KITAGAWA
KOMYO RIKAGAKU KOGYO

BK01017

KITAGAWA

GAS DETECTOR TUBE SYSTEM

An Antibacterial Material in Aspirating Pump for Hygiene Purpose

A Shatterproof Structure on Detector Tube for Safety Purpose

- Certified to ISO9001:2000
- Japan Design Registration No.1131898
- United States Design Patent No.US D467,334S
- The Model AP-20 aspirating pump is certified in conformity with the European standard EN1231

KOMYO RIKAGAKU KOGYO K.K.

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Whenever

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

Wherever

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

Whoever

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

Speedy

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

Safety

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

WE CONTRIBUTE TO PUBLIC SAFETY AND SECURITY

KITAGAWA GAS DETECTOR TUBE HAS BEEN IMPROVED FOR SAFETY ON USE BY WRAPPING WITH CLEAR FILM.

Hence, glass pieces will not be scattered even if the tube is broken by mistake.
Read carefully the instruction sheet provided in a tube box before use.

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

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

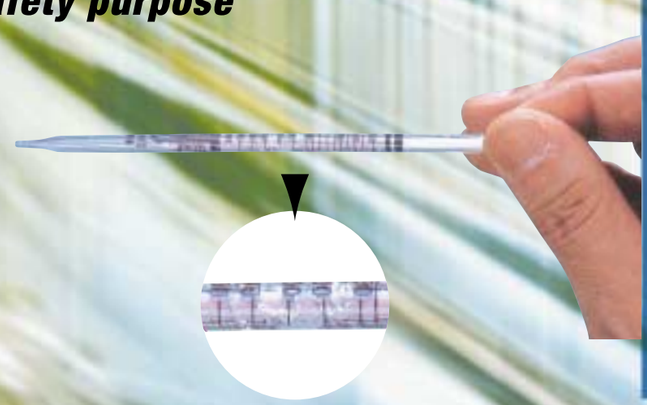
"KITAGAWA GAS DETECTOR TUBE SYSTEM" is noted with above excellent features in analysis of gas concentration and is therefore widely used throughout the world.

KITAGAWA MODEL AP-20

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

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

A Shatteproof structure for safety purpose



APPLICATIONS

Detailed more in page 27 and in each tube data as typical applications

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

In case gases are used as material or intermediates in various industries and impurities in the gas are measured by gas detector tubes in order to make products' quality up and production efficiency up by preventing deterioration of catalysts.

Air-pollution Source

Flue gases suchas Nitrogen compounds, SO_2, CO, CO_2, HCl and O_2 are possible to measure economically together with Model P-10FG Flue gas sampler for air pollution control.

Industrial Waste Water

Effluent can be analyzed for certain types of pollution. The method is so simple and quick, accordingly 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.

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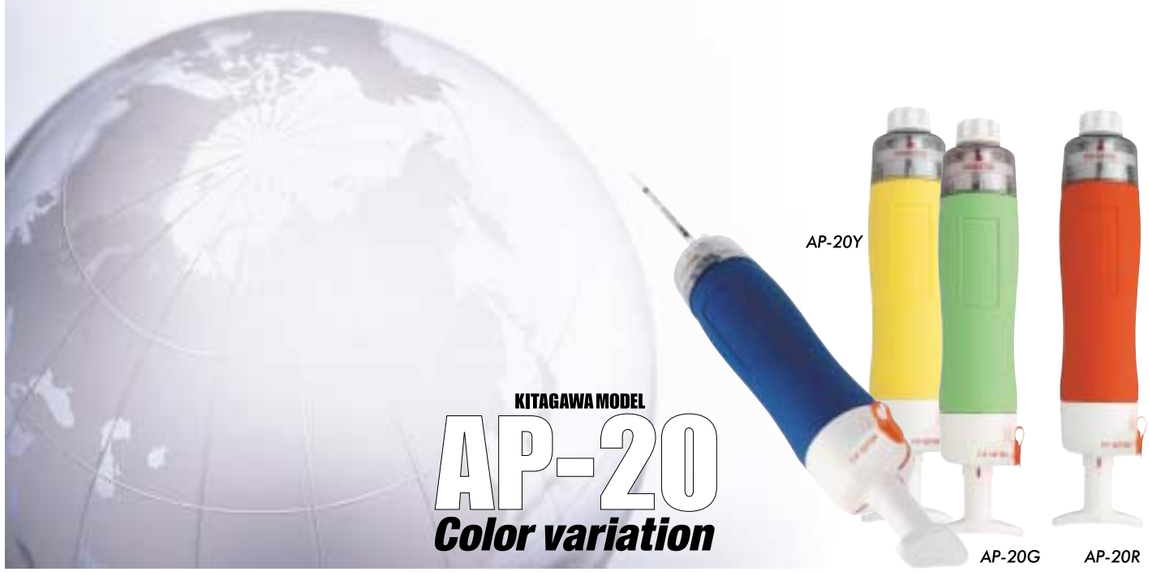

Certificate of ISO 9000:2000

We KOMYO RIKAGAKU KOGYO K.K., have been assessed and certified as meeting the requirements of ISO 9000:2000, 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
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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

Hand strap allows the compact 300gm pump to be carried safely and easily.

To fit a hand smoothly With An Antibacterial Blue Grip

50ml sample volume catch dramatically increases the effective measurement range of nearly all tubes.

Glass tip storage prevents the dangerous spread of glass tips and allows safe disposal.

End of sample time indicator gives a positive, visual indication for the operator to take the tube reading.

1 ***Prepare Aspirating puimp.***
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 case where the detector tubes which have plural measuring ranges, the scale range printed on each detector tube and the number of pump strokes are marked by a circle (○).**
   Example: Tube No. 102SD

Measuring Range (ppm)	No. of Pump Strokes
250~5,000	1/2
100~2,000	①
40~800	2

2. **The range printed on the tube box shows the range of the minimum and maximum detectable concentrations.**
   Example: Tube No.102SD 40~5,000

NOTICE 2

In case where gas concentration is read by using a conversion chart as shown in the tube instruction sheet, mark © is affixed 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 orders.

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 isobuty 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.A) 0.5 (B)
Acetone CH_3COCH_3	102SA	0.1~ 2.0%	①	Orange	Dark brown	Leakage & file hazard detection in acetate rayon industry, paints industry & pharmaceutical industry	3	10	Alcohols,Other Ketones, Aromatic hydrocarbons, Esters, Halogenated hydrocarbons (0.5%)	200 (J) 500 (A.B)
		1.0~ 5.0%	1/2							
	102SC	0.01~ 4.0%	1	Yellow	Pink	Impurity test of dissolved acetylene	1	10	Acetaldehyde (30), Acrolein (20), Methy ethyl ketone (150), Methyl isobutyl ketone (400)	
	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							
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	

※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 • 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ⓒC	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 0.5~10 2 0.25~5 4 0.2~4 5		Yellow	Red		1	2 × 5	HCN	
Allyl alcohol CH_2=CHCH$_2$OH	184SⓒC	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 5~130 2		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	
	105SD	1~20 ① 0.5~10 2 0.2~4 5		Pale purple	Pale yellow	Industrial hygiene	3	10	Amines	
	105SH	0.5~30%	1	Pink	Blue・Brownish green	Process control & leakage detection in synthetic ammonia plant, cuprammonium rayon process, fertilizer mfg.	3	10	H_2S (3,000)	
	105SM	0.1~0.1%	1	Pale purple	Pale yellow	Process control	2	10	Amines	
Aniline (Aminobenzene) $C_6H_5NH_2$	181S	2~30 ① 1~15 2		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)
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)	0.1 (J) 0.05 (A.B)
	121U	0.1~2.0 ① 0.05~1.0 2		Pale yellow	Pink	Industrial hygiene, semiconductor manufacturing process	2	10	Hydrogen selenide, Mercaptans, H_2S, HCN SO_2	
Benzene-in presence of Gasoline and/or other Aromatic hydrocarbons C_6H_6	118SB	5~200	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 0.2~1 5		White	Greenish brown		2	2 × 5	Toluene (1,000), Xylene (1,000), Ethyl benzene (1,000), Co (2), Hexane (2)	

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Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/ box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Benzene C_6H_6	118SC	4~100 2~50 1~25	1 ② 4	White	Greenish brown	Industrial hygiene (suspected carcinogen in humans)	2	10	Toluene, Xylene, CO(50), Hexane (100)	0.5 (A) 1 (B)
	118SD	1~75 0.2~15 0.1~7.5	1 ⑤ 10	White	Greenish brown		2	2 × 5	Toluene, Xylene, Co (2.0), Hexane (2.0)	
Bromine 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)
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 2.5~50	① 2	Pale yellow	Pale blue		1	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	
	168SD	0.5 ~10.0	1	Pink	Pale yellow		3	2 × 5	H_2S (7), Isobutylene (0.2), NH_3 (1)	
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 4~120	② 4	Yellow	Pale blue	Organic solvent treating, industrial hygiene	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	100 (J.A.B)
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	5~60	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	2	10	Alcohols, Esters, Paraffin hydrocarbons, Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	20 (A) 25 (B)
tert-Butyl mercaptan $(CH_3)_3CSH$	130U	0.5~5 1~10	① 1/2	Pale yellow	Pink	Industrial hygiene	2	10	Arsine, Hydrogen selenide, H_2S, HCN	0.5 (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	0.1~ 2.6% 0.2~ 5.2%	① 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)	5,000 (J.A.B)

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Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/ box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Carbon dioxide CO_2 Concentration chart method	126B	0.03~0.7% 100~1,500	1 3	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)
Carbon dioxide CO_2	126SB	0.05~1.0%	1	Purplish blue	Pale pink		2	10	HCN (100), Cl_2 (200), SO_2, H_2S (150), NO_2	
	126SF	100~2,000 200~4,000	① 1/2	Pink	Yellow		2	10	HCN	
	126SG	0.02~0.7% 0.04~1.4%	① 1/2	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	10 (J.A.B)
	141SB	2~50 0.8~20	② 4	Pink	Yellow	Industrial hygiene	3	2 × 5	H_2S (120), SO_2, Cl_2	
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	Acetylene (5), H_2S (20), SO_2 (1/5 × CO*), NO_2 (1/10 × 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*)	

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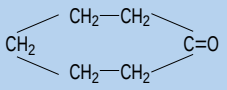
Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/ box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Carbon monoxide -ultra high range CO	106UH	0.1~10% 0.2~20%	① 1/2	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	1~60 0.5~1	① 2	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 (1/5 × COS*), CS_2 (1/10 × COS*), H_2S (1/2 × COS*), C_4H_9 (0.1%)	
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 0.125~2.5 0.1~2.0	① 4 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 0.05~1	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 1~5	① 5	White	Pale brown	Industrial hygiene	1	2 × 5	Toluene, Xylene, CO (50), n-Hexane (100), Benzene, Ethyl benzene	10 (J.A) 1 (B)
Chloroform (Trichloromethane) $CHCl_3$	152S	70~500 35~250 23~167	② 3 4	White	Yellowish orange	Industrial hygiene (suspected carcinogen in humans)	2	2 × 5	Halogens, Halogenated hydrocarbons, n-Hexane (200)	10 (J.A) 2 (B)
Chloropicrin (Nitrotrichloromethane) Cl_3CNO_2	172S	0.1~16.0 0.05~8.0	① 2	White	Pink	Industrial hygiene	1	2 × 5	Carbon tetrachloride, Phosgene	0.1 (J.A)
Chloroprene (2-Chlorobutadiene) CH_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.A)
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	25 (J.A) 10 (B)
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)
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)

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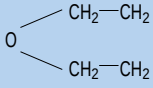
Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/ box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Dibutyl amine $(C_4H_9)_2NH$	105SD Ⓒ	2~20	1	Pale puple	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	235S	10~160	1	White	Purple	Industrial hygiene	1	2 × 5	Nitrogen oxides, Halogens, Halogenated hydrocarbons, Hexane (20), Alcohols (400), Toluene (20)	100 (J.A.B)
1,2-Dichloroethane (Ethylidene dichloride) $ClCH_2CH_2Cl$	230S	5~50	1	White	Purple		1	2 × 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) $CHCl=CHCl$	145S	5~400	1	White	Reddish orange	Extraction of natural dyes; mfg. perfumes; paints industry & painting; ferment retardation, industrial hygiene	1	2 × 5	Cl_2 (15), Vinyl chloride (5), Tetrachloroethylene (3), Trichloroethylene (3)	150 (J) 200 (A.B)
Dichloromethane (Methylene chloride) CH_2Cl_2	180S	30~1,000 ② 10~200 4		White	Reddish orange	Industrial hygiene	2	2 × 5	Halogens, Halogenated hydrocarbons	50 (J.A) 100 (B)
1,3-Dichloropane $ClCH_2CH_2CH_2Cl$	194S	10~500	1	White	Purple		1	2 × 5	Halogenated hydrocarbons	
Diethyl amine $(C_2H_5)_2NH$	222S	1~20	1	Pale purple	Pale yellow		3	10	NH_3, Other amines	10 (J.B) 5 (A)
Diethyl ether (Ethyl 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	
Diisopropyl amine $[(CH_3)_2CH]_2NH$	105SD Ⓒ	1~16	1	Pale purple	Pale yellow		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 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 1~15 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		3	10	Amines	
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)

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				Original	Stain					
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)
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	Amnonia, 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%)	100 (A.B) 50 (J)
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 -high range $H_2C=CH_2$	108SA	20~ 1,200	1	Yellow	Blue		2	10	CO, H_2S, Acetylene, Propylene	
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	2	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	0.01~ 1.8% 1.0~ 4.0%	① 1/2	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)	
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	⑴/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	

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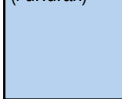
				Original	Stain					
Ethyl mercaptan (Ethanethiol) C_2H_5SH	130U	[0.5~5] 1~10	① 1/2	Pale Yellow	Pink	Industrial hygiene	2	10	Arsine, Hydrogen selenide, H_2S, HCN	0.5 (A.B)
Formaldehyde HCHO	171SA	20~ 1,500	1	Yellow	Pink	Atmospheric pollution survey, germicide, fungicide organic mfg. Industrial hygiene	2	2 × 5	Other aldehydes	0.5 (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, NH3, (10), NO2 (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) 	122SA©	0.01~ 0.9% 0.2~ 2.0%	1 1/2	Orange	Dark brown	Fire hazard detection in paints industry & painting	3	10	Aromatic hydrocarbons, Esters, Ketones, Alcohols, Halogenated hydrocarbons	
Furfural (2-Furaldehyde) 	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	2~25	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-$C6H_{14}$ Mineral turpentine	187S		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	[0.05~ 0.6%] 0.11~ 1.32%	① 1/2	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	1 ② 4	Yellow	Pale blue	Rocket fuel, corrosion protection of boiler, antioxidant	1	10	NH_3, Amines	0.01 (A) 0.02 (B)
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	[20~600] 40~ 1,200	① 1/2	Purple	Pink	Industrial hygiene, process control, leakage detection, fire hazard detection; phamaceuticals organics mfg.	2	2 × 5	SO_2, Cl_2	5 (J.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)

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				Original	Stain					
Hydrogen cyanide HCN	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)	5 (J) 10 (B)
	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 0.17~12	③ 6 9	Greenish yellow	Pink	Dehydrator, mfg. of Hydrofluoric acid, and Freon, industrial hygiene	3	10	Cl_2, HCl	3 (J) 1.8 (B)
Hydrogen peroxide H_2O_2	247S	0.5~10.0	5	White	Yellow	Mfg. bleach, industrial chemicals and medicine	3	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.A) 0.02 (B)
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 (J.A.B)
	120SC	0.005~0.16%	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	[1~30] 2~60	① 1/2	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	[50~1,000] 100~2,000 25~500	① 1/2 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	[0.05~0.6%] 0.1~1.2%	① 1/2	White	Dark brown		2	10	SO_2 (0.3%)	
	120U	[0.2~0.3] 0.4~6.0	① 1/2	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	5 (J.A.B)
	120UT	[5~40%] 2.5~5%	⑴⑵ 1	Pale blue	Black		3	10	SO_2 (8%)	
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	

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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) $(CH_3)_2CHCH_2OH$	280U	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)
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)
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	
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	
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.A)
Mercury vapour Hg	142S	0.5~10 mg/m^3 0.1~2.0 mg/m^3	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/m_3 (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)

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Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/ box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
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)
Methyl acetate $CH_3CO_2CH_3$	222SAⒸ	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	5~60	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	
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 (A) 5 (B)
	157SB	2~80 ① 1~25 2 0.4~10 4		White	Yellow		3	2 × 5	Halogens, Halogenated hydrocarbons, Hexane (200)	
	157JS	3-70 g/m³	1/2	Yellow	Brown		2	2 × 10		
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.A.B)
Methyl chloroform (1,1,1-Trichloroethane) CH_3CCl_3	160S	30~400 ① 15~200 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Ⓒ	0.05~ 2.2% 1.0~ 5.0%	1 1/2	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	

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Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/ box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
Methyl iodide (Iodomethane) CH_3I	176S	4~40 2~20	② 4	Yellow	Dark brown	(Suspected carcinogen in humans)	2/3	2 × 5	H_2S (7), n-Hexane (500), Acetone (700), Benzene (2), Toluene (2), Xylene (2), Halogenated hydrocarbons	2 (A.B)
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.A.B)
	155U	5~300	1	Yellow	Pale blue	Industrial hygiene	2	10	Alcohols, Esters, Aliphatic hydrocarbons (over C_3), Aromatic hydrocarbons, Ketones, Halogenated hydrocarbons	
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	0.5~5 1~10	① 1/2	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	Industrial hygiene	2	10	Esters, Ketones, Alcohols, Aromatic hydrocarbons	50 (A)
Methyl styrene $CH_3C_6H_4CH=CH_2$	193S	10~500	1	White	Yellow		3	10	Styrene	50 (A)
Monoethanol amine (2-Aminoethanol) $HOC_2H_4NH_2$	224SA	1~50 0.5~25	① 2	Pink	Pale purple		2	10	Other Amines, NH_3, Hydrazine	3 (J.A.B)
Morpholine C_4H_9NO	105SDⓒ	2~22	1	Pale purple	Pale yellow	Solvent; rubber accelerator	3	10	Amines	20 (A.B)
Naphthalene $C_{10}H_8$	153Uⓒ	10~100	1	Pale yellow	Pale blue	Industrial hygiene	1	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons	10 (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.B)
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)	3 (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	0.5~15 1~30	① 1/2	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)	
Organic gas checker	186		1	Orange	Black or Dark green		2	10	H_2S (10)	

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				Original	Stain					
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	1.5~3% 3~24%	1 ①/②	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 Pink	Brown Yellow	Combustion control	1.5	2 × 5		(CO_2) 5000 (J.A.B)
Ozone O_3	182SA	50~500 100~1,000	① 1/2	Dark blue	Yellow	Process control	2	10	Cl_2, NO_2	0.1 (J.A)
	182SB	10~100 50~50 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)
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)
	121SB**	5~90	1	Pale blue	Yellowish brown		3	10		
Phosphine PH_3	121SC	20~700 40~1,400	① 1/2	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)	
	121SD	1~20.0 0.5~10.0 0.25~5.0	1/2 ① 2	Pale orange	Brownish purple		1	10	NH_3, (60), Arsine, Hydrogen selenide, Nickel carbonyl	
Phosphine-high range PH_3	121SH	100~1,600 200~3,200	① 1/2	White	Orange		3	10	NO_2, H_2S, SO_2	

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※※Air flow control orifice is required.

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				Original	Stain					
Phosphine PH_3	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	0.3 (J.A)
Propane C_3H_3	125SA	0.02~0.5%	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)	
Propylene oxide (1.2-Epoxypropane) CH_3CHCH_2O	163SA	0.05~3.0% 1.0~5.0%	① 1/2	Orange	Dark brown	Leakage detection in preparation of propylene oxide	3	10	Aromatic hydrocarbons, Esters, Ketones, Alcohols, Halogenated hydrocarbons	2 (A) 5 (B)
n-Propyl mercaptan $CH_2CH_2OH_2SH$	130U	0.5~5 1~10	① 1/2	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 carbon-dioxide SO_2	103SG	0.5~25 0.1~3	① 4	Blue purple	White		3	10	NO_2 (0.5), H_2S (0.5), NH_3 (1)	2 (A)
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)

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				Original	Stain					
Tetrachloroethylene (Perchloroethylene) $Cl_2C=CCl_2$	135SA	5~150 10~300	① 1/2	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	
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)
Tetrahydrofuran 	102SAⓒ	0.2~3.0% 2.0~5.0%	1 1/2	Orange	Dark brown	Fire hazard detection in paints industry & painting petrochemical industry, Industrial hygiene	3	10	Alcohols, Esters, Ketones, Aromatic hydrocarbon	200 (J) 50 (A.B)
	162U	20~400	1	Pale Yellow	Pale blue		2	10	Alcohols, Esters, Ketones, Aromatic hydrocarbons, 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)	50 (J.A.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	236S	10~100	1	White	Purple	Industrial hygiene	1	2 × 5	Nitrogen oxides, Halogens, Halogenated hydrocarbons, Hexane (100)	10 (J.A)
Trichloroethylene $Cl_2C=CHCl$	134SA	5~150 10~300	① 1/2	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	25 (J) 50 (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	1~10 2~20	① 1/2	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)
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)

※Interfered by coexistence more than parenthesized rate.

Gas to be measured (Synonym) Chemical Formula	Tube No.	Measuring Range (ppm)	No. of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes/ box	Interferences (ppm)	T.L.V (ppm) J: JPN A: U.S.A B: U.K.
				Original	Stain					
2, 2, 4-Trimethyl pentane $(CH_3)_3CCH_2C(CH_3)_2$	113SB Ⓒ	100~1,400 200~4,000	① 1/2	Orange	Yellowish green	Automotive fuel	2	10	Paraffin, Aromatic hydrocarbons, Alcohols (6%), Ketones (6%), Esters (6%)	
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 (2,000), Acetylene (1%), Ethylene (300), Cl_2 (10 × Vinyl chloride*)	
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 (0.2%), 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 or Toluene (5), Methanol (1%), Hexane (0.1%)	50 (J.B) 100 (A)
	143SB	5~200	2	White	Brown		2	10		

※Interfered by coexistence more than parenthesized rate.

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

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

(3) TLV.(J): Threshold Limit Values listed in Japanese Journal of industrial Health issued by Japan Association of Industrial Health.
TLV.(A): Threshold Limit Values for chemical Substances in the Work environment Adopted by ACGIH (American Conference of Governmental Industrial Hygienists) with Intended Change for 2006.
TLV. (B): Occupational Exposure Limit listed on guidance Note EH40/2005 from the Health and Safety Executive in U.K.

SUBSTANCES TO BE MEASURED BY USING CONVERSION CHARTS

Chemical substances listed in this section can be measured by using respective conversion charts existing gas detector tubes on demands.

However, note that this conversion chart method is available for 20 ˚C (68˚ F) in temperature and detailed conditions such as other temperatures, humidity and coexisting gases are not confirmed. Please specify the name of substance with relevant tube No. 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
Bromochloromethane	CH_2BrCl	5-400 ppm	157SB
Bromoform	$CHBr_3$	0.5-20 ppm	157SB
Butyl ether	$(CH_3CH_2CH_2CH_2)_2O$	10-1,200 ppm	111U
Butyl methacrylate	$CH_2=C(CH_3)CO_2C_4H_9$	20-1,000 ppm	111U
tert-Butyl methyl ether	$CH_3OC(CH_3)_3$	25-500 ppm	111U
m-Chlorotoluene	$C_6H_4Cl(CH_3)$	1-10 ppm	132SC
o-Chlorotoluene	$ClC_6H_4CH_3$	3-80 ppm	132SC
p-Chlorotoluene	$ClC_6H_4CH_3$	2-60 ppm	132SC
Crotonaldehyde	$CH_3CH=CHCHO$	2-40 ppm	190U
Cumene	$C_6H_5CH(CH_3)_2$	20-140 ppm	111U
Cyclohexene	C_6H_{10}	20-300 ppm	111U
Decahydronaphthalene	$C_{10}H_{18}$	20-200 ppm	111U
n-Decane	$CH_3(CH_2)_8CH_3$	5-90 ppm	111U
1,1-Dichloroethylene	$CH_2=CCl_2$	1-22 ppm	132SC
1,2-Dichloroethylene	$CH_3CHClCH_2Cl$	20-250 ppm	157SB
1,3-Dichloroethylene	$CHCl=CHCH_2Cl$	1-10 ppm	132SC
Dicyclopentadiene	$C_{10}H_{12}$	2-60 ppm	190U
Diethyl benzene	$C_6H_4(C_2H5)_2$	10-180 ppm	111U
Disilane	Si_2H_6	1-50 ppm	240S
Ethylene chlorohydrine	$ClCH_2CH_2OH$	5-300 ppm	119U
Ethyl bromide	C_2H_5Br	5-400 ppm	157SB
Ethyl methacrylate	$CH_2=C(CH_3)CO_2C_2H_5$	20-500 ppm	111U
Isophorone	$C_9H_{14}O$	5-80 ppm	197U
Isopropyl amine	$(CH_3)_2CHNH_2$	1-12 ppm	222S
Isopropyl cellosolve	$(CH_3)_2HCO(CH_2)_2COH$	5-350 ppm	190U
Isopropyl ether	$[(CH_3)_2CH]_2O$	30-800 ppm	111U
Methyl butyl ketone	$CH_3(CH_2)_3COCH_3$	5-80 ppm	237S
Methyl isothiocyanate	C_2H_3NS	10-200 ppm	111U
Mineral turpentine	—	4-200 ppm	111U
n-Nonane	$CH_3(CH_2)_7CH_3$	5-160 ppm	111U
α-Pinene	$C_{10}H_{16}$	20-300 ppm	158S
1-Propanol	$CH_3CH_2CH_2OH$	20-300 ppm	190U
Propylene oxide	CH_3CHCH_2O	3-70 ppm	122SC
Pyridine	C_5H_5N	0.2-5 ppm	219S
Tetrahydrothiophen	C_4H_8S	4-100 ppm	190U
Trichlorotoluene	$C_6H_5CCl_3$	0.2-4 ppm	132SC
∗Benzaldehyde	C_6H_5CHO	5-70 ppm	190U
∗1,1,2,2-Tetrachloroethane	$CHCl_2CHCl_2$	20-60 ppm	236S
∗Propylene glycol	$CH_3CH(OH)CH_2OH$	20-300 ppm	122SC

∗N.B. Upon these three kinds of measurement, the conversion chart and the measuring renge may vary at each manufacturing lot.

COMPRESSED BREATHING AIR TEST SYSTEM

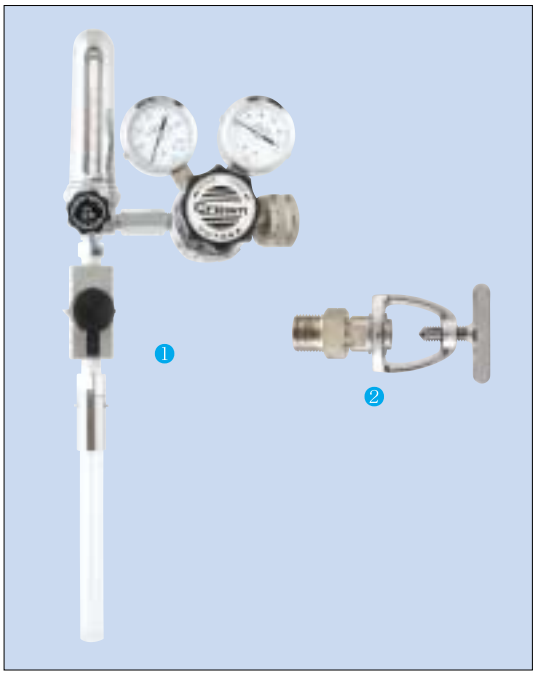
The system is designed to measure impurities in compressed breathing air such as in scuba and rescue cylinders, as well as from an outlet of an air-charge compressor.

●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	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 optionally necessary 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
❾ Instruction manual ……1 set

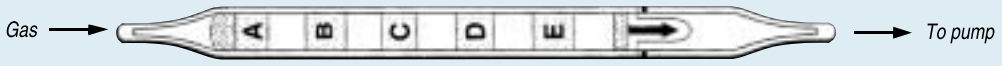
Optional Accessories for 604SP only

❶ 50mL plastic syringe
❷ 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 the two-kind tubes are possible to detect various kinds of gases.
Although the main purpose of this system is qualitative analysis, simple quantitative analysis of the gases is also possiblel.

●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

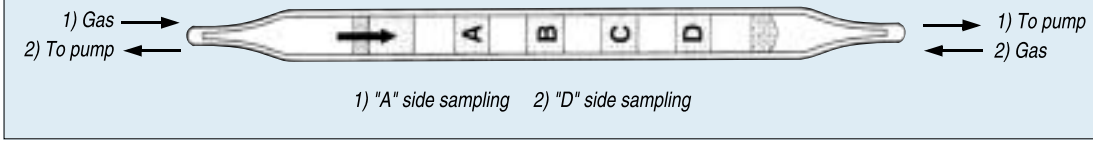
Substances to be detected and the detectable gas concentration limit (Unit: ppm) (※ :Organic gas)

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.	Detector Tube	Chemical Formula	Measuring Range (ppm)	Sampling		Sampling Method	Colour Change		Typical Applications	Shelf Life (year)	Use of detector kit
				Volume (mL)	Time (sec)		Original	Stain			
200SA	Sulphide ion	S^{2-}	2~1,000	over 5.0	180	Immersion methed	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 methed	White	Pale brown		2	
201SA	Chloride ion	Cl^-	10~2,000	over 5.0	90	Immersoin 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	
202	Iron ion	Fe^{3+}	50~400	1.0	250	Injection method	Pale yellow	Brown	Waste water analysis in pulp & paper mills, petroleum refineries other chemical industries, waste disposal plants water treatment, school hygiene	1	Injector (1ml) (As extra)
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 mehtod	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

Quantity of tubes per box:10 tubes each.

INDOOR AIR POLLUTANTS MEASUREMENT DETECTOR TUBE

Tube No.	Detector Tube	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	Yellow	Pink	Indoor air pollutants	1
710A	Formaldehyde	HCHO	0.05~1.0 0.10~2.0	30	30 15	Yellowish orange	Pink		1
721	Toluene	$C_6H_3CH_3$	0.05~1.0	200	20	White	Brown		1
721Ⓒ	Xylene	$C_6H_4(CH_3)_2$	0.1~1.4	200	20	White	Brown		1
730	p-Dichlorobenzene	p-$C_6H_4Cl_2$	0.01~0.40	200	15	Yellow	Reddish purple		1

Quantity of tubes per box:20 tubes(Tube No.721, 730: 2 × 10 tudes).
Model S-23E or S-25N Air Sampler is required for above tubes (See page 26).

ATMOSPHERIC ENVIRONMENT MEASUREMENT DETECTOR TUBE

Tube No.	Detector Tube	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	Atomospheric environment measurement	2
750	Trichloroethylene	$Cl_2C=CHCl$	30~400μg/m³ 69~920μg/m³	100	30 15	Yellow	Reddish purple		1
760	Tetrachloroethylene	$Cl_2C=CCl_2$	30~400μg/m³ 69~920μg/m³	100	30 15	Yellow	Reddish purple		1

Quantity of tubes per box:20 tubes(Tube No.721, 730: 2 × 10 tudes).
Model S-23E or S-25N Air Sampler is required for above tubes (See page 26).

TIME WEIGHTED AVERAGE TUBES

Tube No.	Detector Tube	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	Hyodrogen 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	10~80μg/m³	400	60	Pale purple	Pale yellow	For Cultural-property protection in art galleries and museums	2
901NHL	Ammonia	NH_3	1~12μg/m³	400	60	Pale purple	Pale yellow	For clean room monitoring of semiconductor industries	2

Model S-23E Air Sampler is reguired for above tubes.

CRIMINAL INVESTIGATION DETECTOR TUBE

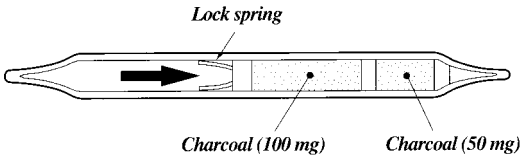
Tube No.	Detector Tube	Chemical Formula	Measuring Range (ppm)	No.of Pump Strokes	Colour Change		Typical Applications	Shelf Life (year)	Q'ty of tubes / box
					Original	Stain			
290P	Detector tube for crime investigation			1	White	[Gasoline]Brown/dark brown/orange [Kerosene]Pink/dark brown	Discriminate 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		1	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		1.5	2 × 5
290EA	Ethyl alcohol in blood	C_2H_5OH	0.2~2.0mg/mL	3	Pink	Pale blue		5/6	2 × 5
290PQ	Paraquat dichloride in blood-qualitative	$CH_3(C_5H_4N)_2CH_3Cl_2$			White	Blue		3	10

COLLECTION TUBES

CHARCOAL TUBE (Tube No. 800B)

Useful for sampling orgnic solvent in air with personal sampler for industrial hygiene (Conformed to NIOSH requirements)

Two Sections System 100mg + 50mg

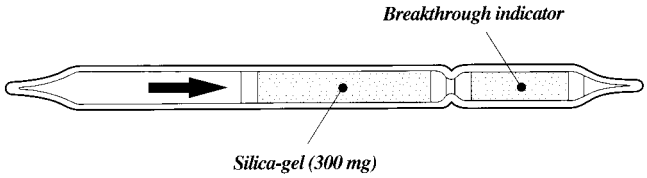


※Quantity of tubes per box: 20 tubes

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

SPECIAL DETECTORS & ACCESSORIES

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

Available in 5 metres (SH-5N) and 10 metres (SH-10N) length, 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 gas detection vertically and horizontally 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. 300 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).

SPECIAL DETECTORS & ACCESSORIES

Model SA-10 One-hand Operation Switch

In case of operations on a ladder, high places and narrow space, one-hand sampling is available by pushing down the switch knob. (Possible to attach on Model AP-1 and 400 pumps.)
An extra adaptor is required for model AP-20.

Model B-191 Tip Cutter

Cut tips of detector tubes, do not scatter and accumulated pieces can be checked through a clear body.

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-1 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.

SPECIAL DETECTORS & ACCESSORIES

Model S-23E Air Sampler

Model S-25N Air Sampler

SPECIFICATIONS

Model	S-23E
Air pump	Diaphragm
Maximum suctlon 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	Oigital display by LCD
Measuring and display at momentary flow	Flow seting 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)

SPECIFICATIONS

Model	S-25N
Air pump	Double diaphragm
Range of flow volume setting	0.2~0.5L/min.
Sampling flow level range	0.0~9999.9L
Display range of set time	0.00~999.59 (hour, minute)
Time setting display range	Time: minute, a day of the week (1week)
Buill-in flow meter	Mass-flow sensor
Display part	LCD device
Operating temperature	0~40℃
Power supply voltage	Dry battery (size AA battery × 8) (Exclusive Nickel Hydrogen battery 7.2V, AC adapter is optional)
Dimensions	109 (W) × 67.5 (H) × 138 (D) mm
Main body weight	680g (including 8 × size AA dry batteries)
Standard accessories	Soft case (Shoulder belt)

P-50/UFO-ⅡH

Harmful Gas Detector for Disaster Relief

In a sudden disaster, there is high possibility of secondary disaster to the rescue team. Especially the disaster by the toxic gas is dangerous because of the invisibility.
The “Harmful Gas Detector for Disaster Relief” can measure the toxic gas easily and quickly at the disaster scene.

Composition of P-50

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

Composition of UFO-ⅡH

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

●For Organic 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

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 thanks, 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 apparatuses: 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 driving by drunken persons.

(12) Others: Detection of arsenic in foods: Measurement of formaldehyde vapour generated from textile products; measurement of various kinds of ion.

NUMERICAL INDEX OF KITAGAWA DETECTOR TUBES

Tube No.	Detector Tube
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
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
109SA	Chlorine
109SB	Chlorine
109U	Chlorine
110S	Gasoline
111SA	Ethyl acetate
111SAⓒ	Methyl acetate
111U	Ethyl acetate
111U	Isopropyl acetate
111Uⓒ	1,2,4-Trimethyl benzene
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 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
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
121SH	Phosphine-high range
121U	Phosphine
121U	Arsine
122SA	Ethylene oxide
122SAⓒ	Furan
122SAⓒ	Isopropyl alcohol
122SAⓒ	Methyl ethyl ketone
122SAⓒ	Methyl isobutyl ketone
122SC	Ethylene oxide
122SD	Ethylene oxide-low range
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
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
140SA	Arsine
141SA	Carbon disulphide
141SB	Carbon disulphide
142S	Mercury vapour
143SA	Xylene
143SB	Xylene
145S	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
158S	Styrene
※158SB	Styrene
159SA	Oxygen
159SB	Oxygen
159SC	Oxygen-Non-heating type
160S	Methyl chloroform
162U	Tetrahydrofuran
163SA	Propylene oxide
164SA	Methyl mercaptan
164SH	Methyl mercaptan
165SA	Ethyl mercaptan
165SB	Ethyl mercaptan
166S	Ethylene dibromide
167S	Hydrogen selenide
168SA	1,3-Butadiene
168SB	1,3-Butadiene
168SC	1,3-Butadiene
※168SD	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
176S	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
192S	Epichlorohydrine
193S	Methyl styrene
194S	1,3-Dichloropropane
196S	N,N-Dimethylformamide
197U	Cyclohexanone
198U	Methyl cyclohexanone
199U	Methyl cyclohexanol
200SA	Sulphide ion
200SB	Sulphide ion
201SA	Chloride ion
201SB	Chloride ion
202	Iron 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
223S	2,2-Dichloroethyl ether
224SA	Monoethanol amine
227S	Dimethyl amine
227S	Ethyl amine
227S	Methyl amine
229S	N,N-Dimethylacetamide
230S	1,2-Dichloroethane
232SA	Ethylene glycol
232SB	Ethylene glycol
233S	Nitric acid vapour
234SA	Free residual chlorine
235S	1,1-Dichloroethane
236S	1,1,2-Trichloroethane
237S	Vinyl acetate
238S	Furfuryl alcohol
239S	Carbonyl sulphide
240S	Silane
242S	Diborane
243U	Tetraethoxysilane
244U	Sulphuric acid
※247S	Hydrogen peroxide
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
290PQ	Paraquat dichloride in blood-qualitative
290P	Detector tube for crime investigation
※290P II	Detector tube for crime investigation
300	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 tube (CO)
601SP	Compressed breathing air test tube (CO_2)
602SP	Compressed breathing air test tube (Oil mist)
603SPA	Compressed breathing air test tube (H_2O)
604SP	Compressed breathing air test tube (O_2)
710	Formaldehyde-Indoor air quality
710A	Formaldehyde-Indoor air quality
721	Toluene-Indoor air quality
721Ⓒ	Xylene-Indoor air quality
730	p-Dichlorobenzene-Indoor air quality
※740	Nitrogen dioxide-Indoor air quality
※750	Trichloroethylene
※760	Tetrachloroethylene
800B	Charcoal tube
801	Silica-gel tube
900NHH	Ammonia in art galleries/museums
901NHL	Ammonia in clean room

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

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