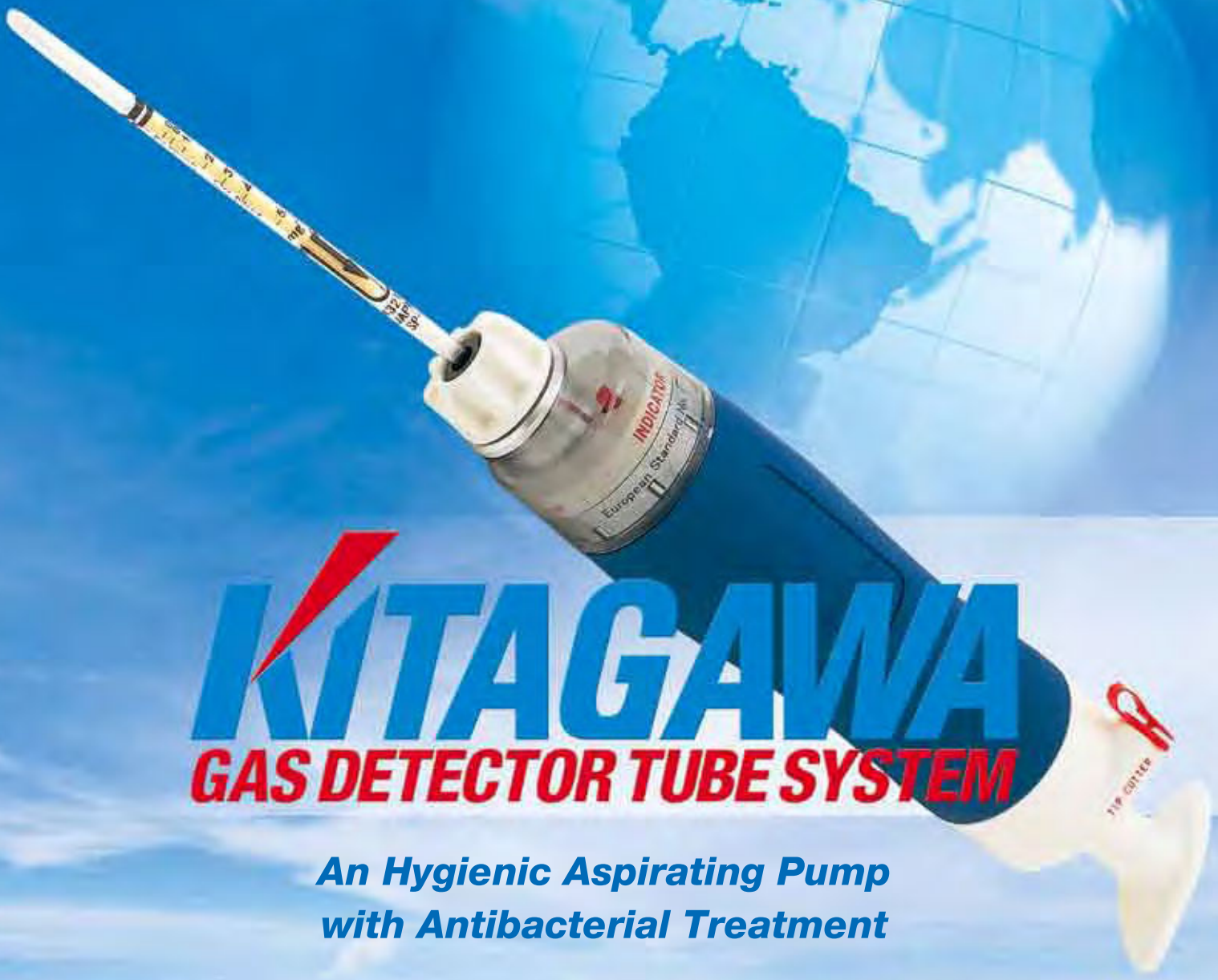
BK01017
B.13/08/7D



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

KOMYO RIKAGAKU KOGYO K.K.
ADDRESS:1-8-28 SHIMONOGE, TAKATSU-KU, KAWASAKI-CITY, KANAGAWA 213-0006, JAPAN
TEL:+81(0)44-833-8911 FAX:+81(0)44-833-2672
URL http://www.komyokk.co.jp/english/

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.

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.

WE CONTRIBUTE TO PUBLIC SAFETY AND SECURITY

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

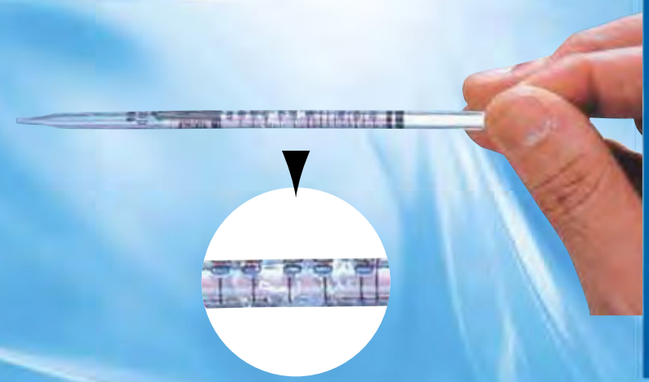
If a tube is broken by accident, the glass pieces will not scatter.
Please read the instruction sheet provided in each box of tubes before use.

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.

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_2, CO, CO_2, HCl and O_2.

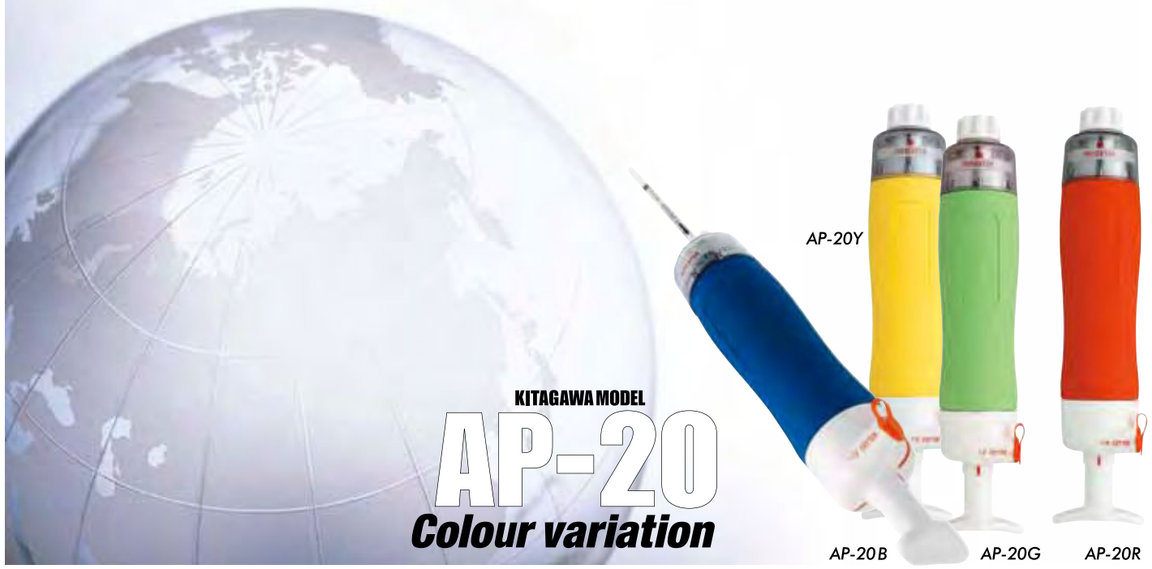
Industrial Waste Water

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

KITAGAWA
GAS DETECTOR TUBE SYSTEM

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

CONTENTS



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:

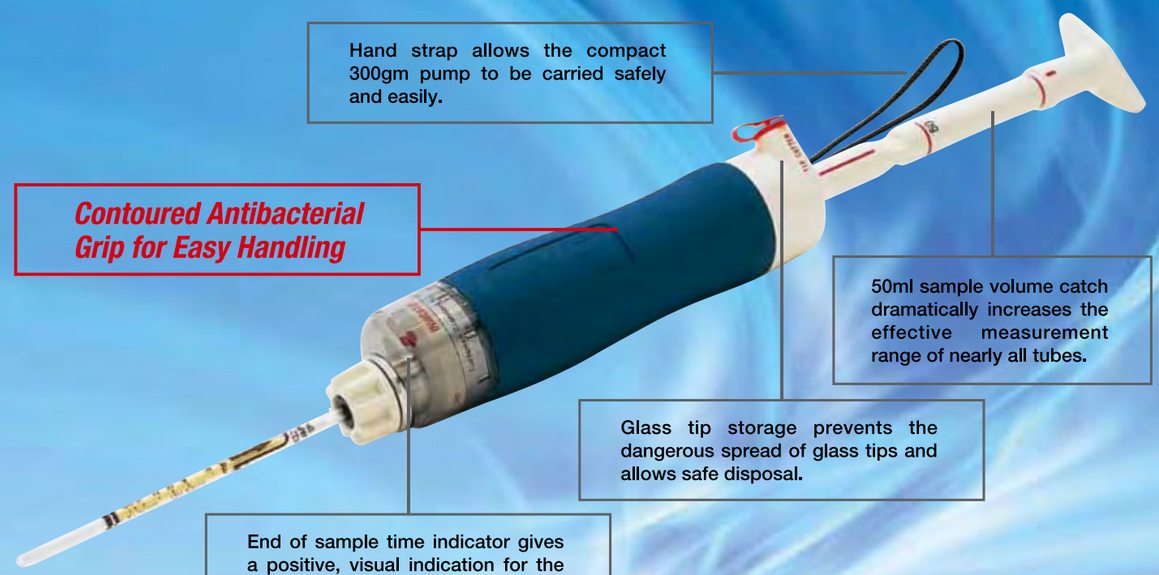
Head Office	1-8-28 Shimonoge, Takatsu-ku, Kawasaki-shi, Kanagawa, Japan
Aizu Komyo K.K. Bange Factory	380 Aza Kunema, Ooaza Niidate, Aizubange-machi, Kawanuma-gun, Fukushima, Japan
Aizu Komyo K.K. Misato Factory	2-8 Aza Shimizu, Kubo Ozawa, Aizumisato-machi, Oonuma-gun, Fukushima, Japan
Osaka Branch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

OPERATION

KITAGAWA MODEL

AP-20

ASPIRATING PUMP FOR GAS DETECTOR TUBES



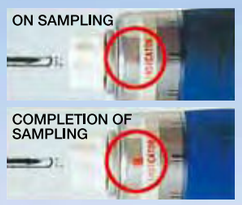
1 ***Prepare aspirating pump.***
Check the pump for leaks in accordance with "CHECKING PRIOR TO USE" in the instruction sheet.

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: Original	Colour Change: Stain	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.
Acetaldehyde CH_3CHO 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_2 (10)	50 (J) 20 (B)
Acetaldehyde CH_3CHO	133SB ‡	5~140	1	Yellow	Pink	Mfg. synthetic rubber, plastics, various organics	2	10	Other aldehydes, Ethanol	
Acetic acid CH_3COOH	216S	1~50	1	Pale pink	Yellow	Mfg. cellulose acetate rayon, vinyl acetate, a seasoning	3	10	SO_2 (1/20 × Acetic acid ＊), NO_2 (10), HCL (2 × Acetic acid ＊), Cl_2 (5)	10 (J.A.B)
Acetic anhydride $(CH_3CO)_2O$	216S©	1~15	1	Pale pink	Yellow	Acetylating agent	3	10	SO_2 (1/20 × Acetic acid ＊), NO_2 (10), HCl(2 × Acetic acid ＊), Cl_2 (5)	5 (J) 1 (A) 0.5 (B)
Acetone CH_3COCH_3	102SA	1.0~ 5.0%	1/2	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%)	
		(0.1~ 2.0%)	①							
	102SC ‡	0.01~ 4.0%	1	Yellow	Pink		1	10	Acetaldehyde (30), Acrolein (20), Methy ethyl ketone (150), Methyl isobutyl ketone (400)	200 (J.A) 500 (B)
	102SD	125~ 5,000	1/2	Yellow	Dark brown	Industrial hygiene for both plant and laboratory	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
		(50~ 2,000)	①							
		20~800	2							

‡ 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: Original	Colour Change: Stain	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.
Acetylene $HC \equiv CH$	101S	50~ 1,000	1	Pale yellow	Brownish blue	Process control & leakage detection in synthetic ammonia plant, cuprammonium rayon process	3	10	Oleffins (10), H_2S (10), CO (50), NH_3, Butadiene (25), HCH, Cl_2, NO_2, CS_2, Benzene	
Acetylene・Ethylene -separation measurement C_2H_2 & C_2H_4	280S	C_2H_2; 20~300	1	Yellow	Dark brown		1	2 × 5	Tube for C_2H_2; CO (10), H_2 (5,000), Ethylene (2,000) Tube for C_2H_4; CO (1,350), Acetylene (370), Propylene (20)	
		C_2H_4; 200~ 2,000		Pale yellow	Blue					
Acrolein (Acryl aldehyde) $CH_2=CHCHO$ 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), Methy isobutyl ketone (500)	0.1 (J.B)
Acrylic acid $CH_2=CHCOOH$	216S©	1~50	1	Pale pink	Yellow	Material of acrylic resin	3	10	SO_2 (1/20 × Acetic acid ＊), NO_2 (10), HCl (2 × Acetic acid ＊), Cl_2 (5)	2 (A)
Acrylonitrile (Vinyl cyanide) $CH_2=CHCN$	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)	①	Yellow	Red		1	2 × 5	HCN	
		0.5~10	2							
		0.25~5	4							
		0.2~4	5							
Allyl alcohol $CH_2=CHCH_2OH$	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_3	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_2 (1/4 × NH_3 ＊), Cl_2 (2), Amines	
	105SC	(10~260)	①	Pale purple	Pale yellow	Synthetic ammonia plant, leakage detection of refrigerant in ice plant, Industrial hygiene	3	10	SO_2 (1/5 × NH_3 ＊), Cl_2 (2), Amines	
		5~130	2							
	105SD	(1~20)	①	Pale purple	Pale yellow		3	10	Amines	
		0.5~10	2							
		0.2~4	5							
	105SE	10~200	1/2	Pale purple	Pale yellow		3	10	Sulphur dioxide, Chlorine, Amines	
		(5~100)	①							
		1~20	5							
	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_2S (3,000)	
	105SM	0.1~ 1.0%	1	Pale purple	Pale yellow	Process control	2	10	Amines	
Aniline (Aminobenzene) $C_6H_5NH_2$	181S	(2~30)	①	White	Yellow	Industrial hygiene	3	10	Toluidine (1/3 × Aniline ＊), NH_3, Aliphatic amines or Aromatic amines (the same conc. of Aniline)	1 (J.B) 2 (A)
		1~15	2							

‡ 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: Original	Colour Change: Stain	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.
Arsine AsH_3	140SA	5~160	1	White	Dark brown	Doping gas analysis in semiconductor industry, waste gas analysis in metal refinery	2	10	H_2S (5), Hydrogen selenide (5), Phosphine (5)	0.01 (J) 0.005 (A) 0.05 (B)
	121U	[0.1~2.0]	①	Pale yellow	Pink	Industrial hygiene, semiconductor manufacturing process	2	10	Hydrogen selenide, Mercaptans, H_2S, HCN, SO_2	
		0.05~1.0	2							
Benzene-in the presence of Gasoline and/or other Aromatic hydrocarbons C_6H_6	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]	①	White	Greenish brown		2	2 × 5	Toluene (1,000), Xylene (1,000), Ethyl benzene (1,000), CO (2), Hexane (2)	
		0.2~1	5							
Benzene C_6H_6	118SC	4~100	1	White	Greenish brown	Industrial hygiene (suspected carcinogen in humans)	2	10	Toluene, Xylene, CO (50), Hexane (100)	0.5 (A) 1 (B)
		[2~50]	②							
		1~25	4							
	118SD	1~75	1	White	Greenish brown		2	2 × 5	Toluene, Xylene, CO (2.0), Hexane (2.0)	
		[0.2~15]	⑤							
		0.1~7.5	10							
Bromine Br_2 Concentration chart method	114	1~20	1	White	Orange	Industrial hygiene	2	10	Cl_2 (1), ClO_2 , NO_2	0.1 (J.A.B)
Bromochloromethane CH_2BrCl	157SB© ‡	[2~80]	①	White	Yellow		3	2 × 5		200 (A)
		20~400	1/2							
Bromoform $CHBr_3$	157SB© ‡	[1~20]	①	White	Yellow		3	2 × 5		1 (J) 0.5 (A)
		0.5~9	2							
1-Bromopropane $CH_3CH_2CH_2Br$	157SB© ‡	5~80	1	White	Yellow		3	2 × 5		10 (A)
2-Bromopropane $(CH_3)_2CHBr$	157SB© ‡	5~80	1	White	Yellow		3	2 × 5		1 (J)
1,3-Butadiene $CH_2=CHCH=CH_2$	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_2S, Benzene, NH_3, HCN	
	168SC	[5~100]	①	Pale yellow	Pale blue		1	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
		2.5~50	2							
	168SE	0.5~10.0	1	Pink	White		3	2 × 5	H_2S, Isobutylene, NH_3	
		[0.1~2.0]	④							
n-Butane $CH_3(CH_2)_2CH_3$	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) $CH_3CH_2CH_2CH_2OH$	190U©	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) $CH_3CH_2CH(OH)CH_3$	189U	[10~300]	②	Yellow	Pale blue	Organic solvent treating, industrial hygiene	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	100 (J.A.B)
		4~120	4							

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

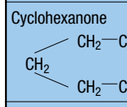
Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change: Original	Colour Change: Stain	Typical Applications	Shelf Life (year)	Q'ty of tubes/ box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
tert-Butanol $(CH_3)_3COH$	111U©	20~500	1	Yellow	Brown	Organic solvent treating, industrial hygiene	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	100(A)
Butyl acetate $CH_3CO_2C_4H_9$	139SB©	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 $CH_2=CHCO_2(CH_2)CH_3$	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 $C_4H_9NH_2$	105SD©	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) $C_4H_9OCH_2CH_2OH$	190U©	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 $(CH_3CH_2CH_2CH_2)_2O$	111U©	10~1,200	1	Yellow	Brown		2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
tert-Butyl mercaptan $(CH_3)_3CSH$	130U	1~10	1/2	Pale yellow	Pink	Industrial hygiene	2	10	Arsine, Hydrogen selenide, H_2S, HCN	0.5 (A)
		[0.5~5]	①							
	165SB	[5~80]	(1/2)	Yellow	Pink		2	10	H_2S, PH_3, Arsine, Hydrogen selenide, HCN, NO_2, NH_3, SO_2, Other Amines	
		2.5~40	1							
Butyl methacrylate $CH_2=C(CH_3)CO_2C_4H_9$	111U©	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) $CH_3OC(CH_3)_3$	111U©	25~500	1	Yellow	Brown	Fuel, powder, blast cell, etc; antiknock, solvent, abstergent	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	50(A)
Butyric acid $CH_3CH_2CH_2COOH$	216S©	3~60	1	Pale pink	Yellow	Conflate artificial flavour; medicine; emulsifying agent	3	10	SO_2 (1/20 × Acetic acid ∗), NO_2 (10), HCl (2 × Acetic acid ∗), Cl_2 (5)	
Carbon dioxide CO_2	126SA	0.2~5.2%	1/2	Purplish blue	Pale pink	Air contamination test in buildings, closed vessels, tunnels, other confined spaces, CO_2 concentration control in green houses, poultry farm, fruit storage	2	10	HCN (200), Cl_2 (100), SO_2 (500), H_2S (100)	
		[0.1~2.6%]	①							
Carbon dioxide CO_2 Concentration chart method	126B	[0.03~0.7%]	①	Purplish blue	Pale pink	Industrial hygiene	2	10	HCN (100), Cl_2 (200), SO_2, H_2S (150), NO_2	
		100~1,500	3							

∗ 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: Original	Colour Change: Stain	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.
Carbon dioxide CO_2	126SB	0.05~1.0%	1	Purplish blue	Pale pink	Industrial hygiene	2	10	HCN (100), Cl_2 (200), SO_2, H_2S (150), NO_2	5,000 (J.A.B)
	126SF	200~4,000 [100~2,000]	1/2 ①	Pink	Yellow		2	10	NO_2, H_2S, HCl, SO_2, HCN, Cl_2	
	126SG	0.04~1.4% [0.02~0.7%]	1/2 ①	Pink	Yellow		2	10	HCN	
Carbon dioxide -extra high range CO_2	126SH	1~20%	1	Pink	Yellow	Combustion gas analysis	2	10	SO_2 (3,000), H_2S (3,000), NO_2 (50)	
Carbon dioxide -ultra high range CO_2	126UH	5~50%	1/2	White	Purple	Industrial hygiene	2	10		
Carbon disulphide CS_2	141SA ‡	30~500	1	Pink	Yellow	Recovery control in viscose rayon &cellophane plant, mfg. viscose rayon &cellophane	2	2 × 5	H_2S (400), SO_2, Cl_2	1 (J) 1 (A) 10 (B)
	141SB ‡	[2~50] 0.8~20	② 4	Pink	Yellow	Industrial hygiene	3	2 × 5	H_2S (120), SO_2, Cl_2	
	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_2 (5,000), Acetylene, SO_2 or NO_2 (1/5 × CO ∗)	50 (J) 25 (A) 30 (B)
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_2S (1,000), NO_2 (1), H_2 (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_2 (10%), H_2S (1,000)	
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_2 (5,000), C_2H_2 (1/5 × CO ∗), SO_2 (1/5 × CO ∗), NO_2 (1/5 × CO ∗)	
	106SA	40~2,000 [20~1,000] 5~50	1/2 ① 4	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_2 (5,000), Acetylene (1/5 × CO ∗), SO_2 (1/5 × CO ∗), NO_2 (1/5 × CO ∗)	
	106SC	1~50	1	Orange	Reddish purple		1	10	Formic acid, SO_2, C_2H_2, H_2, H_2S	
	106SH	0.1~2.0%	1	White	Brown		1	10	Propane (0.15%), iso-Butane (0.2%), Hexane (0.1%), Acetylene (0.3%), Ethylene (0.15%)	
	106SS	30~500	1	Yellow	Dark brown		1.5	10	Acetylene (1/20 × CO ∗), SO_2 (1/2 × CO ∗), NH_3 (100 × CO ∗), H_2S (1/2 × CO ∗)	

‡ 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: Original	Colour Change: Stain	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.
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_4	147S ‡	5~60	1	White	Red	Paint manufacture, fire extinguishers waxes, polishes	1	2 × 5	Phosgene, Halogens, Cl_2, 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_2, CS_2, H_2S, n-Butane(0.1%)	5 (A)
Chlorine Cl_2	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_2 (1), Cl_2O (1), NO_2 (1/2 × Cl_2 ∗)	0.5 (J.A.B)
	109SB	[0.5~10.0] ① 0.125~2.5 4 0.1~2.0 5		White	Pale orange		2	10	Br_2 (1), ClO_2 (1), NO_2 (1/5 × Cl_2 ∗), NCl_3 (5)	
	109U	[0.1~2] ① 0.05~1 2		White	Pale purple		2	10	HCl (20 × Cl_2 ∗), NO_2	
Chlorine dioxide ClO_2 Concentration chart method	116	1~20	1	White	Reddish orange	Leakage defection in textile & paper bleaching plant; water treatment	2	10	Br_2, Cl_2 or NO_2 (1)	0.1 (A.B)
Chlorobenzene C_6H_5Cl	178SB	[5~140] ① 1~5 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) $CHCl_3$	152S ‡	[70~500] ② 35~250 3 23~167 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_3CNO_2	172S ‡	[0.1~16.0] ① 0.05~8.0 2		White	Pink	Industrial hygiene	1	2 × 5	Carbon tetrachloride, Phosgene	0.1 (J.A)
Chloroprene (2-Chlorobutadiene) CH_2=CClCH=CH_2	169S	1.0~20 [0.5~10]	1 ②	Greenish yellow	Pink		3	2 × 5	Cl_2, HCl (2,000), Vinyl chloride, Acetylene, Ethylene	10 (A)
Cresol $C_6H_4(CH_3)OH$	183U	0.5~25.0	2	Pale yellow	Pale brown		2	10	NH_3 (200), Aliphatic amines (50), Aromatic hydrocarbons (50), Phenols (2.5)	5 (J) 20mg/m^3 (A)
Crotonaldehyde CH_3CH=CHCHO	190U©	2~40	3	Yellow	Pale blue	Compound materials	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	
Cumene (Isopropylbenzene) $C_6H_5CH(CH_3)_2$	111U©	20~140	1	Yellow	Brown	Organic synthesis intermediate; Fuel	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	50 (A) 25 (B)
Cyclohexane C_6H_{12}	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 $C_6H_{11}OH$	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_6H_{10}	111U©	20~300	1	Yellow	Brown	Medicament, synthetic intermediate	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	100(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: Original	Colour Change: Stain	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.
Cyclohexyl amine $C_6H_{11}NH_2$	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 $C_{10}H_{18}$	111U©	20~200	1	Yellow	Brown	Solvent, adstergent, wax for floor	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
n-Decane $CH_3(CH_2)_8CH_3$	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) $(CH_3)_2C(OH)CH_2COCH_3$	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_2H_6	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 $(C_4H_9)_2NH$	105SD©	2~20	1	Pale puple	Pale yellow	Mfg. dye	3	10	Amines	
o-Dichlorobenzene $C_6H_4Cl_2$	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 $C_6H_4Cl_2$	215S ‡	10~150	1	White	Purplish brown		1	10	Benzene, Toluene, Hexane	10 (J.A) 25 (B)
1,1-Dichloroethane (Ethylidene chloride) CH_3CHCl_2	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) $ClCH_2CH_2Cl$	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 $(ClCH_2CH_2)_2O$	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_2	150 (J) 200 (A.B)
Dichloromethane (Methylene chloride) CH_2Cl_2	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 $CH_3CHClCH_2Cl$	157SB© ‡	20~250	1	White	yellow		3	2 × 5		10(A)
1,3-Dichloropropane $ClCH_2CH_2CH_2Cl$	194S ‡	10~500	1	White	Purple		1	2 × 5	Halogenated hydrocarbons	
1,3-Dichloropropene $ClCH_2CH=CHCl$	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 $C_{10}H_{12}$	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 $(C_2H_5)_2NH$	222S	1~20	1	Pale purple	Pale yellow	Industrial hygiene	3	10	NH_3, Other amines	10 (J) 5 (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: Original	Colour Change: Stain	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.
Diethylbenzene $C_6H_4(C_2H_5)_2$	111U©	10~180	1	Yellow	Brown	Organic synthesis intermediate; solvent, abstergent	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
Ethyl ether (Diethyl ether) $C_2H_5OC_2H_5$	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 $[(CH_3)_2CHCH_2]_2CO$	139U©	20~1,000	1	Yellow	Pale blue		2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons, Halogenated hydrocarbons, Paraffin hydrocarbons	25 (A)
Diisopropyl amine $[(CH_3)_2CH]_2NH$	105SD©	1~16	1	Pale purple	Pale yellow	Dyestuffs, surfactant, herbicide	3	10	Amines	5 (A.B)
N,N-Dimethylacetamide $CH_3CON(CH_3)_2$	229S	5~70	2	Pale purple	Pale yellow	Solvents for chemical reaction, refinery and resins paint remover	1	10	CO_2, NH_3, Amines, Hydrazine	10 (J.A.B)
Dimethyl amine $(CH_3)_2NH$	227S	1~20	1	Pale purple	Pale yellow	Industrial hygiene	3	10	NH_3, Other amines	10 (J) 5 (A) 2 (B)
N,N-Dimethylaniline $C_6H_5N(CH_3)_2$	105SD©	0.5~9	1	Pale purple	Pale yellow	Mfg. Vanillin; dye	3	10	Amines	5 (J.A.B)
Dimethyl ether (Methyl ether) CH_3OCH_3	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 $HCON(CH_3)_2$	196S	2~30 1~15	① 2	Pale purple	Pale yellow	Stationary phase of chromatography	2	10	SO_2 (200), CO_2 (0.1%), NH_3, 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 $[CH_3(CH_2)_2]_2NH$	105SD©	1~14	1	Pale purple	Pale yellow	Synthesis intermediate	3	10	Amines	
Divinyl benzene $C_6H_4(CHCH_2)_2$	158S©	5~50	1	White	Yellow	Ion exchange resin and membrance, 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_3H_5OCl	192S	5~50	3	Greenish yellow	Pink	Mfg, Epoxy resin, Chlorinated rubber, Glycerin	1	2 × 5	Halogenated hydrocarbons	0.5 (A.B)
Ethyl acetate $CH_3CO_2C_2H_5$	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	Fire hazard detection in paints industry & painting	2	10	Other esters, Ketones, Alcohols, Aromatic hydrocarbons, Halogenated hydrocarbons	
Ethyl acrylate $CH_2=CHCO_2C_2H_5$	211U©	5~60	2	Yellow	Pale blue	Material of Acrylic resin	2	10	Alcohols, Paraffin hydrocarbons, Esters, Halogenated hydrocarbons, Aromatic hydrocarbons	5 (A.B)

Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change: Original	Colour Change: Stain	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.
Ethyl alcohol (Ethanol) C_2H_5OH	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 $C_2H_5NH_2$	227S	1~20	1	Pale purple	Pale yellow	Industrial hygiene	3	10	Ammonia, Other Amines	10 (J) 5 (A) 2 (B)
Ethyl benzene $C_6H_5C_2H_5$	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_2H_5Br	157SB© ‡	2~80 20~400	① 1/2	White	Yellow		3	2 × 5		5 (A)
Ethyl-tert-Butyl Ether (ETBE) $C_2H_5O(CH_3)_3$	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) $C_2H_5OCH_2CH_2OH$	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) $CH_3CO_2CH_2OC_2H_5$	190U©	5~150	3	Yellow	Pale blue		2	10		5 (J.A) 10 (B)
Ethylene -colour intensity $H_2C=CH_2$	108B	0.5~100 0.1~20	① 5	Pale yellow	Blue	Coal mining safety; concentration control in ripening fruits; organics, mfg: plastics	3	10	CO, NO_2 (1), Cl_2, Butane, Pentane, Acetylene, H_2S (1,000), HCN, CS_2, NH_3, H_2 (10%)	200 (A)
Ethylene $H_2C=CH_2$	108SA	20~ 1,200	1	Yellow	Blue		2	10	CO, H_2S, Acetylene, Propylene	
	108SC	1~200	4	Yellow	Blue	Used for fruits ripening control	2	2 × 5	Acetylene, CO, Propylene, H_2S	
Ethylene dibromide (1, 2-Dibromoethane) $BrCH_2CH_2Br$	166S ‡	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) $HOCH_2CH_2OH$	232SA	20~250 mg/m³	2	Pink	Yellow	Industrial hygiene	1.5	2 × 5	Ethylene oxide, SO_2, Aldehydes, H_2S	
	232SB	3~40 mg/m³	3	Pale pink	Yellow		2	2 × 5	Aldehydes, SO_2, H_2S	
Ethylene oxide CH_2CH_2O	122SA	1.0~ 4.0% 0.01~ 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_2, H_2S	
	122SD ‡	0.7~ 14.0 0.1~2.0	1 ④	Yellow	Pale pink	Atmospheric pollution surveys in hospitals	1	2 × 5	Formaldehyde (0.5)	
	122SL	130~ 2,600 50~ 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_3), Halogenated hydrocarbons	

‡ 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: Original	Colour Change: Stain	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.
Ethyl mercaptan (Ethanethiol) C_2H_5SH	165SA	4~160 2~80 1~40	1 ② 4	White	Yellow	Atmospheric pollution survey, concentration control of odorant, plastics manufactures	2	10	Methyl sulphide (1), NO_2 (1), Cl_2 (0.2)	0.5 (A.B)
	165SB	5~80 2.5~40	1/2 1	Yellow	Pink	In LP gas	2	10	H_2S, PH_3, Arsine, Hydrogen selenide, HCN, NO_2, NH_3, SO_2, Other Amines	
	130U	1~10 0.5~5	1/2 ①	Pale Yellow	Pink	Industrial hygiene	2	10	Arsine, Hydrogen selenide, H_2S, HCN	
Ethyl methacrylate $CH_2=C(CH_3)CO_2C_2H_5$	111U©	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 ‡	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 ‡	0.1~4.0 0.05~ 2.0	⑤ 10	Yellow	Pink		1	10	Acetaldehyde, NH_3 (10), NO_2 (3)	
Formic acid HCOOH	216S	1~50	1	Pale pink	Yellow	Mfg. organic medicine, industrial hygiene	3	10	SO_2 (1/20 × HCOOH), NO_2 (10), HCl (2 × HCOOH), Cl_2 (5), Acetic acid	5 (J.A.B)
Furan (Furfuran) HC=CH | | >O HC=CH	122SA©	0.2~ 2.0% 0.01~ 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©	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 $C_4H_3OCH_2OH$	238S	5~25	5	White	Black	Material of furan resin, resin denaturant, solvent, industrial hygiene	1	10		5 (J.B) 10 (A)
Gasoline (Petrol) CnHm	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_4H_{10}, n-C_5H_{12}, n-C_8H_{18}, n-C_6H_{14} Mineral turpentine	187S	50~ 1,400	1	Orange	Yellowish green		2	10	Aromatic hydrocarbons	
Heptane $CH_3(CH_2)_5CH_3$	113SB©	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 $CH_3(CH_2)_4CH_3$	113SA	0.11~ 1.32% 0.05~ 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 hydrocabons	
	113SC	20~800 5~200	1 ③	Yellow	Pale blue		2	10	Toluene	
Hydrazine (Amidrazone) $NH_2 \cdot NH_2$	219S	0.2~10 0.1~5 0.05~ 2.5	2 ④ 8	Yellow	Blue	Rocket fuel, corrosion protection of boiler, antioxidant	2	10	NH_3, Amines	0.01 (A) 0.02 (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: Original	Colour Change: Stain	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.
Hydrogen H_2	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 20~600	1/2 ①	Purple	Pink	Industrial hygiene, process control, leakage detection, fire hazard detection; phamaceuticals organics mfg.	2	2 × 5	SO_2, Cl_2	5 (J) 1 (B)
	173SB	4~40 2~20 0.4~4	1/2 ① 5	Yellowish green	Pink		3	2 × 5	Cl_2	
Hydrogen cyanide HCN	112SA	0.01~3.0%	1	Yellow	Brownish red	Concentration control in fumigation process	3	10	Acetone, CS_2, SO_2 (200), H_2S (100), Dicyanide	5 (J) 10 (B)
	112SB ‡	2~100 0.5~25	① 4	Yellow	Red	Electro-plating, metal hardening fumigation process, industrial hygiene	2	10	SO_2 (1), H_2S (3), NH_3 (5)	
	112SC ‡	0.3~8	3	Yellow	Red		1	2 × 5	SO_2 (1), PH_3, H_2S, NH_3 (2)	
Hydrogen fluoride HF	156S	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_2, HCl	0.5 (J.A) 1.8 (B)
Hydrogen peroxide H_2O_2	247S ‡	0.5~10.0	5	White	Yellow	Mfg. bleach, industrial chemicals and medicine	1	10	HCHO (10)	1 (A.B)
Hydrogen selenide H_2Se	167S	5~600 1~120	① 5	Pale yellow	Dark brown	Doping gas analysis in mfg. semiconductor, industrial hygiene	1	10	Arsine (10), H_2S, Iron carbonyl (10), SO_2, Hg_2, Acetylene (3%), CO (0.1%), Nickel carbonyl (10)	0.005 (J) 0.05 (A) 0.02 (B)
	242S©	1~20 0.5~10	① 2	Pale yellow	Reddish purple		2	10		
Hydrogen sulphide H_2S	120SB	6~300 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_2 (12), Mercaptans (550), NO_2 (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_3	
	120SD	2~60 1~30	1/2 ①	White	Pale brown		3	10	SO_2 (10), Mercaptans (300), NO_2 (2)	
	120SE	2~40 1~20 0.5~10	1/2 ① 2	Yellow	Pink		2	10	PH_3, Mercaptans, NH_3, NO_2	
	120SF	100~2,000 50~1,000 25~500	1/2 ① 2	White	Black	Impurity test of industrial raw gases, chemicals mfg; metallurgy.	3	10	SO_2 (5,000), Mercaptans	
	120SH	0.1~4.0%	1	Pale blue	Black	Process control in sulphur recovery plant in petroleum refinery	3	10	SO_2 (0.5%)	
	120SM	0.1~1.2% 0.05~0.6%	1/2 ①	White	Dark brown		2	10	SO_2 (0.3%)	
	120U	0.2~6.0 0.1~3.0	1/2 ①	Pale yellow	Pink	Industrial hygiene	2	10	Arsine, Hydrogen selenide, Mercaptans, PH_3, HCN, SO_2	
Hydrogen sulphide -ultra high range H_2S	120UH	2~20%	1/2	Pale bule	Black	Oil field (esp. oil well)	3	10	SO_2	
	120UT	5~40% 2.5~5%	1/2 1	Pale blue	Black		3	5	SO_2 (8%)	

‡ 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: Original	Colour Change: Stain	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.
Hydrogen sulphide-Mercaptans -separation measurement H_2S & R·SH	282S	H2S; 1~30 R·SH; 0.5~5	1	White Pale yellow	Pale brown Pink		2	2 × 5	Tube for H_2S; SO_2 (1/3 × H_2S ∗), NO_2 (1/5 × H_2S ∗) Tube for R·SH; NO_2 (2), NH_3, H_2S (30)	
Isobutane $(CH_3)_3CH$	113SB©	50~1,200	1	Orange	Yellowish green	Industrial hygiene	2	10	Alcohols, Ketones or Esters (60%), Aromatic hydrocarbons, Parafin hydrocarbons	
Isobutyl acetate $CH_3CO_2CH_2CH(CH_3)_2$	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	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
Isobutyl acrylate $CH_2CHCO_2CH_2CH(CH_3)_2$	211U©	5~60	2	Yellow	Pale blue	Industrial hygiene	2	10	Alcohols, Paraffin hydrocarbons, Esters, Halogenated hydrocarbons, Aromatic hydrocarbons	
Isobutyl alcohol (Isobutanol) $(CH_3)_2CHCH_2OH$	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 $(CH_3)_2C=CH_2$	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 $CH_3CH_2CH_2COOH$	216S©	3~50	1	Pale pink	Yellow	Disinfectant; arificial flavour; substrate for perfume; tan processing	3	10	SO_2 (1/20 × Acetic acid ∗), NO_2 (10), HCL (2 × Acetic acid ∗), Cl_2 (5)	
Isopentyl acetate (Isoamyl acetate) $CH_3CO_2CH_2CH_2(CH_3)_2$	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) $(CH_3)_2CHCH_2CH_2OH$	209U	5~100	3	Yellow	Pale blue	Stabilizer for Sodium thiosulphate hypo, industrial hygiene	2	10	Alcohols, Toluene	100 (J.A.B)
Isophorone $C_9H_{14}O$	197U©	5~80	3	Yellow	Pale blue	Solvent; ink, paint, lacquer, adhesive, copolymer, lag, finish and biocide	3	10	Alcohols	
Isoprene $CH_2=C(CH_3)CH=CH_2$	190U©	1~16	3	Yellow	Pale blue	Industrial hygiene	2	10	Alcohols, Esters, Aliphatic hydrocarbons (over C_3), Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	
Isopropyl acetate $CH_3CO_2CH(CH_3)_2$	139SB©	0.01~1.2%	2	Orange	Brownish green	Fire fazard 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	Other Esters, Ketones, Alcohols, Aromatic hydrocarbons, Paraffin hydrocarbons	
Isopropyl alcohol (2-Propanol) $CH_3CH(OH)CH_3$	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	50~1,200 20~480	① 2	Yellow	Pale blue	Industrial hygiene	2	10	Other Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	

∗ 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: Original	Colour Change: Stain	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.
Isopropyl cellosolve $(CH_3)_2HCO(CH_2)_2COH$	190U©	5~350	3	Yellow	Pale blue		2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	25 (A)
Isopropyl ether $[(CH_3)_2CH]_2O$	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 $(CH_3)_2CHSH$	130U	1~10 0.5~5	1/2 ①	Pale Yellow	Pink		2	10	Arsine, Hydrogen selenide, H_2S, HCN	
Isopropylamine $(CH_3)_2CHNH_2$	222S©	1~12	1	Pale purple	Pale yellow		3	10		5 (A)
Isovaleric acid $(CH_3)_2CHCH_2COOH$	216S©	3~50	1	Pale pink	Yellow	Artiflcial fiavour, perfume and medical uses	3	10	SO_2 (1/20 × Acetic acid ＊), NO_2 (10), HCL (2 × Acetic acid ＊), Cl_2 (5)	
Maleic anhydride $C_4H_2O_3$	216S	0.2~10	4	Pale pink	Yellow	Material of polyester resin	3	10	SO_2 (1/20 × Acetic acid ＊), NO_2 (10), HCL (2 × Acetic acid ＊), Cl_2 (5)	0.1 (J) 0.01 mg/m³ (A)
Mercury vapour Hg	142S	0.5~10 mg/m³ 0.1~2.0 mg/m³	1 ⑤	Grey	Pale orange	Electrolytic soda industry; mfg. thermometer, fluorescent lamp	3	10	HCl (0.5), NO_2 (0.1), Cl_2 (0.1), H_2S (0.5)	0.025 mg/m³ (J.A)
Mesityl oxide (4-Methyl-3-penten-2-one) $CH_3COCH=C(CH_3)_2$	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 $CH_2=C(CH_3)COOH$	216S©	1~50	1	Pale pink	Yellow	Mfg. soluble polymer	3	10	SO_2 (1/20 × Acetic acid ＊) NO_2 (10), HCL (2 × Acetic acid ＊), Cl_2 (5)	20 (A.B)
1-Methoxy-2-propanol $CH_2CHOHCHOCH_3$	197U©	10~500	1	Yellow	Pale blue	Solvent; ink, lacquer, cellulose, dye, etc	3	10	Alcohols	100 (A)
Methyl acetate $CH_3CO_2CH_3$	111SA©	0.1~3.0%	1	Orange	Dark green	Fire hazard defection 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 $CH_2=CHCO_2CH_3$	211U	2~60	2	Yellow	Pale blue	Material of Acrylic resin, industrial hygiene	2	10	Alcohols, Esters, Paraffin hydrocarbons (over C_3), Aromatic hydrocarbons, Halogenated hydrocarbons	2 (A)
Methyl alcohol (Methanol) CH_3OH	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_3), 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		

＊ 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: Original	Colour Change: Stain	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.
Methyl amine CH_3NH_2	227S	1~20	1	Pale purple	Pale yellow	Industrial hygiene	3	10	NH_3, Other amines	10 (J) 5 (A)
N-Methyl aniline $C_6H_5NHCH_3$	105SD©	0.5~6	2	Pale purple	Pale yellow	Acid acceptor; solvent	3	10	Amines	0.5 (A)
Methyl bromide (Bromomethane) CH_3Br	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_2, Br_2 or NO_2 (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/m³	1/2	Yellow	Brown		2	2 × 10		
Methyl butyl ketone $CH_3(CH_2)_3COCH_3$	237S©	5~80	2	Yellow	Pale blue		2	10		5 (A)
Methyl cellosolve (Ethylene glycol monomethyl ether) (2-Methoxyethanol) $CH_3OCH_2CH_2OH$	190U	5~500	3	Yellow	Pale blue	Organic solvent treating	2	10	Paraffin hydrocarbons (over C_3), Alcohols, Ketones, Aromatic hydrocarbons, Halogenated hydrocarbons, Esters	5 (J.B) 0.1 (A)
Methyl cellosolve acetate $CH_3CO_2CH_2CH_2OCH_3$	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_3CCl_3	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 $C_6H_{11}CH_3$	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 $CH_3C_6H_{10}OH$	199U	5~200	3	Yellow	Pale blue	Mfg. Imbricating oil & liquer, industrial hygiene	2	10	Alcohols	50 (J.A.B)
Methyl cyclohexanone $CH_3C_6H_9O$	198U	2~100	3	Yellow	Pale blue	Industrial hygiene	2	10	Alcohols	50 (J.A.B)
Methyl ethyl ketone (2-Butanone) $CH_3COC_2H_5$	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_3I	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: Original	Colour Change: Stain	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.
Methyl isobutyl ketone (Isopropyl acetone) $CH_3COH_2CH(CH_3)_2$	122SA©	0.01~ 0.6%	3	Orange	Dark brown	Solvent forgums, 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_3), Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	
Methyl isothiocyanate (MITC) CH_3NCS	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_3SH	164SA	5~140	1	White	Reddish yellow	Pesticides, fungicides, plastics, Atmospheric pollution survey, concentration control of odorant	2	10	Cl_2 (0.2), Methyl sulphide (1), Ethyl mercaptan, Acetylene, CO, Acetylene, H_2S	0.5 (A.B)
	164SH	50~ 1,000	1	Pale yellow	Orange		3	10	H_2S (650), NO_2 (1,000), Cl_2 (1/3 × CH_3SH ∗)	
	130U	1~10 (0.5~5)	1/2 ①	Pale yellow	Pink		2	10	Arsine, Hydrogen selenide, H_2S, HCN	
Methyl methacrylate $CH_2=C(CH_3)CO_2CH_3$	184S	10~160	1	Yellow	Pale blue	Pigment, adhesive, paintings	2	10	Esters, Ketones, Alcohols, Aromatic hydrocarbons	50 (A.B)
Methyl propyl ketone $CH_3CO(CH_2)_2CH_3$	139U	20~ 1,500	1		Pale blue	Industrial hygiene	2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons, Halogenated hydrocarbons, Paraffin hydrocarbons	
Methyl styrene $CH_3C_6H_4CH=CH_2$	193S	10~500	1	White	Yellow	Synthetic resin	3	10	Styrene	50 (A)
Monoethanol amine (2-Aminoethanol) $HOC_2H_4NH_2$	224SA	(1~50) 0.5~25	① 2	Pink	Pale purple	Pesticide, solvent, abstergent	2	10	Other Amines, NH_3, Hydrazine	3 (J.A) 1 (B)
Morpholine C_4H_9NO	105SD©	2~22	1	Pale purple	Pale yellow	Solvent; rubber accelerator	3	10	Amines	20 (A) 10 (B)
Naphthalene $C_{10}H_8$	153U©	10~100	1	Pale yellow	Pale blue	Industrial hygiene	1	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	2 (A)
Nickel carbonyl (Nickel tetracarbonyl) $Ni(CO)_4$ Concentration chart method	129	20~700	1	Pale yellow	Dark purple	Waste gas analysis	1/2	10	Arsine, Iron carbonyl, Mercury vapour, H_2S or SO_2 (10), CO (1,000)	0.001 (J) 0.05 (A)
Nitric acid vapour HNO_3	233S ‡	(2~20) 1~10	① 2	Pale yellow	Purple	Industrial hygiene	1	10	HF (8) or NO_2 (50), HCl	2 (J.A)
Nitrogen dioxide NO_2	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_2, Br_2, I_2 or Ozone (5), NO (10)	0.2 (A)
	117SB	0.5~30.0	2	White	Yellowish orange		1	10	Cl_2, Br_2, or I_2 (2), NO (15)	
	117SD	0.1~1.0	3	White	Pale purple		1.5	2 × 5	O_3 (2), SO_2 (7), Cl_2 (3)	
Nitrogen oxide and dioxide -separately measurable NO & NO_2 Concentration chart method	174A	NO; 10~300 NO_2; 1~40	1	White	Yellowish orange	Exhaust gas analysis	2	5	Cl_2 (1)	25 (NO) (A) 3 (NO_2) (A)
	174B				Pale yellowish orange	Flue gas analysis (with hollow glass tubes)	2	2 × 5		
Nitrogen oxides $NO + NO_2$	175SA	20~250	1	White	Yellow	Exhaust gas analysis	1	10	SO_2 (100), HCl (1,000)	
	175U	1~30 (0.5~15)	1/2 ①	White	Pale purple	Industrial hygiene	3	10	H_2S (5), HCl (500)	
	175SH	100~ 2,500	1	White	Yellow	Exhaust gas analysis	2	10	HCl (500)	

‡ 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: Original	Colour Change: Stain	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.
n-Nonane $CH_3(CH_2)_7CH_3$	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_2S (10)	
Oxygen O_2	159SA	2~24%	1/2	White	Brown	Oxygen deficiency in underground or closed vessel, tunnels, mines	2	5	CO_2 (5%), H_2S (2%), NO_2 (2%), SO_2 (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_2	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_2 & CO_2	281S	O_2; 2~10% CO_2; 1~20%	1	White	Brown	Combustion control	1.5	2 × 5		(CO_2) 5000 (J.A.B)
				Pink	Yellow					
Ozone O_3	182SA	100~ 1,000 (50~500)	1/2 ①	Dark blue	Yellow	Process control	2	10	Cl_2, NO_2	0.1 (J) 0.05 (A)
	182SB	10~100 (5~50) 2.5~25	1/2 ① 2	Blue	Pale yellow		2	10	NO_2 (10)	
	182U	0.15~ 3.0 (0.05~ 1.0) 0.025~ 0.5	1 ③ 6	Blue	White	Air pollution analysis, industrial hygiene	2	10	NO_2 (0.5), Cl_2 (10), Oxidant	
Pentane $CH_3(CH_2)_3CH_3$	113SB©	50~ 1,000	1	Orange	Yellowish green	Industrial hygiene	2	10	Paraffin hydrocarbons, Aromatic hydrocarbons (over C_3), Alcohols (6%), Ketones (6%), Esters (6%)	300 (J) 600 (A.B)
Pentyl acetate (Amyl acetate) $CH_3CO_2(CH_2)_4CH_3$	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 $CH_3(CH_2)_3CH_2NH_2$	105SD©	2~22	1	Pale purple	Pale yellow	Dye; insecticide; synthetic detergent; corrosion inhibitor; medicine; petrol additive	3	10	Amines	
Phenol C_6H_5OH	183U	0.5~25.0	2	Pale yellow	Pale light brown Pale brown	Industrial hygiene	2	10	NH_3 (200), Aliphatic amines (50), Phenols (2.5), Aromatic amines (50)	5 (J.A) 2 (B)
Phosgene (Carbonyl chloride) $COCl_2$	146S ‡	(0.5~20) 0.1~4.0	① 5	White	Red	Leakage detection in mfg. dyes, chemicals, industrial hygiene	1	10	Cl_2 (5), HCl (10), NO_2 (100), SO_2 (0.2%)	0.1 (J.A) 0.02 (B)
Phosphine in acetylene PH_3	121SA †	20~800	1	Pale blue	Reddish purple	Impurity test of calcium carbide & acetylene	3	10	Arsine or H_2S (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.

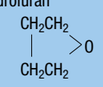
Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change: Original	Colour Change: Stain	Typical Applications	Shelf Life (year)	Q'ty of tubes/ box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
Phosphine PH_3	121SC	40~1,400 [20~700]	1/2 ①	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_2S (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_3 (20), Mercaptans, Hydrogen sulphide (50)	
	121SG	5~150	1	White	Yellow		3	10	H_2S (5), H_2Se (5)	
	121SH	200~3,200 [100~1,600]	1/2 ①	White	Orange		3	10	NO_2, H_2S, SO_2	
	121SS	400~6,000 [200~3,000]	1/2 ①	White	Orange	Fumigation of grains	3	10	Hydrogen cyanide (3%), Ammonia (0.6%)	
	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_2S, HCN, SO_2, Arsine	
α-Pinene $C_{10}H_{16}$	158S©	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 $CH_3CH_2CH_2OH$	190U©	20~300	3	Yellow	Pale blue		2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	100 (A)
Propane C_3H_3	125SA	0.02~0.50%	1	Orange	Brown	Mfg. city gas, fire hazard detection	2	10	Toluene, Hexane, Trichloro-ethylene	1,000 (A)
Propionic acid CH_3CH_2COOH	216S©	3~50	1	Pale pink	Yellow	Mfg. propionate and ester; Nickel-electro plating solution; ester perfume; artificial flavour; medicine; cellulose solvent	3	10	SO_2 (1/20 × Acetic acid ＊), NO_2 (10), HCL (2 × Acetic acid ＊), Cl_2 (5)	10 (A.B)
Propyl acetate $CH_3CO_2(CH_2)_2CH_3$	139SB©	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 $CH_3CH_2CH_2NH_2$	105SD©	1~20	1	Pale purple	Pale yellow	Analgesic	3	10	Amines	
Propylene $CH_2=CHCH_3$	185S	50~1,000	1	Yellow	Dark blue	Leakage detection	2	10	CO (200), Acetylene (50), Ethylene, H_2S (50)	500 (A)
Propylene glycol $CH_3CHOHCH_2OH$	122SC©	5~50	1	Pale pink	Yellow	Mfg. moisturizer, lubricant, emulsify, anti-freeze	2	10	Aldehydes, SO2, H2S	
Propylene oxide (1,2-Epoxypropane) CH_3CHCH_2O	122SC©	3~70	1	Pale pink	Yellow	Leakage detection in preparation of propylene oxide	2	2 × 5	Aldehydes, SO_2, H_2S	2 (J.A) 5 (B)
	163SA	1.0~5.0% [0.05~3.0%]	1/2 ①	Orange	Dark brown		3	10	Aromatic hydrocarbons, Esters, Ketones, Alcohols, Halogenated hydrocarbons	
Propylene oxide	163SD ‡	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: Original	Colour Change: Stain	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.
n-Propyl mercaptan $CH_2CH_2OH_2SH$	130U	1~10 [0.5~5]	1/2 ①	Pale yellow	Pink	Industrial hygiene	2	10	Arsine, Hydrogen selenide, H_2S, HCN	
Pyridine C_5H_5N	105SD©	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_4	240S ‡	[1~50] 0.5~25	① 2	Yellow	Red	Industrial hygiene, semiconductor manufacturing process	1	10	PH_3 (20), Arsine (50), Disilane (2), Diborane (20)	100 (J) 0.5 (B)
Styrene (Vinyl benzene) $C_6H_5CH=CH_2$	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)	20 (J.A) 100 (B)
	158SB	[2~100] 1~50	② 4	White	Yellow		3	2 × 5		
Sulphur dioxide SO_2	103SA	0.1~3.0%	1	Yellow	Blue	Process control in sulphuric acid paint (chemical mfg.)	3	10	H_2S (400)	2 (A)
	103SB	0.02~0.3%	1	White	Orange	Process control in sulphuric ore calcination	3	10	H_2S (100)	
	103SC	20~300	1	Purple	Yellow	Metal refining, mfg. sulphuric acid & nitric acid; waste gas analysis	2	10	Cl_2 (1/5 × SO_2 ＊), NO_2 (100), H_2S (100 × SO_2 ＊)	
	103SD	1~60	1	Pink	Yellow	Metal refining, mfg. sulphuric acid & nitric acid, industrial hygiene	3	10	NO_2 (1 × SO_2 ＊), Cl_2 (2 × SO_2 ＊)	
	103SE ‡	[0.5~10] 0.25~5	① 2	Pink	Yellow	Metal refining, mfg. sulphuric acid & nitric acid; waste gas analysis	1	10	NO_2, HCl	
Sulphur dioxide-in flue gas SO_2	103SF	0.02~0.3%	1	White	Orange	Flue gas analysis in heat power plant (with moisture control tube)	3	2 × 5	H_2S (100)	
Sulphur dioxide-in carbondioxide SO_2	103SG	[0.5~25] 0.1~3	① 4	Blue purple	White	Process control in beverage industry	3	10	NO_2 (0.5), H_2S (0.5), NH_3 (1)	
Sulphuric acid H_2SO_4	244U	0.5~5 mg/m³	5	Yellow	Pink	Petrochemical industry, industrial hygiene	2	10	HCl, HF, NO_2, Nitric acid, C_{12}	0.2mg/m³ (A)
Tetrachloroethylene (Perchloroethylene) $Cl_2C=CCl_2$	135SA ‡	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_2	25 (A) 50 (B)
	135SB ‡	[1~10] 0.2~2.0	① 4	Pale orange	Blueish purple		1	10	Trichloroethylene, 1, 2-Dichloroehylene 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 ‡	125~1,250 [50~500]	1/2 ①	Yellow	Red	Process control in dry cleaning industry	1	10	1,2-Dichloroethylene (10), Trichloroethylene (10)	
Tetraethoxysilane $Si(OC_2H_5)_4$	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: Original	Colour Change: Stain	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.
Tetrahydrofuran 	102SA©	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_4H_8S	190U©	4~100	3	Yellow	Pale blue	Odorant	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	
Toluene (Methyl benzene) $C_6H_5CH_3$	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 $C_6H_4(CH_3)(NH_2)$	105SD©	2~22	1	Pale purple	Pale yellow	Dye; printing	3	10	Amines	1 (J) 2 (A)
p-Toluidine $C_6H_4(CH_3)(NH_2)$	105SD©	2~20	1	Pale purple	Pale yellow	Analytical reagent; dye	3	10	Amines	2 (A)
1, 1, 2-Trichloroethane Cl_2CHCH_2Cl	236SA ‡	10~100	1	White	Purple	Industrial hygiene	1	3 × 5	Nitrogen oxides, Halogens, Halogenated hydrocarbons, Hexane (100)	10 (J.A)
Trichloroethylene $Cl_2C=CHCl$	134SA ‡	10~300 [5~150]	1/2 ①	White	Red	Metal decreasing & cleaning; dry cleaning & insect fumigation of clothes; mfg. printing inks, industrial hygiene	2	10	Vinyl chloride, HCl, 1, 2-Dichloroethylene, Tetrachoroethylene, Cl_2	10 (J.A) 100 (B)
	134SB ‡	2.3~36.8 [1~16] 0.2~3.2	1/2 ① 4	Pale orange	Blueish purple		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 $(C_2H_5)_3N$	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_3, Other Amines	1 (A) 2 (B)
Trimethyl amine $(CH_3)_3N$	222S	1~20	1	Pale purple	Pale yellow	Industrial hygiene	3	10	NH_3, 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 $C_6H_3(CH_3)_3$	111U©	20~250	1	Yellow	Brown		2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	25 (J.A.B)
2, 2, 4-Trimethyl pentane $(CH_3)_3CCH_2C(CH_3)_2$	113SB©	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: Original	Colour Change: Stain	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.
n-Undecane $CH_3(CH_2)_9CH_3$	111U©	10~140	1	Yellow	Brown		2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
n-Valeric acid $CH_3(CH_2)_3CO_2H$	216S©	3~70	1	Pale pink	Yellow	Artificial flavour; perfume; lubricant; plasticizer, medicine	3	10	SO_2 (1/20 × Acetic acid ∗), NO_2 (10), HCL (2 × Acetic acid ∗), Cl_2 (5)	
Vinyl acetate $CH_3CO_2CH=CH_2$	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) $CH_2=CHCl$	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_2, 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_2 (50)	
Water vapour H_2O	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_3 (0.02%), NO_2 (0.2%)	
	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_2O	177UR	2~12 LB/MMCF	2	Yellow	Yellowish green	Petrochemical industry, industrial hygiene	3	10		
Xylene (Dimethyl benzene) $C_6H_4(CH_3)_2$	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_2CHCH_2Cl	1-40 ppm	132SC
Benzyl chloride	$C_6H_5CH_2Cl$	1-16 ppm	132SC
1-Bromopropane	$CH_3CH_2CH_2Br$	10-500 ppm	157SA
2-Bromopropane	$(CH_3)_2CHBr$	10-500 ppm	157SA
m-Chlorotoluene	$C_6H_4Cl(CH_3)$	0.5-10 ppm	132SC
o-Chlorotoluene	$ClC_6H_4CH_3$	1-50 ppm	132SC
p-Chlorotoluene	$ClC_6H_4CH_3$	1-50 ppm	132SC
p-Cymene	$CH_3C_6H_4CH(CH_3)_2$	20-200 ppm	102SD
1,1-Dichloroethylene	$CH_2 = CCl_2$	1-22 ppm	132SC
Disilane	Si_2H_6	1-50 ppm	240S
Ethylene chlorohydrine	$ClCH_2CH_2OH$	5-300 ppm	119U
Iodine	I_2	0.7-42 ppm	117SB
Mineral turpentine	—	4-200 ppm	111U
Trichlorotoluene	$C_6H_5CCl_3$	0.2-4 ppm	132SC
☆Benzaldehyde	C_6H_5CHO	5-70 ppm	190U
☆1,1,2,2-Tetrachloroethane	$CHCl_2CHCl_2$	20-80 ppm	236SA

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

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_2)	601SP	100~3,000	2	Purplish blue	Pale pink	2	10
Oil mist	602SP	0.3~5mg/m^3	25	Yellow	Pale blue	2	10
Water vapour (H_2O)	603SPA	20~160mg/m^3	1	Yellow	Yellowish green or blue	3	10
Oxygen (O_2)	※ 604SP	2~24%	1	White	Brown	2	10

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

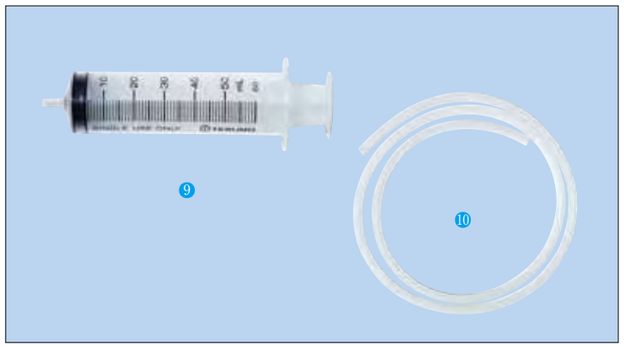
● Model P-41R Compressed Breathing Air Sampling Kit

Composition

❶ Control assembly ·····1 set
(Including an adapter with W22-14RH Female thread for rescue and on-land cylinders) ····· 1 pc
❷ International fitting yoke (For a scuba cylinder) ····· 1 pc
❸ Gas detector tube (an extra option) ····· 1 pc
❹ Tube protector ····· 1 pc
❺ Tip cutter for Gas detector tube ····· 1 pc
❻ Wrench ····· 1 pc
❼ Digital stopwatch ····· 1 pc
❽ Carrying case (Aluminum) ····· 1 pc
Instruction manual ·····1 set

Optional Accessories for 604SP only

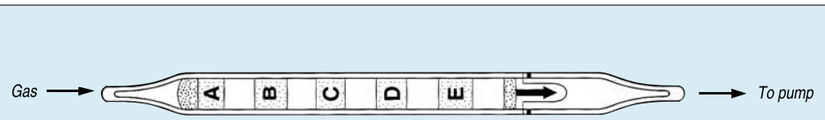
❾ 50mL plastic syringe
❿ 1m vinyl tube



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)



Section	Original
A	Pale purple
B	Reddish purple
C	White
D	White
E	Yellow

Specifications

❶ Tube/box : 10 tubes (10-time use)
❷ Pump stroke : 1 (100mL)
❸ Sampling time : 20 seconds
❹ Shelf life : 1 year

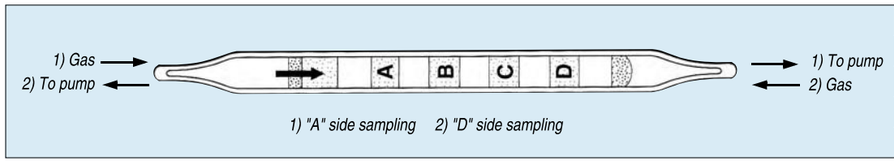
Substances to be detected and the detectable gas concentration limit (Unit: ppm) (※ Organic gas)

NH_3 (5)	SO_2 (10)	HCl (20)	Acetic acid (15) ※	CO (10)	Acetylene (10) ※
Amines (50)	Cl_2 (5)	NO_2 (5)	H_2S (10)	PH_3 (2)	Methyl mercaptan (10) ※

Non-discoloration confirmed substances

HCN Ethylene CO_2 NO

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



Section	Original
A	Orange
B	White
C	Yellow
D	Yellow

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

❶ Tube/box : 10 tubes (5-time use)
❷ Pump stroke : 1 (100mL) +1 (100mL)
❸ Sampling time : 30+30 seconds
❹ 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_2 (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_2S (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_3Br Acetic acid Methane CCl_4 Pyridine

DETECTOR TUBES USED FOR DISSOLVED SUBSTANCES IN SOLUTION

Tube No.	Substance	Chemical Formula	Measuring Range (ppm)	Sampling Volume (mL)	Sampling Time (sec)	Sampling Method	Colour Change Original	Colour Change Stain	Typical Applications	Shelf Life (year)	Use of detector kit
200SA	Sulphide ion	S^{2-}	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	Immersion method	White	Pale brown		2	
201SA	Chloride ion	Cl^-	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	Immersion method	Brown	White		2	
201SC			1~60	over 5.0	180	Immersion method	Brown	Pale yellow		2	
203S	Copper ion	Cu^{2+}	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^-	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_2	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_2O	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 0.04~0.48	300 300	30 10	Yellowish orange	Pink	Indoor air pollutants	1
710A ‡			0.05~1.0 0.10~2.0	30	30 15	Yellowish orange	Pink		1
713 ‡			0.01~0.50	350	10	Yellowish orange	Pink		1
721 ‡	Toluene	$C_6H_5CH_3$	0.05~1.0	200	20	White	Brown		1
721© ‡	Ethyl benzene	$C_6H_4(C_2H_5)_2$	0.05~1.2						1
721© ‡	Xylene	$C_6H_4(CH_3)_2$	0.1~1.4						1
730	p-Dichlorobenzene	$p\text{-}C_6H_4Cl_2$	0.01~0.40	200	15	Yellow	Reddish purple		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_2	0.01~0.1 0.02~0.2	200 200	20 10	White	Reddish purple	1Atmospheric environment measurement	2
750	Trichloroethylene	$Cl_2C = CHCl$	30~400 g/m³ 69~920 g/m³	100	30 15	Yellowish orange	Purple red		1
760	Tetrachloroethylene	$Cl_2C = CCl_2$	30~400 g/m³ 69~920 g/m³	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_3	5~200	8	1~8	Purple	Yellow		3	25 (J.A.B)
502	Hydrogen Sulphide	H_2S	1~20	6	1~8	White	Brown		1	5 (J.A.B)
503	Sulphur dioxide	SO_2	0.5~20	6	1~8	Purple	Yellow		3	2 (A.B)
504	Toluene	$C_6H_5CH_3$	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_3	10~80 g/m³	400	60	Pale purple	Pale yellow	For Cultural-property protection in art galleries and museums	2
901NHL	Ammonia	NH_3	1~12 g/m³	400	60	Pale purple	Pale yellow	For clean room monitoring of semiconductor industries	2
910	Organic acid	Acetic acid $CH_2 = CHCOOH$	10~400 g/m³ 25~1000 g/m³	200 200	60 30	Pale pink	Pale yellow	For Cultural-property protection in art galleries and museums	3
		Formic acid HCOOH	20~800 g/m³	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

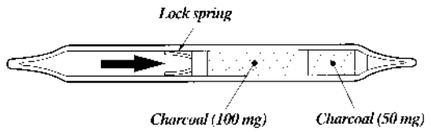
Tube No.	Detector Tube	Chemical Formula	Measuring Range (ppm)	No.of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes / box
					Original	Stain			
290P	Detector tube for crime investigation			1	White	[Gasoline]Brown/dark brown/orange [Kerosene]Pink/dark brown	Discriminate Gasoline and/or Kerosene	1	10
290PⅡ	Detector tube for crime investigation			1	White	[Gasoline]Yellow/brown/greenish brown [Kerosine]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_2H_5OH	0.2~2.0mg/mL	3	Pink	Pale blue		1	2 × 5
290HS ‡	Hydrogen sulphide in blood	H_2S	0.1~1.0 g/mL	1	Pale yellow	Pink		1	2 × 5
290PQ	Paraquat dichloride in blood-qualitative	$CH_3(C_5H_4N)_2CH_3Cl_2$		—	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)

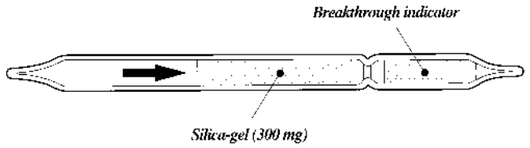
Useful for sampling organic solvent vapours in air with personal sampler for industrial hygiene
(Conformed to NIOSH requirements)
Two Sections System 100mg ＋ 50mg



※ Quantity of tubes per box: 20 tubes

SILICA GEL TUBE (Tube No. 801)

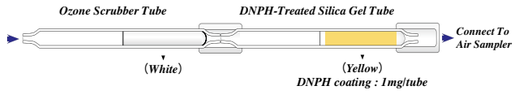
Useful for sampling polar solvent vapours which cannot be collected by Charcoal tube such as Methanol
One Section System 300mg with Breakthrough indicator



※ 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 asmospheres, 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_3.

‡ 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.

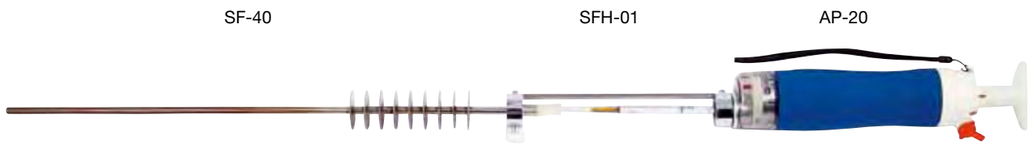
Model AS-1/AS-2 Air Flow Indicator

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



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

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 B-191 Tip Cutter

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

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 SS-100 100ml Glass Syringe

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

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 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_2), No. 175SA (NOx}, No. 175SH (NOx), No. 103SF (SO_2), No. 106SA (CO), No. 126SH (CO_2), No. 173SA (HCl) and No. 159SC (O_2) tubes are useful with this sampler.

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. Remaning time display: Display subtraction/addition (Preset value when shipped from factory is subtraction)
Operating temperature	0~40℃
Power supply voltage	AC100V 50/60Hz (AC220V as extra option)
Main body dimensions	130 (W) × 270 (H) × 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℃ , 10-90%RH (without water condensation)
Power supply	Lithium Ion secondary battery (option) Alkaline AA size battery AC adaptor (option)
Size	145 (w) × 95 (H) × 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 Choroform 152S

MODEL TWS-201 TUBE WARMING SYSTEM

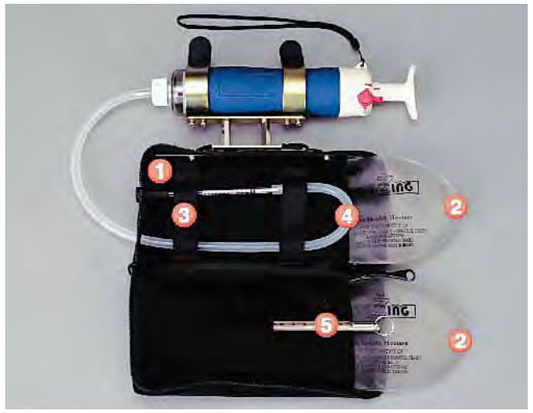
The MODEL TWS-201 TUBE WARMING SYSTEM is designed for measuring gases and vapours in low temperature conditions (down to -20℃).

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

❶ Bag
❷ Hot pack（×2）
❸ Detector tube holder
❹ Connection tube
❺ 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)

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
77S	Water content in solvent
100	Carbon monoxide-length of stain
101S	Acetylene
102SA	Acetone
102SA©	Tetrahydrofuran
102SC	Acetone
102SD	Acetone
103SA	Sulphur dioxide
103SB	Sulphur dioxide
103SC	Sulphur dioxide
103SD	Sulphur dioxide
103SE	Sulphur dioxide
103SF	Sulphur dioxide-in flue gas
103SG	Sulphur dioxide
104SA	Ethyl alcohol
105SA	Ammonia
105SB	Ammonia
105SC	Ammonia
105SD	Ammonia
105SD©	Butyl amine
105SD	Cyclohexyl amine
105SD©	Dibutyl amine
105SD©	Diisopropyl amine
105SD©	N,N-Dimethylaniline
105SD©	Dipropyl amine
105SD©	n-Methyl aniline
105SD©	Morpholine
105SD©	Pentyl amine
105SD©	Propyl amine
105SD©	Pyridine
105SD©	o-Toluidine
105SD©	p-Toluidine
105SE	Ammonia
105SE	Trimethyl amine
105SH	Ammonia
105SM	Ammonia
106B	Carbon monoxide-in presence of ethylene, colour intensity
106C	Carbon monoxide-in presence of ethylene and/or nitrogen oxides, colour intensity
106S	Carbon monoxide
106SA	Carbon monoxide
106SC	Carbon monoxide
106SH	Carbon monoxide
106SS	Carbon monoxide
106UH	Carbon monoxide-ultra high range
107SA	Diethyl ether
107U	Diethyl ether
108B	Ethylene-colour intensity
108SA	Ethylene-high range
108SC	Ethylene
109SA	Chlorine
109SB	Chlorine
109U	Chlorine
110S	Gasoline
111SA	Ethyl acetate
111SA©	Methyl acetate
111U	Ethyl acetate
111U	Isopropyl acetate
111U©	tert-Butanol
111U©	Butyl ether
111U©	Butyl methacrylate
111U©	tert-Butyl methyl ether
111U©	Cumene
111U©	Cyclohexene
111U©	Decahydronaphthalene
111U©	n-Decane
111U©	Diethyl benzene
111U©	Ethyl methacrylate
111U©	Isopropyl ether
111U©	n-Nonane
111U©	1,2,4-Trimethyl benzene
111U©	n-Undecane
112SA	Hydrogen cyanide
112SB	Hydrogen cyanide
112SC	Hydrogen cyanide
113SA	n-Hexane
113SB	n-Hexane
113SB©	Isobutylene
113SB©	Methyl cyclohexane
113SB©	2,2,4-Trimethyl pentane
113SB©	Heptane
113SB©	Isobutane
113SB©	Pentane
113SC	n-Hexane
114	Bromine
115S	Cyclohexane
116	Chlorine dioxide
117SA	Nitrogen dioxide
117SB	Nitrogen dioxide
117SD	Nitrogen dioxide
118SB	Benzene-in the presence of gasoline and the other aromatic hydrocarbons
118SC	Benzene
118SD	Benzene
118SE	Benzene-in presence of gasoline and the other aromatic hydrocarbons
119SA	Methyl alcohol
119LPG	Methanol in LPG
119U	Methyl alcohol
119U©	1,4-Dioxane
120SB	Hydrogen sulphide
120SC	Hydrogen sulphide-in presence of sulphur dioxide
120SD	Hydrogen sulphide
120SE	Hydrogen sulphide
120SF	Hydrogen sulphide
120SH	Hydrogen sulphide
120SM	Hydrogen sulphide
120U	Hydrogen sulphide
120UH	Hydrogen sulphide-ultra high range
120UT	Hydrogen sulphide-ultra high range
121SA	Phosphine in acetylene
121SB	Phosphine in acetylene
121SC	Phosphine
121SD	Phosphine
121SG	Phosphine
121SH	Phosphine-high range
121SS	Phosphine
121U	Phosphine
121U	Arsine
122SA	Ethylene oxide
122SA©	Furan
122SA©	Isopropyl alcohol
122SA©	Methyl ethyl ketone
122SA©	Methyl isobutyl ketone
122SC	Ethylene oxide
122SC©	Propylene glycol
122SC©	Propylene oxide
122SD	Ethylene oxide-low range
122SL	Ethylene oxide
122SM	Ethylene oxide
123S	Dimethyl ether
124SA	Toluene
124SB	Toluene
124SH	Toluene
125SA	Propane
126B	Carbon dioxide
126SA	Carbon dioxide
126SB	Carbon dioxide
126SF	Carbon dioxide
126SG	Carbon dioxide
126SH	Carbon dioxide-extra high range
126UH	Carbon dioxide-ultra high range
128SA	Acrylonitrile
128SB	Acrylonitrile
128SC	Acrylonitrile
128SD	Acrylonitrile
129	Nickel carbonyl
130U	tert-Butyl mercaptan
130U	Ethyl mercaptan
130U	Isopropyl mercaptan
130U	Methyl mercaptan
130U	n-Propyl mercaptan
131	Inorganic gas qualitative detector tube
132SA	Vinyl chloride
132SB	Vinyl chloride
132SC	Vinyl chloride
133A	Acetaldehyde
133SB	Acetaldehyde
134SA	Trichloroethylene
134SB	Trichloroethylene
134SG	Trichloroethylene
135SA	Tetrachloroethylene
135SB	Tetrachloroethylene
135SG	Tetrachloroethylene
135SM	Tetrachloroethylene
136	Acrolein
137U	Hydrogen
138U	Butyl acetate
139SB	Methyl ethyl ketone
139SB©	Butyl acetate
139SB©	1,4-Dioxane
139SB©	Isobutyl acetate
139SB©	Isopropyl acetate
139SB©	Propyl acetate
139U	Methyl ethyl ketone
139U	Methyl propyl ketone
139U©	Diisobutyl ketone
140SA	Arsine
※141SA	Carbon disulphide
141SB	Carbon disulphide
141SC	Carbon disulphide
142S	Mercury vapour
143SA	Xylene
143SB	Xylene
145SA	1,2-Dichloroethylene
146S	Phosgene
147S	Carbon tetrachloride
150U	Isopropyl alcohol
151U	Propyl acetate
152S	Chloroform
153U	Isobutyl acetate
153U©	Naphthalene
155U	Methyl isobutyl ketone
156S	Hydrogen fluoride
157JS	Methyl bromide
157SA	Methyl bromide
157SB	Methyl bromide
157SB©	Bromochloromethane
157SB©	Bromoform
157SB©	1-Bromopropane
157SB©	2-Bromopropane
157SB©	Dibromomethane
157SB©	1,2-Dichloropropane
157SB©	Ethyl bromide
157SD	Methyl bromide
158S	Styrene
158S©	Divinyl benzene
158S©	α-Pinene
158SB	Styrene

NUMERICAL INDEX OF KITAGAWA DETECTOR TUBES

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

■ Specifications are subject to change without any prior notice. ※ NEW DETECTOR TUBES ©WITH CONVERSION CHART

APPLICATIONS

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.

DISTRIBUTED BY:

EURO-GAS management services ltd

Euro-Gas Management Services Ltd.
Churston House, Bascombe Road, Churston Ferrers,
Devon, TQ5 0JJ, United Kingdom.
Tel: +44(0)1803 844414 Fax: +44(0)1803 844224
Email: euro-gas@btconnect.com
Website: www.euro-gasman.com

MANUFACTURED BY:

KOMYO RIKAGAKU KOGYO K.K.

ADDRESS:1-8-28, SHIMONOGE, TAKATSU-KU, KAWASAKI-CITY,
KANAGAWA 213-0006, JAPAN
TEL:+81-(0)44-833-8911 FAX:+81-(0)44-833-2672
URL http://www.komyokk.co.jp/english/
E-mail qa@komyokk.co.jp

B.13/08/7D
printed in Japan