

| Section | Original Colour |
|---------|-----------------|
| A       | Orange          |
| B       | White           |
| C       | Yellow          |
| D       | Yellow          |

## 1. SPECIFICATIONS

- 1) Substances to be detected : Acetaldehyde, Actone, Acetylene, Aniline, Benzene, 1,3-Butadiene, Butane, 1-Butanol, Butyl acetate, Carbon disulphide, Cresol, Ethyl acetate, Ethyl amine, Ethyl benzene, Ethyl cellosolve, Ethylene, Ethylene oxide, Formaldehyde, Gasoline, Heptane, Hexane, Isopropyl alcohol, Kerosine, Methyl alcohol, Methyl ethyl ketone, Methyl isobutylketone, Methyl mercaptan, Pentane, Phenol, Propane, Styrene, Tetrachloroethylene, Tetrahydrofuran, Toluene, 1,1,1-Trichloroethane, Trichloroethylene, Vinyl chloride, Xylene, \* Arsine, \* Carbon monoxide and \* Hydrogen sulphide (\* : Inorganic gas)
- 2) Tube per box : 10 tubes (5-time use)
- 3) Pump stroke : 1 (100mℓ) + 1 (100mℓ)
- 4) Sampling time : 30 + 30 seconds
- 5) Shelf life : 1 year
- 6) Operating temperature : 0 ~ 40 ℃
- 7) Colour change : Refer to following "3. DISCOLOURATION / QUALITATIVE CHART"
- 8) Non-discolouration confirmed substances : Acetic acid, Carbon tetrachloride, Methane, Methyl bromide and Pyridine

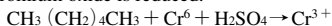
## 2. CHEMICAL REACTION

### SECTION

A

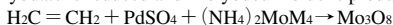
### CHEMICAL REACTION PRINCIPLES

Chromium oxide is reduced.



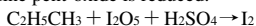
B

Molybdate is reduced and Molybdenum blue is produced.



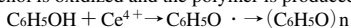
C

Iodine pent-oxide is reduced.



D

Phenol is oxidized and the polymer is produced.



### 3. DISCOLOURATION / QUALITATIVE CHART

#### CHART 1. ORGANIC GAS QUALITATIVE QUALITATIVE DETECTION CHART

| “A” side sampling<br>Selection | “D” side sampling<br>Selection |              |                  |               | * 1) Substances<br>— * 2 (X) —<br>— * 3 (X/Y) —  |
|--------------------------------|--------------------------------|--------------|------------------|---------------|--|
|                                | A<br>(Orange)                  | B<br>(White) | C<br>(Yellow)    | D<br>(Yellow) |  |
| Dark brown                     | Dark brown                     | —            | —                | —             | 1) Propane (100)<br>2) Butane (10)<br>3) Pentane (10)<br>4) Hexane (10)<br>5) Trichloroethylene (10)<br>6) Tetrachloroethylene (100)<br>7) Vinyl chloride (10)                           |
|                                |                                | White        | —                | —             | 8) Butadiene (100)   |
|                                | Greenish brown                 | —            | Pale blue        | —             | 9) Gasoline (0.1mg/ℓ)  |
|                                |                                | —            | Pale brown       | —             | 10) Benzene (10/100)<br>11) Toluene (30/200)<br>12) Xylene (60/1,000)<br>13) Ethylene benzene (60/400)   |
|                                | —                              | —            | Pale blue        | —             | 14) Ethylene (10)<br>15) Acetylene (10,000/100)  |
|                                |                                |              | Yellowish orange | —             | 16) Styrene (100)  |
|                                |                                |              | —                | —             | 17) Acetone (600)<br>18) Methyl ethyl ketone (100)<br>19) Ethyl acetate (600)<br>20) Butyl acetate (100)<br>21) Ethylene oxide (100)<br>22) Formaldehyde (600)<br>23) Kerosene (0.1mg/ℓ) |

| “A” side sampling<br>Selection | “D” side sampling<br>Selection |              |                  |               | * 1) Substances<br>— * 2 (X) —<br>— * 3 (X/Y) —   |   |
|--------------------------------|--------------------------------|--------------|------------------|---------------|---|---|
|                                | A<br>(Orange)                  | B<br>(White) | C<br>(Yellow)    | D<br>(Yellow) |   |   |
| Greenish brown                 | Greenish brown                 | —            | —                | —             | 24) Heptane (10)<br>25) Carbon disulphide (100)   |   |
|                                | —                              | —            | Yellowish orange | —             | 26) Methyl mercaptan (100/20)   |   |
| Green                          | —                              | —            | Black            | —             | 27) Methyl alcohol (100)<br>28) 1-Butanol (100)<br>29) Acetaldehyde (100)<br>30) Methyl isobutyl Ketone (100)<br>31) Ethyl cellosolve (100)<br>32) Tetrahydrofuran (100)<br>33) 1,1,1-Trichloroethane (1,000) |   |
|                                | —                              | —            | —                | —             | 34) Hydrogen sulphide (100,10)<br>35) Arsine (100,20)   |   |
| —                              | —                              | —            | Pale blue        | —             | 36) Isopropyl alcohol (600)   |   |
|                                |                                |              | —                | Pale brown    | —   | 37) Carbon monoxide (100)                 |
|                                |                                |              |                  | Bluish green  | —   | 38) Phenol (10)<br>39) Cresol (20)        |
|                                |                                |              |                  | Pale blue     | —   | 40) Aniline (40)<br>41) Ethyl amine (100) |

NOTES : —

- (1) —: Undiscoloured
- (2) \* 1 : Item No. for quick reference to details in CHART 2.
- (3) \* 2 (X) : Detectable gas concentration limit of the substance (Unit : ppm)  
\* 3 (X/Y) : “X” means detectable gas concentration limit (Unit : ppm) of “A” side sampling and “Y” means “D” side sampling’s one.
- (4) The discolouration length is approx.0.5 to 1.0 mm.
- (5) Substance No.34) ,35) and 37) are inorganic gases.”

**CHART 2. CHART FOR GAS-CONCENTRATION LEVEL AND DISCOLOURATION**

| ORGANIC SUBSTANCES     | CONC. LEVEL | "A" side sampling  |                      |                      | "D" side sampling    |                      |  |
|------------------------|-------------|--------------------|----------------------|----------------------|----------------------|----------------------|--|
|                        |             | SECTION A (Orange) | SECTION B (White)    | SECTION C (Yellow)   | SECTION D (Yellow)   |                      |  |
| 1) Propane             | H           | Dark brown (I)     | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       |  |
|                        | L           | Dark brown (I)     | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       |  |
| 2) Butane              | H           | Dark brown (I)     | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       |  |
|                        | M           | Dark brown (I)     | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       |  |
|                        | L           | Dark brown (III)   | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     |  |
| 3) Pentane             | H           | Greenish brown (I) | Greenish brown (I)   | Greenish brown (I)   | Greenish brown (I)   | Greenish brown (I)   |  |
|                        | M           | Dark brown (I)     | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       |  |
|                        | L           | Dark brown (III)   | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     |  |
| 4) Hexane              | H           | Greenish brown (I) | Greenish brown (I)   | Greenish brown (I)   | Greenish brown (I)   | Greenish brown (I)   |  |
|                        | M           | Dark brown (II)    | Dark brown (II)      | Dark brown (II)      | Dark brown (II)      | Dark brown (II)      |  |
|                        | L           | Dark brown (III)   | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     |  |
| 5) Trichloroethylene   | H           | Dark brown (I)     | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       |  |
|                        | M           | Dark brown (II)    | Dark brown (II)      | Dark brown (II)      | Dark brown (II)      | Dark brown (II)      |  |
|                        | L           | Dark brown (III)   | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     |  |
| 6) Tetrachloroethylene | H           | Dark brown (I)     | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       |  |
|                        | L           | Dark brown (III)   | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     |  |
| 7) Vinyl chloride      | H           | Dark brown (I)     | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       | Dark brown (I)       |  |
|                        | M           | Dark brown (II)    | Dark brown (II)      | Dark brown (II)      | Dark brown (II)      | Dark brown (II)      |  |
|                        | L           | Dark brown (III)   | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     |  |
| 8) Butadiene           | H           | Dark brown (II)    | Dark brown (II)      | Dark brown (II)      | Dark brown (II)      | Dark brown (II)      |  |
|                        | L           | Dark brown (III)   | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     | Dark brown (III)     |  |
| 9) Gasoline            | H           | Dark brown (I)     | Brown (I)            | Brown (I)            | Brown (I)            | Brown (I)            |  |
|                        | M           | Dark brown (III)   | Brown (I)            | Brown (I)            | Brown (I)            | Brown (I)            |  |
|                        | L           | Dark brown (III)   | Greenish brown (III) | Greenish brown (III) | Greenish brown (III) | Greenish brown (III) |  |
| 10) Benzene            | H           | Dark brown (I)     | Pale brown (I)       | Pale brown (I)       | Pale brown (I)       | Pale brown (I)       |  |
|                        | M           | Dark brown (II)    | Pale brown (I)       | Pale brown (I)       | Pale brown (I)       | Pale brown (I)       |  |
|                        | L           | Dark brown (III)   | Pale brown (I)       | Pale brown (I)       | Pale brown (I)       | Pale brown (I)       |  |
| 11) Toluene            | H           | Dark brown (I)     | Brown (I)            | Brown (I)            | Brown (I)            | Brown (I)            |  |
|                        | M           | Dark brown (III)   | Pale brown (I)       | Pale brown (I)       | Pale brown (I)       | Pale brown (I)       |  |
|                        | L           | Dark brown (III)   | Pale brown (I)       | Pale brown (I)       | Pale brown (I)       | Pale brown (I)       |  |

| ORGANIC SUBSTANCES      | CONC. LEVEL | "A" side sampling                               |  |                   |  | "D" side sampling  |  |  |  |
|-------------------------|-------------|---|--|-------------------|--|--------------------|--|--|--|
|                         |             | SECTION A (Orange)                              |  | SECTION B (White) |  | SECTION C (Yellow) |  | SECTION D (Yellow)                           |  |
|                         |             |   |  |                   |  |                    |  |  |  |
| 12) Xylene              | H           | Dark brown (II)                                 |  |                   |  | Pale brown (II)    |  |  |  |
|                         | M<br>L      | Dark brown (III)                                |  |                   |  |                    |  |  |  |
| 13) Ethyl benzene       | H           | Dark brown (II)                                 |  |                   |  | Brown (I)          |  |  |  |
|                         | M<br>L      | Dark brown (III)                                |  |                   |  | Pale brown (II)    |  |  |  |
| 14) Ethylene            | H           | Dark brown (I)                                  |  |                   |  |                    |  | Deep blue (II)                               |  |
|                         | M           | Dark brown (I)                                  |  |                   |  |                    |  | Deep blue (II)                               |  |
|                         | L           | Dark brown (III)                                |  |                   |  |                    |  | Pale blue (II)                               |  |
| 15) Acetylene           | H           | Dark brown (I)                                  |  |                   |  | Dark brown (I)     |  | Deep blue (II)                               |  |
|                         | M<br>L      | Section "C" is also discoloured to Brown (III). |  |                   |  |                    |  | Deep blue (II)                               |  |
| 16) Styrene             | H           | Dark brown (III)                                |  |                   |  |                    |  | Pale blue (II)                               |  |
|                         | M<br>L      | Dark brown (III)                                |  |                   |  | Dark brown (III)   |  | Yellowish orange (I)<br>Yellowish orange (I) |  |
| 17) Acetone             | H<br>M      | Dark brown (III)                                |  |                   |  |                    |  |  |  |
| 18) Methyl ethyl ketone | H           | Dark brown (III)                                |  |                   |  |                    |  |  |  |
|                         | M<br>L      | Dark brown (III)                                |  |                   |  |                    |  |  |  |
| 19) Ethyl acetate       | H<br>M      | Dark brown (III)                                |  |                   |  |                    |  |  |  |
| 20) Butyl acetate       | H           | Dark brown (III)                                |  |                   |  |                    |  |  |  |
|                         | M<br>L      | Dark brown (III)                                |  |                   |  |                    |  |  |  |
| 21) Ethylene oxide      | H           | Dark brown (III)                                |  |                   |  |                    |  |  |  |
|                         | M<br>L      | Dark brown (III)                                |  |                   |  |                    |  |  |  |

| ORGANIC SUBSTANCES         | CONC. LEVEL | "A" side sampling    |                      |                   |       | "D" side sampling  |                |                    |       |
|----------------------------|-------------|----------------------|----------------------|-------------------|-------|--------------------|----------------|--------------------|-------|
|                            |             | SECTION A (Orange)   |                      | SECTION B (White) |       | SECTION C (Yellow) |                | SECTION D (Yellow) |       |
|                            |             |                      |                      |                   |       |                    |                |                    |       |
| 22) Formaldehyde           | H           | Greenish brown (I)   | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | M           | Dark brown (III)     | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | L           | Dark brown (III)     | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
| 23) Kerosene               | H           | Dark brown (II)      | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | M           | Dark brown (III)     | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | L           | Dark brown (III)     | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
| 24) Heptane                | H           | Greenish brown (I)   | Greenish brown (I)   | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | M           | Greenish brown (II)  | Greenish brown (II)  | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | L           | Greenish brown (III) | Greenish brown (III) | _____             | _____ | _____              | _____          | _____              | _____ |
| 25) Carbon disulphide      | H           | Greenish brown (I)   | Greenish brown (I)   | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | M           | Greenish brown (II)  | Greenish brown (II)  | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | L           | _____                | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
| 26) Methyl mercaptan       | M           | Greenish brown (III) | _____                | _____             | _____ | _____              | Deep blue (II) | _____              | _____ |
| 27) Methyl alcohol         | H           | Greenish brown (III) | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | M           | Greenish brown (III) | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | L           | _____                | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
| 28) 1-Butanol              | H           | Greenish brown (III) | Greenish brown (III) | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | M           | Greenish brown (III) | Greenish brown (III) | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | L           | _____                | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
| 29) Acetaldehyde           | H           | Green (II)           | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | M           | Greenish brown (III) | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | L           | _____                | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
| 30) Methyl isobutyl ketone | H           | Greenish brown (III) | Greenish brown (III) | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | M           | Greenish brown (III) | Greenish brown (III) | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | L           | _____                | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
| 31) Ethyl cellosolve       | H           | Green (III)          | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | M           | Greenish brown (III) | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | L           | _____                | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
| 32) Tetrahydrofuran        | H           | Green (III)          | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | M           | Greenish brown (III) | _____                | _____             | _____ | _____              | _____          | _____              | _____ |
|                            | L           | _____                | _____                | _____             | _____ | _____              | _____          | _____              | _____ |

| ORGANIC SUBSTANCES                       | CONC. LEVEL | "A" side sampling         |                    | "D" side sampling |           |   |  |
|--|-------------|---------------------------|--------------------|-------------------|-----------|---|--|
|  |             | SECTION A (Orange)        | SECTION A (Orange) | A (Orange)        | B (White) | C (Yellow)                              | D (Yellow)                               |
| 33) 1,1,1-Trichloroethane                | H<br>M      | Greenish brown (III)      |                    |                   |           |   |  |
| 34) Hydrogen sulphide (H <sub>2</sub> S) | H<br>M<br>L | Green (II)<br>Green (III) | Green (II)         |                   |           | Black (II)<br>Black (II)<br>Black (III) |  |
| 35) Arsine                               | M<br>L      | Green (II)                |                    |                   |           | Black (I)<br>Black (II)                 |  |
| 36) Isopropyl alcohol                    | H<br>M      | Green (III)               |                    |                   |           |   |  |
| 37) Carbon monoxide (CO)                 | H<br>M<br>L |                           |                    |                   |           | Pale blue (II)<br>Pale blue (III)       |  |
| 38) Phenol                               | M<br>L      |                           |                    |                   |           |   | Pale brown (I)<br>Pale brown (I)         |
| 39) Cresol                               | M<br>L      |                           |                    |                   |           |   | Pale brown (I)<br>Pale brown (I)         |
| 40) Aniline                              | M<br>L      |                           |                    |                   |           |   | Bluish green (III)<br>Bluish green (III) |
| 41) Ethyl amine                          | H<br>M<br>L |                           |                    |                   |           |   | White (I)<br>Pale blue (III)             |

NOTES : —

- 1) — : Undiscoloured
- 2) CONC. LEVEL (Gas concentration level) : H ; approx. 1,000-5,000 ppm  
M ; approx. 100-500 ppm  
L ; approx. 10-50 ppm
- 3) Discolouration level : 1 ; The whole layer is discoloured.  
2 ; A half layer is discoloured.  
3 ; Approx.0.5-2.0 mm of the layer is discoloured.
- 4) Substance No.34 ,35) and 37) are inorganic substances.

#### NON-DISCOLOURATION CONFIRMED SUBSTANCES

- 1) Carbon tetrachloride
- 2) Pyridine
- 3) Methyl bromide
- 4) Acetic acid
- 5) Methane
- 6) Ethane