>3</sub> ) <sub>3</sub> CCH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub>	113SB <sup>⊕</sup>	200~4,000 100~1,400	1/2 ①	Orange	Yellowish green	Automotive fuel	2	10	Paraffin, Aromatic hydrocarbons, Alcohols (6%), Ketones (6%), Esters (6%)	

‡ This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).

Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
n-Undecane CH <sub>3</sub> (CH <sub>2</sub> ) <sub>9</sub> CH <sub>3</sub>	111U <sup>⊕</sup>	10~140	1	Yellow	Brown		2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
n-Valeric acid CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> CO <sub>2</sub> H	216S <sup>⊕</sup>	3~70	1	Pale pink	Yellow	Artificial flavour; perfume; lubricant; plasticizer, medicine	3	10	SO <sub>2</sub> (1/20 × Acetic acid *), NO <sub>2</sub> (10), HCl (2 × Acetic acid *), Cl <sub>2</sub> (5)	
Vinyl acetate CH <sub>3</sub> CO <sub>2</sub> CH=CH <sub>2</sub>	237S	10~120 5~60	① 2	Yellow	Pale blue	Process control in Acetylene plant	2	10	Ethylene (150), Alcohols, Ethers, Esters	10 (A)
Vinyl chloride (Chloroethylene) CH <sub>2</sub> =CHCl	132SA	0.05~1.0%	1	Brownish orange	Brownish green	Leakage & fire hazard detection in PVC plant, industrial hygiene	3	10	Acetylene (3%), Propane (0.2%), Other organic gases or vapors except Halogenated hydrocarbons (50)	2.5 (J) 1 (A) 3 (B)
	132SB ‡	5~500	1	White	Reddish orange	Process control, leakage detection and fire hazard detection in synthetic rubber & plastics industry	1.5	2 × 5	Cl <sub>2</sub> , HCl, Other Halogens, Halogenated hydrocarbons	
	132SC	0.4~12.0 0.2~6.0 0.1~3.0	1 ② 4	Greenish yellow	Pink	Industrial hygiene	3	2 × 5	HCl (500), Acetylene (1%), Ethylene (300), Cl <sub>2</sub> (50)	
Water vapour H <sub>2</sub> O	177SA	1.7~33.8 mg/L	1	Yellowish green	Purple	Industrial hygiene, process control	3	10	Methanol (0.3%), Ethanol (0.3%), Ethyl acetate (0.3%), Acetone (0.5%), NH <sub>3</sub> (0.02%), NO <sub>2</sub> (0.2%)	3
	177U	0.05~2.0 mg/L	1	Greenish yellow	Blue (over 0.6mg/l) Yellowish green (less than 0.6mg/l)	Industrial hygiene, process control	3	10	Alcohols	
	177UL	3~80 LB/MMCF	1	Yellow	Blue (over 40LB/MMCF) Yellowish green (below 40LB/MMCF)	Petrochemical industry, industrial hygiene	3	10		
Water vapour -ultra low range H <sub>2</sub> O	177UR	2~12 LB/MMCF	2	Yellow	Yellowish green	Petrochemical industry, industrial hygiene	3	10		
Xylene (Dimethyl benzene) C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>	143SA	5~1,000	2	White	Brown	Leakage & fire hazard detection in phthalic acid plant; paints industry & painting mfg. dyes, adhesives, printing inks, cleaning fluids, industrial hygiene	1.5	10	Benzene, Toluene, Ethyl benzene, Methanol (1%), Hexane (0.1%)	50 (J.B) 100 (A)
	143SB	5~200	2	White	Brown		2	10	Toluene (1/5 × Xylene)	

‡ This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).

\* Interfered by coexistence more than parenthesized rate.

Notes: (1) Only compounds commonly occurring and affecting accurate readings are listed. Interferences are normally in proportion to the ratio of interfering compound to the substance to be measured. The figure listed after the interferences are "ppm" unless otherwise indicated.

(2) 2 × 5 in the Q'ty of tube/box column means 5 detector tubes and 5 pretreat tubes.

(3) 3 × 5 in the Q'ty of tube/box column means 5 detector tubes and 10 (in total) pretreat tubes.

(4) TLV.(J): Occupational Exposure Limits (OELs) recommended in Journal of Occupational Health issued by the Japan Society for Occupational Health.

TLV.(A): Threshold Limit Values for Chemical Substances in the Work Environment Adopted by ACGIH (American Conference of Governmental Industrial Hygienists) with Intended Changes for 2012.

TLV. (B): Occupational Exposure Limit listed on guidance Note EH40/2007 from the Health and Safety Executive in U.K.

## SUBSTANCES TO BE MEASURED BY USING CONVERSION CHARTS

Conversion charts are available, upon request, for the following listed chemical substances using existing detector tubes within the Kitagawa range.

These conversion charts are for use in a temperature of 20°C (68°F). Other conditions, such as different temperatures, humidity and coexisting gases, are not confirmed. Please specify the name of the substance to be measured together with the tube number when ordering.

SUBSTANCE	CHEMICAL FORMULA	MEASURING RANGE	USING TUBE
Allyl chloride	CH <sub>2</sub> CHCH <sub>2</sub> Cl	1-40 ppm	132SC
Benzyl chloride	C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> Cl	1-16 ppm	132SC
1-Bromopropane	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> Br	10-500 ppm	157SA
2-Bromopropane	(CH <sub>3</sub> ) <sub>2</sub> CHBr	10-500 ppm	157SA
m-Chlorotoluene	C <sub>6</sub> H <sub>4</sub> Cl(CH <sub>3</sub> )	0.5-10 ppm	132SC
o-Chlorotoluene	ClC <sub>6</sub> H <sub>4</sub> CH <sub>3</sub>	1-50 ppm	132SC
p-Chlorotoluene	ClC <sub>6</sub> H <sub>4</sub> CH <sub>3</sub>	1-50 ppm	132SC
p-Cymene	CH <sub>3</sub> C <sub>6</sub> H <sub>4</sub> CH(CH <sub>3</sub> ) <sub>2</sub>	20-200 ppm	102SD
1,1-Dichloroethylene	CH <sub>2</sub> = CCl <sub>2</sub>	1-22 ppm	132SC
Disilane	Si <sub>2</sub> H <sub>6</sub>	1-50 ppm	240S
Ethylene chlorohydrine	ClCH <sub>2</sub> CH <sub>2</sub> OH	5-300 ppm	119U
Iodine	I <sub>2</sub>	0.7-42 ppm	117SB
Mineral turpentine	—	4-200 ppm	111U
Trichlorotoluene	C <sub>6</sub> H <sub>5</sub> CCl <sub>3</sub>	0.2-4 ppm	132SC
* Benzaldehyde	C <sub>6</sub> H <sub>5</sub> CHO	5-70 ppm	190U
* 1,1,2,2-Tetrachloroethane	CHCl <sub>2</sub> CHCl <sub>2</sub>	20-80 ppm	236SA

☆ N.B. For the above two substances, the conversion chart and the measuring range may vary with each manufacturing lot.

## SPECIAL APPLICATION TUBES

### COMPRESSED BREATHING AIR TEST SYSTEM

The system is designed to measure impurities in compressed breathing air such as in scuba and rescue cylinders, as well as from an outlet of an air-charge compressor.

#### ● Compressed Breathing Air Test Tubes

Substances to be measured	Tube No.	Measuring Range (ppm)	Sampling Time (minutes)	Colour Change		Shelf Life (year)	Q'ty of tubes / box
				Original	Stain		
Carbon monoxide (CO)	600SP	5~100 2.5 ~ 5	② 4	Yellow	Dark brown	2	10
Carbon dioxide (CO <sub>2</sub> )	601SP	100~3,000	2	Purplish blue	Pale pink	2	10
Oil mist	602SP	0.3~5mg/m <sup>3</sup>	25	Yellow	Pale blue	2	10
Water vapour (H <sub>2</sub> O)	603SPA	20~160mg/m <sup>3</sup>	1	Yellow	Yellowish green or blue	3	10
Oxygen (O <sub>2</sub> )	※ 604SP	2~24%	1	White	Brown	2	10

※ A 50mL plastic syringe and a 1m vinyl tube are optional accessories for 604SP.

#### ● Model P-41R Compressed Breathing Air Sampling Kit

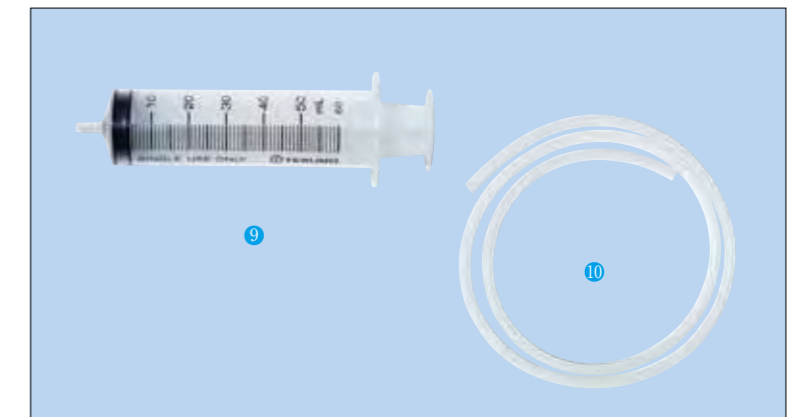


#### Composition

- ① Control assembly ..... 1 set  
(Including an adapter with W22-14RH Female thread for rescue and on-land cylinders) ..... 1 pc
- ② International fitting yoke (For a scuba cylinder) ..... 1 pc
- ③ Gas detector tube (an extra option) ..... 1 pc
- ④ Tube protector ..... 1 pc
- ⑤ Tip cutter for Gas detector tube ..... 1 pc
- ⑥ Wrench ..... 1 pc
- ⑦ Digital stopwatch ..... 1 pc
- ⑧ Carrying case (Aluminum) ..... 1 pc
- Instruction manual ..... 1 set

#### Optional Accessories for 604SP only

- ⑨ 50mL plastic syringe
- ⑩ 1m vinyl tube

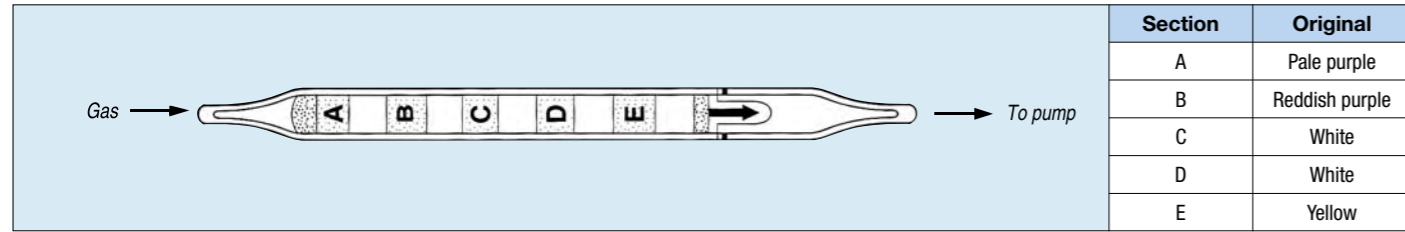




**INORGANIC GAS/ORGANIC GAS QUALITATIVE DETECTOR TUBES**

Our new qualitative-analysis-detector-tube system is composed of only two (2) kinds of gas detector tubes which contain different reagents at multiple sections in the tubes.  
Only these tubes are able to detect various kinds of gases.  
Although the main purpose of this system is qualitative analysis, simple quantitative analysis of the gases is also possible.

**Inorganic Gas Qualitative Detector Tube (Tube No 131)**



**Specifications**

- ① Tube/box : 10 tubes (10-time use)
- ② Pump stroke : 1 (100mL)
- ③ Sampling time : 20 seconds
- ④ Shelf life : 1 year

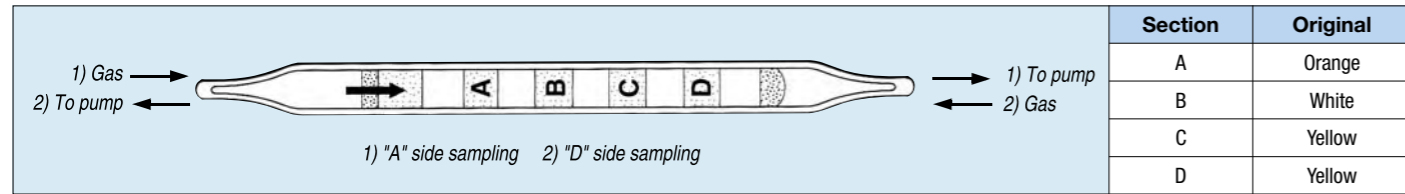
**Substances to be detected and the detectable gas concentration limit (Unit: ppm) (※ Organic gas)**

NH<sub>3</sub> (5)      SO<sub>2</sub> (10)      HCl (20)      Acetic acid (15) ※      CO (10)      Acetylene (10) ※  
Amines (50)      Cl<sub>2</sub> (5)      NO<sub>2</sub> (5)      H<sub>2</sub>S (10)      PH<sub>3</sub> (2)      Methyl mercaptan (10) ※

**Non-discoloration confirmed substances**

HCN    Ethylene    CO<sub>2</sub>    NO

**Organic Gas Qualitative Detector Tube (Tube No 186B)**



The "A" side sampling at the arrow mark direction and the "D" side sampling at an inverse direction of the arrow mark are required by using two fresh tubes for one-time analysis.

**Specifications**

- ① Tube/box : 10 tubes (5-time use)
- ② Pump stroke : 1 (100mL) +1 (100mL)
- ③ Sampling time : 30+30 seconds
- ④ Shelf life : 2 years

**Substances to be detected and the detectable gas concentration limit (Unit: ppm) (※ Inorganic gas)**

Hexane (10)      Acetylene (100)      Ethylene oxide (100)      CS<sub>2</sub> (100)  
Propane (100)      Gasoline (0.1 mg/L)      Methyl mercaptan (20)      Phenol (10)  
Butane (10)      Kerosine (0.1 mg/L)      Toluene (200)      Cresol (20)  
Pentane (10)      Benzene (100)      Ethyl benzene (400)      Aniline (50)  
Heptane (10)      Acetone (500)      Xylene (1,000)      Ethyl amine (100)  
1,1,1-Trichloroethane (1,000)      Methyl ethyl ketone (100)      Styrene (100)      Arsine (20) ※  
Trichloroethylene (100)      Methyl isobutyl ketone (100)      Methyl alcohol (100)      H<sub>2</sub>S (10) ※  
Tetrachloroethylene (100)      Formaldehyde (10)      1-Butanol (100)      CO (100) ※  
Vinyl chloride (10)      Acetaldehyde (100)      Isopropyl alcohol (500)  
Ethylene (10)      Ethyl acetate (500)      Ethyl cellosolve (100)  
Butadiene (1,000)      Butyl acetate (100)      Tetrahydrofuran (100)

**Non-discoloration confirmed substances**

CH<sub>3</sub>Br    Acetic acid    Methane    CCl<sub>4</sub>    Pyridine

**DETECTOR TUBES USED FOR DISSOLVED SUBSTANCES IN SOLUTION**

Tube No.	Substance	Chemical Formula	Measuring Range (ppm)	Sampling		Sampling Method	Colour Change		Typical Applications	Shelf Life (year)	Use of detector kit
				Volume (mL)	Time (sec)		Original	Stain			
200SA	Sulphide ion	S <sup>2-</sup>	2~1,000	over 5.0	180	Immersion method	White	Dark brown	Waste water analysis in pulp & paper mills, petroleum refineries, other chemical industries, waste disposal plants, water treatment plant	1	None needed
200SB			0.5~10	over 5.0	150		White	Pale brown		2	
201SA	Chloride ion	Cl <sup>-</sup>	10~2,000	over 5.0	90	Immersion method	Brown	Pale yellow	Detection of salt water in marine lubricating oils, impurity test, testing portable water supply	3	None needed
201SB			3~200	over 5.0	90		Brown	White		2	
201SC			1~60	over 5.0	180		Brown	Pale yellow		2	
203S	Copper ion	Cu <sup>2+</sup>	1~100mg/L	over 5.0	60	Direct sampling method	White	Orange	Waste water analysis in pulp & paper mills, petroleum refineries, other chemical industries, waste disposal plants, water treatment, school hygiene	1	Rubber ball (As extra)
204S	Cyanide ion	CN <sup>-</sup>	0.2~5	over 5.0	120 to 240	Direct sampling method	White	Blue	KCN & NaCN in water	2	Rubber ball (As extra)
205SL	Salinity	NaCl	0.01~0.8%	over 5.0	30	Suction method	Brown	White	Detection of salt water in marine lubricating oils, impurity test, testing portable water supply	2	Filter paper/ Rubber ball (As extra)
234SA	Free residual chlorine	Cl <sub>2</sub>	0.4~5	over 5.0	180	Immersion method	White	Purple	Detection of dissolved chlorine for disinfection & sterilization of swimming pools, etc.	2	None needed
77S	Water content in solvent	H <sub>2</sub> O	10~160mg/L 50~400mg/L	Position C D	10 10	Direct sampling method	Yellow	Blueish purple	Detection of water content in solvent	2	Rubber bulb

Quantity of tubes per box:10 tubes each.

**INDOOR AIR POLLUTANTS MEASUREMENT DETECTOR TUBE**

Tube No.	Gas to be measured	Chemical Formula	Measuring Range (ppm)	Sampling		Colour Change		Typical Applications	Shelf Life (year)
				Flow Rate (mL/min)	Time (minutes)	Original	Stain		
710 ‡	Formaldehyde	HCHO	0.01-0.12	300	30	Yellowish orange	Pink	Indoor air pollutants	1
710A ‡			0.04-0.48	300	10	Yellowish orange	Pink		1
713 ‡			0.05-1.0	30	30	Yellowish orange	Pink		1
721 ‡	Toluene	C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>	0.05-1.0	200	20	White	Brown	Indoor air pollutants	1
721© ‡	Ethyl benzene	C <sub>6</sub> H <sub>4</sub> (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub>	0.05-1.2						1
721© ‡	Xylene	C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>	0.1-1.4						1
730	p-Dichlorobenzene	p-C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub>	0.01-0.40	200	15	Yellow	Reddish purple	Indoor air pollutants	1

‡ This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).  
 Quantity of tubes per box:20 tubes(Tube No.721, 730: 2 × 10 tubes).  
 Model S-23E or S-27 Air Sampler is required for above tubes (See page 35).

**ATMOSPHERIC ENVIRONMENT MEASUREMENT DETECTOR TUBE**

Tube No.	Gas to be measured	Chemical Formula	Measuring Range (ppm)	Sampling		Colour Change		Typical Applications	Shelf Life (year)
				Flow Rate (mL/min)	Time (minutes)	Original	Stain		
740	Nitrogen dioxide	NO <sub>2</sub>	0.01-0.1 0.02-0.2	200 200	20 10	White	Reddish purple	1 Atmospheric environment measurement	2
750	Trichloroethylene	Cl <sub>2</sub> C = CHCl	30-400 g/m <sup>3</sup> 69-920 g/m <sup>3</sup>	100	30 15	Yellowish orange	Purple red		1
760	Tetrachloroethylene	Cl <sub>2</sub> C = CCl <sub>2</sub>	30-400 g/m <sup>3</sup> 69-920 g/m <sup>3</sup>	100	30 15	Yellowish orange	Purple red		1
770	Hydrogen fluoride	HF	0.05-1.0	250	10	Pale yellow	Pink	Industrial hygiene	2

Quantity of tubes per box:10 tubes each.(Tube No.750, 760: 2 × 10 tubes)  
 Model S-23E or S-27 Air Sampler is required for above tubes (See page 35).

**TIME WEIGHTED AVERAGE TUBES**

Tube No.	Gas to be measured	Chemical Formula	Measuring Range (ppm)	Sampling		Colour Change		Typical Applications	Shelf Life (year)	T.L.V T.W.A (ppm) J: JPN A: U.S.A B: U.K.
				Flow Rate (mL/min)	Time (hours)	Original	Stain			
500	Carbon monoxide	CO	5-400	6	0.5-8	White	Brown ringed	Industrial hygiene	3	50 (J.B) 25 (A)
501	Ammonia	NH <sub>3</sub>	5-200	8	1-8	Purple	Yellow		3	25 (J.A.B)
502	Hydrogen Sulphide	H <sub>2</sub> S	1-20	6	1-8	White	Brown		1	5 (J.A.B)
503	Sulphur dioxide	SO <sub>2</sub>	0.5-20	6	1-8	Purple	Yellow		3	2 (A.B)
504	Toluene	C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>	20-200	10	1-8	White	Brown		3	50 (J.A.B)

Quantity of tubes per box:10 tubes each.  
 TLV-TWA(The Threshold Limit Value-Time Weighted Average): The time-weighted average concentration for an 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

**SUPER-HIGH SENSITIVITY DETECTOR TUBES FOR AMMONIA IN ART GALLERIES/MUSEUMS AND CLEAN ROOMS**

Tube No.	Gas to be measured	Chemical Formula	Measuring Range	Sampling		Colour Change		Typical Applications	Shelf Life (year)
				Flow Rate (mL/min)	Time (hours)	Original	Stain		
900NHH	Ammonia	NH <sub>3</sub>	10-80 g/m <sup>3</sup>	400	60	Pale purple	Pale yellow	For Cultural-property protection in art galleries and museums	2
901NHL	Ammonia	NH <sub>3</sub>	1-12 g/m <sup>3</sup>	400	60	Pale purple	Pale yellow	For clean room monitoring of semiconductor industries	2
910	Organic acid	Acetic acid CH <sub>3</sub> COOH	10-400 g/m <sup>3</sup> 25-1000 g/m <sup>3</sup>	200	60	Pale pink	Pale yellow	For Cultural-property protection in art galleries and museums	3
		Formic acid HCOOH	20-800 g/m <sup>3</sup>	200	30				
				200	60				

Quantity of tubes per box:10 tubes each.  
 Model S-23E or S-27 Air Sampler is required for above tubes (See page 35).

**CRIMINAL INVESTIGATION DETECTOR TUBE**

Tube No.	Detector Tube	Chemical Formula	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes / box
					Original	Stain			
290P	Detector tube for crime investigation			1	White	[Gasoline]Brown/dark brown/orange [Kerosene]Pink/dark brown	Discriminate Gasoline and/or Kerosene	1	10
290P II	Detector tube for crime investigation			1	White	[Gasoline]Yellow/brown/greenish brown [Kerosene]Brown/pale pink/pale brown		2	10
290CN ‡	Hydrogen cyanide in blood	HCN	2-30mg/L	1	Yellow	Red	Screening test for cause identification of one's death	2	2 × 5
290CO †	Carbon monoxide in blood	CO	20-90%COHb	1	Yellow	Blackish brown		1	2 × 5
290EA †	Ethyl alcohol in blood	C <sub>2</sub> H <sub>5</sub> OH	0.2-2.0mg/mL	3	Pink	Pale blue		1	2 × 5
290HS ‡	Hydrogen sulphide in blood	H <sub>2</sub> S	0.1-1.0 g/mL	1	Pale yellow	Pink		1	2 × 5
290PQ	Paraquat dichloride in blood-qualitative	CH <sub>3</sub> (C <sub>6</sub> H <sub>4</sub> N) <sub>2</sub> CH <sub>3</sub> Cl <sub>2</sub>		—	White	Blue		3	10

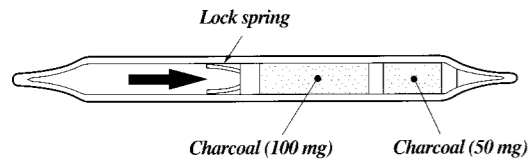
‡ This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).  
 † Air flow control orifice is required.



## COLLECTION TUBES

### CHARCOAL TUBE (Tube No. 800B)

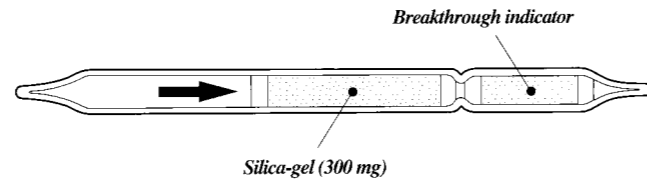
Useful for sampling organic solvent vapours in air with personal sampler for industrial hygiene (Conformed to NIOSH requirements)  
Two Sections System 100mg + 50mg



※ Quantity of tubes per box: 20 tubes

### SILICA GEL TUBE (Tube No. 801)

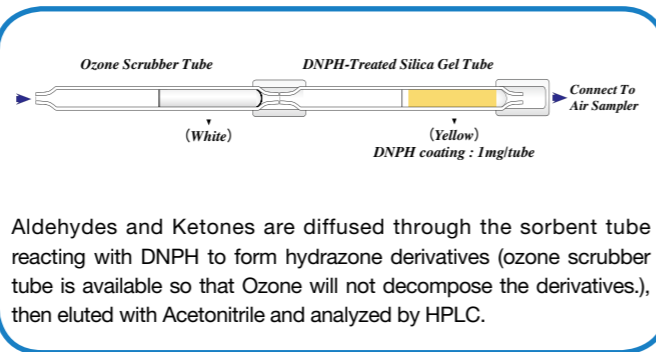
Useful for sampling polar solvent vapours which cannot be collected by Charcoal tube such as Methanol  
One Section System 300mg with Breakthrough indicator



※ Quantity of tubes per box: 10 tubes

### DNPH-TREATED SILICA GEL SORBENT TUBE For sampling for airborne levels of Aldehydes and Ketones (Tube No. 810 ‡)

Ideal for analysis by High Performance Liquid Chromatography (HPLC). The special sorbent tube contains silica gel crystals treated with 2,4-Dinitrophenylhydrazine (DNPH), designed to collect Formaldehyde, MEK and other Aldehydes and Ketones in indoor and industrial atmospheres, when used in conjunction with an air sampling pump.



Aldehydes and Ketones are diffused through the sorbent tube reacting with DNPH to form hydrazone derivatives (ozone scrubber tube is available so that Ozone will not decompose the derivatives.), then eluted with Acetonitrile and analyzed by HPLC.

### CHARACTERISTICS

- Stable and low blank value enable high performance analysis.
- Determine low concentration quantity with low sampling volume.
- High sampling volume.  
e.g. max. sampling flow rate (200mL/min) enables collection of 10ppm HCHO at 30 minutes.
- No breakthrough from coexisting Aldehydes.
- Identical condition can be applied for all sampling, from low to high concentration.
- Ozone scrubber (Tube No. 820) removes 1ppm O<sub>3</sub>.

‡ This tube must be stored in a refrigerated place (0-10 °C/32-50 °F).

## SPECIAL DETECTORS & ACCESSORIES

### Model SH-5N/SH-10N Rubber Extension Hose

Available in 5 metre (SH-5N) and 10 metre (SH-10N) lengths, for remote sampling with aspirating pump Model AP-20. Useful for drawing samples from inaccessible and confined areas such as manholes, sumps, ship holds, warehouses, tanks, process pipes, etc.



### Model SR-200R Extension Sampling Rod

Used with aspirating pump Model AP-20, for vertical and horizontal gas detection in unreachable positions of up to 2 metres.



### Model AS-1/AS-2 Air Flow Indicator

To determine velocity and direction of air flow; Model AS-1 for spot tests, Model AS-2 for continuous measurement and No. 301 for tubes only (10 tubes/box).



### Model AS-3 Extension Air Flow Indicator

Consists of dry batteries and pump attached on the handle of the extension rod for continuous air flow check up to 2 metres (Non-explosion proof type).



### Model SFH-01 Hot-Air Prove holder

SF-40

SFH-01

AP-20



This is to fix the connection between AP-20 and SF-40. It is available up to 600 degrees centigrade.



## SPECIAL DETECTORS & ACCESSORIES

### Model SA-10 One-hand Operation Switch

For one handed operation whilst working on a ladder, in high places or narrow spaces, sampling is available by pushing down the switch knob. (Can be attached to Model AP-1 and 400 pumps)



### Model SF-40 Hot-air Probe

Where hot sample is measured like emission gas from gas fittings or automobiles, this probe at 40 cm in length is available.



### Model SPG-1N Sampling Probe for gases in Soil

Chlorinated organic solvents in soil can be sampled through this probe at 1 metre in length. Digging tools to make a hole in soil are not included.



Applied aspirating pump:  
Model AP-20  
Applied detector tubes:  
1) No.134SA  
Trichloroethylene:5-300ppm  
2) No.134SB  
Trichloroethylene:1-16ppm  
3) No.135SA  
Tetrachloroethylene:5-300ppm  
4) No.135SB  
Tetrachloroethylene:1-10ppm  
5) No.160S  
1,1,1-Trichloroethane:15-400ppm  
(Methyl chloroform)

### Model B-191 Tip Cutter

Tips can be cut from the detector tubes and collected within this clear plastic container to prevent scattering.



### Model SS-100 100ml Glass Syringe

This is available for the measurement of high temperature gas or for diluting high concentration gas.



### Model P-10FG Flue Gas Sampler

Composed of a ribbon heater, stainless steel sampling probe, suction pump, Model AP-20 aspirating pump and carrying case. No. 174B (NO & NO<sub>2</sub>), No. 175SA (NO<sub>x</sub>), No. 175SH (NO<sub>x</sub>), No. 103SF (SO<sub>2</sub>), No. 106SA (CO), No. 126SH (CO<sub>2</sub>), No. 173SA (HCl) and No. 159SC (O<sub>2</sub>) tubes are useful with this sampler.



## SPECIAL DETECTORS & ACCESSORIES

### Model S-23E Air Sampler



#### SPECIFICATIONS

Model	S-23E
Air pump	Diaphragm
Maximum suction pressure	More than 40 kPa (At full load)
Gas sampling control mode	Time mode : Automatic pump stop by timer presetting (Accumulated volume indication available) Accumulated mode : Automatic pump stop by accumulated volume (Suctioning time indication available)
Display	Digital display by LCD
Measuring and display at momentary flow	Flow setting by needle valve Measuring range : 0.00-1.10L Minimum display : 0.01L
Measuring and display at sampling flow	Measuring range : 0.00-9999L Minimum display : 0.01L
Time setting range (Revolution)	Measuring range : 00.00-99.59 (hour, minute) Minimum display : 1min. Remaining time display: Display subtraction/addition (Preset value when shipped from factory is subtraction)
Operating temperature	0-40°C
Power supply voltage	AC100V 50/60Hz (AC220V as extra option)
Main body dimensions	130 (W) x 270 (H) x 283 (D) mm
Main body weight	Approx. 4kg
Height for measuring	930mm(without detector tube and connecting tube) 1,000-1,050mm (with detector tube)

### Model S-27 Air Sampler



#### SPECIFICATIONS

Model	S-27
Air pump	Double diaphragm
Range of flow volume setting	0.100-0.500L/min.
Range of flow volume display	0.000-0.750L/min
Time setting / display	Year / Month / Date / Time
Built-in flow meter	Mass-flow sensor
Operating temperature / humidity	0-40°C, 10-90%RH (without water condensation)
Power supply	Lithium Ion secondary battery (option) Alkaline AA size battery AC adaptor (option)
Size	145 (w) x 95 (H) x 67 (D)mm (without projection part)
Weight	0.65kgs (including Alkaline AA size battery)
Standard accessory	Model DB-10N Battery unit for Alkaline battery Suction holder for low flow volume

Options  
Model LI-10N Battery unit  
Model CX-200 Tripod  
Model QC-10N Quick charger  
Suction inlet set  
Model PA-1203 AC adaptor  
Model VFE-3 Filter element (5pcs/set)  
Soft case  
Communication cable with software

### P-50/UFO- II H

Harmful Gas Detector for Disaster Relief



During a disaster, the rescue team may be at risk from invisible toxic gases. The Harmful Gas Detector for Disaster Relief can measure toxic gas levels easily and quickly at the disaster scene.

#### Composition of P-50

· Gas Aspirating Pump (AP-20B) · Rubber extension hose (5m) · Tip Cutter (B-191)  
· Container for used detector tubes · Accessories · Carrying case  
· Instruction manual · Gas qualitative flow chart (Organic gas)  
· Gas qualitative flow chart (Inorganic gas) · 131 · 186B

#### Composition of UFO- II H

20 sets of gas detector tubes as following are added to P-50 as standard.

#### ● For Inorganic gases

Ammonia 105SB Hydrogen sulphide 120SB Carbon monoxide 106SA  
Hydrogen cyanide 112SB Carbon disulphide 141SA Carbon dioxide 126SA  
Chlorine 109SB Sulphur dioxide 103SD Hydrogen chloride 173SB  
Hydrogen selenide 167S Phosgene 146S Hydrogen fluoride 156S  
Nitro-oxide compound 174A Nitric acid vapour 233S

#### ● For Organic gases

Toluene 124SA Acetylene 101S Methyl alcohol 119SA  
Ethylene oxide 122SA Methyl amine 227S Chloroform 152S



## SPECIAL DETECTORS & ACCESSORIES

### MODEL TWS-201 TUBE WARMING SYSTEM

The MODEL TWS-201 TUBE WARMING SYSTEM is designed for measuring gases and vapours in low temperature conditions (down to -20°C).

When the inside of the bag of MODEL TWS-201 TUBE WARMING SYSTEM is heated with the hot packs, gas detector tubes are brought up to their operating temperature.

The system enables gases and vapours to be measured to the same accuracy as in ordinary temperature conditions.

Enables usage of the Detector Tube System in cold conditions

#### Operation



#### Composition

- ① Bag
- ② Hot pack (×2)
- ③ Detector tube holder
- ④ Connection tube
- ⑤ Thermometer

### DETECTOR SCOPE, DS-110W



- DS-110W is compact, light-weighted, and magnifies the scale of the gas detector tube for the easy check.
- DS-110W has the lighting function by the dry battery, and it employs the energy-saving method that means the light turns on when the gas detector is inserted and turns off when the gas detector tube is removed.

Lighting method : LED x 2 pcs  
 Power supply : "AA" size dry battery x 2 pcs  
 Continual usage time : Approx. 70 minutes (with Alkaline dry battery)  
 Weight : Approx. 115g (Not including dry batteries)

## SPECIAL DETECTORS & ACCESSORIES

Chlorine solvent which is used in the industry of cleaning and semiconductor causes an environmental problem to the public water system and underground water. It is easy to measure the concentration of solvent in the drainage by measuring the head space gas by P-20 and P-24AP.

### Model P-20 Simple Measurement Set for Chlorocarbons in Drainage



P-20 includes : Resinous gas collector, one collecting bottle and thermometer

### Model P-24AP Simple Measurement Set for Chlorocarbons in Drainage



P-24AP includes : AP-20 Aspirating pump, four collecting bottles, thermometer and carrying case

### Available gas detector tubes with Model P-20 and P-24AP

Chemical name	Detector tube used	Measuring range
Dichloromethane	180S	2 ~ 54 mg/L
Carbon tetrachloride	147S	0.1 ~ 1.0 mg/L
1,2-Dichloroethane	230SA	0.3 ~ 3.7 mg/L
1,1-Dichloroethylene	132SC	0.01 ~ 0.27 mg/L
cis-1,2-Dichloroethylene	145S	0.1 ~ 2.7 mg/L
1,1,1-Trichloroethane	160S	0.67 ~ 9.0 mg/L
1,1,2-Trichloroethane	236SA	1.4 ~ 5.6 mg/L
Trichloroethylene	134SB	0.03 ~ 0.47 mg/L
Tetrachloroethylene	135SB	0.03 ~ 0.27 mg/L
1,3-Dichloropropene	132SC	0.02 ~ 0.5 mg/L
Benzene	118SC	0.1 ~ 1.5 mg/L

# NUMERICAL INDEX OF KITAGAWA DETECTOR TUBES

Tube No.	Detector Tube	Tube No.	Detector Tube	Tube No.	Detector Tube	Tube No.	Detector Tube
77S	Water content in solvent	109SB	Chlorine	120SE	Hydrogen sulphide	133A	Acetaldehyde
100	Carbon monoxide-length of stain	109U	Chlorine	120SF	Hydrogen sulphide	133SB	Acetaldehyde
101S	Acetylene	110S	Gasoline	120SH	Hydrogen sulphide	134SA	Trichloroethylene
102SA	Acetone	111SA	Ethyl acetate	120SM	Hydrogen sulphide	134SB	Trichloroethylene
102SA©	Tetrahydrofuran	111SA©	Methyl acetate	120U	Hydrogen sulphide	134SG	Trichloroethylene
102SC	Acetone	111U	Ethyl acetate	120UH	Hydrogen sulphide-ultra high range	135SA	Tetrachloroethylene
102SD	Acetone	111U	Isopropyl acetate	120UT	Hydrogen sulphide-ultra high range	135SB	Tetrachloroethylene
103SA	Sulphur dioxide	111U©	tert-Butanol	121SA	Phosphine in acetylene	135SG	Tetrachloroethylene
103SB	Sulphur dioxide	111U©	Butyl ether	121SB	Phosphine in acetylene	135SM	Tetrachloroethylene
103SC	Sulphur dioxide	111U©	Butyl methacrylate	121SC	Phosphine	136	Acrolein
103SD	Sulphur dioxide	111U©	tert-Butyl methyl ether	121SD	Phosphine	137U	Hydrogen
103SE	Sulphur dioxide	111U©	Cumene	121SG	Phosphine	138U	Butyl acetate
103SF	Sulphur dioxide-in flue gas	111U©	Cyclohexene	121SH	Phosphine-high range	139SB	Methyl ethyl ketone
103SG	Sulphur dioxide	111U©	Decahydronaphthalene	121SS	Phosphine	139SB©	Butyl acetate
104SA	Ethyl alcohol	111U©	n-Decane	121U	Phosphine	139SB©	1,4-Dioxane
105SA	Ammonia	111U©	Diethyl benzene	121U	Arsine	139SB©	Isobutyl acetate
105SB	Ammonia	111U©	Ethyl methacrylate	122SA	Ethylene oxide	139SB©	Isopropyl acetate
105SC	Ammonia	111U©	Isopropyl ether	122SA©	Furan	139SB©	Propyl acetate
105SD	Ammonia	111U©	n-Nonane	122SA©	Isopropyl alcohol	139U	Methyl ethyl ketone
105SD©	Butyl amine	111U©	1,2,4-Trimethyl benzene	122SA©	Methyl ethyl ketone	139U	Methyl propyl ketone
105SD	Cyclohexyl amine	111U©	n-Undecane	122SA©	Methyl isobutyl ketone	139U©	Diisobutyl ketone
105SD©	Dibutyl amine	112SA	Hydrogen cyanide	122SC	Ethylene oxide	140SA	Arsine
105SD©	Diisopropyl amine	112SB	Hydrogen cyanide	122SC©	Propylene glycol	※141SA	Carbon disulphide
105SD©	N,N-Dimethylaniline	112SC	Hydrogen cyanide	122SC©	Propylene oxide	141SB	Carbon disulphide
105SD©	Dipropyl amine	113SA	n-Hexane	122SD	Ethylene oxide-low range	141SC	Carbon disulphide
105SD©	n-Methyl aniline	113SB	n-Hexane	122SL	Ethylene oxide	142S	Mercury vapour
105SD©	Morpholine	113SB©	Isobutylene	122SM	Ethylene oxide	143SA	Xylene
105SD©	Pentyl amine	113SB©	Methyl cyclohexane	123S	Dimethyl ether	143SB	Xylene
105SD©	Propyl amine	113SB©	2,2,4-Trimethyl pentane	124SA	Toluene	145SA	1,2-Dichloroethylene
105SD©	Pyridine	113SB©	Heptane	124SB	Toluene	146S	Phosgene
105SD©	o-Toluidine	113SB©	Isobutane	124SH	Toluene	147S	Carbon tetrachloride
105SD©	p-Toluidine	113SB©	Pentane	125SA	Propane	150U	Isopropyl alcohol
105SE	Ammonia	113SC	n-Hexane	126B	Carbon dioxide	151U	Propyl acetate
105SE	Trimethyl amine	114	Bromine	126SA	Carbon dioxide	152S	Chloroform
105SH	Ammonia	115S	Cyclohexane	126SB	Carbon dioxide	153U	Isobutyl acetate
105SM	Ammonia	116	Chlorine dioxide	126SF	Carbon dioxide	153U©	Naphthalene
106B	Carbon monoxide-in presence of ethylene, colour intensity	117SA	Nitrogen dioxide	126SG	Carbon dioxide	155U	Methyl isobutyl ketone
106C	Carbon monoxide-in presence of ethylene and/or nitrogen oxides, colour intensity	117SB	Nitrogen dioxide	126SH	Carbon dioxide-extra high range	156S	Hydrogen fluoride
		117SD	Nitrogen dioxide	126UH	Carbon dioxide-ultra high range	157JS	Methyl bromide
		118SB	Benzene-in the presence of gasoline and the other aromatic hydrocarbons	128SA	Acrylonitrile	157SA	Methyl bromide
				128SB	Acrylonitrile	157SB	Methyl bromide
106S	Carbon monoxide	118SC	Benzene	128SC	Acrylonitrile	157SB©	Bromochloromethane
106SA	Carbon monoxide	118SD	Benzene	128SD	Acrylonitrile	157SB©	Bromoform
106SC	Carbon monoxide	118SE	Benzene-in presence of gasoline and the other aromatic hydrocarbons	129	Nickel carbonyl	157SB©	1-Bromopropane
106SH	Carbon monoxide			130U	tert-Butyl mercaptan	157SB©	2-Bromopropane
106SS	Carbon monoxide	119SA	Methyl alcohol	130U	Ethyl mercaptan	157SB©	Dibromomethane
106UH	Carbon monoxide-ultra high range	119LPG	Methanol in LPG	130U	Isopropyl mercaptan	157SB©	1,2-Dichloropropane
107SA	Diethyl ether	119U	Methyl alcohol	130U	Methyl mercaptan	157SB©	Ethyl bromide
107U	Diethyl ether	119U©	1,4-Dioxane	130U	n-Propyl mercaptan	157SD	Methyl bromide
108B	Ethylene-colour intensity	120SB	Hydrogen sulphide	131	Inorganic gas qualitative detector tube	158S	Styrene
108SA	Ethylene-high range	120SC	Hydrogen sulphide-in presence of sulphur dioxide	132SA	Vinyl chloride	158S©	Divinyl benzene
108SC	Ethylene			132SB	Vinyl chloride	158S©	α -Pinene
109SA	Chlorine	120SD	Hydrogen sulphide	132SC	Vinyl chloride	158SB	Styrene

# NUMERICAL INDEX OF KITAGAWA DETECTOR TUBES

Tube No.	Detector Tube	Tube No.	Detector Tube	Tube No.	Detector Tube	Tube No.	Detector Tube
159SA	Oxygen	190U	Ethyl cellosolve	216S©	n-Valeric acid	600SP	Compressed breathing air test (CO)
159SB	Oxygen	190U	Methyl cellosolve	219S	Hydrazine	601SP	Compressed breathing air test (CO2)
159SC	Oxygen-Non-heating type	190U©	1-Butanol	221SA	n-Butane	602SP	Compressed breathing air test (Oil mist)
160S	Methyl chloroform	190U©	Butyl cellosolve	222S	Diethyl amine	603SPA	Compressed breathing air test (H2O)
162U	Tetrahydrofuran	190U©	Diacetone alcohol	222S	Trimethyl amine	604SP	Compressed breathing air test (O2)
163SA	Propylene oxide	190U©	Ethyl cellosolve acetate	222S©	Isopropylamine	710	Formaldehyde-Indoor air quality
※163SD	Propylene oxide	190U©	Furfural	223S	2,2-Dichloroethyl ether	710A	Formaldehyde-Indoor air quality
164SA	Methyl mercaptan	190U©	Isoprene	224SA	Monoethanol amine	713	Formaldehyde
164SH	Methyl mercaptan	190U©	Mesityl oxide	227S	Dimethyl amine	721	Toluene-Indoor air quality
165SA	Ethyl mercaptan	190©	Crotonaldehyde	227S	Ethyl amine	721©	Ethyl benzene
165SB	Ethyl mercaptan	190©	Dicyclopentadiene	227S	Methyl amine	721©	Xylene-Indoor air quality
165SB	tert-Butyl mercaptan	190©	Isopropyl cellosolve	229S	N,N-Dimethylacetamide	730	p-Dichlorobenzene-Indoor air quality
166S	Ethylene dibromide	190©	Methyl cellosolve acetate	230SA	1,2-Dichloroethane	740	Nitrogen dioxide-Indoor air quality
167S	Hydrogen selenide	190©	1-Propanol	232SA	Ethylene glycol	750	Trichloroethylene
168SA	1,3-Butadiene	190©	Tetrahydrothiophen	232SB	Ethylene glycol	760	Tetrachloroethylene
168SB	1,3-Butadiene	192S	Epichlorohydrine	233S	Nitric acid vapour	770	Hydrogen fluoride
168SC	1,3-Butadiene	193S	Methyl styrene	234SA	Free residual chlorine	800B	Charcoal tube
168SE	1,3-Butadiene	194S	1,3-Dichloropropane	235SA	1,1-Dichloroethane	801	Silica-gel tube
169S	Chloroprene	196S	N,N-Dimethylformamide	236SA	1,1,2-Trichloroethane	810	DNPH Collection tube
171SA	Formaldehyde	197U	Cyclohexanone	237S	Vinyl acetate	820	Ozone scrubber
171SB	Formaldehyde	197U©	Isophorone	237S©	Methyl butyl ketone	900HH	Ammonia in art galleries/museums
171SC	Formaldehyde	197U©	1-Methoxy-2-propanol	238S	Furfuryl alcohol	901NHL	Ammonia in clean room
172S	Chloropicrin	198U	Methyl cyclohexanone	239S	Carbonyl sulphide	910	Organic acid
173SA	Hydrogen chloride	199U	Methyl cyclohexanol	240S	Silane		
173SB	Hydrogen chloride	200SA	Sulphide ion	242S	Diborane		
174A	Nitro-oxide compound	200SB	Sulphide ion	242S©	Hydrogen selenide		
174B	Nitro-oxide compound-in flue gas	201SA	Chloride ion	243U	Tetraethoxysilane		
175SA	Nitrogen oxides	201SB	Chloride ion	244U	Sulphuric acid		
175SH	Nitrogen oxides	201SC	Chloride ion	245UH	Methyl isothiocyanate		
175U	Nitrogen oxides	203S	Copper ion	245UL	Methyl isothiocyanate		
176SC	Methyl iodide	204S	Cyanide ion	245UM	Methyl isothiocyanate		
176UH	Methyl iodide	205SL	Salinity	247S	Hydrogen peroxide		
177SA	Water vapour	206U	Cyclohexanol	248U	Ethyl-tert-Butyl Ether		
177U	Water vapour	208U	Isobutyl alcohol	249S	1,3-Dichloropropene		
177UL	Water vapour	209U	Isopentyl alcohol	280S	Acetylene·Ethylene		
177UR	Water vapour-ultra low range	210U	Pentyl acetate		-separation measurement		
178SB	Chlorobenzene	211U	Butyl acrylate	281S	Oxygen·Carbon dioxide		
179S	Ethyl benzene	211U	Methyl acrylate		-separation measurement		
180S	Dichloromethane	211U©	Ethyl acrylate	282S	Hydrogen sulphide·Mercaptans		
181S	Aniline	211U©	Isobutyl acrylate		-separation measurement		
182SA	Ozone	213S	Triethyl amine	290CN	Hydrogen cyanide in blood		
182SB	Ozone	214S	o-Dichlorobenzene	290CO	Carbon monoxide in blood		
182U	Ozone	215S	p-Dichlorobenzene	290EA	Ethyl alcohol in blood		
183U	Cresol	216S	Acetic acid	290HS	Hydrogen sulphide in blood		
183U	Phenol	216S	Formic acid	290PQ	Paraquat dichloride in blood-qualitative		
184S	Methyl methacrylate	216S©	Acetic anhydride	290P	Detector tube for crime investigation		
184S©	Allyl alcohol	216S©	Acrylic acid	290PII	Detector tube for crime investigation		
185S	Propylene	216S©	Butyric acid	301	Air flow indicator tube		
186	Organic gas checker	216S©	Isobutyric acid	500	TWA-Carbon monoxide		
186B	Organic gas qualitative detector tube	216S©	Isovaleric acid	501	TWA-Ammonia		
187S	General hydrocarbons	216S©	Maleic anhydride	502	TWA-Hydrogen sulphide		
188U	Isopentyl acetate	216S©	Methacrylic acid	503	TWA-Sulphur dioxide		
189U	2-Butanol	216S©	Propionic acid	504	TWA-Toluene		



## The gas detector tube has many applications and many advantages which other analysis methods do not have.

- (1) Measurement of working environment: The gas detector tube is used for measuring quickly concentrations of harmful gases and vapours in the working environment and for grasping their concentration distributions in work sites. It is also used for the measurement of comparatively thick harmful gases or vapours in open tanks, painting rooms, plating tanks electrolytical cells, storage sheds and gas leaking places, and the efficiency of local exhaust systems, overall ventilators and air purifiers.
- (2) Measurement for the environmental sanitation of buildings and offices: In a closed room, the concentrations of harmful gases, such as carbon monoxide and carbon dioxide, are increased by respiration of human bodies. Measuring the efficiency of the ventilation by using gas detector tubes is effective for human bodies and working efficiency.
- (3) Measurements for the sanitation of schools and as teaching material: It is widely used as teaching material for health education, physical education and science.
- (4) Measurements of pollutants in the atmosphere: In this case, it is necessary to measure much lower concentrations than the allowable concentration for industrial hygiene. That is because the allowable concentration for a living environment should be considered to be 1/10 to 1/100 of that for industrial hygiene. Gas detector tubes can be also used for this purpose.
- (5) Measurements of pollutants in flue gas: Measurement of pollutants in flue gas is important for the prevention of air pollution. The Japanese Industrial Standards (JIS) provide various kinds of test methods as analysis methods for flue gas, of which the simplest one is the gas detector tube method, all other methods being very complicated.
- (6) Measurement of harmful gases in ships: It is used for the measurement of harmful gases in ships in conformity with the IMO rule.
- (7) Process control: When gas is used as a raw material in chemical and other industries, it happens that a very small quantity of impurity poisons the catalyst or gives a bad effect on the quality of the products. Therefore, it is necessary to measure and control this very small quantity of impurity. Furthermore, it is necessary to measure impure gas in products, mixing ratios of gas materials and composition of exhaust gas. The gas detector tube is used for testing the purity of gas in this type of quality control.
- (8) Mine safety: Pit fire or gas explosions caused by the spontaneous ignition of coals in the pit frequently occurs in stage by detecting a very small quantity of carbon monoxide or of ethylene co-existing with the carbon monoxide by using detector tube. The detector tube is also used for the measurement of carbon monoxide after pit fires or explosions.
- (9) Prevention of gas explosion: The concentration of inflammable gas in air or gas can be measured safely and quickly by the detector tube method. The measurement does not require any power source such as battery or heat source, so can be performed without any danger, providing no ignition source even in the presence of explosive mixed gas. For instance, tank explosion accidents can be prevented by measuring acetylene generated in the carbide tank or tank lorry.
- (10) Combustion inspection of gas apparatus: The combustion condition of gas apparatus after gas conversion can be inspected by using detector tubes for carbon monoxide.
- (11) Measurement of alcohol in drunken person's breath: Breath alcohol detector tubes are used by police stations of the metropolis and prefectures of Japan for the control of driving by drunken persons.
- (12) Others: Detection of arsenic in food: Measurement of formaldehyde vapour generated from textile products; measurement of various kinds of ion.

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