



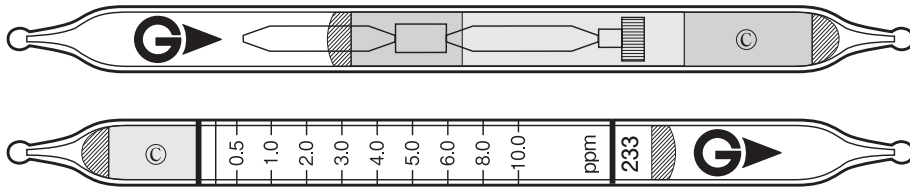
# GASTEC

GAS DETECTION SYSTEM  
Detector Tube List

22<sup>nd</sup>  
e d i t i o n

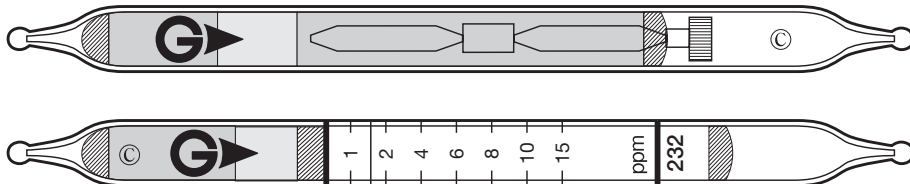
## NEW tubes

### Chloropicrin No.233



|                 |              |
|-----------------|--------------|
| Scale range     | (0.1)-10ppm  |
| Measuring range | 0.045-22ppm  |
| Colour change   | White→Yellow |
| Shelf life      | 1 year       |

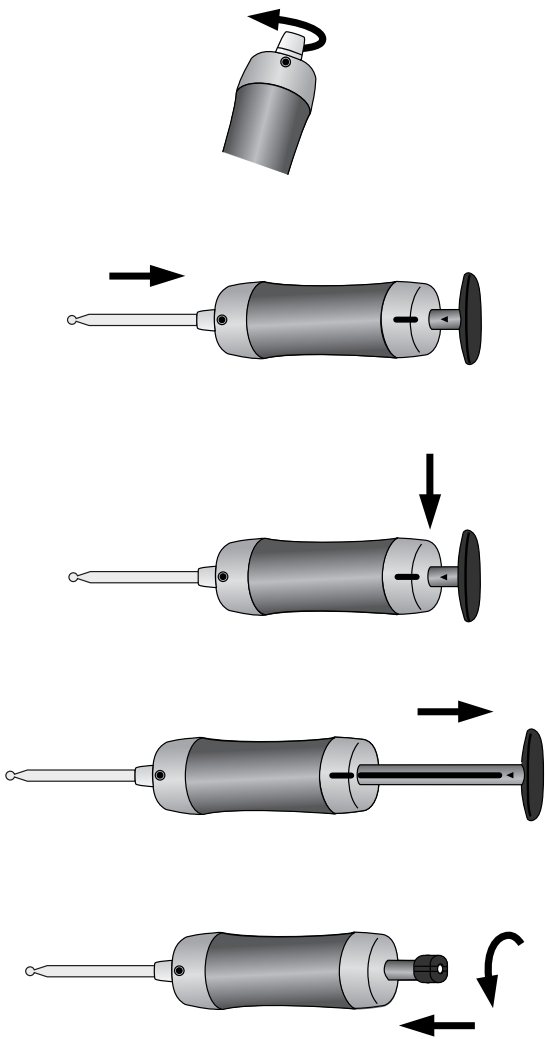
### I,2-Dichloroethane No.232



|                 |                                  |
|-----------------|----------------------------------|
| Scale range     | 1-15ppm                          |
| Measuring range | 1-39ppm                          |
| Colour change   | White→Pale purple                |
| Shelf life      | 1 year<br>(Refrigerated storage) |

# PREPARATION

## Inspecting the pump model GV-100 before measurement (air leak check)



(1) Confirm that the inlet clamping nut is firmly tightened.

(2) After confirming that the pump handle is fully in (therefore, the guide line on the pump shaft is not seen), insert a fresh unbroken detector tube into the rubber inlet of the pump.

(3) Align the guide mark (red line) on the back plate and the guide mark (▲100) on the handle.

(4) Pull out the handle fully along the red guide line on the pump shaft to the lock position, and wait 1 minute.

(5) Unlock the handle by turning it more than 1/4 turns and guide it back gradually.

(6) Confirm the handle returns to the initial position and the guide line on the pump shaft is not seen.

### △ NOTE

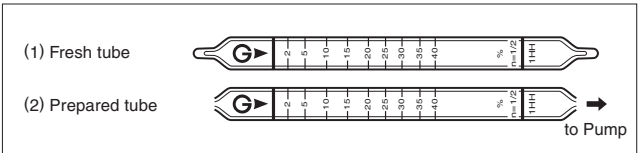
When the handle is unlocked, be sure to guide it back gradually by applying a little resistance. Otherwise, the handle will spring back due to the vacuum in the pump cylinder and possibly damage internal parts.

### △ NOTE

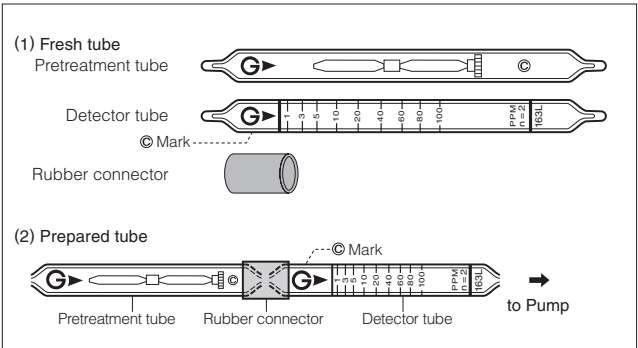
The above air leak check feature in accordance with EN1231,4.2.

### Detector Tube

#### ■ Single tube (Example: No.1HH Carbon Monoxide)

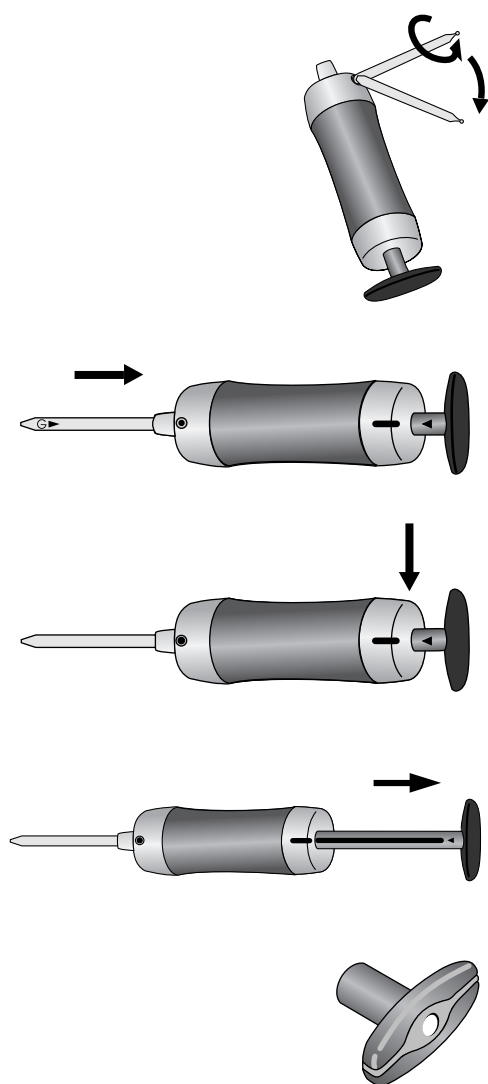


#### ■ Twin tube (Example: No.163L Ethylene Oxide)

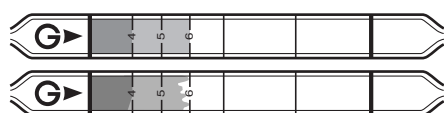
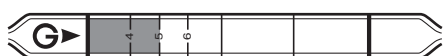


# OPERATION

## Simple and accurate measurements with the Gastec standard detector tube system



- Insert the detector tube end straight into the tube tip breaker of the Pump.
- Rotate the detector tube so that the diamond cutter of the tube tip breaker scratches the surface of the tube end.
- Hold the detector tube firmly near the tube tip breaker and bend the tube toward you to break the tube tip.
- Confirm the pump handle is fully pushed in (therefore, the guide line on the pump shaft is not seen). Then insert the detector tube into the rubber inlet of the Pump with the arrow (▶) on the tube pointing toward the pump.
- Align the guide mark (red line) on the back plate and the guide mark (▲100 or ▲50 depending on the detector tube) on the handle.
- Direct the tube end to the point of measurement and pull out the handle fully (for 100mL sampling) or halfway (for 50mL sampling) along the guide line to the lock position.
- Wait until the sampling time has elapsed. The completion of the sampling of 100mL or 50mL can be confirmed by the flow finish indicator on the handle.



### How to read the detector tube

- The end of the colour change layer flat: Read the value at the end of the layer. In this example, the reading should be 5%.
- The end of the colour change layer slanted: Read the value in the middle of the slant. In this exaggerated example, the reading should be 5%.
- The demarcation of the colour change layer pale: Read the value in the middle between the dark layer end and the pale layer end. In this exaggerated example, the reading should be 5%.

### △ NOTE

Read instructions for your Gastec detector tube and model GV-100S carefully.

| Gas or Vapour<br>to be Measured<br>Chemical Formula               | Tube No. & Name          |                                   | Measuring<br>Range<br>(ppm)          | No. of<br>Pump<br>Strokes | Colour Change      |                  | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm)                      |
|-------------------------------------------------------------------|--------------------------|-----------------------------------|--------------------------------------|---------------------------|--------------------|------------------|-------------------------|------|-----------------------------------------------------|
|                                                                   |                          |                                   |                                      |                           | Original           | Stain            |                         |      |                                                     |
| Acetaldehyde<br>CH <sub>3</sub> CHO                               | 92                       | Acetaldehyde                      | 300-750<br>10-300<br>5-10            | 1<br>②<br>4               | Yellow             | Red              | 2*                      |      | C 25                                                |
|                                                                   | 92M                      | Acetaldehyde                      | 5-100<br>2.5-5                       | ①<br>2                    | Yellow             | Red              | 2*                      |      |                                                     |
|                                                                   | 92L                      | Acetaldehyde                      | 1-20                                 | 1                         | Yellow             | Brown            | 2*                      | T    |                                                     |
| Acetic acid<br>CH <sub>3</sub> CO <sub>2</sub> H                  | 81                       | Acetic acid                       | 50-100<br>2-50<br>1-2                | 1/2<br>①<br>2             | Pink               | Yellow           | 3                       | H    | 10                                                  |
|                                                                   | 81L                      | Acetic acid                       | 10-25.0<br>0.25-10<br>0.125-0.25     | 1/2<br>①<br>2             | Pink               | Pale yellow      | 2*                      | T    |                                                     |
|                                                                   |                          |                                   |                                      |                           |                    |                  |                         |      |                                                     |
| Acetic anhydride<br>(CH <sub>3</sub> CO) <sub>2</sub> O           | 81                       | Acetic acid                       | 0.6-15                               | 1                         | Pink               | Yellow           | 3                       | H    | 1                                                   |
|                                                                   | 81L                      | Acetic acid                       | 0.15-6                               | 1                         | Pink               | Pale yellow      | 2*                      | T    |                                                     |
| Acetone<br>CH <sub>3</sub> COCH <sub>3</sub>                      | 151                      | Acetone                           | 0.8-2.0%<br>0.05-0.8%                | 1<br>②                    | Orange             | Dark green       | 3                       | T    | 500                                                 |
|                                                                   | 151L                     | Acetone                           | 4000-12000<br>50-4000                | 1<br>②                    | Yellow             | Red              | 2*                      | T    |                                                     |
| Acetone cyanohydrin<br>(CH <sub>3</sub> ) <sub>2</sub> C(OH)(CN)  | 12L                      | Hydrogen cyanide                  | 2.5-60                               | 1                         | Yellow             | Pink             | 2                       | T    | C5mg/m <sup>3</sup>                                 |
| Acetonitrile<br>CH <sub>3</sub> CN                                | 52                       | Nitro compounds<br>(Pyrotec tube) | 3-180                                | 1                         | White              | Yellowish orange | 3                       | P    | 20                                                  |
| Acetylene<br>HC≡CH                                                | 171                      | Acetylene                         | 2.0-4.0%<br>0.1-2.0%<br>0.05-0.1%    | 1/2<br>①<br>2             | White              | Brown            | 3                       | T    |                                                     |
|                                                                   | 103                      | Hydrocarbons (Lower class)        | 1.8-3.6%<br>0.15-1.8%<br>0.075-0.15% | 1/2<br>1<br>2             | Yellowish brown    | Greenish brown   | 2                       | ++   |                                                     |
|                                                                   | 172                      | Ethylene                          | 32.5-1040                            | 1                         | Pale yellow        | Blue             | 3                       | T    |                                                     |
| Acetylene dichloride                                              | See 1,2-Dichloroethylene |                                   |                                      |                           |                    |                  |                         |      |                                                     |
| Acid gases                                                        | 80                       | Acid gases                        | 40-80<br>2-40<br>1-2                 | 1<br>②<br>4               | Pale bluish purple | Yellow           | 2                       |      |                                                     |
| Acrolein<br>CH <sub>2</sub> :CHCHO                                | 93                       | Acrolein                          | 10-800<br>3.3-10                     | ②<br>4                    | Yellow             | Red              | 2*                      | T    | C 0.1                                               |
| Acrylic acid<br>CH <sub>2</sub> :CHCO <sub>2</sub> H              | 81                       | Acetic acid                       | 2-50                                 | 1                         | Pink               | Yellow           | 3                       | H    | 2                                                   |
|                                                                   | 81L                      | Acetic acid                       | 0.45-18                              | 1                         | Pink               | Pale yellow      | 2*                      | T    |                                                     |
| Acrylonitrile<br>CH <sub>2</sub> :CHCN                            | 191                      | Acrylonitrile                     | 120-360<br>5-120<br>2-5              | 1<br>②<br>4               | Yellow             | Red              | 3                       | +T   | 2                                                   |
|                                                                   | 191L                     | Acrylonitrile                     | 6-18<br>0.2-6<br>0.1-0.2             | 1<br>②<br>4               | Yellow             | Pink             | 3                       | +    |                                                     |
|                                                                   | 102L                     | Hexane                            | 600-14400                            | 1                         | Orange             | Dark green       | 3                       |      |                                                     |
| Aliphatic hydrocarbons                                            | 140                      | Aliphatic hydrocarbons            | 1000-3000<br>20-1000<br>6-20         | 1/2<br>①<br>2             | Yellow             | Dark brown       | 2                       | T    | Alkane<br>(C <sub>1</sub> -C <sub>4</sub> )<br>1000 |
| Allyl amine<br>CH <sub>2</sub> :CHCH <sub>2</sub> NH <sub>2</sub> | 180                      | Amines                            | 8.5-170                              | 1                         | Pink               | Yellow           | 3                       | T    |                                                     |
|                                                                   | 180L                     | Amines                            | 0.4-8                                | 1                         | Pink               | Pale orange      | 2                       | T    |                                                     |
| Allyl Isothiocyanate<br>CH <sub>2</sub> :CHCH <sub>2</sub> NCS    | 149                      | Methyl methacrylate               | 5-200                                | 2                         | Yellow             | Pale blue        | 2                       | T    |                                                     |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                             | Tube No. & Name  |                       | Measuring<br>Range<br>(ppm)              | No. of<br>Pump<br>Strokes | Colour Change |                                            | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|-------------------------------------------------------------------------------------------------|------------------|-----------------------|------------------------------------------|---------------------------|---------------|--------------------------------------------|-------------------------|------|--------------------------------|
|                                                                                                 |                  |                       |                                          |                           | Original      | Stain                                      |                         |      |                                |
| Allyl chloride<br>CH <sub>2</sub> :CHCH <sub>2</sub> Cl                                         | 101L             | Gasoline (Petrol)     | 0.1-3.4%                                 | 1/2                       | Orange        | Dark green                                 | 3                       |      | 1                              |
|                                                                                                 | 131L             | Vinyl chloride        | 3.2-48                                   | 2                         | Yellow        | Reddish brown                              | 2*                      | +T   |                                |
| Amines<br>CH <sub>3</sub> NH <sub>2</sub> calibration                                           | 180              | Amines                | 5-100                                    | 1                         | Pink          | Yellow to Brown                            | 3                       | T    |                                |
|                                                                                                 | 180L             | Amines                | 0.5-10                                   | 1                         | Pink          | Yellow to Pale orange<br>or Grayish purple | 2                       | T    |                                |
| 2-Aminoethanol                                                                                  | See Ethanolamine |                       |                                          |                           |               |                                            |                         |      |                                |
| Ammonia<br>NH <sub>3</sub>                                                                      | 3H               | Ammonia               | 16-32%<br>1-16%<br>0.2-1%                | 1/2<br>①<br>2-5           | Purple        | Yellow                                     | 3                       |      | 25                             |
|                                                                                                 | 3HM              | Ammonia               | 1.6-3.52%<br>0.05-1.6%                   | 1/2<br>①                  | Pink          | Yellow                                     | 3                       |      |                                |
|                                                                                                 | 3M               | Ammonia               | 500-1000<br>50-500<br>10-50              | 1/2<br>①<br>2-5           | Purple        | Yellow                                     | 3                       |      |                                |
|                                                                                                 | 3La              | Ammonia               | 100-200<br>5-100<br>2.5-5                | 1/2<br>①<br>2             | Purple        | Yellow                                     | 3                       | T    |                                |
|                                                                                                 | 3L               | Ammonia               | 30-78<br>1-30<br>0.5-1                   | 1/2<br>①<br>2             | Pink          | Yellow                                     | 3                       | T    |                                |
|                                                                                                 | 180              | Amines                | 1.5-30                                   | 1                         | Pink          | Yellow                                     | 3                       | T    |                                |
|                                                                                                 |                  |                       |                                          |                           |               |                                            |                         |      |                                |
| Amyl acetate<br>CH <sub>3</sub> CO <sub>2</sub> (CH <sub>2</sub> ) <sub>4</sub> CH <sub>3</sub> | 147              | Amyl acetate          | 10-200                                   | 2                         | Yellow        | Pale blue                                  | 2                       | T    | 50                             |
| Aniline<br>C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub>                                        | 181              | Aniline               | 30-60<br>2.5-30<br>1.25-2.5              | 2<br>③<br>5               | Pale yellow   | Pale green                                 | 3                       |      | 2                              |
| Arsine<br>AsH <sub>3</sub>                                                                      | 19LA             | Arsine                | 2.4-10<br>1.5-2.4<br>0.1-1.5<br>0.04-0.1 | 1<br>3<br>⑤<br>10         | Yellow        | Red                                        | 2                       |      | 0.005                          |
| Aromatic hydrocarbons                                                                           | 120              | Aromatic hydrocarbons | 100-200<br>2-100<br>0.4-2                | 1/2<br>①<br>2-5           | White         | Brown                                      | 3                       |      |                                |
| Benzaldehyde<br>C <sub>6</sub> H <sub>5</sub> CHO                                               | 91L              | Formaldehyde          | 4-92                                     | 1                         | Yellow        | Reddish brown                              | 3*                      | T    |                                |
| Benzene<br>C <sub>6</sub> H <sub>6</sub>                                                        | 121S             | Benzene               | 120-312<br>5-120<br>2-5                  | 1<br>②<br>4               | White         | Dark green                                 | 3                       | +    | 0.5                            |
|                                                                                                 | 121              | Benzene               | 60-120<br>5-60<br>2.5-5                  | 1<br>②<br>4               | White         | Dark green                                 | 3                       |      |                                |
|                                                                                                 | 121SL            | Benzene               | 20-100<br>1-20                           | 1<br>⑤                    | White         | Dark green                                 | 3                       | +    |                                |
|                                                                                                 | 121L             | Benzene               | 10-65<br>0.1-10                          | 1<br>⑤                    | White         | Dark green                                 | 3                       | +    |                                |
|                                                                                                 | 121SP            | Benzene               | 20-66<br>0.2-20                          | 1<br>③                    | White         | Brown                                      | 2                       | +    |                                |
|                                                                                                 | 171              | Acetylene             | 0.03-0.6%                                | 4                         | White         | Brown                                      | 3                       | T    |                                |
|                                                                                                 |                  |                       |                                          |                           |               |                                            |                         |      |                                |
| Benzyl bromide<br>C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> Br                              | 136L             | Methyl bromide        | 10-100                                   | 1                         | White         | Yellow                                     | 2                       | +    |                                |

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See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                              | Tube No. & Name               |                                    | Measuring<br>Range<br>(ppm)                                                  | No. of<br>Pump<br>Strokes | Colour Change   |                      | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|--------------------------------------------------------------------------------------------------|-------------------------------|------------------------------------|------------------------------------------------------------------------------|---------------------------|-----------------|----------------------|-------------------------|------|--------------------------------|
|                                                                                                  |                               |                                    |                                                                              |                           | Original        | Stain                |                         |      |                                |
| Benzyl chloride<br>C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> Cl                              | 132L                          | Trichloroethylene                  | 1.6-20                                                                       | 2                         | Yellow          | Purple               | 2✱                      | T    | 1                              |
| Boron trichloride<br>BCl <sub>3</sub>                                                            | 12L                           | Hydrogen cyanide                   | 2.25-54                                                                      | 1                         | Yellow          | Pink                 | 2                       | T    |                                |
| Bromine<br>Br <sub>2</sub>                                                                       | 8La                           | Chlorine                           | 0.05-0.8                                                                     | 4                         | White           | Pale pink            | 3                       |      | 0.1                            |
| Bromochloromethane                                                                               | See Chlorobromomethane        |                                    |                                                                              |                           |                 |                      |                         |      |                                |
| Bromoform<br>CHBr <sub>3</sub>                                                                   | 136L                          | Methyl bromide                     | 1-50                                                                         | 1                         | White           | Yellow               | 2                       | +    | 0.5                            |
| 1,3-Butadiene<br>CH <sub>2</sub> :CHCH:CH <sub>2</sub>                                           | 174                           | 1,3-Butadiene                      | 50-800                                                                       | 1                         | Pale yellow     | White                | 3                       | T    | 2                              |
|                                                                                                  | 174L                          | 1,3-Butadiene                      | 5-100<br>2.5-5                                                               | ④<br>8                    | Pale yellow     | White                | 3                       |      |                                |
|                                                                                                  | 174LL                         | 1,3-Butadiene                      | 0.5-5                                                                        | 1                         | Pink            | Pale yellow          | 3✱                      | +    |                                |
| Butane<br>C <sub>4</sub> H <sub>10</sub>                                                         | 104                           | Butane                             | 25-1400                                                                      | 1                         | Orange          | Dark green           | 3                       |      |                                |
|                                                                                                  | 103                           | Hydrocarbons (Lower class)         | 0.84-1.68%<br>0.07-0.84%<br>0.035-0.07%                                      | 1/2<br>1<br>2             | Yellowish brown | Greenish brown       | 2                       | ++   |                                |
| 1-Butanol<br>CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> OH                  | 114                           | 1-Butanol                          | 10-150                                                                       | 3                         | Yellow          | Pale blue            | 3                       | T    | 20                             |
| 2-Butanol<br>CH <sub>3</sub> CH <sub>2</sub> CH(OH)CH <sub>3</sub>                               | 115                           | 2-Butanol                          | 5-150                                                                        | 3                         | Yellow          | Pale blue            | 3                       | T    | 100                            |
| 2-Butanone                                                                                       | See Methyl ethyl ketone (MEK) |                                    |                                                                              |                           |                 |                      |                         |      |                                |
| Butyl acetate<br>CH <sub>3</sub> CO <sub>2</sub> (CH <sub>2</sub> ) <sub>3</sub> CH <sub>3</sub> | 142                           | Butyl acetate                      | 0.05-0.8%                                                                    | 2                         | Orange          | Dark green           | 3                       | T    | 150                            |
|                                                                                                  | 142L                          | Butyl acetate                      | 10-300                                                                       | 2                         | Yellow          | Dark Brown           | 2                       | T    |                                |
| tert-Butyl alcohol<br>(CH <sub>3</sub> ) <sub>3</sub> COH                                        | 102L                          | Hexane                             | 500-12000                                                                    | 2                         | Orange          | Dark green           | 3                       |      | 100                            |
| Butyl acrylate<br>CH <sub>2</sub> :CHCO <sub>2</sub> C <sub>4</sub> H <sub>9</sub>               | 142L                          | Butyl acetate                      | 7-210                                                                        | 2                         | Yellow          | Dark brown           | 2                       | T    | 2                              |
| Butylamine<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> NH <sub>2</sub>                    | 180                           | Amines                             | 8-160                                                                        | 1                         | Pink            | Grayish red to Brown | 3                       | T    | C 5                            |
|                                                                                                  | 180L                          | Amines                             | 0.55-11                                                                      | 1                         | Pink            | Pale orange          | 2                       | T    |                                |
| tert-Butylamine<br>(CH <sub>3</sub> ) <sub>3</sub> CNH <sub>2</sub>                              | 180                           | Amines                             | 5.5-110                                                                      | 1                         | Pink            | Pale brown           | 3                       | T    |                                |
| n-Butyl bromide<br>C <sub>4</sub> H <sub>9</sub> Br                                              | 136H                          | Methyl bromide                     | 24-360                                                                       | 1                         | White           | Yellow               | 3                       | +    |                                |
|                                                                                                  | 136L                          | Methyl bromide                     | 10-100                                                                       | 1                         | White           | Yellow               | 2                       | +    |                                |
|                                                                                                  | 136LA                         | Methyl bromide                     | 2.4-43.2<br>1-18                                                             | 1<br>2                    | White           | Yellow               | 2                       | +    |                                |
| Butyl mercaptan<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> SH                            | 70L                           | Mercaptans                         | 6.4-12.8<br>0.8-6.4<br>0.32-0.8<br>0.16-0.32                                 | 1/2<br>1<br>2<br>4        | Yellow          | Red                  | 2                       |      | 0.5                            |
| tert-Butyl mercaptan<br>(CH <sub>3</sub> ) <sub>3</sub> CSH                                      | 75                            | tert-Butyl mercaptan               | 60-150mg/m <sup>3</sup><br>30-60mg/m <sup>3</sup><br>2.5-30mg/m <sup>3</sup> | 1/2<br>1<br>②             | Yellow          | Red                  | 2                       | T    |                                |
|                                                                                                  |                               |                                    | 15-30mg/m <sup>3</sup><br>1-15mg/m <sup>3</sup><br>0.5-1mg/m <sup>3</sup>    | 1/2<br>①<br>2             |                 |                      |                         |      |                                |
|                                                                                                  |                               |                                    |                                                                              |                           |                 |                      |                         |      |                                |
|                                                                                                  | 77                            | TBM and DMS                        | 1-15mg/m <sup>3</sup>                                                        | 1                         | Yellow          | Pink                 | 2✱                      | +T   |                                |
| 70L                                                                                              | Mercaptans                    | 4-8<br>0.5-4<br>0.2-0.5<br>0.1-0.2 | 1/2<br>1<br>2<br>4                                                           | Yellow                    | Red             | 2                    |                         |      |                                |

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P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                               | Tube No. & Name |                                                    | Measuring<br>Range<br>(ppm)               | No. of<br>Pump<br>Strokes | Colour Change |                                        | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|-----------------------------------------------------------------------------------|-----------------|----------------------------------------------------|-------------------------------------------|---------------------------|---------------|----------------------------------------|-------------------------|------|--------------------------------|
|                                                                                   |                 |                                                    |                                           |                           | Original      | Stain                                  |                         |      |                                |
| Butyric acid<br>CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CO <sub>2</sub> H | 81L             | Acetic acid                                        | 0.325-13                                  | 1                         | Pink          | Pale yellow                            | 2 *                     | T    |                                |
| Butyronitrile<br>CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CN               | 191L            | Acrylonitrile                                      | 6-180                                     | 1                         | Yellow        | Pink                                   | 3                       | +    |                                |
| Carbon dioxide<br>CO <sub>2</sub>                                                 | 2HH             | Carbon dioxide                                     | 5-40%<br>2.5-5%                           | ①②<br>1                   | Orange        | Yellow                                 | 3                       |      | 5000                           |
|                                                                                   | 2H              | Carbon dioxide                                     | 10-20%<br>1-10%<br>0.5-1%                 | 1/2<br>①<br>2             | White         | Purple                                 | 3                       |      |                                |
|                                                                                   | 2L              | Carbon dioxide                                     | 3-6%<br>0.25-3%<br>0.13-0.25%             | 1/2<br>①<br>2             | White         | Purple                                 | 3                       |      |                                |
|                                                                                   | 2LL             | Carbon dioxide                                     | 300-5000                                  | ①                         | Pale blue     | Purple                                 | 3                       |      |                                |
|                                                                                   | 2LC             | Carbon dioxide                                     | 2000-4000<br>100-2000                     | 1/2<br>①                  | Pale red      | Yellow                                 | 2                       |      |                                |
|                                                                                   |                 |                                                    |                                           |                           |               |                                        |                         |      |                                |
| Carbon disulphide<br>CS <sub>2</sub>                                              | 13M             | Carbon disulphide                                  | 1600-4000<br>50-1600<br>20-50             | 1/2<br>①<br>2             | Purple        | Yellow                                 | 3                       | +T   | 1                              |
|                                                                                   | 13              | Carbon disulphide                                  | 50-100<br>2.5-50<br>1.25-2.5<br>0.63-1.25 | 1/2<br>①<br>2<br>4        | Blue          | Yellow                                 | 3                       | +T   |                                |
|                                                                                   | 13L             | Carbon disulphide                                  | 3.0-8.1<br>0.1-3.0                        | 1<br>②                    | Bluish purple | White                                  | 2                       | +T   |                                |
|                                                                                   |                 |                                                    |                                           |                           |               |                                        |                         |      |                                |
|                                                                                   |                 |                                                    |                                           |                           |               |                                        |                         |      |                                |
|                                                                                   |                 |                                                    |                                           |                           |               |                                        |                         |      |                                |
| Carbon monoxide<br>CO                                                             | 1HH             | Carbon monoxide                                    | 2-50%<br>1-2%                             | ①②<br>1                   | White         | Blackish brown                         | 3                       |      | 25                             |
|                                                                                   | 1H              | Carbon monoxide                                    | 5-10%<br>0.2-5%<br>0.1-0.2%               | 1/2<br>①<br>2             | White         | Blackish brown                         | 3                       |      |                                |
|                                                                                   | 1M              | Carbon monoxide                                    | 2-4%<br>0.1-2%<br>0.05-0.1%               | 1/2<br>①<br>2             | White         | Pale brown                             | 3                       |      |                                |
|                                                                                   | 1LM             | Carbon monoxide                                    | 1000-2000<br>50-1000<br>25-50             | 1/2<br>①<br>2             | White         | Pale brown/Pale green<br>(dual layers) | 3                       |      |                                |
|                                                                                   | 1L              | Carbon monoxide                                    | 1000-2000<br>25-1000<br>2.5-25            | 1/2<br>①<br>2-10          | Yellow        | Blackish brown                         | 3                       |      |                                |
|                                                                                   | 1La             | Carbon monoxide                                    | 500-1000<br>25-500<br>12.5-25<br>8-12.5   | 1/2<br>①<br>2<br>3        | Yellow        | Blackish brown                         | 3                       | T    |                                |
|                                                                                   | 1LK             | Carbon monoxide<br>(in Hydrogen)                   | 300-600<br>100-300<br>5-100               | 1/2<br>1<br>③             | White         | Pale brown/Pale green<br>(dual layers) | 3                       |      |                                |
|                                                                                   | 1LKC            | Carbon monoxide<br>(in Hydrogen with Hydrocarbons) | 5-100                                     | ③                         | White         | Pale brown/Pale green<br>(dual layers) | 3                       | +    |                                |
|                                                                                   | 1LL             | Carbon monoxide                                    | 5-50                                      | 2                         | Yellow        | Blackish brown                         | 3                       |      |                                |
|                                                                                   | 1LC             | Carbon monoxide                                    | 1-30                                      | 1                         | White         | Pale pink                              | 2                       | T    |                                |
|                                                                                   |                 |                                                    |                                           |                           |               |                                        |                         |      |                                |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula | Tube No. & Name           |                                              | Measuring<br>Range<br>(ppm)       | No. of<br>Pump<br>Strokes | Colour Change      |                | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|-----------------------------------------------------|---------------------------|----------------------------------------------|-----------------------------------|---------------------------|--------------------|----------------|-------------------------|------|--------------------------------|
|                                                     |                           |                                              |                                   |                           | Original           | Stain          |                         |      |                                |
| Carbon tetrachloride<br>CCl4                        | 134                       | Carbon tetrachloride                         | 2.5-60<br>0.5-2.5                 | ①<br>2-5                  | White              | Yellow         | 1*                      | +    | 5                              |
|                                                     | 134L                      | Carbon tetrachloride                         | 5-12<br>0.25-5                    | 1<br>②                    | White              | Yellow         | 1*                      | +    |                                |
| Carbonyl chloride                                   | See Phosgene              |                                              |                                   |                           |                    |                |                         |      |                                |
| Carbonyl sulphide<br>COS                            | 21                        | Carbonyl sulphide                            | 100-200<br>10-100<br>5-10         | 1/2<br>①<br>2             | Blue               | Yellow         | 2*                      | +    | 5                              |
|                                                     | 21LA                      | Carbonyl sulphide                            | 50-125<br>5-50<br>2-5             | 1/2<br>①<br>2             | Bluish purple      | White          | 2*                      | +T   |                                |
| Chlorine<br>Cl2                                     | 8HH                       | Chlorine                                     | 0.5-10%<br>0.25-0.5%              | ①②<br>1                   | Reddish purple     | Yellow         | 3                       |      | 0.5                            |
|                                                     | 8H                        | Chlorine                                     | 500-1000<br>50-500<br>25-50       | 1/2<br>①<br>2             | White              | Vermilion      | 3                       |      |                                |
|                                                     | 8La                       | Chlorine                                     | 8-16<br>0.5-8<br>0.1-0.5          | 1/2<br>①<br>2-5           | White              | Pale pink      | 3                       |      |                                |
|                                                     | 8LL                       | Chlorine                                     | 1-2<br>0.05-1<br>0.025-0.05       | 1/2<br>①<br>2             | White              | Pale green     | 1*                      |      |                                |
|                                                     | 80                        | Acid gases                                   | 0.7-14                            | 2                         | Pale bluish purple | White          | 2                       |      |                                |
| Chlorine dioxide<br>ClO2                            | 23M                       | Chlorine dioxide                             | 5-10<br>0.5-5<br>0.1-0.5          | 1/2<br>①<br>2-5           | White              | Pale pink      | 3                       |      | 0.1                            |
|                                                     | 23L                       | Chlorine dioxide                             | 0.6-1.2<br>0.05-0.6<br>0.025-0.05 | 1/2<br>①<br>2             | White              | Pale green     | 1*                      |      |                                |
|                                                     | 8H                        | Chlorine                                     | 25-250                            | 1                         | White              | Vermilion      | 3                       |      |                                |
|                                                     | 8La                       | Chlorine                                     | 0.3-4.8                           | 1                         | White              | Pale pink      | 3                       |      |                                |
| Chlorobenzene<br>C6H5Cl                             | 126                       | Chlorobenzene                                | 200-500<br>5-200<br>2-5           | 1/2<br>①<br>2             | White              | Gray           | 3                       |      | 10                             |
|                                                     | 126L                      | Chlorobenzene                                | 10-43<br>0.5-10                   | 1<br>③                    | Yellow             | Pale purple    | 2*                      | T    |                                |
| Chlorobromomethane<br>CH2BrCl                       | 135                       | 1,1,1-Trichloroethane<br>(Methyl chloroform) | 22-110                            | 1                         | White              | Reddish orange | 3                       | +T   | 200                            |
|                                                     | 136H                      | Methyl bromide                               | 18-270                            | 1                         | White              | Yellow         | 3                       | +    |                                |
|                                                     | 136L                      | Methyl bromide                               | 11-110                            | 1                         | White              | Yellow         | 2                       | +    |                                |
|                                                     | 136LA                     | Methyl bromide                               | 0.7-12.6                          | 2                         | White              | Yellow         | 2                       | +    |                                |
| Chlorocyclohexane<br>C6H11Cl                        | 102L                      | Hexane                                       | 50-1200                           | 2                         | Orange             | Dark green     | 3                       |      |                                |
| Chlorodifluoromethane (R22)<br>CHClF2               | 51H                       | Fluorochlorocarbons<br>(Pyrotec tube)        | 0.8-2.4%<br>0.1-0.8%              | 1/2<br>1                  | White              | Reddish orange | 3                       | +P   | 1000                           |
|                                                     | 51                        | Fluorochlorocarbons<br>(Pyrotec tube)        | 25-1000                           | 1                         | Yellow             | Reddish purple | 3                       | +P   |                                |
|                                                     | 51L                       | Fluorochlorocarbons<br>(Pyrotec tube)        | 50-135<br>2.5-50                  | 1<br>2                    | Yellow             | Reddish purple | 3                       | +P   |                                |
| 1-Chloro-2,3-epoxy propane                          | See Epichlorohydrin       |                                              |                                   |                           |                    |                |                         |      |                                |
| 2-Chloroethanol                                     | See Ethylene chlorohydrin |                                              |                                   |                           |                    |                |                         |      |                                |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                         | Tube No. & Name     |                                       | Measuring<br>Range<br>(ppm)          | No. of<br>Pump<br>Strokes | Colour Change |                | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|---------------------------------------------------------------------------------------------|---------------------|---------------------------------------|--------------------------------------|---------------------------|---------------|----------------|-------------------------|------|--------------------------------|
|                                                                                             |                     |                                       |                                      |                           | Original      | Stain          |                         |      |                                |
| Chloroethylene                                                                              | See Vinyl chloride  |                                       |                                      |                           |               |                |                         |      |                                |
| Chloroform<br>CHCl <sub>3</sub>                                                             | 137                 | Chloroform                            | 100-400<br>10-100<br>4-10            | 3<br>⑤<br>7               | White         | Orange         | 3                       | +H   | 10                             |
|                                                                                             | 137LA               | Chloroform                            | 12-30<br>2-12<br>0.5-2               | 1<br>②<br>4               | White         | Pale purple    | 1*                      | +T   |                                |
|                                                                                             | 137LL               | Chloroform                            | 0.3-4.5                              | ④                         | White         | Pale purple    | 1*                      | +T   |                                |
|                                                                                             |                     |                                       |                                      |                           |               |                |                         |      |                                |
| Chloropicrin<br>Cl <sub>3</sub> CNO <sub>2</sub>                                            | 134                 | Carbon tetrachloride                  | 2.5-60                               | 1                         | White         | Yellow         | 1*                      | +    | 0.1                            |
|                                                                                             | 134L                | Carbon tetrachloride                  | 0.125-2.5                            | 2                         | White         | Yellow         | 1*                      | +    |                                |
|                                                                                             | 233                 | Chloropicrin                          | 10-22<br>0.1-10<br>0.045-0.1         | 1/2<br>1<br>2             | White         | Yellow         | 1                       | +    |                                |
| 2-Chloro-1,1,1,2-tetrafluoroethane(R124)<br>CHClFCF <sub>3</sub>                            | 51                  | Fluorochlorocarbons<br>(Pyrotec tube) | 45-1800                              | 1                         | Yellow        | Reddish purple | 3                       | +P   |                                |
| m-Cresol<br>C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> )OH                              | 61                  | o-Cresol                              | 1-25                                 | 2                         | Pale yellow   | Gray           | 2*                      | T    | 20mg/m <sup>3</sup> (IFV)      |
| o-Cresol<br>C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> )OH                              | 61                  | o-Cresol                              | 25-62.5<br>1-25<br>0.4-1             | 1<br>②<br>4               | Pale yellow   | Gray           | 2*                      | T    | 20mg/m <sup>3</sup> (IFV)      |
| p-Cresol<br>C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> )OH                              | 61                  | o-Cresol                              | 1-25                                 | 2                         | Pale yellow   | Gray           | 2*                      | T    | 20mg/m <sup>3</sup> (IFV)      |
| Cumene<br>C <sub>6</sub> H <sub>5</sub> CH(CH <sub>3</sub> ) <sub>2</sub>                   | 122L                | Toluene                               | 2-100                                | 2                         | White         | Brown          | 3                       |      | 50                             |
| Cyclohexane<br>C <sub>6</sub> H <sub>12</sub>                                               | 102H                | Hexane                                | 0.6-1.2%<br>0.03-0.6%<br>0.015-0.03% | 1/2<br>1<br>2             | Orange        | Dark green     | 3                       |      | 100                            |
|                                                                                             | 102L                | Hexane                                | 60-1440                              | 1                         | Orange        | Dark green     | 3                       |      |                                |
| Cyclohexanol<br>C <sub>6</sub> H <sub>11</sub> OH                                           | 118                 | Cyclohexanol                          | 5-100                                | 2                         | Yellow        | Pale blue      | 2                       | T    | 50                             |
| Cyclohexanone<br>C <sub>6</sub> H <sub>10</sub> O                                           | 154                 | Cyclohexanone                         | 30-75<br>2-30                        | 2<br>④                    | Pale yellow   | Yellow         | 2*                      | T    | 20                             |
|                                                                                             | 91L                 | Formaldehyde                          | 10-470                               | 1/2                       | Yellow        | Reddish brown  | 3*                      | T    |                                |
| Cyclohexene<br>C <sub>6</sub> H <sub>10</sub>                                               | 151                 | Acetone                               | 0.05-0.8%                            | 1                         | Orange        | Brownish green | 3                       | T    | 300                            |
| Cyclohexylamine<br>C <sub>6</sub> H <sub>13</sub> N                                         | 180                 | Amines                                | 7-140                                | 1                         | Pink          | Salmon pink    | 3                       | T    | 10                             |
|                                                                                             | 180L                | Amines                                | 0.5-10                               | 1                         | Pink          | Pale orange    | 2                       | T    |                                |
| Cymene<br>C <sub>10</sub> H <sub>14</sub>                                                   | 141L                | Ethyl acetate                         | 5.6-224                              | 2                         | Yellow        | Blackish brown | 2                       | T    |                                |
| n-Decane<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>8</sub> CH <sub>3</sub>                 | 105                 | Hydrocarbons (Higher class)           | 400-6000<br>200-400                  | 1<br>2                    | White         | Blackish brown | 3                       |      |                                |
| Diacetone alcohol<br>(CH <sub>3</sub> ) <sub>2</sub> C(OH)CH <sub>2</sub> COCH <sub>3</sub> | 154                 | Cyclohexanone                         | 2.5-100                              | 2                         | Pale yellow   | Yellow         | 2*                      | T    | 50                             |
| Diacetyl<br>CH <sub>3</sub> COCOCH <sub>3</sub>                                             | 92                  | Acetaldehyde                          | 25-1500                              | 3                         | Yellow        | Red            | 2*                      | T    | 0.01                           |
| 1,2-Diaminoethane                                                                           | See Ethylenediamine |                                       |                                      |                           |               |                |                         |      |                                |
| Diborane<br>B <sub>2</sub> H <sub>6</sub>                                                   | 22                  | Diborane                              | 2-5<br>0.05-2<br>0.02-0.05           | 1<br>②<br>5               | Yellow        | Red            | 2                       | T    | 0.1                            |
|                                                                                             |                     |                                       |                                      |                           |               |                |                         |      |                                |
|                                                                                             |                     |                                       |                                      |                           |               |                |                         |      |                                |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                                       | Tube No. & Name          |                                              | Measuring<br>Range<br>(ppm) | No. of<br>Pump<br>Strokes | Colour Change |                | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|-----------------------------------------------------------------------------------------------------------|--------------------------|----------------------------------------------|-----------------------------|---------------------------|---------------|----------------|-------------------------|------|--------------------------------|
|                                                                                                           |                          |                                              |                             |                           | Original      | Stain          |                         |      |                                |
| 1,1-Dibromoethane<br>CH <sub>3</sub> CHBr <sub>2</sub>                                                    | 136L                     | Methyl bromide                               | 7-70                        | 1                         | White         | Yellow         | 2                       | +    |                                |
| 1,2-Dibromoethane                                                                                         | See Ethylene dibromide   |                                              |                             |                           |               |                |                         |      |                                |
| Dibromomethane<br>CH <sub>2</sub> Br <sub>2</sub>                                                         | 136L                     | Methyl bromide                               | 5-50                        | 1                         | White         | Yellow         | 2                       | +    |                                |
| Di-n-butylamine<br>(CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> ) <sub>2</sub> NH     | 180                      | Amines                                       | 5-100                       | 1                         | Pink          | Pale orange    | 3                       | T    |                                |
|                                                                                                           | 180L                     | Amines                                       | 0.4-8                       | 1                         | Pink          | Pale orange    | 2                       | T    |                                |
| m-Dichlorobenzene<br>C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub>                                        | 127                      | o-Dichlorobenzene                            | 2.5-300                     | 2                         | White         | Light brown    | 3                       | T    |                                |
| o-Dichlorobenzene<br>C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub>                                        | 127                      | o-Dichlorobenzene                            | 2.5-300                     | 2                         | White         | Light brown    | 3                       | T    | 25                             |
| p-Dichlorobenzene<br>C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub>                                        | 127                      | o-Dichlorobenzene                            | 2.5-300                     | 2                         | White         | Light brown    | 3                       | T    | 10                             |
| Dichlorodifluoromethane (R12)<br>CCl <sub>2</sub> F <sub>2</sub>                                          | 51H                      | Fluorochlorocarbons<br>(Pyrotec tube)        | 2600-7800<br>325-2600       | 1/2<br>1                  | White         | Reddish orange | 3                       | +P   | 1000                           |
|                                                                                                           | 51                       | Fluorochlorocarbons<br>(Pyrotec tube)        | 11-440                      | 1                         | Yellow        | Reddish purple | 3                       | +P   |                                |
|                                                                                                           | 51L                      | Fluorochlorocarbons<br>(Pyrotec tube)        | 36-97.2<br>1.8-36           | 1<br>2                    | Yellow        | Reddish purple | 3                       | +P   |                                |
| 1,1-Dichloroethane<br>CH <sub>3</sub> CHCl <sub>2</sub>                                                   | 135                      | 1,1,1-Trichloroethane<br>(Methyl chloroform) | 90-450                      | 1                         | White         | Reddish orange | 3                       | +T   | 100                            |
| 1,2-Dichloroethane                                                                                        | See Ethylene dichloride  |                                              |                             |                           |               |                |                         |      |                                |
| 1,1-Dichloroethylene                                                                                      | See Vinylidene chloride  |                                              |                             |                           |               |                |                         |      |                                |
| 1,2-Dichloroethylene<br>ClCH:CHCl                                                                         | 139                      | 1,2-Dichloroethylene                         | 100-250<br>10-100<br>5-10   | 1/2<br>①<br>2             | Yellow        | Reddish purple | 2✱                      | T    | 200                            |
|                                                                                                           | 132HA                    | Trichloroethylene                            | 80-800                      | 1                         | Yellow        | Reddish purple | 2✱                      | T    |                                |
|                                                                                                           | 132LL                    | Trichloroethylene                            | 0.375-6.0                   | 1                         | Yellow        | Purple         | 2✱                      | T    |                                |
| 1,1-Dichloro-1-fluoroethane<br>(R141b)<br>CH <sub>3</sub> CCl <sub>2</sub> F                              | 51                       | Fluorochlorocarbons<br>(Pyrotec tube)        | 400-1000<br>10-400          | 1/2<br>1                  | Yellow        | Reddish purple | 3                       | +P   |                                |
|                                                                                                           | 51L                      | Fluorochlorocarbons<br>(Pyrotec tube)        | 1.1-22                      | 2                         | Yellow        | Reddish purple | 3                       | +P   |                                |
| Dichloromethane                                                                                           | See Methylene chloride   |                                              |                             |                           |               |                |                         |      |                                |
| Dichloropentafluoropropane<br>(R225)                                                                      | 51                       | Fluorochlorocarbons<br>(Pyrotec tube)        | 20-800                      | 1                         | Yellow        | Reddish purple | 3                       | +P   |                                |
|                                                                                                           | 51L                      | Fluorochlorocarbons<br>(Pyrotec tube)        | 1.4-28                      | 2                         | Yellow        | Reddish purple | 3                       | +P   |                                |
| 3,3-Dichloro-1,1,2,2-<br>pentafluoropropane (R225ca)<br>CHCl <sub>2</sub> CF <sub>2</sub> CF <sub>3</sub> | 51                       | Fluorochlorocarbons<br>(Pyrotec tube)        | 20-800                      | 1                         | Yellow        | Reddish purple | 3                       | +P   |                                |
|                                                                                                           | 51L                      | Fluorochlorocarbons<br>(Pyrotec tube)        | 1.4-28                      | 2                         | Yellow        | Reddish purple | 3                       | +P   |                                |
| 1,2-Dichloropropane                                                                                       | See Propylene dichloride |                                              |                             |                           |               |                |                         |      |                                |
| 1,3-Dichloropropene<br>ClCH <sub>2</sub> CH:CHCl                                                          | 132HA                    | Trichloroethylene                            | 45-450                      | 2                         | Yellow        | Reddish purple | 2✱                      | T    | 1                              |
|                                                                                                           | 131La                    | Vinyl chloride                               | 0.5-10                      | 2                         | Yellow        | Reddish brown  | 2✱                      | +    |                                |
| 1,2-Dichloro-1,1,2,2-<br>tetrafluoroethane (R114)<br>CClF <sub>2</sub> CClF <sub>2</sub>                  | 51H                      | Fluorochlorocarbons<br>(Pyrotec tube)        | 3800-11400<br>475-3800      | 1/2<br>1                  | White         | Reddish orange | 3                       | +P   | 1000                           |
|                                                                                                           | 51                       | Fluorochlorocarbons<br>(Pyrotec tube)        | 20-800                      | 1                         | Yellow        | Reddish purple | 3                       | +P   |                                |
|                                                                                                           | 51L                      | Fluorochlorocarbons<br>(Pyrotec tube)        | 36-97.2<br>1.8-36           | 1<br>2                    | Yellow        | Reddish purple | 3                       | +P   |                                |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                                                          | Tube No. & Name       |                                       | Measuring<br>Range<br>(ppm) | No. of<br>Pump<br>Strokes | Colour Change |                                                            | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------------|---------------------------|---------------|------------------------------------------------------------|-------------------------|------|--------------------------------|
|                                                                                                                              |                       |                                       |                             |                           | Original      | Stain                                                      |                         |      |                                |
| 2,2-Dichloro-1,1,1-trifluoroethane (R123)<br>CHCl <sub>2</sub> CF <sub>3</sub>                                               | 51                    | Fluorochlorocarbons<br>(Pyrotec tube) | 560-1600<br>14-560          | 1/2<br>1                  | Yellow        | Reddish purple                                             | 3                       | +P   |                                |
|                                                                                                                              | 51L                   | Fluorochlorocarbons<br>(Pyrotec tube) | 1.4-28                      | 2                         | Yellow        | Reddish purple                                             | 3                       | +P   |                                |
| Dichlorvos<br>C <sub>4</sub> H <sub>7</sub> Cl <sub>2</sub> O <sub>4</sub> P                                                 | 132LL                 | Trichloroethylene                     | 0.11-1.8                    | 2                         | Yellow        | Purple                                                     | 2*                      | T    | 0.1mg/m <sup>3</sup> (FV)      |
| Diethylamine<br>(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> NH                                                             | 180                   | Amines                                | 5.5-110                     | 1                         | Pink          | Pale Brown                                                 | 3                       | T    | 5                              |
|                                                                                                                              | 180L                  | Amines                                | 0.45-9                      | 1                         | Pink          | Pale orange                                                | 2                       | T    |                                |
| Diethylaminoethanol<br>(C <sub>2</sub> H <sub>5</sub> )NCH <sub>2</sub> CH <sub>2</sub> OH                                   | 180L                  | Amines                                | 0.6-12                      | 1                         | Pink          | Pale orange                                                | 2                       | T    | 2                              |
| Diethyl benzene<br>C <sub>6</sub> H <sub>4</sub> (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub>                               | 122L                  | Toluene                               | 2-150                       | 4                         | White         | Brown                                                      | 3                       |      |                                |
| Diethylenetriamine<br>H <sub>2</sub> NCH <sub>2</sub> CH <sub>2</sub> NHCH <sub>2</sub> CH <sub>2</sub> NH <sub>2</sub>      | 180L                  | Amines                                | 0.95-19                     | 1                         | Pink          | Grayish purple<br>(Pale orange at the end<br>of staining)* | 2                       | T    | 1                              |
| Diethylethanolamine<br>(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> NC <sub>2</sub> H <sub>4</sub> OH                       | 180                   | Amines                                | 6-120                       | 1                         | Pink          | Pale brown                                                 | 3                       | T    | 2                              |
| Diethyl ether                                                                                                                | See Ethyl ether       |                                       |                             |                           |               |                                                            |                         |      |                                |
| Diisobutylene<br>(CH <sub>3</sub> ) <sub>3</sub> CCH:C(CH <sub>3</sub> ) <sub>2</sub>                                        | 121                   | Benzene                               | 45-540                      | 1                         | White         | Dark green                                                 | 3                       |      | 25                             |
| Diisobutyl ketone<br>[(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> ] <sub>2</sub> CO                                    | 102L                  | Hexane                                | 0.2-1%                      | 2                         | Orange        | Dark green                                                 | 3                       |      |                                |
|                                                                                                                              | 91L                   | Formaldehyde                          | 0.58-29                     | 4                         | Yellow        | Reddish brown                                              | 3*                      | T    |                                |
| Diisopropylamine<br>[(CH <sub>3</sub> ) <sub>2</sub> CH] <sub>2</sub> NH                                                     | 180                   | Amines                                | 5-100                       | 1                         | Pink          | Pale orange                                                | 3                       | T    | 5                              |
|                                                                                                                              | 180L                  | Amines                                | 0.3-6                       | 1                         | Pink          | Pale orange                                                | 2                       | T    |                                |
| Diisopropyl benzene<br>C <sub>6</sub> H <sub>5</sub> N [CH(CH <sub>3</sub> ) <sub>2</sub> ] <sub>2</sub>                     | 141L                  | Ethyl acetate                         | 10-400                      | 1/2                       | Yellow        | Blackish brown                                             | 2                       | T    |                                |
| N,N-Dimethyl acetamide<br>CH <sub>3</sub> CON(CH <sub>3</sub> ) <sub>2</sub>                                                 | 184                   | N,N-Dimethyl acetamide                | 60-240<br>5-60<br>1.5-5     | 1<br>②<br>4               | Pink          | Pale yellow                                                | 3                       | T    | 10                             |
| Dimethylamine<br>(CH <sub>3</sub> ) <sub>2</sub> NH                                                                          | 3H                    | Ammonia                               | 1.2-19.2%                   | 1                         | Purple        | Yellow                                                     | 3                       |      | 5                              |
|                                                                                                                              | 180                   | Amines                                | 5.5-110                     | 1                         | Pink          | Salmon pink                                                | 3                       | T    |                                |
|                                                                                                                              | 180L                  | Amines                                | 0.45-9                      | 1                         | Pink          | Pale orange                                                | 2                       | T    |                                |
| 2-Dimethylaminoethanol<br>(CH <sub>3</sub> ) <sub>2</sub> NCH <sub>2</sub> CH <sub>2</sub> OH                                | 180L                  | Amines                                | 0.65-13                     | 1                         | Pink          | Pale orange                                                | 2                       | T    |                                |
| Dimethylaminopropylamine<br>(CH <sub>3</sub> ) <sub>2</sub> NCH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> NH <sub>2</sub> | 180                   | Amines                                | 8-160                       | 1                         | Pink          | Grayish red                                                | 3                       | T    |                                |
|                                                                                                                              | 180L                  | Amines                                | 0.6-12                      | 1                         | Pink          | Pale orange                                                | 2                       | T    |                                |
| N,N-Dimethylaniline<br>C <sub>6</sub> H <sub>5</sub> N(CH <sub>3</sub> ) <sub>2</sub>                                        | 181                   | Aniline                               | 2.5-30                      | 3                         | Pale yellow   | Pale green                                                 | 3                       |      | 5                              |
| Dimethylbenzene                                                                                                              | See Xylene            |                                       |                             |                           |               |                                                            |                         |      |                                |
| Dimethyl disulphide<br>(CH <sub>3</sub> ) <sub>2</sub> S <sub>2</sub>                                                        | 53                    | Dimethyl sulphide<br>(Pyrotec tube)   | 0.3-6                       | 3                         | Bluish purple | White                                                      | 2                       | +TP  | 0.5                            |
| Dimethylethanolamine<br>(CH <sub>3</sub> ) <sub>2</sub> NCH <sub>2</sub> CH <sub>2</sub> OH                                  | 180                   | Amines                                | 6.5-130                     | 1                         | Pink          | Pale orange to Yellow                                      | 3                       | T    |                                |
|                                                                                                                              | 180L                  | Amines                                | 0.65-13                     | 1                         | Pink          | Pale orange                                                | 2                       | T    |                                |
| N,N-Dimethylethylamine<br>C <sub>2</sub> H <sub>5</sub> N(CH <sub>3</sub> ) <sub>2</sub>                                     | 180                   | Amines                                | 4-80                        | 1                         | Pink          | Yellow                                                     | 3                       | T    |                                |
|                                                                                                                              | 180L                  | Amines                                | 0.3-6                       | 1                         | Pink          | Pale orange                                                | 2                       | T    |                                |
| N,N-Dimethyl formamide<br>HCON(CH <sub>3</sub> ) <sub>2</sub>                                                                | 183                   | N,N-Dimethyl formamide                | 30-90<br>2-30<br>0.8-2      | 1/2<br>①<br>2             | Pink          | Pale red                                                   | 3                       | T    | 10                             |
| 2,6-Dimethyl-4-heptanone                                                                                                     | See Diisobutyl ketone |                                       |                             |                           |               |                                                            |                         |      |                                |
| Dimethylhydrazine<br>NH <sub>2</sub> N(CH <sub>3</sub> ) <sub>2</sub>                                                        | 185                   | Hydrazine                             | 0.1-2                       | 5                         | Pink          | Yellow                                                     | 3                       | H    | 0.01                           |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump. ※1:Pale orange when low concentration  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                                        | Tube No. & Name            |                                       | Measuring<br>Range<br>(ppm)         | No. of<br>Pump<br>Strokes | Colour Change  |                                                         | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |                    |
|------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------|-------------------------------------|---------------------------|----------------|---------------------------------------------------------|-------------------------|------|--------------------------------|--------------------|
|                                                                                                            |                            |                                       |                                     |                           | Original       | Stain                                                   |                         |      |                                |                    |
| Dimethyl sulphide<br>(CH <sub>3</sub> ) <sub>2</sub> S                                                     | 53                         | Dimethyl sulphide<br>(Pyrotec tube)   | 0.5-10<br>0.25-0.5                  | ③<br>5                    | Bluish purple  | White                                                   | 2                       | +T   | 10                             |                    |
|                                                                                                            | 77                         | TBM and DMS                           | 1-15mg/m <sup>3</sup>               | 1                         | Pink           | Pale yellow                                             | 2✱                      | +    |                                |                    |
| 1,4-Dioxane<br>C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>                                                | 159                        | Tetrahydrofuran                       | 25-140                              | 2                         | Pink           | Pale blue                                               | 3                       | T    | 20                             |                    |
|                                                                                                            | 163                        | Ethylene oxide                        | 0.1-6.0%                            | 1                         | Orange         | Green                                                   | 3                       |      |                                |                    |
| Dipropylamine<br>(CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> ) <sub>2</sub> NH                        | 180                        | Amines                                | 4-80                                | 1                         | Pink           | Yellow                                                  | 3                       | T    |                                |                    |
|                                                                                                            | 180L                       | Amines                                | 0.35-7                              | 1                         | Pink           | Pale orange                                             | 2                       | T    |                                |                    |
| Divinyl benzene<br>C <sub>6</sub> H <sub>4</sub> (CH:CH <sub>2</sub> ) <sub>2</sub>                        | 124L                       | Styrene                               | 1-15                                | 3                         | White          | Yellow                                                  | 3                       |      | 10                             |                    |
| Divinyl methoxysilane<br>(CH <sub>2</sub> :CH <sub>2</sub> ) <sub>2</sub> CH <sub>3</sub> OSi              | 113L                       | Isopropyl alcohol                     | 6.5-25.0                            | 2                         | Pink           | Pale blue                                               | 3                       | T    |                                |                    |
| Enflurane (2-Chloro-1,1,2-Trifluoroethyl Difluoromethyl Ether)<br>CHClFCH <sub>2</sub> OCHF <sub>2</sub>   | 51                         | Fluorochlorocarbons<br>(Pyrotec tube) | 20-1200                             | 1                         | Yellow         | Reddish purple                                          | 3                       | +P   | 75                             |                    |
|                                                                                                            | 51L                        | Fluorochlorocarbons<br>(Pyrotec tube) | 25-145                              | 2                         | Yellow         | Reddish purple                                          | 3                       | +P   |                                |                    |
| Epichlorohydrin<br>CH <sub>2</sub> OCHCH <sub>2</sub> Cl                                                   | 163L                       | Ethylene oxide                        | 1.2-120                             | 2                         | Yellow         | Reddish brown                                           | 1✱                      | +T   | 0.5                            |                    |
| 1,2-Epoxypropane                                                                                           | See Propylene oxide        |                                       |                                     |                           |                |                                                         |                         |      |                                |                    |
| Ethanethiol                                                                                                | See Ethyl mercaptan        |                                       |                                     |                           |                |                                                         |                         |      |                                |                    |
| Ethanol<br>C <sub>2</sub> H <sub>5</sub> OH                                                                | 112                        | Ethanol                               | 2.5-7.5%<br>0.05-2.5%<br>0.01-0.05% | 1/2<br>①<br>2             | Pink           | Pale blue                                               | 3                       | T    |                                |                    |
|                                                                                                            |                            |                                       | 112L                                | Ethanol                   |                |                                                         |                         |      |                                | 100-2000<br>50-100 |
| Ethyl alcohol                                                                                              | See Ethanol                |                                       |                                     |                           |                |                                                         |                         |      |                                |                    |
| Ethanalamine<br>H <sub>2</sub> NCH <sub>2</sub> CH <sub>2</sub> OH                                         | 180                        | Amines                                | 7-140                               | 3                         | Pink           | Yellow                                                  | 3                       | T    |                                | 3                  |
|                                                                                                            | 180L                       | Amines                                | 1.95-39                             | 1                         | Pink           | Grayish purple<br>(Pale orange at the end of staining)✱ | 2                       | T    |                                |                    |
| Ethyl acetate<br>CH <sub>3</sub> CO <sub>2</sub> C <sub>2</sub> H <sub>5</sub>                             | 141                        | Ethyl acetate                         | 0.1-1.5%                            | 1                         | Orange         | Dark green                                              | 3                       | T    | 400                            |                    |
|                                                                                                            | 141L                       | Ethyl acetate                         | 20-800                              | 2                         | Yellow         | Blackish brown                                          | 2                       | T    |                                |                    |
| Ethyl acrylate<br>CH <sub>2</sub> :CHCO <sub>2</sub> C <sub>2</sub> H <sub>5</sub>                         | 141L                       | Ethyl acetate                         | 8-320                               | 2                         | Yellow         | Blackish brown                                          | 2                       | T    | 5                              |                    |
| Ethylamine<br>C <sub>2</sub> H <sub>5</sub> NH <sub>2</sub>                                                | 180                        | Amines                                | 5-100                               | 1                         | Pink           | Yellow                                                  | 3                       | T    | 5                              |                    |
|                                                                                                            | 180L                       | Amines                                | 0.45-9                              | 1                         | Pink           | Pale orange                                             | 2                       | T    |                                |                    |
| Ethyl benzene<br>C <sub>6</sub> H <sub>5</sub> C <sub>2</sub> H <sub>5</sub>                               | 122                        | Toluene                               | 11-330                              | 1                         | White          | Brown                                                   | 3                       |      | 20                             |                    |
|                                                                                                            | 122L                       | Toluene                               | 1-70                                | 2                         | White          | Brown                                                   | 3                       |      |                                |                    |
| p-Ethyl benzylchloride<br>C <sub>6</sub> H <sub>4</sub> (C <sub>2</sub> H <sub>5</sub> )CH <sub>2</sub> Cl | 131La                      | Vinyl chloride                        | 2.5-50                              | 2                         | Yellow         | Reddish brown                                           | 2✱                      | +    |                                |                    |
| Ethyl bromide<br>C <sub>2</sub> H <sub>5</sub> Br                                                          | 136L                       | Methyl bromide                        | 100-200<br>10-100<br>2.5-10         | 1/2<br>①<br>4             | White          | Yellow                                                  | 2                       | +    | 5                              |                    |
| Ethyl chloroformate<br>ClCO <sub>2</sub> C <sub>2</sub> H <sub>5</sub>                                     | 131La                      | Vinyl chloride                        | 7-140                               | 2                         | Yellow         | Reddish brown                                           | 2✱                      | +    |                                |                    |
| Ethyl chloride<br>C <sub>2</sub> H <sub>5</sub> Cl                                                         | 138                        | Methylene chloride                    | 15-150                              | 1                         | White          | Pale pink                                               | 3                       | +T   | 100                            |                    |
| Ethylene<br>CH <sub>2</sub> :CH <sub>2</sub>                                                               | 172                        | Ethylene                              | 800-1680<br>25-800                  | 1/2<br>①                  | Pale yellow    | Blue                                                    | 3                       | T    | 200                            |                    |
|                                                                                                            |                            |                                       |                                     |                           |                |                                                         |                         |      |                                |                    |
|                                                                                                            | 172L                       | Ethylene                              | 50-100<br>0.2-50                    | 2<br>④                    | Pale yellow    | Blue                                                    | 3                       | T    |                                |                    |
|                                                                                                            |                            |                                       |                                     |                           |                |                                                         |                         |      |                                |                    |
| 103                                                                                                        | Hydrocarbons (Lower class) | 8.4-16.8%<br>0.1-8.4%<br>0.35-0.7%    | 1/2<br>1<br>2                       | Yellowish brown           | Greenish brown | 2                                                       | ++                      |      |                                |                    |
|                                                                                                            |                            |                                       |                                     |                           |                |                                                         |                         |      |                                |                    |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump. ※ 1:Pale orange when low concentration  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                                                    | Tube No. & Name                  |                                              | Measuring<br>Range<br>(ppm)        | No. of<br>Pump<br>Strokes | Colour Change |                | Shelf<br>Life<br>(year) | Note     | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------|------------------------------------|---------------------------|---------------|----------------|-------------------------|----------|--------------------------------|
|                                                                                                                        |                                  |                                              |                                    |                           | Original      | Stain          |                         |          |                                |
| Ethylene<br>CH <sub>2</sub> :CH <sub>2</sub>                                                                           | 171                              | Acetylene                                    | 0.1-2.0%                           | 1                         | White         | Brown          | 3                       | T        | 200                            |
| Ethylene chlorohydrin<br>ClCH <sub>2</sub> CH <sub>2</sub> OH                                                          | 111L                             | Methanol                                     | 80-200                             | 3                         | Pink          | Pale blue      | 3                       | T        | C 1                            |
| Ethylenediamine<br>H <sub>2</sub> NCH <sub>2</sub> CH <sub>2</sub> NH <sub>2</sub>                                     | 180                              | Amines                                       | 14-280                             | 1                         | Pink          | Yellow         | 3                       | T        | 10                             |
|                                                                                                                        | 180L                             | Amines                                       | 0.9-18                             | 1                         | Pink          | Pale orange    | 2                       | T        |                                |
| Ethylene dibromide<br>BrCH <sub>2</sub> CH <sub>2</sub> Br                                                             | 136H                             | Methyl bromide                               | 14-210                             | 1                         | White         | Yellow         | 3                       | +        |                                |
|                                                                                                                        | 136L                             | Methyl bromide                               | 8-80                               | 1                         | White         | Yellow         | 2                       | +        |                                |
| Ethylene dichloride<br>ClCH <sub>2</sub> CH <sub>2</sub> Cl                                                            | 232                              | 1,2-Dichloroethane                           | 15-39<br>1-15                      | 1<br>②                    | White         | Pale purple    | 1*<br>3                 | +T<br>+T | 10                             |
|                                                                                                                        | 135                              | 1,1,1-Trichloroethane<br>(Methyl chloroform) | 400-2000                           | 1                         | White         | Reddish orange | 3                       | +T       |                                |
|                                                                                                                        | 135L                             | 1,1,1-Trichloroethane<br>(Methyl chloroform) | 104-1040                           | 1                         | White         | Pale pink      | 2                       | +T       |                                |
| Ethylene glycol<br>HOCH <sub>2</sub> CH <sub>2</sub> OH                                                                | 165L                             | Ethylene glycol                              | 10-100mg/m <sup>3</sup>            | 2                         | Yellow        | Reddish brown  | 3*<br>3                 | +T<br>T  | C 100mg/m <sup>3</sup>         |
| Ethylene glycol monobutyl ether<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> OCH <sub>2</sub> CH <sub>2</sub> OH | 113L                             | Isopropyl alcohol                            | 200-1000                           | 2                         | Pink          | Pale blue      | 3                       | T        | 20                             |
|                                                                                                                        | 113LL                            | Isopropyl alcohol                            | 60-400                             | 2                         | Pink          | Pale blue      | 2                       | T        |                                |
| Ethylene glycol monoethyl ether<br>C <sub>2</sub> H <sub>5</sub> OCH <sub>2</sub> CH <sub>2</sub> OH                   | 113L                             | Isopropyl alcohol                            | 110-1000                           | 2                         | Pink          | Pale blue      | 3                       | T        | 5                              |
|                                                                                                                        | 113LL                            | Isopropyl alcohol                            | 46-460                             | 2                         | Pink          | Pale blue      | 2                       | T        |                                |
| Ethylene glycol monomethyl ether<br>CH <sub>3</sub> OCH <sub>2</sub> CH <sub>2</sub> OH                                | 113L                             | Isopropyl alcohol                            | 75-760                             | 2                         | Pink          | Pale blue      | 3                       | T        | 0.1                            |
|                                                                                                                        | 113LL                            | Isopropyl alcohol                            | 44-440                             | 2                         | Pink          | Pale blue      | 2                       | T        |                                |
| Ethylene glycol monomethyl ether acetate                                                                               | See 2-Methoxyethyl acetate       |                                              |                                    |                           |               |                |                         |          |                                |
| Ethylene oxide<br>C <sub>2</sub> H <sub>4</sub> O                                                                      | 163                              | Ethylene oxide                               | 0.05-3.0%                          | 1                         | Orange        | Green          | 3                       |          | 1                              |
|                                                                                                                        | 163L                             | Ethylene oxide                               | 100-350<br>1-100<br>0.4-1          | 1<br>②<br>4               | Yellow        | Reddish brown  | 1*<br>1                 | +T<br>+T |                                |
|                                                                                                                        |                                  |                                              | 5-10<br>0.1-5                      | 2<br>④                    |               |                |                         |          |                                |
| Ethyl ether<br>(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O                                                         | 161                              | Ethyl ether                                  | 0.04-1.0%                          | 1                         | Orange        | Dark green     | 3                       | T        | 400                            |
|                                                                                                                        | 161L                             | Ethyl ether                                  | 400-1200<br>10-400                 | 1<br>②                    | Yellow        | Pale blue      | 2                       | T        |                                |
| Ethylidene chloride                                                                                                    | See 1,1-Dichloroethane           |                                              |                                    |                           |               |                |                         |          |                                |
| Ethyl mercaptan<br>C <sub>2</sub> H <sub>5</sub> SH                                                                    | 72                               | Ethyl mercaptan                              | 5-120<br>0.5-5                     | ①<br>2-10                 | White         | Yellow         | 3                       | T        | 0.5                            |
|                                                                                                                        |                                  |                                              | 30-75<br>0.5-30<br>0.2-0.5         | 1/2<br>①<br>2             |               |                |                         |          |                                |
|                                                                                                                        |                                  |                                              | 5-120<br>0.5-5                     | 1<br>2-10                 |               |                |                         |          |                                |
|                                                                                                                        | 70L                              | Mercaptans                                   | 4-8<br>0.5-4<br>0.2-0.5<br>0.1-0.2 | 1/2<br>1<br>2<br>4        | Yellow        | Red            | 2                       |          |                                |
|                                                                                                                        |                                  |                                              |                                    |                           |               |                |                         |          |                                |
|                                                                                                                        |                                  |                                              |                                    |                           |               |                |                         |          |                                |
| 71H                                                                                                                    | Methyl mercaptan                 | 100-3800                                     | 1                                  | White                     | Yellow        | 3              |                         |          |                                |
| N-Ethyl morpholine<br>C <sub>6</sub> H <sub>13</sub> NO                                                                | 180                              | Amines                                       | 5-100                              | 1                         | Pink          | Yellow         | 3                       | T        | 5                              |
|                                                                                                                        | 180L                             | Amines                                       | 0.3-6                              | 1                         | Pink          | Pale orange    | 2                       | T        |                                |
| Fluorine<br>F <sub>2</sub>                                                                                             | 17                               | Hydrogen fluoride                            | 0.5-50                             | 1                         | Yellow        | Brown          | 3                       | H        | 1                              |
| Fluorotrichloromethane                                                                                                 | See Trichlorofluoromethane (R11) |                                              |                                    |                           |               |                |                         |          |                                |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                      | Tube No. & Name            |                                       | Measuring<br>Range<br>(ppm)             | No. of<br>Pump<br>Strokes | Colour Change   |                                                            | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|------------------------------------------------------------------------------------------|----------------------------|---------------------------------------|-----------------------------------------|---------------------------|-----------------|------------------------------------------------------------|-------------------------|------|--------------------------------|
|                                                                                          |                            |                                       |                                         |                           | Original        | Stain                                                      |                         |      |                                |
| Formaldehyde<br>HCHO                                                                     | 91M                        | Formaldehyde                          | 2000-6400<br>20-2000<br>8-20            | 1/2<br>①<br>2             | Yellow          | Red                                                        | 2*                      | T    | C 0.3                          |
|                                                                                          | 91                         | Formaldehyde                          | 50-100<br>20-50<br>2-20                 | 1/2<br>1<br>②             | White           | Brown                                                      | 3                       | +    |                                |
|                                                                                          | 91L                        | Formaldehyde                          | 5-40<br>0.1-5                           | 1<br>⑤                    | Yellow          | Reddish brown                                              | 3*                      | T    |                                |
|                                                                                          | 91LL                       | Formaldehyde                          | 0.05-1                                  | 5                         | Yellowish brown | Reddish brown                                              | 1*                      | T    |                                |
| Formic acid<br>HCO <sub>2</sub> H                                                        | 81                         | Acetic acid                           | 5.2-130                                 | 1                         | Pink            | Yellow                                                     | 3                       | H    | 5                              |
|                                                                                          | 81L                        | Acetic acid                           | 0.5-20                                  | 1                         | Pink            | Yellow                                                     | 2*                      | T    |                                |
| Furfural<br>C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>                                 | 154                        | Cyclohexanone                         | 2-30                                    | 4                         | Pale yellow     | Yellow                                                     | 2*                      | T    | 2                              |
| Gasoline (Petrol)<br>C <sub>n</sub> H <sub>m</sub>                                       | 101                        | Gasoline (Petrol)                     | 0.6-1.2%<br>0.03-0.6%<br>0.015-0.03%    | 1/2<br>①<br>2             | Orange          | Dark green                                                 | 3                       |      | 300                            |
|                                                                                          | 101L                       | Gasoline (Petrol)                     | 1000-2000<br>30-1000                    | 1<br>②                    | Orange          | Dark green                                                 | 3                       |      |                                |
|                                                                                          | 1M                         | Carbon monoxide                       | 0.1-2%                                  | 1                         | White           | Pale brown                                                 | 3                       |      |                                |
| Halothane (2-Bromo-2-chloro-<br>1,1,1 - trifluoroethane)<br>CF <sub>3</sub> CHBrCl       | 51H                        | Fluorochlorocarbons<br>(Pyrotec tube) | 800-6400                                | 1                         | White           | Reddish orange                                             | 3                       | +P   | 50                             |
|                                                                                          | 51                         | Fluorochlorocarbons<br>(Pyrotec tube) | 240-960                                 | 1                         | Yellow          | Reddish purple                                             | 3                       | +P   |                                |
|                                                                                          | 51L                        | Fluorochlorocarbons<br>(Pyrotec tube) | 3-60                                    | 2                         | Yellow          | Reddish purple                                             | 3                       | +P   |                                |
| Heptane<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>5</sub> CH <sub>3</sub>               | 101                        | Gasoline (Petrol)                     | 0.6-1.2%<br>0.03-0.6%<br>0.015-0.03%    | 1/2<br>1<br>2             | Orange          | Dark green                                                 | 3                       |      | 400                            |
|                                                                                          | 101L                       | Gasoline (Petrol)                     | 1000-2000<br>30-1000                    | 1<br>2                    | Orange          | Dark green                                                 | 3                       |      |                                |
|                                                                                          | 103                        | Hydrocarbons (Lower class)            | 0.84-1.68%<br>0.07-0.84%<br>0.035-0.07% | 1/2<br>1<br>2             | Yellowish brown | Greenish brown                                             | 2                       | ++   |                                |
|                                                                                          | 105                        | Hydrocarbons (Higher class)           | 180-2700<br>90-180                      | 1<br>2                    | White           | Blackish brown                                             | 3                       |      |                                |
| Hexamethylenediamine<br>H <sub>2</sub> N(CH <sub>2</sub> ) <sub>6</sub> NH <sub>2</sub>  | 180L                       | Amines                                | 1.55-31                                 | 1                         | Pink            | Grayish purple<br>(Pale orange at the end<br>of staining)* | 2                       | T    | 0.5                            |
| Hexane<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>4</sub> CH <sub>3</sub>                | 102H                       | Hexane                                | 0.6-1.2%<br>0.03-0.6%<br>0.015-0.03%    | 1/2<br>①<br>2             | Orange          | Dark green                                                 | 3                       |      | 50                             |
|                                                                                          | 102L                       | Hexane                                | 50-1200<br>4-50                         | ①<br>5                    | Orange          | Dark green                                                 | 3                       |      |                                |
|                                                                                          | 103                        | Hydrocarbons (Lower class)            | 0.6-1.2%<br>0.05-0.6%<br>0.025-0.05%    | 1/2<br>1<br>2             | Yellowish brown | Greenish brown                                             | 2                       | ++   |                                |
|                                                                                          | 105                        | Hydrocarbons (Higher class)           | 160-2400<br>80-160                      | 1<br>2                    | White           | Blackish brown                                             | 3                       |      |                                |
| Hexone                                                                                   | See Methyl isobutyl ketone |                                       |                                         |                           |                 |                                                            |                         |      |                                |
| 2-Hexyl alcohol<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> CH(OH)CH <sub>3</sub> | 141L                       | Ethyl acetate                         | 60-2400                                 | 3                         | Yellow          | Blackish brown                                             | 2                       | T    |                                |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump. ※1:Pale orange when low concentration  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula             | Tube No. & Name |                                         | Measuring<br>Range<br>(ppm)              | No. of<br>Pump<br>Strokes | Colour Change      |                            | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|-----------------------------------------------------------------|-----------------|-----------------------------------------|------------------------------------------|---------------------------|--------------------|----------------------------|-------------------------|------|--------------------------------|
|                                                                 |                 |                                         |                                          |                           | Original           | Stain                      |                         |      |                                |
| Hexylamine                                                      | 180             | Amines                                  | 9-180                                    | 1                         | Pink               | Pale orange                | 3                       | T    |                                |
| CH <sub>3</sub> (CH <sub>2</sub> ) <sub>5</sub> NH <sub>2</sub> | 180L            | Amines                                  | 0.65-13                                  | 1                         | Pink               | Pale orange                | 2                       | T    |                                |
| Hydrazine<br>N <sub>2</sub> H <sub>4</sub>                      | 185             | Hydrazine                               | 0.1-2<br>0.05-0.1                        | ⑤<br>10                   | Pink               | Yellow                     | 3                       | H    | 0.01                           |
| Hydrocarbons (Higher Class)                                     | 105             | Hydrocarbons (Higher class)             | 200-3000<br>100-200                      | ①<br>2                    | White              | Blackish brown             | 3                       |      |                                |
| Hydrocarbons (Lower Class)                                      | 103             | Hydrocarbons (Lower class)              | 1.2-2.4%<br>0.1-1.2%<br>0.05-0.1%        | 1/2<br>①<br>2             | Yellowish brown    | Greenish brown             | 2                       | ++   |                                |
| Hydrogen<br>H <sub>2</sub>                                      | 30              | Hydrogen                                | 0.5-2%                                   | 1                         | Yellow             | Yellowish brown            | 3                       |      |                                |
| Hydrogen bromide<br>HBr                                         | 15L             | Nitric acid                             | 0.8-16                                   | 1                         | Yellow             | Reddish purple             | 3                       | H    | C 2                            |
| Hydrogen chloride<br>HCl                                        | 14R             | Hydrogen chloride<br>(for Low Humidity) | 200-5000<br>50-200                       | ①<br>2-4                  | Purple             | ※2<br>Yellow/Pale pink     | 3                       |      | C 2                            |
|                                                                 | 14M             | Hydrogen chloride                       | 500-1000<br>20-500<br>10-20              | 1/2<br>①<br>2             | Yellow             | Red                        | 3                       |      |                                |
|                                                                 | 14L             | Hydrogen chloride                       | 20-76<br>1-20<br>0.2-1                   | 1/2<br>①<br>2-5           | Yellow             | Pink                       | 3                       |      |                                |
|                                                                 | 80              | Acid gases                              | 8-160                                    | 2                         | Pale bluish purple | Pale red purple            | 2                       |      |                                |
|                                                                 | 8HH             | Chlorine                                | 1.5-30%                                  | 1/2                       | Reddish purple     | Yellow                     | 3                       |      |                                |
| Hydrogen cyanide<br>HCN                                         | 12H             | Hydrogen cyanide                        | 0.05-1.6%                                | 1                         | Yellow             | White                      | 3                       | T    | C 4.7                          |
|                                                                 | 12M             | Hydrogen cyanide                        | 800-2400<br>50-800<br>17-50              | 1/2<br>①<br>2             | Yellow             | Red                        | 3                       |      |                                |
|                                                                 |                 |                                         | 60-150<br>2.5-60<br>1.25-2.5<br>0.5-1.25 | 1/2<br>①<br>2<br>5        |                    |                            | 2                       | T    |                                |
|                                                                 | 12LL            | Hydrogen cyanide                        | 5-10<br>0.2-5                            | 1<br>②                    | Yellow             | Pink                       | 2                       |      |                                |
| Hydrogen fluoride<br>HF                                         | 17              | Hydrogen fluoride                       | 20-100<br>0.5-20<br>0.25-0.5             | 1<br>④<br>7               | Yellow             | ※3<br>Brown /<br>Deep pink | 3                       | H    | 0.5                            |
|                                                                 | 17L             | Hydrogen fluoride                       | 10-72<br>0.2-10<br>0.09-0.2              | 1<br>③<br>5               | Yellow             | Brown                      | 2                       | H    |                                |
|                                                                 | 17LL            | Hydrogen fluoride                       | 6.9-24<br>3.0-6.9<br>0.05-3.0            | 1<br>3<br>⑤               | Yellow             | Brown                      | 2                       | TH   |                                |
| Hydrogen peroxide<br>H <sub>2</sub> O <sub>2</sub>              | 32              | Hydrogen peroxide                       | 0.5-10                                   | 5                         | White              | Yellow                     | 3                       | T    | 1                              |
| Hydrogen sulphide<br>H <sub>2</sub> S                           | 4HT             | Hydrogen sulphide                       | 20-40%<br>2-20%<br>1-2%                  | 1/2<br>①<br>2             | Pale blue          | Blackish brown             | 3                       |      | 1                              |
|                                                                 | 4HP             | Hydrogen sulphide                       | 10-20%<br>0.5-10%<br>0.25-0.5%           | 1/2<br>①<br>2             | Pale blue          | Blackish brown             | 3                       |      |                                |

T: Temp Correction   H: Humidity Correction   +: Twin Tubes   ++: Nine Tubes   \* Refrigerated Storage   Mesh: Correction Factor/Chart  
 ※2 Become "Yellow" under about 500 ppm. Become "Pale pink" over about 500 ppm.   ※3 May become "Deep pink" at high concentration.  
 P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
 See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                                                  | Tube No. & Name       |                                                                    | Measuring<br>Range<br>(ppm)                    | No. of<br>Pump<br>Strokes | Colour Change      |                   | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|----------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------------------------------------------|------------------------------------------------|---------------------------|--------------------|-------------------|-------------------------|------|--------------------------------|
|                                                                                                                      |                       |                                                                    |                                                |                           | Original           | Stain             |                         |      |                                |
| Hydrogen sulphide<br>H <sub>2</sub> S                                                                                | 4HH                   | Hydrogen sulphide                                                  | 2-4%<br>0.1-2%                                 | 1/2<br>①                  | Pale blue          | Blackish brown    | 3                       |      | 1                              |
|                                                                                                                      | 4H                    | Hydrogen sulphide                                                  | 2000-4000<br>100-2000<br>10-100                | 1/2<br>①<br>2-10          | White              | Brown             | 3                       |      |                                |
|                                                                                                                      | 4HM                   | Hydrogen sulphide                                                  | 800-1600<br>50-800<br>25-50                    | 1/2<br>①<br>2             | White              | Brown             | 3                       |      |                                |
|                                                                                                                      | 4M                    | Hydrogen sulphide                                                  | 250-500<br>25-250<br>12.5-25                   | 1/2<br>①<br>2             | White              | Brown             | 3                       |      |                                |
|                                                                                                                      | 4L                    | Hydrogen sulphide                                                  | 120-240<br>10-120<br>1-10                      | 1/2<br>①<br>2-10          | White              | Brown             | 3                       |      |                                |
|                                                                                                                      | 4LL                   | Hydrogen sulphide                                                  | 60-120<br>2.5-60<br>0.25-2.5                   | 1/2<br>①<br>2-10          | White              | Brown             | 3                       |      |                                |
|                                                                                                                      | 4LK                   | Hydrogen sulphide                                                  | 20-40<br>2-20<br>1-2                           | 1/2<br>①<br>2             | White              | Brown             | 3                       |      |                                |
|                                                                                                                      | 4LB                   | Hydrogen sulphide                                                  | 6-12<br>1-6<br>0.5-1                           | 1/2<br>①<br>2             | Yellow             | Pink              | 2                       |      |                                |
|                                                                                                                      | 4LT                   | Hydrogen sulphide                                                  | 2.0-4.0<br>0.1-2.0<br>0.05-0.1                 | 1/2<br>①<br>2             | Yellow             | Pink              | 2*                      |      |                                |
|                                                                                                                      | 45S                   | Hydrogen sulphide,<br>Sulphur dioxide<br>(Separate quantification) | H <sub>2</sub> S: 60-120<br>2.5-60<br>1.25-2.5 | 1/2<br>①<br>2             | White              | Brown             | 3                       | +    |                                |
| Hydrogen sulphide<br>+ Sulphur dioxide (Total Quantification)<br>H <sub>2</sub> S+SO <sub>2</sub>                    | 45H                   | Hydrogen sulphide<br>+ Sulphur dioxide                             | 4.0-8.0%<br>0.2-4.0%<br>0.02-0.2%              | 1/2<br>①<br>2-10          | Brown              | Pale yellow       | 3                       |      | H <sub>2</sub> S : 1           |
| 4-Hydroxy-4-methyl-2-pentanone                                                                                       | See Diacetone alcohol |                                                                    |                                                |                           |                    |                   |                         |      |                                |
| Iodine<br>I <sub>2</sub>                                                                                             | 9L                    | Nitrogen dioxide                                                   | 0.2-12                                         | 2                         | White              | Yellowish Orange  | 3                       |      | 0.01                           |
|                                                                                                                      | 80                    | Acid gases                                                         | 0.12-2.4                                       | 2                         | Pale bluish purple | Light bluish gray | 2                       |      |                                |
| Isoamyl acetate<br>CH <sub>3</sub> CO <sub>2</sub> (CH <sub>2</sub> ) <sub>2</sub> CH(CH <sub>3</sub> ) <sub>2</sub> | 148                   | Isoamyl acetate                                                    | 10-200                                         | 2                         | Yellow             | Pale blue         | 2                       | T    | 50                             |
| Isoamyl alcohol<br>(CH <sub>3</sub> ) <sub>2</sub> CH(CH <sub>2</sub> ) <sub>2</sub> OH                              | 117                   | Isoamyl alcohol                                                    | 5-300                                          | 2                         | Yellow             | Pale blue         | 3                       | T    | 100                            |
| Isobutane<br>(CH <sub>3</sub> ) <sub>3</sub> CH                                                                      | 103                   | Hydrocarbons (Lower class)                                         | 0.84-1.68%<br>0.07-0.84%<br>0.035-0.07%        | 1/2<br>1<br>2             | Yellowish brown    | Greenish brown    | 2                       | ++   |                                |
|                                                                                                                      | 104                   | Butane                                                             | 55-3080                                        | 1                         | Orange             | Dark green        | 3                       |      |                                |
| Isobutene<br>(CH <sub>3</sub> ) <sub>2</sub> C:CH <sub>2</sub>                                                       | 101L                  | Gasoline (Petrol)                                                  | 0.07-2.2%                                      | 1                         | Orange             | Dark green        | 3                       |      | 250                            |
| Isobutyl acetate<br>CH <sub>3</sub> CO <sub>2</sub> CH <sub>2</sub> CH(CH <sub>3</sub> ) <sub>2</sub>                | 144                   | Isobutyl acetate                                                   | 10-300                                         | 2                         | Yellow             | Blackish brown    | 2                       | T    | 150                            |
| Isobutyl acrylate<br>CH <sub>2</sub> :CHCO <sub>2</sub> CH <sub>2</sub> CH(CH <sub>3</sub> ) <sub>2</sub>            | 142L                  | Butyl acetate                                                      | 2.6-78                                         | 2                         | Yellow             | Dark brown        | 2                       | T    |                                |
| Isobutyl alcohol<br>(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> OH                                             | 116                   | Isobutyl alcohol                                                   | 10-150                                         | 2                         | Yellow             | Pale blue         | 3                       | T    | 50                             |
| Isooctane<br>(CH <sub>3</sub> ) <sub>3</sub> CCH <sub>2</sub> CH(CH <sub>3</sub> ) <sub>2</sub>                      | 101                   | Gasoline (Petrol)                                                  | 0.027-0.54%                                    | 1                         | Orange             | Dark green        | 3                       |      | 300                            |
| Isopentane<br>(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> CH <sub>3</sub>                                      | 103                   | Hydrocarbons (Lower class)                                         | 1.08-2.16%                                     | 1/2                       | Yellowish brown    | Greenish brown    | 2                       | ++   | 1000                           |
|                                                                                                                      |                       |                                                                    | 0.09-1.08%                                     | 1                         |                    |                   |                         |      |                                |
|                                                                                                                      |                       |                                                                    | 0.045-0.09%                                    | 2                         |                    |                   |                         |      |                                |
| Isopentyl acetate                                                                                                    | See Isoamyl acetate   |                                                                    |                                                |                           |                    |                   |                         |      |                                |

T: Temp Correction H: Humidity Correction ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                                        | Tube No. & Name      |                      | Measuring<br>Range<br>(ppm)                                                      | No. of<br>Pump<br>Strokes | Colour Change |                   | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|------------------------------------------------------------------------------------------------------------|----------------------|----------------------|----------------------------------------------------------------------------------|---------------------------|---------------|-------------------|-------------------------|------|--------------------------------|
|                                                                                                            |                      |                      |                                                                                  |                           | Original      | Stain             |                         |      |                                |
| Isopentyl alcohol                                                                                          | See Isoamyl alcohol  |                      |                                                                                  |                           |               |                   |                         |      |                                |
| Isophorone<br>C <sub>9</sub> H <sub>14</sub> O                                                             | 154                  | Cyclohexanone        | 2-30                                                                             | 8                         | Pale yellow   | Yellow            | 2*                      | T    | C 5                            |
| Isopropyl acetate<br>CH <sub>3</sub> CO <sub>2</sub> CH(CH <sub>3</sub> ) <sub>2</sub>                     | 146                  | Isopropyl acetate    | 10-500                                                                           | 2                         | Yellow        | Blackish brown    | 2                       | T    | 100                            |
| Isopropyl alcohol<br>CH <sub>3</sub> CH(OH)CH <sub>3</sub> (i-C <sub>3</sub> H <sub>7</sub> OH)            | 113                  | Isopropyl alcohol    | 2.5-5.0%<br>0.04-2.5%<br>0.02-0.04%                                              | 1/2<br>①<br>2             | Pink          | Pale blue         | 3                       | T    | 200                            |
|                                                                                                            | 113L                 | Isopropyl alcohol    | 50-800<br>20-50                                                                  | ①<br>2                    | Pink          | Pale blue         | 3                       | T    |                                |
|                                                                                                            | 113LL                | Isopropyl alcohol    | 200-460<br>20-200                                                                | 1<br>②                    | Pink          | Pale blue         | 2                       | T    |                                |
| Isopropyl amine<br>(CH <sub>3</sub> ) <sub>2</sub> CHNH <sub>2</sub>                                       | 180                  | Amines               | 5.5-110                                                                          | 1                         | Pink          | Salmon pink       | 3                       | T    | 5                              |
|                                                                                                            | 180L                 | Amines               | 0.45-9                                                                           | 1                         | Pink          | Pale orange       | 2                       | T    |                                |
| Isopropyl ether<br>[(CH <sub>3</sub> ) <sub>2</sub> CH(CH <sub>3</sub> )] <sub>2</sub> O                   | 141L                 | Ethyl acetate        | 18-720                                                                           | 2                         | Yellow        | Blackish brown    | 2                       | T    | 250                            |
|                                                                                                            | 161                  | Ethyl ether          | 0.018-0.45%                                                                      | 2                         | Orange        | Dark green        | 3                       | T    |                                |
| Isopropyl mercaptane<br>(CH <sub>3</sub> ) <sub>2</sub> CHSH                                               | 70                   | Mercaptans           | 10-240                                                                           | 1                         | White         | Yellow            | 3                       | T    |                                |
| Isovaleric acid<br>(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> CO <sub>2</sub> H                     | 81                   | Acetic acid          | 2-50                                                                             | 1                         | Pink          | Yellow            | 3                       | H    |                                |
|                                                                                                            | 81L                  | Acetic acid          | 0.38-15                                                                          | 1                         | Pink          | Pale yellow       | 2*                      | T    |                                |
| LPG (Liquified petroleum gas)                                                                              | 100A                 | LPG                  | 0.02-0.8%                                                                        | 1                         | Orange        | Blackish green    | 3                       |      |                                |
| Maleic anhydride<br>C <sub>4</sub> H <sub>2</sub> O <sub>3</sub>                                           | 81                   | Acetic acid          | 0.8-20                                                                           | 1                         | Pink          | Yellow            | 3                       | H    | 0.01mg/m <sup>3</sup> (FV)     |
| Mercaptans<br>R · SH                                                                                       | 70                   | Mercaptans           | 5-120<br>0.5-5                                                                   | ①<br>2-10                 | White         | Yellow            | 3                       | T    |                                |
|                                                                                                            | 70L                  | Mercaptans           | 4-8<br>0.5-4<br>0.2-0.5<br>0.1-0.2                                               | 1/2<br>①<br>2<br>4        | Yellow        | Red               | 2                       |      |                                |
| 2-Mercaptoethanol<br>HSCH <sub>2</sub> CH <sub>2</sub> OH                                                  | 75L                  | tert-Butyl mercaptan | 0.5-7.5                                                                          | 1                         | Yellow        | Pink              | 2*                      | T    |                                |
| Mercury vapour<br>Hg                                                                                       | 40                   | Mercury vapour       | 6-13.2mg/m <sup>3</sup><br>0.25-6mg/m <sup>3</sup><br>0.05-0.25mg/m <sup>3</sup> | 1/2<br>①<br>5             | White         | Pale orange       | 3                       |      | 0.025mg/m <sup>3</sup>         |
| Mesityl oxide<br>(CH <sub>3</sub> ) <sub>2</sub> C:CHCOCH <sub>3</sub>                                     | 141L                 | Ethyl acetate        | 27-1080                                                                          | 2                         | Yellow        | Blackish brown    | 2                       | T    | 15                             |
| Methacrylic acid<br>CH <sub>2</sub> :C(CH <sub>3</sub> )COOH                                               | 81                   | Acetic acid          | 1.8-45                                                                           | 1                         | Pink          | Yellow            | 3                       | H    | 20                             |
|                                                                                                            | 81L                  | Acetic acid          | 0.35-14                                                                          | 1                         | Pink          | Pale yellow       | 2*                      | T    |                                |
| Methacrylonitrile<br>CH <sub>2</sub> :C(CH <sub>3</sub> )CN                                                | 192                  | Methacrylonitrile    | 10-32<br>0.5-10<br>0.2-0.5                                                       | 1<br>②<br>4               | Yellow        | Red               | 3                       | +    | 1                              |
| Methaldehyde<br>(CH <sub>3</sub> CHO) <sub>n</sub>                                                         | 91L                  | Formaldehyde         | 0.065-3.25                                                                       | 3                         | Yellow        | Reddish brown     | 3*                      | T    |                                |
| Methanethiol                                                                                               | See Methyl mercaptan |                      |                                                                                  |                           |               |                   |                         |      |                                |
| Methanol<br>CH <sub>3</sub> OH                                                                             | 111                  | Methanol             | 1.5-4.5%<br>0.02-1.5%<br>0.004-0.02%<br>0.002-0.004%                             | 1/2<br>①<br>2<br>4        | Pink          | Pale blue         | 3                       | T    | 200                            |
|                                                                                                            | 111L                 | Methanol             | 40-1000<br>20-40                                                                 | ①<br>2                    | Pink          | Pale blue         | 3                       | T    |                                |
|                                                                                                            | 111LL                | Methanol             | 20-56<br>2-20                                                                    | 2<br>④                    | Pale yellow   | Pale bluish Green | 2                       | T    |                                |
| 2-Methoxyethyl acetate<br>CH <sub>3</sub> CO <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> OCH <sub>3</sub> | 113L                 | Isopropyl alcohol    | 300-1300                                                                         | 2                         | Pink          | Pale blue         | 3                       | T    | 0.1                            |
| 1-Methoxy-2-propanol<br>CH <sub>3</sub> OCH <sub>2</sub> CH(OH)CH <sub>3</sub>                             | 113LL                | Isopropyl alcohol    | 26-260                                                                           | 2                         | Pink          | Pale blue         | 2                       | T    | 50                             |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                               | Tube No. & Name           |                                       | Measuring<br>Range<br>(ppm) | No. of<br>Pump<br>Strokes | Colour Change |                   | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|-----------------------------------------------------------------------------------|---------------------------|---------------------------------------|-----------------------------|---------------------------|---------------|-------------------|-------------------------|------|--------------------------------|
|                                                                                   |                           |                                       |                             |                           | Original      | Stain             |                         |      |                                |
| Methyl alcohol                                                                    | See Methanol              |                                       |                             |                           |               |                   |                         |      |                                |
| Methyl acrylate<br>CH <sub>2</sub> :CHCO <sub>2</sub> CH <sub>3</sub>             | 141L                      | Ethyl acetate                         | 8-320                       | 2                         | Yellow        | Blackish brown    | 2                       | T    | 2                              |
| 2-Methyl allyl chloride<br>CH <sub>2</sub> :C(CH <sub>3</sub> )CH <sub>2</sub> Cl | 131La                     | Vinyl chloride                        | 2.8-55                      | 1                         | Yellow        | Reddish brown     | 2*                      | +    |                                |
| Methylamine<br>CH <sub>3</sub> NH <sub>2</sub>                                    | 180                       | Amines                                | 5-100                       | 1                         | Pink          | Pale brown/Yellow | 3                       | T    | 5                              |
|                                                                                   | 180L                      | Amines                                | 0.5-10                      | 1                         | Pink          | Pale orange       | 2                       | T    |                                |
| N-Methyl aniline<br>C <sub>6</sub> H <sub>5</sub> NHCH <sub>3</sub>               | 181                       | Aniline                               | 3.5-42                      | 2                         | Pale yellow   | Pale green        | 3                       |      | 0.5                            |
| Methyl bromide<br>CH <sub>3</sub> Br                                              | 136H                      | Methyl bromide                        | 300-600                     | 1/2                       | White         | Yellow            | 3                       | +    | 1                              |
|                                                                                   |                           |                                       | 20-300                      | ①                         |               |                   |                         |      |                                |
|                                                                                   |                           |                                       | 10-20                       | 2                         |               |                   |                         |      |                                |
|                                                                                   | 136L                      | Methyl bromide                        | 100-200                     | 1/2                       | White         | Yellow            | 2                       | +    |                                |
|                                                                                   |                           |                                       | 10-100                      | ①                         |               |                   |                         |      |                                |
|                                                                                   |                           | 2.5-10                                | 4                           |                           |               |                   |                         |      |                                |
| 136LA                                                                             | Methyl bromide            | 18-36                                 | 1                           | White                     | Yellow        | 2                 | +                       |      |                                |
|                                                                                   |                           | 1-18                                  | ②                           |                           |               |                   |                         |      |                                |
| 136LL                                                                             | Methyl bromide            | 1.2-3.0                               | 1                           | White                     | Pale purple   | 2                 | +T                      |      |                                |
|                                                                                   |                           | 0.1-1.2                               | ②                           |                           |               |                   |                         |      |                                |
| 2-Methyl-3-butenenitrile<br>CH <sub>2</sub> :CHCH(CH <sub>3</sub> )CN             | 191L                      | Acrylonitrile                         | 0.4-12                      | 2                         | Yellow        | Pink              | 3                       | +    |                                |
| Methyl chloride<br>CH <sub>3</sub> Cl                                             | 51                        | Fluorochlorocarbons<br>(Pyrotec tube) | 12-480                      | 1                         | Yellow        | Reddish purple    | 3                       | +P   | 50                             |
|                                                                                   | 51L                       | Fluorochlorocarbons<br>(Pyrotec tube) | 32-86.4<br>1.6-32           | 1<br>2                    | Yellow        | Reddish purple    | 3                       | +P   |                                |
| Methyl chloroform                                                                 | See 1,1,1-Trichloroethane |                                       |                             |                           |               |                   |                         |      |                                |
| Methyl chloroformate<br>ClCO <sub>2</sub> CH <sub>3</sub>                         | 131La                     | Vinyl chloride                        | 58-1160                     | 5                         | Yellow        | Reddish brown     | 2*                      | +    |                                |
| Methylcyclohexane<br>C <sub>6</sub> H <sub>11</sub> CH <sub>3</sub>               | 102H                      | n-Hexane                              | 0.04-0.84%                  | 1                         | Orange        | Dark green        | 3                       |      | 400                            |
| Methylcyclohexanol<br>CH <sub>3</sub> C <sub>6</sub> H <sub>10</sub> OH           | 119                       | Methylcyclohexanol                    | 5-100                       | 2                         | Yellow        | Pale blue         | 2                       | T    | 50                             |
| Methylcyclohexanone<br>C <sub>7</sub> H <sub>12</sub> O                           | 155                       | Methylcyclohexanone                   | 50-100<br>2-50              | 2<br>③                    | Pale yellow   | Yellow            | 2*                      | T    | 50                             |
| Methylene chloride<br>CH <sub>2</sub> Cl <sub>2</sub>                             | 138                       | Methylene chloride                    | 50-500<br>20-50             | ①<br>2                    | White         | Pale pink         | 3                       | +T   | 50                             |
|                                                                                   | 138L                      | Methylene chloride                    | 60-150<br>10-60<br>4-10     | 1<br>②<br>4               | White         | Pale pink         | 2                       | +T   |                                |
|                                                                                   | 51L                       | Fluorochlorocarbons<br>(Pyrotec tube) | 20-54<br>1-20               | 1<br>2                    | Yellow        | Reddish purple    | 3                       | +P   |                                |
| Methylene iodide<br>CH <sub>2</sub> I <sub>2</sub>                                | 121L                      | Benzene                               | 0.22-22                     | 5                         | White         | Dark green        | 3                       | +    |                                |
| Methyl ether<br>CH <sub>3</sub> OCH <sub>3</sub>                                  | 161                       | Ethyl ether                           | 0.03-0.85%                  | 1                         | Orange        | Dark green        | 3                       | T    |                                |
| Methyl ethyl ketone<br>CH <sub>3</sub> COC <sub>2</sub> H <sub>5</sub>            | 152                       | Methyl ethyl ketone                   | 0.02-0.6%                   | 2                         | Orange        | Dark green        | 3                       | T    | 200                            |
|                                                                                   | 152L                      | Methyl ethyl ketone                   | 120-384<br>10-120           | 1/2<br>①                  | Yellow        | Reddish purple    | 2*                      | +T   |                                |
|                                                                                   | 151L                      | Acetone                               | 21-1680                     | 5                         | Yellow        | Red               | 2*                      | T    |                                |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                           | Tube No. & Name   |                                                   | Measuring<br>Range<br>(ppm)           | No. of<br>Pump<br>Strokes | Colour Change      |                  | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|-----------------------------------------------------------------------------------------------|-------------------|---------------------------------------------------|---------------------------------------|---------------------------|--------------------|------------------|-------------------------|------|--------------------------------|
|                                                                                               |                   |                                                   |                                       |                           | Original           | Stain            |                         |      |                                |
| Methyl hydrazine<br>H <sub>2</sub> NNHCH <sub>3</sub>                                         | 185               | Hydrazine                                         | 0.6-12                                | 5                         | Pink               | Yellow           | 3                       | H    | 0.01                           |
| Methyl iodide<br>CH <sub>3</sub> I                                                            | 230H              | Methyl iodide                                     | 15000-34800<br>6000-15000<br>100-6000 | 1/2<br>1<br>②             | White              | Dark brown       | 2                       | T    | 2                              |
|                                                                                               | 230               | Methyl iodide                                     | 46-108<br>20-46<br>1-20<br>0.5-1      | 1/2<br>1<br>②<br>4        | White              | Gray             | 2*                      | T    |                                |
|                                                                                               | 121L              | Benzene                                           | 0.32-32                               | 5                         | White              | Dark green       | 3                       | +    |                                |
| Methyl isobutyl ketone<br>(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> COCH <sub>3</sub> | 153               | Methyl isobutyl ketone                            | 0.05-0.6%                             | 2                         | Orange             | Dark green       | 3                       | T    | 20                             |
|                                                                                               | 153L              | Methyl isobutyl ketone                            | 50-130<br>2.5-50                      | 1/2<br>①                  | Pale yellow        | Pale blue        | 1                       | T    |                                |
| Methyl isothiocyanate<br>CH <sub>3</sub> NCS                                                  | 141L              | Ethyl acetate                                     | 50-400                                | 2                         | Yellow             | Blackish brown   | 2                       | T    |                                |
| Methyl mercaptan<br>CH <sub>3</sub> SH                                                        | 71H               | Methyl mercaptan                                  | 1000-2700<br>50-1000<br>20-50         | 1/2<br>①<br>2             | White              | Yellow           | 3                       |      | 0.5                            |
|                                                                                               | 71                | Methyl mercaptan                                  | 70-140<br>2.5-70<br>0.25-2.5          | 1/2<br>①<br>2-10          | White              | Yellow           | 3                       | T    |                                |
|                                                                                               | 70                | Mercaptans                                        | 3.5-84<br>0.35-3.5                    | 1<br>2-10                 | White              | Yellow           | 3                       | T    |                                |
|                                                                                               | 70L               | Mercaptans                                        | 4-8<br>0.5-4<br>0.2-0.5<br>0.1-0.2    | 1/2<br>1<br>2<br>4        | Yellow             | Red              | 2                       |      |                                |
| Methyl methacrylate<br>CH <sub>2</sub> :C(CH <sub>3</sub> )CO <sub>2</sub> CH <sub>3</sub>    | 149               | Methyl methacrylate                               | 200-500<br>10-200                     | 1<br>②                    | Yellow             | Pale blue        | 2                       | T    | 50                             |
| N-Methyl morpholine<br>CH <sub>3</sub> N(C <sub>2</sub> H <sub>4</sub> ) <sub>2</sub> O       | 180               | Amines                                            | 5-100                                 | 1                         | Pink               | Yellow           | 3                       | T    |                                |
|                                                                                               | 180L              | Amines                                            | 0.3-6                                 | 1                         | Pink               | Pale orange      | 2                       | T    |                                |
| 4-Methyl pyridine<br>C <sub>6</sub> H <sub>7</sub> N                                          | 182               | Pyridine                                          | 0.38-10.5                             | 1                         | Pink               | Yellow           | 3                       | T    |                                |
| N-Methyl pyrrolidone<br>C <sub>5</sub> H <sub>9</sub> NO                                      | 180               | Amines                                            | 13.5-270                              | 1                         | Pink               | White            | 3                       | T    |                                |
| Monochlorobenzene                                                                             | See Chlorobenzene |                                                   |                                       |                           |                    |                  |                         |      |                                |
| Morpholine<br>NH(C <sub>2</sub> H <sub>4</sub> )O                                             | 180               | Amines                                            | 9-180                                 | 1                         | Pink               | Yellow           | 3                       | T    | 20                             |
|                                                                                               | 180L              | Amines                                            | 0.5-10                                | 1                         | Pink               | Pale orange      | 2                       | T    |                                |
| Naphthalene<br>C <sub>10</sub> H <sub>8</sub>                                                 | 60                | Phenol                                            | 0.5-14                                | 2                         | Pale yellow        | Gray             | 2*                      | T    | 10                             |
| Nitric acid<br>HNO <sub>3</sub>                                                               | 15L               | Nitric acid                                       | 20-40<br>1-20<br>0.1-1                | 1/2<br>①<br>2-10          | Yellow             | Reddish Purple   | 3                       | H    | 2                              |
|                                                                                               | 80                | Acid gases                                        | 5-100                                 | 2                         | Pale bluish purple | Pale red purple  | 2                       |      |                                |
| Nitroethane<br>CH <sub>3</sub> CH <sub>2</sub> NO <sub>2</sub>                                | 52                | Nitro compounds<br>(Pyrotec tube)                 | 4-240                                 | 1                         | White              | Yellowish orange | 3                       | P    | 100                            |
| Nitrogen dioxide<br>NO <sub>2</sub>                                                           | 9L                | Nitrogen dioxide                                  | 30-125<br>0.5-30                      | 1<br>②                    | White              | Yellowish orange | 3                       |      | 0.2                            |
|                                                                                               | 10                | NO & NO <sub>2</sub><br>(Separate quantification) | 2.5-200                               | 1                         | White              | Yellowish orange | 3                       | +    |                                |
|                                                                                               | 80                | Acid gases                                        | 0.2-4                                 | 2                         | Pale bluish purple | Pinkish gray     | 2                       |      |                                |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                      | Tube No. & Name  |                                                   | Measuring<br>Range<br>(ppm)                  | No. of<br>Pump<br>Strokes | Colour Change   |                                                            | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm)                           |
|------------------------------------------------------------------------------------------|------------------|---------------------------------------------------|----------------------------------------------|---------------------------|-----------------|------------------------------------------------------------|-------------------------|------|----------------------------------------------------------|
|                                                                                          |                  |                                                   |                                              |                           | Original        | Stain                                                      |                         |      |                                                          |
| Nitrogen dioxide<br>NO <sub>2</sub>                                                      | 52               | Nitrogen compounds<br>(Pyrotec tube)              | 0.5-30                                       | 1                         | White           | Yellowish orange                                           | 3                       | P    | 0.2                                                      |
| Nitrogen oxide<br>NO                                                                     | 10               | NO & NO <sub>2</sub><br>(Separate quantification) | 5-200<br>2.5-5                               | ①<br>2                    | White           | Yellowish orange                                           | 3                       | +T   | 25                                                       |
| Nitrogen oxides<br>NO+NO <sub>2</sub>                                                    | 11HA             | Nitrogen oxides<br>(Total quantification)         | 50-2500                                      | 1                         | White           | Green                                                      | 2                       |      | NO : 25<br>NO <sub>2</sub> : 0.2                         |
|                                                                                          | 11S              | Nitrogen oxides<br>(Total quantification)         | 250-625<br>10-250<br>5-10                    | 1/2<br>①<br>2             | White           | Pale green                                                 | 2                       |      |                                                          |
|                                                                                          | 11L              | Nitrogen oxides<br>(Total quantification)         | 5.0-16.5<br>0.2-5.0<br>0.08-0.2<br>0.04-0.08 | 1<br>②<br>4<br>8          | White           | Yellowish orange                                           | 3                       |      |                                                          |
|                                                                                          |                  |                                                   |                                              |                           |                 |                                                            |                         |      |                                                          |
|                                                                                          |                  |                                                   |                                              |                           |                 |                                                            |                         |      |                                                          |
|                                                                                          |                  |                                                   |                                              |                           |                 |                                                            |                         |      |                                                          |
| Nitromethane<br>CH <sub>3</sub> NO <sub>2</sub>                                          | 52               | Nitro compounds<br>(Pyrotec tube)                 | 5-300                                        | 1                         | White           | Yellowish orange                                           | 3                       | P    | 20                                                       |
| 1-Nitropropane<br>CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> NO <sub>2</sub>        | 52               | Nitro compounds<br>(Pyrotec tube)                 | 4.2-252                                      | 1                         | White           | Yellowish orange                                           | 3                       | P    | 25                                                       |
| 2-Nitropropane<br>(CH <sub>3</sub> ) <sub>2</sub> CHNO <sub>2</sub>                      | 52               | Nitro compounds<br>(Pyrotec tube)                 | 3.7-222                                      | 1                         | White           | Yellowish orange                                           | 3                       | P    | 10                                                       |
| Nitrotrichloromethane                                                                    | See Chloropicrin |                                                   |                                              |                           |                 |                                                            |                         |      |                                                          |
| Nonane<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>7</sub> CH <sub>3</sub>                | 105              | Hydrocarbons (Higher class)                       | 260-3900<br>130-260                          | 1<br>2                    | White           | Blackish brown                                             | 3                       |      | 200                                                      |
|                                                                                          |                  |                                                   |                                              |                           |                 |                                                            |                         |      |                                                          |
| Octane<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>6</sub> CH <sub>3</sub>                | 101              | Gasoline (Petrol)                                 | 0.036-0.72%                                  | 1                         | Orange          | Dark green                                                 | 3                       |      | 300                                                      |
|                                                                                          | 105              | Hydrocarbons(Higher class)                        | 200-3000<br>100-200                          | 1<br>2                    | White           | Blackish brown                                             | 3                       |      |                                                          |
| Olefines                                                                                 | 100A             | LPG                                               | 0.34-13.6%                                   | 1                         | Orange          | Blackish green                                             | 3                       |      |                                                          |
| Oxygen<br>O <sub>2</sub>                                                                 | 31B              | Oxygen                                            | 6-24%<br>3-6%                                | ①②<br>1                   | Black           | White                                                      | 3                       | ⊕    |                                                          |
| Ozone<br>O <sub>3</sub>                                                                  | 18M              | Ozone                                             | 200-400<br>20-200<br>4-20                    | 1/2<br>①<br>2-5           | Orange          | Pale yellow                                                | 3                       |      | Heavy work:0.05<br>Moderate work:0.08<br>Light work:0.10 |
|                                                                                          | 18L              | Ozone                                             | 0.6-3<br>0.05-0.6<br>0.025-0.05              | 1<br>⑤<br>10              | Blue            | White                                                      | 3                       |      |                                                          |
|                                                                                          |                  |                                                   |                                              |                           |                 |                                                            |                         |      |                                                          |
| Pentachloroethane<br>Cl <sub>2</sub> CHCCl <sub>3</sub>                                  | 133L             | Tetrachloroethylene                               | 40-500                                       | 1                         | Yellow          | Pink                                                       | 2*                      | T    |                                                          |
| 1,3-Pentadiene<br>CH <sub>3</sub> CH:CHCH:CH <sub>2</sub>                                | 174              | 1,3-Butadiene                                     | 250-4000                                     | 1                         | Pale yellow     | White                                                      | 3                       | T    |                                                          |
|                                                                                          | 174L             | 1,3-Butadiene                                     | 42.5-850                                     | 4                         | Pale yellow     | White                                                      | 3                       |      |                                                          |
| Pentamethylenediamine<br>H <sub>2</sub> N(CH <sub>2</sub> ) <sub>5</sub> NH <sub>2</sub> | 180L             | Amines                                            | 0.75-15                                      | 1                         | Pink            | Grayish purple<br>(Pale orange at the end<br>of staining)* | 2                       | T    |                                                          |
| n-Pentane<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> CH <sub>3</sub>             | 104              | Butane                                            | 30-1680                                      | 1                         | Orange          | Dark green                                                 | 3                       |      | 1000                                                     |
|                                                                                          | 103              | Hydrocarbons (Lower class)                        | 0.9-1.8%<br>0.075-0.9%<br>0.0375-0.075%      | 1/2<br>1<br>2             | Yellowish brown | Greenish brown                                             | 2                       | ++   |                                                          |
|                                                                                          |                  |                                                   |                                              |                           |                 |                                                            |                         |      |                                                          |
| 2-Pentenitrile<br>CH <sub>3</sub> CH <sub>2</sub> CH:CHCN                                | 193              | 2-Pentenitrile                                    | 6-15<br>0.5-6                                | 2<br>④                    | Yellow          | Red                                                        | 3                       | +T   |                                                          |
|                                                                                          | 191L             | Acrylonitrile                                     | 0.24-7.2                                     | 2                         | Yellow          | Pink                                                       | 3                       | +    |                                                          |
| 3-Pentenitrile<br>CH <sub>3</sub> CH:CHCH <sub>2</sub> CN                                | 191L             | Acrylonitrile                                     | 0.4-12                                       | 2                         | Yellow          | Pink                                                       | 3                       | +    |                                                          |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
⊕ Five tests (tubes) and long size glass detector tube for tube 31B only. P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump. ※1:Pale orange when low concentration  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                               | Tube No. & Name         |                           | Measuring<br>Range<br>(ppm)               | No. of<br>Pump<br>Strokes | Colour Change   |                | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|---------------------------------------------------------------------------------------------------|-------------------------|---------------------------|-------------------------------------------|---------------------------|-----------------|----------------|-------------------------|------|--------------------------------|
|                                                                                                   |                         |                           |                                           |                           | Original        | Stain          |                         |      |                                |
| Pentyl acetate                                                                                    | See n-Amyl acetate      |                           |                                           |                           |                 |                |                         |      |                                |
| Perchloroethylene                                                                                 | See Tetrachloroethylene |                           |                                           |                           |                 |                |                         |      |                                |
| Petroleum benzine                                                                                 | 106                     | Petroleum naphtha         | 14-28mg/L<br>1-14mg/L<br>0.5-1mg/L        | 1/2<br>1<br>2             | Orange          | Dark Green     | 3                       |      |                                |
| Petroleum distillates                                                                             | See Gasoline (Petrol)   |                           |                                           |                           |                 |                |                         |      |                                |
| Petroleum ether                                                                                   | 106                     | Petroleum naphtha         | 14-28mg/L<br>1-14mg/L<br>0.5-1mg/L        | 1/2<br>1<br>2             | Orange          | Dark Green     | 3                       |      |                                |
| Petroleum naphtha                                                                                 | 106                     | Petroleum naphtha         | 14-28mg/L<br>1-14mg/L<br>0.5-1mg/L        | 1/2<br>①<br>2             | Orange          | Dark green     | 3                       |      |                                |
| Phenol<br>C <sub>6</sub> H <sub>5</sub> OH                                                        | 60                      | Phenol                    | 62.5-187<br>25-62.5<br>1-25<br>0.4-1      | 1/2<br>1<br>②<br>4        | Pale yellow     | Gray           | 2*                      | T    | 5                              |
| Phenylethylene                                                                                    | See Styrene             |                           |                                           |                           |                 |                |                         |      |                                |
| Phosgene<br>COCl <sub>2</sub>                                                                     | 16                      | Phosgene                  | 5-20<br>0.1-5<br>0.05-0.1                 | 1<br>⑤<br>10              | White           | Yellow         | 1.5*                    | T    | 0.1                            |
| Phosphine<br>PH <sub>3</sub>                                                                      | 7H                      | Phosphine                 | 2500-5500<br>200-2500                     | 1/2<br>①                  | Yellow          | Dark brown     | 2                       | T    | 0.3                            |
|                                                                                                   | 7J                      | Phosphine                 | 500-1000<br>25-500<br>2.5-25              | 1/2<br>①<br>2-10          | White           | Pale yellow    | 3                       |      |                                |
|                                                                                                   | 7                       | Phosphine                 | 50-100<br>5-50<br>2.5-5                   | 1<br>②<br>4               | White           | Pale yellow    | 3                       |      |                                |
|                                                                                                   | 7L                      | Phosphine                 | 0.3-5<br>0.15-0.3                         | ⑤<br>10                   | Pale yellow     | Purple         | 3                       |      |                                |
|                                                                                                   | 7LA                     | Phosphine                 | 2.5-9.8<br>1.5-2.5<br>0.1-1.5<br>0.05-0.1 | 1<br>3<br>⑤<br>10         | Yellow          | Red            | 2                       |      |                                |
| α-Pinene<br>C <sub>10</sub> H <sub>16</sub>                                                       | 121                     | Benzene                   | 95-1140                                   | 3                         | White           | Dark green     | 3                       |      | 20                             |
| Propane<br>CH <sub>3</sub> CH <sub>2</sub> CH <sub>3</sub>                                        | 103                     | Hydrocarbons(Lower class) | 1.2-2.4%<br>0.1-1.2%<br>0.05-0.1%         | 1/2<br>1<br>2             | Yellowish brown | Greenish brown | 2                       | ++   |                                |
| Propionaldehyde<br>CH <sub>3</sub> CH <sub>2</sub> CHO                                            | 91L                     | Formaldehyde              | 0.76-38                                   | 1                         | Yellow          | Reddish brown  | 3*                      | T    | 20                             |
|                                                                                                   | 151L                    | Acetone                   | 24-1880                                   | 2                         | Yellow          | Red            | 2*                      | T    |                                |
| Propionic acid<br>CH <sub>3</sub> CH <sub>2</sub> COOH                                            | 81                      | Acetic acid               | 3-75                                      | 1                         | Pink            | Yellow         | 3                       | H    | 10                             |
|                                                                                                   | 81L                     | Acetic acid               | 0.25-10                                   | 1                         | Pink            | Pale yellow    | 2*                      | T    |                                |
| Propionitrile<br>CH <sub>3</sub> CH <sub>2</sub> CN                                               | 191                     | Acrylonitrile             | 50-1200                                   | 4                         | Yellow          | Red            | 3                       | +T   |                                |
| Propyl acetate<br>CH <sub>3</sub> CO <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub> | 145                     | Propyl acetate            | 20-500                                    | 2                         | Yellow          | Blackish brown | 2                       | T    | 200                            |
| Propyl alcohol<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>2</sub> OH                              | 113                     | Isopropyl alcohol         | 0.04-2.5%                                 | 1                         | Pink            | Pale blue      | 3                       | T    | 100                            |
|                                                                                                   | 113L                    | Isopropyl alcohol         | 130-560                                   | 1                         | Pink            | Pale blue      | 3                       | T    |                                |
|                                                                                                   | 113LL                   | Isopropyl alcohol         | 55-170                                    | 2                         | Pink            | Pale blue      | 2                       | T    |                                |

T: Temp Correction   H: Humidity Correction   +: Twin Tubes   ++: Nine Tubes   \* Refrigerated Storage   Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                            | Tube No. & Name |                                                                    | Measuring<br>Range<br>(ppm)                   | No. of<br>Pump<br>Strokes | Colour Change      |                | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|--------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------|-----------------------------------------------|---------------------------|--------------------|----------------|-------------------------|------|--------------------------------|
|                                                                                |                 |                                                                    |                                               |                           | Original           | Stain          |                         |      |                                |
| Propylamine<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>2</sub> NH <sub>2</sub> | 180             | Amines                                                             | 6-120                                         | 1                         | Pink               | Salmon pink    | 3                       | T    |                                |
|                                                                                | 180L            | Amines                                                             | 0.5-10                                        | 1                         | Pink               | Pale orange    | 2                       | T    |                                |
| n-Propyl bromide<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>2</sub> Br         | 136LA           | Methyl bromide                                                     | 1-18                                          | 2                         | White              | Yellow         | 2                       | +    | 0.1                            |
| Propylene<br>CH <sub>3</sub> CH:CH <sub>2</sub>                                | 100A            | LPG                                                                | 0.02-0.8%                                     | 1                         | Orange             | Blackish green | 3                       |      | 500                            |
| Propylene dichloride<br>CH <sub>3</sub> CHClCH <sub>2</sub> Cl                 | 131La           | Vinyl chloride                                                     | 40-800                                        | 2                         | Yellow             | Reddish brown  | 2*                      | +    | 10                             |
| Propylene imine<br>CH <sub>3</sub> CHCH <sub>2</sub> NH                        | 180             | Amines                                                             | 5.5-110                                       | 1                         | Pink               | Yellow         | 3                       | T    | 0.2                            |
|                                                                                | 180L            | Amines                                                             | 0.35-7                                        | 1                         | Pink               | Pale orange    | 2                       | T    |                                |
| Propylene oxide<br>CH <sub>3</sub> CHCH <sub>2</sub> O                         | 163             | Ethylene oxide                                                     | 0.065-3.9%                                    | 1                         | Orange             | Green          | 3                       |      | 2                              |
|                                                                                | 163L            | Ethylene oxide                                                     | 1-100                                         | 1                         | Yellow             | Reddish brown  | 1*                      | +T   |                                |
| Propyl mercaptan<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>2</sub> SH         | 70              | Mercaptans                                                         | 22.5-540                                      | 1                         | White              | Yellow         | 3                       | T    |                                |
|                                                                                | 70L             | Mercaptans                                                         | 4.8-9.6                                       | 1/2                       | Yellow             | Red            | 2                       |      |                                |
|                                                                                |                 |                                                                    | 0.6-4.8                                       | 1                         |                    |                |                         |      |                                |
|                                                                                |                 |                                                                    | 0.24-0.6                                      | 2                         |                    |                |                         |      |                                |
|                                                                                |                 |                                                                    | 0.12-0.24                                     | 4                         |                    |                |                         |      |                                |
| Pyridine<br>C <sub>5</sub> H <sub>5</sub> N                                    | 182             | Pyridine                                                           | 14-35<br>0.5-14<br>0.2-0.5                    | 1/2<br>①<br>2             | Pink               | Yellow         | 3                       | T    | 1                              |
| Stoddard solvent                                                               | 128             | Stoddard solvent                                                   | 50-8000mg/m <sup>3</sup>                      | 1                         | White              | Brown (ring)   | 3                       |      | 100                            |
| Styrene<br>C <sub>6</sub> H <sub>5</sub> CH:CH <sub>2</sub>                    | 124             | Styrene                                                            | 500-1500<br>20-500<br>10-20                   | 1/2<br>①<br>2             | White              | Yellow         | 3                       |      | 20                             |
|                                                                                | 124L            | Styrene                                                            | 25-100<br>2-25                                | 1<br>④                    | White              | Yellow         | 3                       |      |                                |
|                                                                                | 153             | Methyl isobutyl ketone                                             | 0.075-0.9%                                    | 1                         | Orange             | Dark green     | 3                       | T    |                                |
| Sulphur dioxide<br>SO <sub>2</sub>                                             | 5H              | Sulphur dioxide                                                    | 4-8%<br>0.5-4%<br>0.05-0.5%                   | 1/2<br>①<br>2-10          | Orange             | Green          | 3                       |      |                                |
|                                                                                | 5M              | Sulphur dioxide                                                    | 1800-3600<br>100-1800<br>20-100               | 1/2<br>①<br>4             | Purple             | Yellow         | 3                       | T    |                                |
|                                                                                | 5L              | Sulphur dioxide                                                    | 100-200<br>5-100<br>2.5-5<br>1.25-2.5         | 1/2<br>①<br>2<br>4        | Blue               | Yellow         | 3                       |      |                                |
|                                                                                | 5La             | Sulphur dioxide                                                    | 30-60<br>2-30<br>1-2<br>0.5-1                 | 1<br>②<br>4<br>8          | Blue               | Yellow         | 3                       |      |                                |
|                                                                                | 5LC             | Sulphur dioxide                                                    | 10-25<br>0.25-10<br>0.1-0.25                  | 1<br>②<br>4               | Bluish purple      | White          | 3                       | T    |                                |
|                                                                                | 5Lb             | Sulphur dioxide                                                    | 5-10<br>0.2-5<br>0.1-0.2<br>0.05-0.1          | 1<br>②<br>4<br>8          | Yellowish green    | Yellow         | 3                       |      |                                |
|                                                                                | 45S             | Hydrogen sulphide,<br>sulphur dioxide<br>(Separete quantification) | SO <sub>2</sub> : 10-20<br>0.5-10<br>0.25-0.5 | 1/2<br>①<br>2             | Yellowish green    | Yellow         | 3                       | +    |                                |
|                                                                                | 80              | Acid gases                                                         | 1.5-30                                        | 2                         | Pale bluish purple | Yellow         | 2                       |      |                                |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                                  | Tube No. & Name          |                                              | Measuring<br>Range<br>(ppm)       | No. of<br>Pump<br>Strokes | Colour Change |                                                             | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|------------------------------------------------------------------------------------------------------|--------------------------|----------------------------------------------|-----------------------------------|---------------------------|---------------|-------------------------------------------------------------|-------------------------|------|--------------------------------|
|                                                                                                      |                          |                                              |                                   |                           | Original      | Stain                                                       |                         |      |                                |
| Sulphur dioxide<br>+Hydrogen sulphide<br>(Total Quantification)<br>SO <sub>2</sub> +H <sub>2</sub> S | 45H                      | Hydrogen sulphide<br>+Sulphur dioxide        | 4.0-8.0%<br>0.2-4.0%<br>0.02-0.2% | 1/2<br>①<br>2-10          | Brown         | Pale Yellow                                                 | 3                       |      |                                |
| Sulphuric acid<br>H <sub>2</sub> SO <sub>4</sub>                                                     | 35                       | Sulphuric acid                               | 0.5-5mg/m <sup>3</sup>            | 5                         | Pale yellow   | Reddish purple                                              | 2                       | T    | 0.2mg/m <sup>3</sup>           |
| Sulphuryl fluoride                                                                                   | See page 27              |                                              |                                   |                           |               |                                                             |                         |      |                                |
| 1,1,2,2-Tetrabromoethane<br>Br <sub>2</sub> CHCHBr <sub>2</sub>                                      | 135L                     | 1,1,1-Trichloroethane<br>(Methyl chloroform) | 0.92-9.2                          | 4                         | White         | Pale Pink                                                   | 2                       | +T   | 0.1                            |
| 1,1,2,2-Tetrachloro-1,2-<br>difluoroethane (R112)<br>CCl <sub>2</sub> FCCl <sub>2</sub> F            | 51H                      | Fluorochlorocarbons<br>(Pyrotec tube)        | 1000-3000<br>125-1000             | 1/2<br>1                  | White         | Reddish orange                                              | 3                       | +P   | 50                             |
|                                                                                                      | 51                       | Fluorochlorocarbons<br>(Pyrotec tube)        | 7-280                             | 1                         | Yellow        | Reddish purple                                              | 3                       | +P   |                                |
|                                                                                                      | 51L                      | Fluorochlorocarbons<br>(Pyrotec tube)        | 20-54<br>1-20                     | 1<br>2                    | Yellow        | Reddish purple                                              | 3                       | +P   |                                |
| 1,1,2,2-Tetrachloroethane<br>Cl <sub>2</sub> CHCHCl <sub>2</sub>                                     | 131L                     | Vinyl chloride                               | 2-30                              | 2                         | Yellow        | Reddish brown                                               | 2*                      | +T   | 1                              |
| Tetrachloroethylene<br>Cl <sub>2</sub> C:CCl <sub>2</sub>                                            | 133HA                    | Tetrachloroethylene                          | 300-900<br>20-300<br>7-20         | 1/2<br>①<br>2             | Yellow        | Reddish purple                                              | 2*                      | T    | 25                             |
|                                                                                                      | 133M                     | Tetrachloroethylene                          | 100-250<br>5-100<br>2-5           | 1/2<br>①<br>2             | Yellow        | Reddish purple                                              | 2*                      | T    |                                |
|                                                                                                      | 133L                     | Tetrachloroethylene                          | 25-75<br>2-25<br>1-2              | 1/2<br>①<br>2             | Yellow        | Pink                                                        | 2*                      | T    |                                |
|                                                                                                      | 133LL                    | Tetrachloroethylene                          | 3-9<br>0.2-3<br>0.1-0.2           | 1/2<br>①<br>2             | Yellow        | Purple                                                      | 2*                      | T    |                                |
|                                                                                                      | 132HH                    | Trichloroethylene                            | 0.075-1.5%                        | 1                         | White         | Yellowish brown                                             | 3                       | T    |                                |
| Tetrachloromethane                                                                                   | See Carbon tetrachloride |                                              |                                   |                           |               |                                                             |                         |      |                                |
| Tetrahydrofuran<br>C <sub>4</sub> H <sub>8</sub> O                                                   | 159                      | Tetrahydrofuran                              | 50-800<br>20-50                   | ①<br>2                    | Pink          | Pale blue                                                   | 3                       | T    | 50                             |
|                                                                                                      | 159L                     | Tetrahydrofuran                              | 80-232<br>5-80                    | 1/2<br>①                  | Pale yellow   | Pale blue                                                   | 1*                      | T    |                                |
|                                                                                                      | 161                      | Ethyl ether                                  | 0.056-1.4%                        | 1                         | Orange        | Dark green                                                  | 3                       | T    |                                |
| Tetrahydrothiophene<br>C <sub>4</sub> H <sub>8</sub> S                                               | 76H                      | Tetrahydrothiophene                          | 10-200                            | 1                         | Pink          | Pale yellow                                                 | 2                       | +T   |                                |
|                                                                                                      | 76M                      | Tetrahydrothiophene                          | 10-100mg/m <sup>3</sup>           | 2                         | Pink          | Pale yellow                                                 | 2                       | +T   |                                |
|                                                                                                      | 76                       | Tetrahydrothiophene                          | 1-10                              | 4                         | Pink          | Pale yellow                                                 | 2                       | +T   |                                |
| Tetramethylenediamine<br>H <sub>2</sub> N(CH <sub>2</sub> ) <sub>4</sub> NH <sub>2</sub>             | 180                      | Amines                                       | 8.5-170                           | 1                         | Pink          | Purple to yellow                                            | 3                       | T    |                                |
|                                                                                                      | 180L                     | Amines                                       | 0.8-16                            | 1                         | Pink          | Grayish purple<br>(Pale orange at the end<br>of staining)** | 2                       | T    |                                |
| Thionyle chloride<br>SOCl <sub>2</sub>                                                               | 5La                      | Sulphur dioxide                              | 1.44-21.6                         | 2                         | Blue          | Yellow                                                      | 3                       |      | C 0.2                          |
| Toluene<br>C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>                                             | 122                      | Toluene                                      | 300-690<br>10-300<br>5-10         | 1/2<br>①<br>2             | White         | Brown                                                       | 3                       |      | 20                             |
|                                                                                                      |                          |                                              | 50-100<br>2-50<br>1-2             | 1<br>②<br>4               |               |                                                             |                         |      |                                |
|                                                                                                      | 161                      | Ethyl ether                                  | 0.02-0.8%                         | 1                         | Orange        | Dark green                                                  | 3                       | T    |                                |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump. ※1:Pale orange when low concentration  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                      | Tube No. & Name  |                                              | Measuring<br>Range<br>(ppm)       | No. of<br>Pump<br>Strokes | Colour Change |                 | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|------------------------------------------------------------------------------------------|------------------|----------------------------------------------|-----------------------------------|---------------------------|---------------|-----------------|-------------------------|------|--------------------------------|
|                                                                                          |                  |                                              |                                   |                           | Original      | Stain           |                         |      |                                |
| Toluol                                                                                   | See Toluene      |                                              |                                   |                           |               |                 |                         |      |                                |
| o-Toluidine<br>C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> )(NH <sub>2</sub> )        | 181              | Aniline                                      | 5-60                              | 2                         | Pale yellow   | Pale green      | 3                       |      | 2                              |
| Trichloroacetic acid<br>CCl <sub>3</sub> COOH                                            | 15L              | Nitric acid                                  | 1-37.5                            | 1                         | Yellow        | Reddish purple  | 3                       | H    | 0.5                            |
| 1,2,4-Trichlorobenzene<br>C <sub>6</sub> H <sub>3</sub> Cl <sub>3</sub>                  | 131La            | Vinyl chloride                               | 0.65-13                           | 4                         | Yellow        | Reddish brown   | 2*                      | +    | C 5                            |
| 1,1,1-Trichloroethane<br>(Methyl chloroform)<br>CH <sub>3</sub> CCl <sub>3</sub>         | 135              | 1,1,1-Trichloroethane<br>(Methyl chloroform) | 500-2000<br>100-500               | 1/2<br>①                  | White         | Reddish orange  | 3                       | +T   | 350                            |
|                                                                                          | 135L             | 1,1,1-Trichloroethane<br>(Methyl chloroform) | 200-900<br>20-200<br>6-20         | 1/2<br>①<br>2             | White         | Pale pink       | 2                       | +T   |                                |
|                                                                                          | 171              | Acetylene                                    | 0.06-1.2%                         | 1                         | White         | Brown           | 3                       | T    |                                |
| 1,1,2-Trichloroethane<br>Cl <sub>2</sub> CHCH <sub>2</sub> Cl                            | 135              | 1,1,1-Trichloroethane<br>(Methyl chloroform) | 220-750                           | 2                         | White         | Reddish orange  | 3                       | +T   | 10                             |
| Trichloroethylene<br>Cl <sub>2</sub> C:CHCl                                              | 132HH            | Trichloroethylene                            | 1-2.5%<br>0.05-1%                 | 1/2<br>①                  | White         | Yellowish brown | 3                       | T    | 10                             |
|                                                                                          | 132HA            | Trichloroethylene                            | 500-1300<br>50-500<br>20-50       | 1/2<br>①<br>2             | Yellow        | Reddish purple  | 2*                      | T    |                                |
|                                                                                          | 132M             | Trichloroethylene                            | 100-250<br>5-100<br>2-5           | 1/2<br>①<br>2             | Yellow        | Reddish purple  | 2*                      | T    |                                |
|                                                                                          | 132L             | Trichloroethylene                            | 25-70<br>2-25<br>1-2              | 1/2<br>①<br>2             | Yellow        | Purple          | 2*                      | T    |                                |
|                                                                                          | 132LL            | Trichloroethylene                            | 4.0-8.8<br>0.25-4.0<br>0.125-0.25 | 1/2<br>①<br>2             | Yellow        | Purple          | 2*                      | T    |                                |
| Trichlorofluoromethane (R11)<br>CCl <sub>3</sub> F                                       | 51H              | Fluorochlorocarbons<br>(Pyrotec tube)        | 2200-6600<br>275-2200             | 1/2<br>1                  | White         | Reddish orange  | 3                       | +P   | C 1000                         |
|                                                                                          | 51               | Fluorochlorocarbons<br>(Pyrotec tube)        | 8-320                             | 1                         | Yellow        | Reddish purple  | 3                       | +P   |                                |
|                                                                                          | 51L              | Fluorochlorocarbons<br>(Pyrotec tube)        | 16-43.2<br>0.8-16                 | 1<br>2                    | Yellow        | Reddish purple  | 3                       | +P   |                                |
| Trichloromethane                                                                         | See Chloroform   |                                              |                                   |                           |               |                 |                         |      |                                |
| Trichloronitromethane                                                                    | See Chloropicrin |                                              |                                   |                           |               |                 |                         |      |                                |
| 1,2,3-Trichloropropane<br>CH <sub>2</sub> ClCHClCH <sub>2</sub> Cl                       | 135L             | 1,1,1-Trichloroethane<br>(Methyl chloroform) | 36-360                            | 4                         | White         | Pale pink       | 2                       | +T   | 10                             |
| 1,1,2-Trichloro-1,2,2-<br>trifluoroethane (R113)<br>CClF <sub>2</sub> CCl <sub>2</sub> F | 51H              | Fluorochlorocarbons<br>(Pyrotec tube)        | 2000-6000<br>250-2000             | 1/2<br>①                  | White         | Reddish orange  | 3                       | +P   | 1000                           |
|                                                                                          | 51               | Fluorochlorocarbons<br>(Pyrotec tube)        | 10-400                            | ①                         | Yellow        | Reddish purple  | 3                       | +P   |                                |
|                                                                                          | 51L              | Fluorochlorocarbons<br>(Pyrotec tube)        | 20-54<br>1-20                     | 1<br>②                    | Yellow        | Reddish purple  | 3                       | +P   |                                |
| 1,1,1-Trichloro-2,2,2-<br>trifluoroethane (R113a)<br>CCl <sub>3</sub> CF <sub>3</sub>    | 51H              | Fluorochlorocarbons<br>(Pyrotec tube)        | 1600-4800<br>200-1600             | 1/2<br>1                  | White         | Reddish orange  | 3                       | +P   |                                |
|                                                                                          | 51               | Fluorochlorocarbons<br>(Pyrotec tube)        | 10-400                            | 1                         | Yellow        | Reddish purple  | 3                       | +P   |                                |
|                                                                                          | 51L              | Fluorochlorocarbons<br>(Pyrotec tube)        | 16-43.2<br>0.8-16                 | 1<br>2                    | Yellow        | Reddish purple  | 3                       | +P   |                                |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                | Tube No. & Name   |                         | Measuring<br>Range<br>(ppm) | No. of<br>Pump<br>Strokes | Colour Change   |                    | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|------------------------------------------------------------------------------------|-------------------|-------------------------|-----------------------------|---------------------------|-----------------|--------------------|-------------------------|------|--------------------------------|
|                                                                                    |                   |                         |                             |                           | Original        | Stain              |                         |      |                                |
| Triethylamine<br>(C <sub>2</sub> H <sub>5</sub> ) <sub>3</sub> N                   | 180               | Amines                  | 4.5-90                      | 1                         | Pink            | Yellow             | 3                       | T    | 1                              |
|                                                                                    | 180L              | Amines                  | 0.3-6                       | 1                         | Pink            | Pale orange        | 2                       | T    |                                |
| Trimethylamine<br>(CH <sub>3</sub> ) <sub>3</sub> N                                | 3M                | Ammonia                 | 25-250                      | 1                         | Purple          | Yellow             | 3                       |      | 5                              |
|                                                                                    | 180               | Amines                  | 3.5-70                      | 1                         | Pink            | Yellow             | 3                       | T    |                                |
|                                                                                    | 180L              | Amines                  | 0.25-5                      | 1                         | Pink            | Pale orange        | 2                       | T    |                                |
| Trimethyl benzene<br>C <sub>6</sub> H <sub>3</sub> (CH <sub>3</sub> ) <sub>3</sub> | 123               | Xylene                  | 10-300                      | 2                         | White           | Brown              | 3                       |      | 25                             |
| Valeric acid<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> COOH               | 81L               | Acetic acid             | 0.38-15                     | 1                         | Pink            | Pale yellow        | 2*                      | T    |                                |
| Vinyl acetate<br>CH <sub>3</sub> CO <sub>2</sub> CH:CH <sub>2</sub>                | 143               | Vinyl acetate           | 100-250                     | 1                         | White           | Brown              | 3                       | +    | 10                             |
|                                                                                    |                   |                         | 10-100                      | ②                         |                 |                    |                         |      |                                |
|                                                                                    |                   | 5-10                    | 4                           |                           |                 |                    |                         |      |                                |
|                                                                                    | 141               | Ethyl acetate           | 0.06-0.9%                   | 1                         | Orange          | Dark green         | 3                       | T    |                                |
| Vinyl benzene                                                                      | See Styrene       |                         |                             |                           |                 |                    |                         |      |                                |
| Vinyl chloride<br>CH <sub>2</sub> :CHCl                                            | 131               | Vinyl chloride          | 1-2%                        | 1/2                       | Orange          | Dark green         | 3                       |      | 1                              |
|                                                                                    |                   |                         | 0.05-1%                     | ①                         |                 |                    |                         |      |                                |
|                                                                                    |                   | 0.025-0.05%             | 2                           |                           |                 |                    |                         |      |                                |
|                                                                                    | 131La             | Vinyl chloride          | 20-54                       | 1/2                       | Yellow          | Reddish brown      | 2*                      | +    |                                |
|                                                                                    |                   |                         | 1-20                        | ①                         |                 |                    |                         |      |                                |
|                                                                                    | 0.5-1             | 2                       |                             |                           |                 |                    |                         |      |                                |
| 131L                                                                               | Vinyl chloride    | 0.25-0.5                | 4                           | Yellow                    | Reddish brown   | 2*                 | +T                      |      |                                |
|                                                                                    |                   | 3-6.6                   | 1                           |                           |                 |                    |                         |      |                                |
|                                                                                    |                   | 0.2-3                   | ②                           |                           |                 |                    |                         |      |                                |
| 131LB                                                                              | Vinyl chloride    | 0.1-0.2                 | 4                           | Yellow                    | Purple          | 2*                 | T                       |      |                                |
|                                                                                    |                   | 20-70                   | 1                           |                           |                 |                    |                         |      |                                |
|                                                                                    |                   | 1-20                    | ②                           |                           |                 |                    |                         |      |                                |
|                                                                                    |                   | 0.25-1                  | 4                           |                           |                 |                    |                         |      |                                |
| Vinyl cyanide                                                                      | See Acrylonitrile |                         |                             |                           |                 |                    |                         |      |                                |
| Vinylidene chloride<br>CH <sub>2</sub> :CCl <sub>2</sub>                           | 130L              | Vinylidene chloride     | 14-40.6                     | 1/2                       | Yellow          | Reddish brown      | 2*                      | +    | 5                              |
|                                                                                    |                   |                         | 1-14                        | ①                         |                 |                    |                         |      |                                |
|                                                                                    |                   |                         | 0.4-1                       | 2                         |                 |                    |                         |      |                                |
| Vinyl trimethoxysilane<br>CH <sub>2</sub> :CHSi(OCH <sub>3</sub> ) <sub>3</sub>    | 113L              | Isopropyl alcohol       | 6.5-25.0                    | 2                         | Pink            | Pale blue          | 3                       | T    |                                |
| Water vapour<br>H <sub>2</sub> O                                                   | 6                 | Water vapour            | 18-32mg/L                   | 1/2                       | Yellowish green | Purple             | 3                       | T    |                                |
|                                                                                    |                   |                         | 1-18mg/L                    | ①                         |                 |                    |                         |      |                                |
|                                                                                    |                   |                         | 0.5-1mg/L                   | 2                         |                 |                    |                         |      |                                |
|                                                                                    | 6L                | Water vapour            | 1-2mg/L                     | 1/2                       | Yellow          | Purple             | 3                       |      |                                |
|                                                                                    |                   | 0.05-1mg/L              | ①                           |                           |                 |                    |                         |      |                                |
|                                                                                    | 6LP               | Pipeline Dew Point Tube | 40-100LB/MMCF               | 1/2                       | Yellow          | ※4 Greenish purple | 3                       | T    |                                |
|                                                                                    |                   |                         | 3-40LB/MMCF                 | ①                         |                 |                    |                         |      |                                |
|                                                                                    | 6LLP              | Pipeline Dew Point Tube | 2-10LB/MMCF                 | ②                         | Yellow          | Green              | 3                       | T    |                                |
| Xylene<br>C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>            | 123               | Xylene                  | 250-625                     | 1/2                       | White           | Brown              | 3                       |      | 100                            |
|                                                                                    |                   |                         | 10-250                      | ①                         |                 |                    |                         |      |                                |
|                                                                                    |                   |                         | 5-10                        | 2                         |                 |                    |                         |      |                                |
|                                                                                    | 123L              | Xylene                  | 100-200                     | 1                         | White           | Brown              | 3                       |      |                                |
|                                                                                    |                   |                         | 2-100                       | ②                         |                 |                    |                         |      |                                |
| 100A                                                                               | LPG               | 0.1-1.2%                | 2                           | Orange                    | Blackish green  | 3                  |                         |      |                                |
| 122L                                                                               | Toluene           | 100-200                 | 1                           | White                     | Brown           | 3                  |                         |      |                                |
|                                                                                    |                   | 4-100                   | 2                           |                           |                 |                    |                         |      |                                |
|                                                                                    |                   | 2-4                     | 4                           |                           |                 |                    |                         |      |                                |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage Mesh: Correction Factor/Chart  
 LB / MMCF = Pound / Million Cubic Feet (1mg/L = 62.3LB / MMCF)  
 ※4 May become "Purple" with high humidity. P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
 See page 36 for additional symbols and definitions.

■ Passive Dosi-tubes (Time Weighted Average Detector Tubes)

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                      | Tube No. & Name |                      | Measuring<br>Range<br>(ppm) | Measuring<br>Time<br>(hours) | Colour Change  |               | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|------------------------------------------------------------------------------------------|-----------------|----------------------|-----------------------------|------------------------------|----------------|---------------|-------------------------|------|--------------------------------|
|                                                                                          |                 |                      |                             |                              | Original       | Stain         |                         |      |                                |
| Acetaldehyde<br>CH <sub>3</sub> CHO                                                      | 91D             | Formaldehyde         | 0.1-20                      | 1-10                         | Yellow         | Reddish brown | 1*                      |      | C 25                           |
|                                                                                          | 151D            | Acetone              | 4-1200                      | 1-10                         | Yellow         | Reddish brown | 2*                      | T    |                                |
|                                                                                          | 152D            | Methyl ethyl kentone | 1.2-360                     | 1-10                         | Yellow         | Reddish brown | 2*                      | T    |                                |
| Acetic acid<br>CH <sub>3</sub> CO <sub>2</sub> H                                         | 81D             | Acetic acid          | 0.5-100                     | 1-10                         | Purple         | Yellow        | 3                       | T    | 10                             |
| Acetic anhydride<br>(CH <sub>3</sub> CO) <sub>2</sub> O                                  | 81D             | Acetic acid          | 0.3-60                      | 1-10                         | Purple         | Yellow        | 3                       | T    | 1                              |
| Acetone<br>CH <sub>3</sub> COCH <sub>3</sub>                                             | 151D            | Acetone              | 5-1500                      | 1-10                         | Yellow         | Reddish brown | 2*                      | T    | 500                            |
|                                                                                          | 152D            | Methyl ethyl ketone  | 1.4-420                     | 1-10                         | Yellow         | Reddish brown | 2*                      | T    |                                |
| Ammonia<br>NH <sub>3</sub>                                                               | 3D              | Ammonia              | 2.5-1000                    | 0.5-10                       | Purple         | Yellow        | 3                       | T    | 25                             |
|                                                                                          | 3DL             | Ammonia              | 0.1-10                      | 1-10                         | Pink           | Yellow        | 2                       | TH   |                                |
| Benzene<br>C <sub>6</sub> H <sub>6</sub>                                                 | 122DL           | Toluene              | 2.4-600                     | 1-10                         | white          | Brown         | 2                       |      | 0.5                            |
| 1,3-Butadiene<br>CH <sub>2</sub> :CHCH:CH <sub>2</sub>                                   | 174D            | 1,3-Butadiene        | 1.3-200                     | 1-8                          | Reddish purple | Pale brown    | 2                       | T    | 2                              |
| Carbon dioxide<br>CO <sub>2</sub>                                                        | 2D              | Carbon dioxide       | 0.02-12%                    | 0.5-10                       | Pale red       | Yellow        | 2                       | T    | 5000                           |
| Carbon monoxide<br>CO                                                                    | 1D              | Carbon monoxide      | 1.04-2000                   | 0.5-48                       | Pale yellow    | Brown         | 2                       |      | 25                             |
|                                                                                          | 1DL             | Carbon monoxide      | 0.4-400                     | 0.5-24                       | Pale yellow    | Brown         | 2*                      |      |                                |
| Chlorine<br>Cl <sub>2</sub>                                                              | 8D              | Chlorine             | 0.08-100                    | 0.5-24                       | White          | Yellow        | 2                       |      | 0.5                            |
|                                                                                          | 132D            | Trichloroethylene    | 2.4-240                     | 1-8                          | Yellow         | Purple        | 1*                      | T    |                                |
| Cumene<br>C <sub>6</sub> H <sub>5</sub> CH(CH <sub>3</sub> ) <sub>2</sub>                | 122DL           | Toluene              | 3.4-850                     | 1-10                         | White          | Brown         | 2                       |      | 50                             |
| 1,2-Dichloroethylene<br>ClCH:CHCl                                                        | 174D            | 1,3-Butadiene        | 3.8-600                     | 1-8                          | Reddish purple | Pale brown    | 2                       | T    | 200                            |
|                                                                                          | 132D            | Trichloroethylene    | 6-600                       | 1-8                          | Yellow         | Purple        | 1*                      | T    |                                |
| Dimethylamine<br>(CH <sub>3</sub> ) <sub>2</sub> NH                                      | 3D              | Ammonia              | 1.9-750                     | 0.5-10                       | Purple         | Yellow        | 3                       | T    | 5                              |
| N,N-Dimethylethylamine<br>C <sub>2</sub> H <sub>5</sub> N(CH <sub>3</sub> ) <sub>2</sub> | 3D              | Ammonia              | 4-1600                      | 0.5-10                       | Purple         | Yellow        | 3                       | T    |                                |
| Ethanol<br>C <sub>2</sub> H <sub>5</sub> OH                                              | 112D            | Ethanol              | 100-25000                   | 1-10                         | Yellow         | Brown         | 3                       |      |                                |
| Ethyl benzene<br>C <sub>6</sub> H <sub>5</sub> C <sub>2</sub> H <sub>5</sub>             | 122DL           | Toluene              | 2.8-700                     | 1-10                         | White          | Brown         | 2                       |      | 20                             |
| Ethylene<br>CH <sub>2</sub> :CH <sub>2</sub>                                             | 174D            | 1,3-Butadiene        | 1.5-240                     | 1-8                          | Reddish purple | Pale brown    | 2                       | T    | 200                            |
| Formaldehyde<br>HCHO                                                                     | 91D             | Formaldehyde         | 0.1-20                      | 1-10                         | Yellow         | Reddish brown | 1*                      |      | C 0.3                          |
| Formic acid<br>HCO <sub>2</sub> H                                                        | 81D             | Acetic acid          | 0.55-110                    | 1-10                         | Purple         | Yellow        | 3                       | T    | 5                              |
| Furfural<br>C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>                                 | 91D             | Formaldehyde         | 0.3-60                      | 1-10                         | Yellow         | Reddish brown | 1*                      |      | 2                              |
| Hydrazine<br>N <sub>2</sub> H <sub>4</sub>                                               | 3D              | Ammonia              | 1.6-650                     | 0.5-10                       | Purple         | Yellow        | 3                       | T    | 0.01                           |
| Hydrogen chloride<br>HCl                                                                 | 14D             | Hydrogen chloride    | 1-100                       | 1-10                         | Yellow         | Purple        | 3                       | TH   | C 2                            |
|                                                                                          | 132D            | Trichloroethylene    | 1.8-180                     | 1-8                          | Yellow         | Purple        | 1*                      | T    |                                |
| Hydrogen cyanide<br>HCN                                                                  | 12D             | Hydrogen cyanide     | 1-200                       | 1-10                         | Yellow         | Pink          | 2                       |      | C 4.7                          |
| Hydrogen fluoride<br>HF                                                                  | 14D             | Hydrogen chloride    | 2.5-250                     | 1-10                         | Yellow         | Purple        | 3                       | TH   | 0.5                            |
|                                                                                          | 17D             | Hydrogen fluoride    | 1-100                       | 1-10                         | Yellow         | Purple        | 3                       | TH   |                                |
| Hydrogen peroxide<br>H <sub>2</sub> O <sub>2</sub>                                       | 32D             | Hydrogen peroxide    | 0.5-40                      | 1-10                         | White          | Yellow        | 3                       | T    | 1                              |

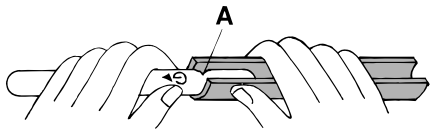
T: Temp Correction   H: Humidity Correction   \* Refrigerated Storage   Mesh: Correction Factor/Chart  
See page 36 for additional symbols and definitions.

| Gas or Vapour<br>to be Measured<br>Chemical Formula                                           | Tube No. & Name |                     | Measuring<br>Range<br>(ppm) | Measuring<br>Time<br>(hours) | Colour Change  |               | Shelf<br>Life<br>(year) | Note | TLV-TWA, C<br>(ACGIH)<br>(ppm) |
|-----------------------------------------------------------------------------------------------|-----------------|---------------------|-----------------------------|------------------------------|----------------|---------------|-------------------------|------|--------------------------------|
|                                                                                               |                 |                     |                             |                              | Original       | Stain         |                         |      |                                |
| Hydrogen sulphide<br>H <sub>2</sub> S                                                         | 4D              | Hydrogen sulphide   | 0.2-200                     | 1-48                         | White          | Brown         | 3                       |      | 1                              |
| Isoprene<br>CH <sub>2</sub> :C(CH <sub>3</sub> )CH:CH <sub>2</sub>                            | 174D            | 1,3-Butadiene       | 2.5-400                     | 1-8                          | Reddish purple | Pale brown    | 2                       | T    |                                |
| Methylamine<br>CH <sub>3</sub> NH <sub>2</sub>                                                | 3DL             | Ammonia             | 0.19-19                     | 1-10                         | Pink           | Yellow        | 2                       | TH   | 5                              |
| Methyl ethyl ketone<br>CH <sub>3</sub> COC <sub>2</sub> H <sub>5</sub>                        | 152D            | Methyl ethyl ketone | 2-600                       | 1-10                         | Yellow         | Reddish brown | 2*                      | T    | 200                            |
|                                                                                               | 91D             | Formaldehyde        | 0.125-25                    | 1-10                         | Yellow         | Reddish brown | 1*                      |      |                                |
|                                                                                               | 151D            | Acetone             | 6.5-1950                    | 1-10                         | Yellow         | Reddish brown | 2*                      | T    |                                |
| Methyl isobutyl ketone<br>(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> COCH <sub>3</sub> | 151D            | Acetone             | 11.5-3450                   | 1-10                         | Yellow         | Reddish brown | 2*                      | T    | 20                             |
|                                                                                               | 152D            | Methyl ethyl ketone | 4-1200                      | 1-10                         | Yellow         | Reddish brown | 2*                      | T    |                                |
| Nitric acid<br>HNO <sub>3</sub>                                                               | 14D             | Hydrogen chloride   | 0.8-80                      | 1-10                         | Yellow         | Purple        | 3                       | TH   | 2                              |
|                                                                                               | 17D             | Hydrogen fluoride   | 0.32-32                     | 1-10                         | Yellow         | Purple        | 3                       | TH   |                                |
| Nitrogen dioxide<br>NO <sub>2</sub>                                                           | 9D              | Nitrogen dioxide    | 0.1-30                      | 1-10                         | White          | Yellow        | 1*                      | T    | 0.2                            |
|                                                                                               | 9DL             | Nitrogen dioxide    | 0.01-3.0                    | 1-24                         | White          | Green         | 1*                      |      |                                |
| Styrene<br>C <sub>6</sub> H <sub>5</sub> CH:CH <sub>2</sub>                                   | 122DL           | Toluene             | 26-6500                     | 1-10                         | White          | Brown         | 2                       |      | 20                             |
| Sulphur dioxide<br>SO <sub>2</sub>                                                            | 5DH             | Sulphur dioxide     | 10-600                      | 1-5                          | Bluish purple  | White         | 3                       | T    |                                |
|                                                                                               | 5D              | Sulphur dioxide     | 0.2-100                     | 1-10                         | Green          | Yellow        | 3                       |      |                                |
| Tetrachloroethylene<br>Cl <sub>2</sub> C:CCl <sub>2</sub>                                     | 133D            | Tetrachloroethylene | 3-150                       | 1-8                          | Yellow         | Purple        | 1*                      | T    | 25                             |
|                                                                                               | 132D            | Trichloroethylene   | 1.5-150                     | 1-8                          | Yellow         | Purple        | 1*                      | T    |                                |
| Toluene<br>C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>                                      | 122DL           | Toluene             | 2-500                       | 1-10                         | White          | Brown         | 2                       |      | 20                             |
| Trichloroethylene<br>Cl <sub>2</sub> C:CHCl                                                   | 132D            | Trichloroethylene   | 3-300                       | 1-8                          | Yellow         | Purple        | 1*                      | T    | 10                             |
| Triethylamine<br>(C <sub>2</sub> H <sub>5</sub> ) <sub>3</sub> N                              | 3D              | Ammonia             | 5.3-2100                    | 0.5-10                       | Purple         | Yellow        | 3                       | T    | 1                              |
| Trimethylamine<br>(CH <sub>3</sub> ) <sub>3</sub> N                                           | 3DL             | Ammonia             | 0.23-23                     | 1-10                         | Pink           | Yellow        | 2                       | TH   | 5                              |
| Vinyl chloride<br>CH <sub>2</sub> :CHCl                                                       | 174D            | 1,5-Butadiene       | 1.5-240                     | 1-8                          | Reddish Purple | Pale brown    | 2                       | T    | 1                              |
| Xylene<br>C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>                       | 122DL           | Toluene             | 3.4-850                     | 1-10                         | White          | Brown         | 2                       |      | 100                            |

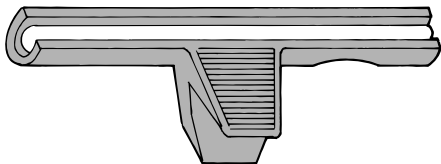
T: Temp Correction H: Humidity Correction \*Refrigerated Storage Mesh: Correction Factor/Chart  
See page 36 for additional symbols and definitions.

### Measurement procedure

- Write down the starting time of measurement on an adhesive label included inside each box of Dosi-tubes, and place the label onto the tube.
- Insert the G marked end of the Dosi-tube into the No.710 Tube Holder, and break the tube end at the breaking line (A). Remove the broken end from the Tube holder.

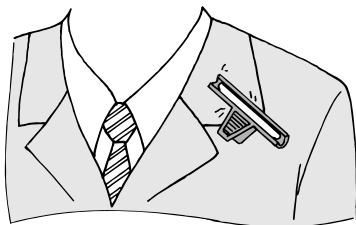


- Insert the Dosi-tube fully into the Tube holder.



- Attach the Tube Holder with the Dositube to the shirt collar for personal sampling, or put it on an appropriate measurement point in the workplace for area monitoring.
- When the measurement is finished, write down the finishing time on the label, and determine the actual sampling time :  
= (finishing time) - (starting time)
- Obtain the average concentration (TWA value) by the following formula.

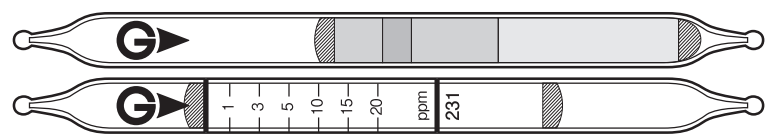
$$\text{TWA value (ppm)} = \frac{\text{Dosi-tube reading (ppm} \cdot \text{hr)}}{\text{Actual sampling time (hr)}}$$



■ Sulphuryl fluoride measurement system

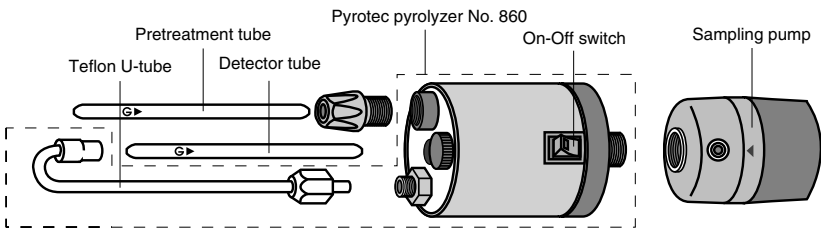
GASTEC developed the Pyrotec pyrolyzer system to enable precise and easy detection of Sulphuryl fluoride. It converts Sulphuryl fluoride (using a process known as thermal cracking) into an easily measurable gas.

\* Use Sulphuryl fluoride pyrotube No. 231, Pyrotec pyrolyzer No. 860, and GASTEC gas sampling pump.



| Gas or Vapour to be Measured<br>Chemical Formula     | Tube No. & Name |                    | Measuring Range (ppm) | No. of Pump Strokes | Colour Change |       | Shelf Life (year) | Note  |
|------------------------------------------------------|-----------------|--------------------|-----------------------|---------------------|---------------|-------|-------------------|-------|
|                                                      |                 |                    |                       |                     | Original      | Stain |                   |       |
| Sulphuryl fluoride<br>SO <sub>2</sub> F <sub>2</sub> | 231             | Sulphuryl fluoride | 1-20                  | 3                   | Bluish purple | White | 2                 | +T ※5 |

T: Temp Correction +: Twin Tubes ※5 for four test



■ 30m Extension hose No.351A-30

The extension hose can be attached to the tip of the gas sampling pump and used for remote downward (30m) measurement.

\* When merely the extension hose tip needs to be replaced or for twin tube operation, simply order the Extension Hose guard rubber (No.358) only.

Currently only the detector tubes listed below are applicable to No. 351A-30. If you need to use other tube, please contact your Gastec representatives.

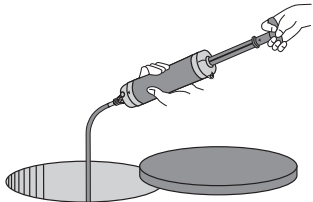
| Gas or Vapour to be Measured | Chemical Formula                                               | Tube No. & Name |                       | Measuring Range (ppm)   | Shelf Life (year) | Note |
|------------------------------|----------------------------------------------------------------|-----------------|-----------------------|-------------------------|-------------------|------|
| Acetaldehyde                 | CH <sub>3</sub> CHO                                            | 92M             | Acetaldehyde          | 2.5—100                 | 2*                | F    |
| Acetic acid                  | CH <sub>3</sub> CO <sub>2</sub> H                              | 81L             | Acetic acid           | 0.125—25.0              | 2*                | TF   |
| Acetone                      | CH <sub>3</sub> COCH <sub>3</sub>                              | 151L            | Acetone               | 50—12000                | 2*                | T    |
| Acrylonitrile                | CH <sub>2</sub> :CHCN                                          | 191L            | Acrylonitrile         | 0.1—18                  | 3                 | +    |
| Ammonia                      | NH <sub>3</sub>                                                | 3M              | Ammonia               | 10—1000                 | 3                 |      |
|                              |                                                                | 3La             | Ammonia               | 2.5—200                 | 3                 | T    |
|                              |                                                                | 3L              | Ammonia               | 0.5—78                  | 3                 | TF   |
| Aromatic hydrocarbons        |                                                                | 120             | Aromatic hydrocarbons | 0.4—200                 | 3                 | F    |
| Arsine                       | AsH <sub>3</sub>                                               | 19La            | Arsine                | 0.04—10                 | 2                 |      |
| Benzene                      | C <sub>6</sub> H <sub>6</sub>                                  | 121S            | Benzene               | 2—312                   | 3                 | +F   |
|                              |                                                                | 121             | Benzene               | 2.5—120                 | 3                 | F    |
|                              |                                                                | 121SL           | Benzene               | 1—100                   | 3                 | +F   |
|                              |                                                                | 121L            | Benzene               | 0.1—65                  | 3                 | +F   |
| 1,3-Butadiene                | CH <sub>2</sub> :CHCH:CH <sub>2</sub>                          | 174             | 1,3-Butadiene         | 50—800                  | 3                 | T    |
|                              |                                                                | 174L            | 1,3-Butadiene         | 2.5—100                 | 3                 |      |
| Carbon dioxide               | CO <sub>2</sub>                                                | 2HH             | Carbon dioxide        | 2.5—40%                 | 3                 | F    |
|                              |                                                                | 2H              | Carbon dioxide        | 0.5—20%                 | 3                 | F    |
|                              |                                                                | 2L              | Carbon dioxide        | 0.13—6%                 | 3                 |      |
|                              |                                                                | 2LL             | Carbon dioxide        | 300—5000                | 3                 |      |
|                              |                                                                | 2LC             | Carbon dioxide        | 100—4000                | 2                 |      |
| Carbon monoxide              | CO                                                             | 1L              | Carbon monoxide       | 2.5—2000                | 3                 | F    |
|                              |                                                                | 1LK             | Carbon monoxide       | 5—600                   | 3                 |      |
|                              |                                                                | 1LL             | Carbon monoxide       | 5—50                    | 3                 | F    |
| Chloropicrin                 | Cl <sub>3</sub> CNO <sub>2</sub>                               | 134             | Carbon tetrachloride  | 2.5—60                  | 1*                | +F   |
|                              |                                                                | 134L            | Carbon tetrachloride  | 0.125—2.5               | 1*                | +F   |
| Cyclohexanol                 | C <sub>6</sub> H <sub>11</sub> OH                              | 118             | Cyclohexanol          | 5—100                   | 2                 | TF   |
| 1,2-Dichloroethylene         | ClCH:CHCl                                                      | 139             | 1,2-Dichloroethylene  | 5—250                   | 2*                | T    |
| 1,3-Dichloropropene          | ClCH <sub>2</sub> CH:CHCl                                      | 131La           | Vinyl chloride        | 0.5—10                  | 2*                | +F   |
| Dichlorvos                   | C <sub>4</sub> H <sub>7</sub> Cl <sub>2</sub> O <sub>4</sub> P | 132LL           | Trichloroethylene     | 0.11—1.8                | 2*                | TF   |
| Ethanol                      | C <sub>2</sub> H <sub>5</sub> OH                               | 112             | Ethanol               | 0.01—7.5%               | 3                 | TF   |
|                              |                                                                | 112L            | Ethanol               | 50—2000                 | 3                 | TF   |
| Ethyl acetate                | CH <sub>3</sub> CO <sub>2</sub> C <sub>2</sub> H <sub>5</sub>  | 141L            | Ethyl acetate         | 20—800                  | 2                 | T    |
| Ethylene                     | CH <sub>2</sub> :CH <sub>2</sub>                               | 172             | Ethylene              | 25—1680                 | 3                 | TF   |
|                              |                                                                | 172L            | Ethylene              | 0.2—100                 | 3                 | TF   |
| Ethylene glycol              | HOCH <sub>2</sub> CH <sub>2</sub> OH                           | 165L            | Ethylene glycol       | 10—100mg/m <sup>3</sup> | 3*                | +TF  |
| Ethyl mercaptan              | C <sub>2</sub> H <sub>5</sub> SH                               | 72              | Ethyl mercaptan       | 0.5—120                 | 3                 | TF   |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage

F: Correction factors might be applied when using No. 351A-30. See No. 351A-30 instruction manual for details. Measuring ranges above will be changed in case correction factors are applied.

| Gas or Vapour to be Measured | Chemical Formula                                                     | Tube No. & Name |                            | Measuring Range (ppm)        | Shelf Life (year) | Note  |
|------------------------------|----------------------------------------------------------------------|-----------------|----------------------------|------------------------------|-------------------|-------|
| Ethylene oxide               | C <sub>2</sub> H <sub>4</sub> O                                      | 163             | Ethylene oxide             | 0.05 — 3.0%                  | 3                 | F     |
|                              |                                                                      | 163L            | Ethylene oxide             | 0.4 — 350                    | 1*                | +TF   |
|                              |                                                                      | 163LL           | Ethylene oxide             | 0.1 — 10                     | 1*                | +TF   |
| Ethyl ether                  | (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O                      | 161             | Ethyl ether                | 0.04 — 1%                    | 3                 | TF    |
| Formaldehyde                 | HCHO                                                                 | 91L             | Formaldehyde               | 0.1 — 40.0                   | 3*                | TF    |
| Gasoline                     | C <sub>n</sub> H <sub>m</sub>                                        | 101L            | Gasoline                   | 30 — 2000                    | 3                 | F     |
| Hexane                       | CH <sub>3</sub> (CH <sub>2</sub> ) <sub>4</sub> CH <sub>3</sub>      | 102L            | Hexane                     | 4 — 1200                     | 3                 | F     |
| Hydrocarbons(Higher class)   |                                                                      | 105             | Hydrocarbons(Higher class) | 100 — 3000                   | 3                 |       |
| Hydrocarbons (Lower class)   |                                                                      | 103             | Hydrocarbons (Lower class) | 0.05 — 2.4%                  | 2                 | ++    |
| Hydrogen                     | H <sub>2</sub>                                                       | 30              | Hydrogen                   | 0.5 — 2%                     | 3                 |       |
| Hydrogen sulphide            | H <sub>2</sub> S                                                     | 4HH             | Hydrogen sulphide          | 0.1 — 4%                     | 3                 |       |
|                              |                                                                      | 4H              | Hydrogen sulphide          | 10 — 4000                    | 3                 |       |
|                              |                                                                      | 4HM             | Hydrogen sulphide          | 25 — 1600                    | 3                 |       |
|                              |                                                                      | 4M              | Hydrogen sulphide          | 12.5 — 500                   | 3                 |       |
|                              |                                                                      | 4L              | Hydrogen sulphide          | 1 — 240                      | 3                 |       |
|                              |                                                                      | 4LL             | Hydrogen sulphide          | 0.25 — 120                   | 3                 |       |
|                              |                                                                      | 4LK             | Hydrogen sulphide          | 1 — 40                       | 3                 |       |
|                              |                                                                      | 4LB             | Hydrogen sulphide          | 0.5 — 12                     | 2                 |       |
|                              |                                                                      | 4LT             | Hydrogen sulphide          | 0.05 — 4.0                   | 2*                |       |
| Isoamyl alcohol              | (CH <sub>3</sub> ) <sub>2</sub> CH(CH <sub>2</sub> ) <sub>2</sub> OH | 117             | Isoamyl alcohol            | 5 — 300                      | 3                 | TF    |
| LPG                          |                                                                      | 100A            | LPG                        | 0.02 — 0.8%                  | 3                 |       |
| Mercaptans                   | R · SH                                                               | 70              | Mercaptans                 | 0.5 — 120                    | 3                 | T     |
|                              |                                                                      | 70L             | Mercaptans                 | 0.1 — 8                      | 2                 |       |
| Mercury vapour               | Hg                                                                   | 40              | Mercury vapour             | 0.05 — 13.2mg/m <sup>3</sup> | 3                 | F     |
| Methanol                     | CH <sub>3</sub> OH                                                   | 111             | Methanol                   | 0.002 — 4.5%                 | 3                 | TF    |
|                              |                                                                      | 111L            | Methanol                   | 20 — 1000                    | 3                 | TF    |
| Methyl bromide               | CH <sub>3</sub> Br                                                   | 136H            | Methyl bromide             | 10 — 600                     | 3                 | +     |
|                              |                                                                      | 136L            | Methyl bromide             | 2.5 — 200                    | 2                 | +     |
|                              |                                                                      | 136LA           | Methyl bromide             | 1 — 36                       | 2                 | +F    |
|                              |                                                                      | 136LL           | Methyl bromide             | 0.1 — 3.0                    | 2                 | +T    |
| Methyl iodide                | CH <sub>3</sub> I                                                    | 230H            | Methyl iodide              | 100 — 34800                  | 2                 | TF    |
|                              |                                                                      | 230             | Methyl iodide              | 0.5 — 108                    | 2*                | TF    |
| Methyl isothiocyanate        | CH <sub>3</sub> NCS                                                  | 141L            | Ethyl acetate              | 50 — 400                     | 2                 | TF    |
| Nitric acid                  | HNO <sub>3</sub>                                                     | 15L             | Nitric acid                | 0.1 — 40                     | 3                 | HF    |
| Nitrogen dioxide             | NO <sub>2</sub>                                                      | 9L              | Nitrogen dioxide           | 0.5 — 125                    | 3                 | F     |
| Nitrogen oxides              | NO+NO <sub>2</sub>                                                   | 11L             | Nitrogen oxides            | 0.04 — 16.5                  | 3                 | F     |
| Petroleum naphtha            |                                                                      | 106             | Petroleum naphtha          | 0.5 — 28mg/L                 | 3                 |       |
| Phenol                       | C <sub>6</sub> H <sub>5</sub> OH                                     | 60              | Phenol                     | 0.4 — 187                    | 2*                | TF    |
| Phosphine                    | PH <sub>3</sub>                                                      | 7H              | Phosphine                  | 200 — 5500                   | 2                 | T     |
|                              |                                                                      | 7J              | Phosphine                  | 2.5 — 1000                   | 3                 | F     |
|                              |                                                                      | 7               | Phosphine                  | 2.5 — 100                    | 3                 |       |
|                              |                                                                      | 7L              | Phosphine                  | 0.15 — 5                     | 3                 |       |
|                              |                                                                      | 7LA             | Phosphine                  | 0.05 — 9.8                   | 2                 |       |
| Styrene                      | C <sub>6</sub> H <sub>5</sub> CH:CH <sub>2</sub>                     | 124             | Styrene                    | 10 — 1500                    | 3                 | F     |
|                              |                                                                      | 124L            | Styrene                    | 2 — 100                      | 3                 | F     |
| Sulphur dioxide              | SO <sub>2</sub>                                                      | 5La             | Sulphur dioxide            | 0.5 — 60                     | 3                 |       |
|                              |                                                                      | 5Lb             | Sulphur dioxide            | 0.05 — 10.0                  | 3                 | F     |
|                              |                                                                      | 5LC             | Sulphur dioxide            | 0.1 — 25                     | 3                 | T     |
| Sulphuric acid               | H <sub>2</sub> SO <sub>4</sub>                                       | 35              | Sulphuric acid             | 0.5 — 5mg/m <sup>3</sup>     | 2                 | T     |
| Sulphuryl fluoride           | SO <sub>2</sub> F <sub>2</sub>                                       | 231             | Sulphuryl fluoride         | 1 — 20                       | 2                 | +T ※6 |
| Toluene                      | C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>                        | 122             | Toluene                    | 5 — 690                      | 3                 | F     |
|                              |                                                                      | 122L            | Toluene                    | 1 — 100                      | 3                 | F     |
| 1,1,1-Trichloroethane        | CH <sub>3</sub> CCl <sub>3</sub>                                     | 135             | 1,1,1-Trichloroethane      | 100 — 2000                   | 3                 | +T    |
| Vinyl chloride               | CH <sub>2</sub> :CHCl                                                | 131             | Vinyl chloride             | 0.025 — 2.0%                 | 3                 | F     |
|                              |                                                                      | 131La           | Vinyl chloride             | 0.25 — 54                    | 2*                | +     |
|                              |                                                                      | 131LB           | Vinyl chloride             | 0.25 — 70                    | 2*                | TF    |
|                              |                                                                      | 131L            | Vinyl chloride             | 0.1 — 6.6                    | 2*                | +TF   |
| Water vapour                 | H <sub>2</sub> O                                                     | 6L              | Water vapour               | 0.05 — 2.0mg/L               | 3                 |       |
| Xylene                       | C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>        | 123             | Xylene                     | 5 — 625                      | 3                 | F     |
|                              |                                                                      | 123L            | Xylene                     | 2 — 200                      | 3                 | F     |

T: Temp Correction H: Humidity Correction +: Twin Tubes ++: Nine Tubes \* Refrigerated Storage ※6:for four test  
F: Correction factors might be applied when using No. 351A-30. See No. 351A-30 instruction manual for details.  
Measuring ranges above will be changed in case correction factors are applied.

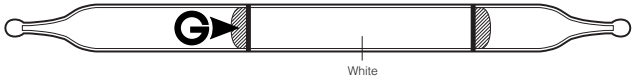


■ Qualitative analysis system for inorganic/organic gas qualitative detector tubes

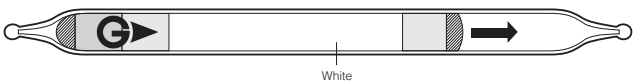
| Gas or Vapour to be Measured                                                                            | Tube No. & Name |                                                  | Measuring Range (ppm) | No. of Pump Strokes | Colour Change        |       | Shelf Life (year) |
|---------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------|-----------------------|---------------------|----------------------|-------|-------------------|
|                                                                                                         |                 |                                                  |                       |                     | Original             | Stain |                   |
| NH <sub>3</sub> , SO <sub>2</sub> , H <sub>2</sub> S, CO, NO <sub>2</sub> , R.SH                        | 25              | Polytec tube-II                                  | Qualitative analysis  | 1                   | Qualitative analysis |       | 2                 |
| NH <sub>3</sub> , H <sub>2</sub> S, CnHm                                                                | 26              | Polytec tube-III                                 | Qualitative analysis  | 1                   | Qualitative analysis |       | 2                 |
| NH <sub>3</sub> , HCl, H <sub>2</sub> S, SO <sub>2</sub> , NO <sub>2</sub> , CO, CO <sub>2</sub>        | 27              | Polytec tube-IV                                  | Qualitative analysis  | 1                   | Qualitative analysis |       | 1.5               |
| HCl, COCl <sub>2</sub> , SO <sub>2</sub> , NO <sub>2</sub> , H <sub>2</sub> S, HCN, CO, CO <sub>2</sub> | 28              | Polytec tube-V                                   | Qualitative analysis  | 1                   | Qualitative analysis |       | 1.5               |
| Unknown Gases                                                                                           | 107             | Polytec tube-I                                   | Qualitative analysis  | 3                   | Qualitative analysis |       | 3                 |
| Kerosene,Gasoline                                                                                       | 108             | Qualitative analysis tube for fire investigation | Qualitative analysis  | 1                   | Qualitative analysis |       | 3                 |

The Gastec polytec system consists of the Model GV-100S Gas sampling pump and the Polytec tubes. The Polytec tubes are unique detector tubes, each having 1 to 8 reaction layers to determine multiple unknown substances in the sample simultaneously. When you pull the handle of the Pump and wait for a predetermined sampling time, the colour (s) of the Polytec tube's layer (s) change uniquely according to the contents of the sample. Six types of Polytec tubes are available: Polytec I (No.107), Polytec II (No.25), Polytec III (No.26), Polytec IV (No.27),Polytec V(No.28), and Qualitative analysis tube for fire investigation (No.108). Detailed descriptions are given in the instruction sheets included with individual Polytec tubes. If you already have the Model GV-100S gas sampling pump, you need only to obtain the desired Polytec tubes.

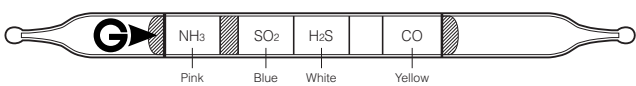
■ Polytec I (No. 107)



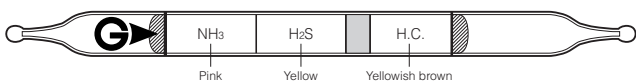
■ Qualitative analysis tube for fire investigation (No. 108)



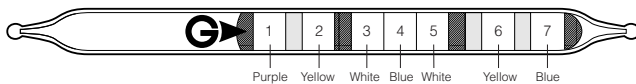
■ Polytec II (No. 25)



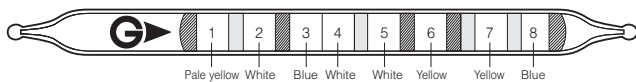
■ Polytec III (No. 26)



■ Polytec IV (No. 27)



■ Polytec V (No. 28)



Example :

■ Polytec V (No. 28)

| Detecting layer | 1                 | 2                                    | 3               | 4                | 5                 | 6                                                       | 7                                                                                               | 8              |
|-----------------|-------------------|--------------------------------------|-----------------|------------------|-------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------|
| Original colour | Pale yellow       | White                                | Blue            | White            | White             | Yellow                                                  | Yellow                                                                                          | Blue           |
| Colour change   | Red               | Yellow                               | Yellow          | Yellow           | Brown             | Pink                                                    | Blackish brown, Gray, Yellowish orange                                                          | Brown          |
| Substance       | Hydrogen chloride | Phosgene, Chlorine, Nitrogen dioxide | Sulphur dioxide | Nitrogen dioxide | Hydrogen sulphide | Hydrogen sulphide, Hydrogen cyanide, Hydrogen phosphide | Carbon monoxide, Hydrogen, Hydrogen phosphide, Acetylene, Ethylene, Propylene, Methyl mercaptan | Carbon dioxide |

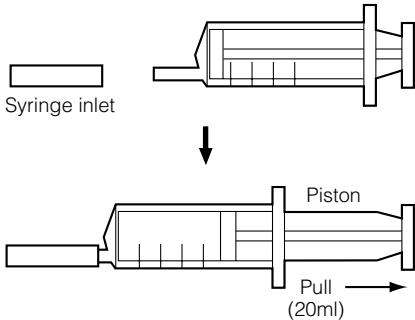
■ Polytec IV (No. 27)

| Detecting layer | 1                     | 2                 | 3                 | 4                                           | 5                          | 6                                                                                                         | 7              |
|-----------------|-----------------------|-------------------|-------------------|---------------------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------|----------------|
| Original colour | Purple                | Yellow            | White             | Blue                                        | White                      | Yellow                                                                                                    | Blue           |
| Colour change   | Yellow                | Red               | Brown             | Yellow, Purple                              | Yellow, Yellowish orange   | Blackish brown, Gray, Yellowish orange                                                                    | Brown          |
| Substance       | Ammonia, Diethylamine | Hydrogen chloride | Hydrogen sulphide | Chlorine, Sulphur dioxide, Nitrogen dioxide | Chlorine, Nitrogen dioxide | Hydrogen sulphide, Carbon monoxide, Hydrogen, Phosphine, Acetylene, Ethylene, Propylene, Methyl mercaptan | Carbon dioxide |

■ Injection method detector tubes

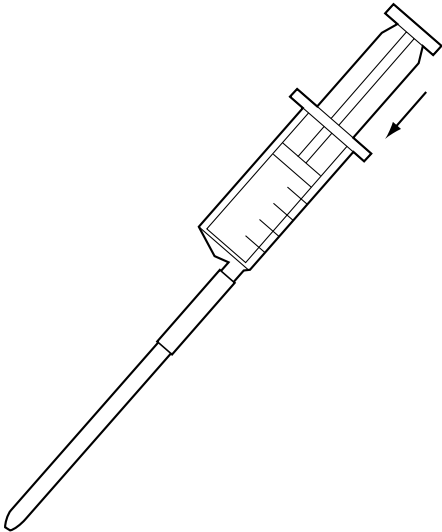
| Gas or Vapour to be Measured | Chemical Formula                                | Tube No. & Name |                | Measuring Range (ppm) | Sampling Volume | Colour Change |                | Shelf Life (year) |
|------------------------------|-------------------------------------------------|-----------------|----------------|-----------------------|-----------------|---------------|----------------|-------------------|
|                              |                                                 |                 |                |                       |                 | Original      | Stain          |                   |
| Carbon dioxide               | CO <sub>2</sub>                                 | 2HT             | Carbon dioxide | 10-100%               | 20mL/20sec.     | White         | Purple         | 3                 |
| Propane                      | CH <sub>3</sub> CH <sub>2</sub> CH <sub>3</sub> | 100B            | Propane        | 0.1-2%                | 20mL/120sec.    | Brown         | Blackish green | 3                 |

① Attach the syringe inlet to the syringe (No.601 or No.611) and collect 20ml of sample into the syringe by pulling its piston.



② Break off both ends of a detector tube (No.100B for No.601 syringe or No.2HT for No.611 syringe) by using the tube tip breaker.

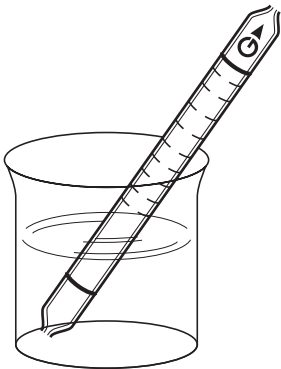
③ Insert the tube securely into the syringe inlet with the arrow pointing away from the syringe. Inject the sample collected in the syringe into the detector tube in 2 minutes (for No.100B) or 20 seconds (for No.2HT), and read the indication.



■ Detector tubes for dissolved substances in solution

| Substance to be Measured    | Chemical Formula | Tube No. & Name |                             | Measuring Range (ppm) | Sampling Method | Colour Change |                | Shelf Life (year) |
|-----------------------------|------------------|-----------------|-----------------------------|-----------------------|-----------------|---------------|----------------|-------------------|
|                             |                  |                 |                             |                       |                 | Original      | Stain          |                   |
| Sulphide ion in solution    | S <sup>2-</sup>  | 211H            | Sulphide ion tube           | 10-1000               | Immersion       | White         | Brown          | 3                 |
|                             |                  | 211M            | Sulphide ion tube           | 2-300                 | Immersion       | White         | Brown          | 3                 |
|                             |                  | 211             | Sulphide ion tube           | 1-100                 | Immersion       | White         | Brown          | 3                 |
|                             |                  | 211LL           | Sulphide ion tube           | 0.5-20                | Immersion       | White         | Brown          | 3                 |
| Ozone in solution           | O <sub>3</sub>   | 218             | Ozone tube                  | 1-10mg/L              | Immersion       | Pale blue     | White          | 3                 |
| Bromide ion in solution     | Br <sup>-</sup>  | 221L            | Chloride ion tube           | 55-2200mg/L           | Immersion       | Brown         | White          | 3                 |
|                             |                  | 221LL           | Chloride ion tube           | 24-480mg/L            | Immersion       | Brown         | White          | 3                 |
| Chloride ion in solution    | Cl <sup>-</sup>  | 221L            | Chloride ion tube           | 25-1000mg/L           | Immersion       | Brown         | White          | 3                 |
|                             |                  | 221LL           | Chloride ion tube           | 10-200mg/L            | Immersion       | Brown         | White          | 3                 |
| Free residual chlorine      | ClO <sup>-</sup> | 222             | Free residual chlorine tube | 0.1-10mg/L            | Immersion       | White         | Reddish orange | 2                 |
| Mercury in solution         | Hg               | 271             | Mercury tube                | 1-20mg/L              | Immersion       | Pale orange   | Bluish purple  | 3                 |
| Chromium(VI)ion in solution | Cr <sup>6+</sup> | 273             | Chromium(VI)ion tube        | 0.5-50mg/L            | Immersion       | White         | Yellow         | 3                 |
| Iron ion in solution        | Fe <sup>2+</sup> | 281             | Iron ion tube               | 5-50mg/L              | Immersion       | White         | Orange         | 3                 |
| Copper ion in solution      | Cu <sup>2+</sup> | 284             | Copper ion tube             | 1-20mg/L              | Immersion       | White         | Orange         | 2*                |
| Zinc in solution            | Zn               | 285             | Zinc tube                   | 3-20mg/L              | Immersion       | Pale orange   | Reddish purple | 3                 |
| Nickel in solution          | Ni               | 291             | Nickel tube                 | 5-50mg/L              | Immersion       | White         | Red            | 3                 |

Dissolved substance in solution can be measured by simply immersing the above Gastec tube into a solution. When the detector tube is immersed vertically into(▶) Pointing upward,the solution will rise up through the tube due to capillary action and react with reagent in the tube.



■ Airtec tube - Compressed breathing air detector tubes

| Gas or Vapour to be Measured | Chemical Formula   | Tube No. & Name |                             | Measuring Range (ppm)     | Flow Rate (mL/min) | Sampling Time (min) | Colour Change |              | Shelf Life (year) |
|------------------------------|--------------------|-----------------|-----------------------------|---------------------------|--------------------|---------------------|---------------|--------------|-------------------|
|                              |                    |                 |                             |                           |                    |                     | Original      | Stain        |                   |
| Carbon monoxide              | CO                 | 1A              | Carbon monoxide Airtec tube | 5-50                      | 100                | 3                   | Yellow        | Dark brown   | 2                 |
| Carbon dioxide               | CO <sub>2</sub>    | 2A              | Carbon dioxide Airtec tube  | 250-3000                  | 100                | 5                   | Orange yellow | Yellow       | 2                 |
|                              |                    | 2Ag             | Carbon dioxide Airtec tube  | 200-3000                  | 100                | 1.5                 | Pale blue     | Purple       | 3                 |
| Water vapour                 | H <sub>2</sub> O   | 6AH             | Water vapour Airtec tube    | 500-5000                  | 300                | 1                   | Green         | Purple       | 2                 |
|                              |                    | 6A              | Water vapour Airtec tube    | 20-80mg/m <sup>3</sup>    | 100                | 5                   | Yellow        | Green        | 2                 |
|                              |                    | 6Ag             | Water vapour Airtec tube    | 150-3000mg/m <sup>3</sup> | 300                | 1                   | Green         | Purple       | 2                 |
| Nitrogen oxides              | NO+NO <sub>2</sub> | 11A             | Nitrogen oxides Airtec tube | 0.06-2                    | 100                | 2                   | white         | Bluish green | 3                 |
|                              |                    |                 |                             | 0.02-0.7                  | 100                | 5                   |               |              |                   |
| Oil mist                     |                    | 109AD           | Oil mist Airtec tube        | 0.2-5.0mg/m <sup>3</sup>  | 1000               | 20                  | Pale red      | Pale blue    | 2                 |
|                              |                    | 109A            | Oil mist Airtec tube        | 0.3-1.5mg/m <sup>3</sup>  | 1000               | 60                  | White         | Dark green   | 2                 |

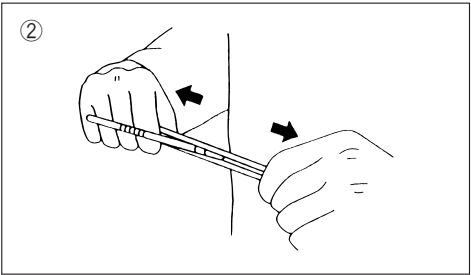
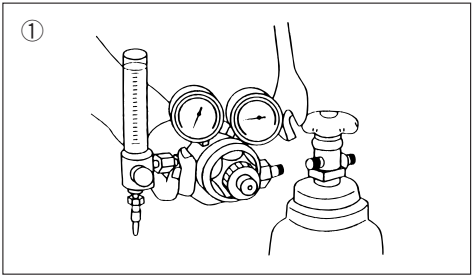
Gastec Airtec Tube allows anyone to simply, quickly, and quantitatively measure the quality of their compressed breathing air. Easy to use, the Airtec tube is an accurate and precise method for detecting CO, CO<sub>2</sub>, Water vapour, Nitrogen oxides and Oil mist. Using Airtec tube direct reading vapour tubes, simply connect the pressure reducer to your high pressure air source, compressor, cylinder, or air line and adjust the flowmetre to the required setting.

Operators often produce or are performed in the presence of harmful airborne contaminants. When self-contained breathing apparatus or other devices are used for respiratory protection, the quality of the breathing air requires special attention. Contaminants entering the compressor or contaminants generated by the compressor can be harmful to the worker and the respiratory equipment.

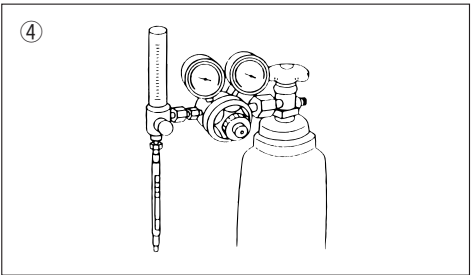
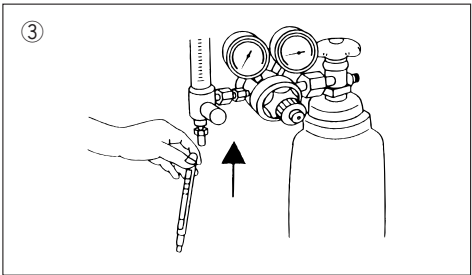
Airtec tube is a convenient economical system for testing the quality of your compressed breathing air. You do not have to learn how to operate and calibrate sophisticated instrumentation. With Aritec Tube, the measurement is quick and simple and dose not require user calibration. Just snap off both “break away” ends of the tube, insert the tube into the tube holder with the directional arrow pointing down, and adjust the flowmetre to the specified flow rate. After the required time, note where the colour stain stops and take the measurement from the direct reading tube.

■ Measurement procedure: (a case of contaminant test in cylinder)

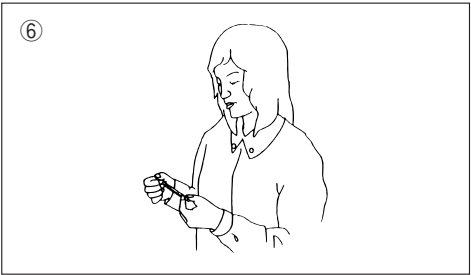
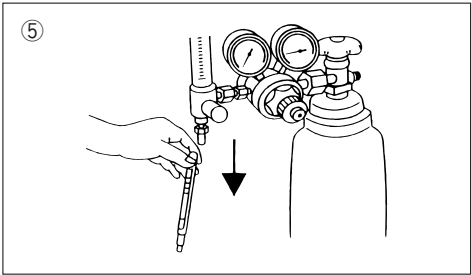
1. Install a pressure reducer with gauge and flowmetre to a cylinder, compressor or air line and adjust the flowmetre the required setting.
2. Break tips off a fresh detector tube in the tube tip breaker and insert a tube into a tube holder.



3. Attach the rubber tube holder to the flowmetre outlet. Make certain the tube arrow **G➡** on the tube pointing in a down direction.
4. Turn on the cylinder or compressor and confirm the flow metre according to each Airtec tube specifications.



5. Time the sampling time with a stopwatch.
6. As soon as sampling time has elapsed turn off the cylinder or compressor, and remove the tube from the tube holder and then read colour change layer immediately.



■
 Detector tubes for Automatic Air Sampling Pump

| Gas or Vapour to be Measured | Chemical Formula                                                | Tube No. & Name |                     | Measuring Range (ppm)                                     | Flow Rate (mL/min) | Sampling Time (min) | Colour Change |                     | Note | Shelf Life (year) |
|------------------------------|-----------------------------------------------------------------|-----------------|---------------------|-----------------------------------------------------------|--------------------|---------------------|---------------|---------------------|------|-------------------|
|                              |                                                                 |                 |                     |                                                           |                    |                     | Original      | Stain               |      |                   |
| Acrylonitrile                | CH <sub>2</sub> CHCN                                            | 191TP           | Acrylonitrile       | 3.0-12.6<br>0.2-3.0                                       | 50<br>100          | 10<br>10            | Yellow        | Pink                | +T   | 2                 |
| Acetone                      | CH <sub>3</sub> COCH <sub>3</sub>                               | 151TP           | Acetone             | 25-800                                                    | 100                | 10                  | Yellow        | Red                 | T    | 2*                |
| Benzene                      | C <sub>6</sub> H <sub>6</sub>                                   | 121P            | Benzene             | 250-3000 μg/m <sup>3</sup>                                | 50                 | 60                  | White         | Brown               | +    | 2                 |
| Chlorine                     | Cl <sub>2</sub>                                                 | 8TP             | Chlorine            | 0.05-0.6                                                  | 100                | 10                  | Pink          | White               |      | 2                 |
| p-Dichlorobenzene            | C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub>                   | 127P            | p-Dichlorobenzene   | 100-3000 μg/m <sup>3</sup>                                | 100                | 30                  | Yellow        | Pale reddish purple | +T   | 2                 |
| Ethyl benzene                | C <sub>6</sub> H <sub>5</sub> C <sub>2</sub> H <sub>5</sub>     | 122P            | Toluene             | 110-2750 μg/m <sup>3</sup>                                | 200                | 30                  | White         | Pale brown          | +    | 2                 |
| Ethylene oxide               | C <sub>2</sub> H <sub>4</sub> O                                 | 163TPM          | Ethylene oxide      | 1-50                                                      | 50                 | 10                  | Yellow        | Reddish brown       | +T   | 1*                |
|                              |                                                                 | 163TP           | Ethylene oxide      | 0.1-5                                                     | 50                 | 10                  | Yellow        | Pale orange         | +T   | 1*                |
| Formaldehyde                 | HCHO                                                            | 91P             | Formaldehyde        | 0.4-1.44<br>0.02-0.4                                      | 200<br>200         | 10<br>30            | Yellow        | Pink                | T    | 1*                |
|                              |                                                                 | 91PL            | Formaldehyde        | 0.20-0.80<br>0.01-0.20                                    | 200<br>200         | 10<br>30            | Pale Yellow   | Pink                | T    | 1*                |
|                              |                                                                 | 91TP            | Formaldehyde        | 0.50-1.75<br>0.01-0.50                                    | 50<br>100          | 10<br>10            | Yellow        | Pale orange         | T    | 1*                |
| Hexane                       | CH <sub>3</sub> (CH <sub>2</sub> ) <sub>4</sub> CH <sub>3</sub> | 102TP           | Hexane              | 2-80                                                      | 100                | 10                  | Orange        | Dark green          |      | 3                 |
| Hydrogen cyanide             | HCN                                                             | 12TP            | Hydrogen cyanide    | 4.5-9.0<br>0.3-4.5                                        | 50<br>100          | 10<br>10            | Yellow        | Pink                |      | 1                 |
| Hydrogen fluoride            | HF                                                              | 17TP            | Hydrogen fluoride   | 3.0-9.0<br>0.05-3.0                                       | 50<br>100          | 10<br>10            | Yellow        | Brown               | TH   | 2                 |
| Hydrogen sulphide            | H <sub>2</sub> S                                                | 4TP             | Hydrogen sulphide   | 8.0-16.0<br>0.5-8.0                                       | 50<br>100          | 10<br>10            | White         | Brown               |      | 3                 |
| Isopropyl alcohol            | CH <sub>3</sub> CH(OH)CH <sub>3</sub>                           | 113TP           | Isopropyl alcohol   | 200-400<br>20-200                                         | 100<br>100         | 5<br>10             | Pink          | Pale blue           | T    | 2                 |
| Methanol                     | CH <sub>3</sub> OH                                              | 111TP           | Methanol            | 20-300                                                    | 50                 | 10                  | Pink          | Pale blue           | T    | 2                 |
| Methyl ethyl ketone          | CH <sub>3</sub> COC <sub>2</sub> H <sub>5</sub>                 | 152TP           | Methyl ethyl ketone | 20-300                                                    | 100                | 10                  | Yellow        | Red                 | T    | 2*                |
| Nitrogen dioxide             | NO <sub>2</sub>                                                 | 9P              | Nitrogen dioxide    | 0.02-0.20                                                 | 100                | 30                  | White         | Orange brown        | T    | 2                 |
| Tetrachloroethylene          | Cl <sub>2</sub> C:CCl <sub>2</sub>                              | 133P            | Tetrachloroethylene | 300-720 μg/m <sup>3</sup><br>20-300 μg/m <sup>3</sup>     | 100<br>100         | 15<br>30            | Yellow        | Purple              | +T   | 2                 |
|                              |                                                                 | 133TP           | Tetrachloroethylene | 5-80                                                      | 100                | 10                  | Yellow        | Reddish purple      | +T   | 2                 |
| Toluene                      | C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>                   | 122P            | Toluene             | 2500-7000 μg/m <sup>3</sup><br>100-2500 μg/m <sup>3</sup> | 200<br>200         | 10<br>30            | White         | Pale brown          | +    | 2                 |
|                              |                                                                 | 122TP           | Toluene             | 2-80                                                      | 100                | 10                  | White         | Brown               | +    | 2                 |
| Trichloroethylene            | Cl <sub>2</sub> C:CHCl                                          | 132P            | Trichloroethylene   | 500-1200 μg/m <sup>3</sup><br>20-500 μg/m <sup>3</sup>    | 100<br>100         | 15<br>30            | Yellow        | Purple              | +T   | 2                 |
|                              |                                                                 | 132TP           | Trichloroethylene   | 15-33<br>1-15                                             | 50<br>100          | 10<br>10            | Yellow        | Reddish purple      | +T   | 2                 |
| Vinyl chloride               | CH <sub>2</sub> CHCl                                            | 131P            | Vinyl chloride      | 50-1500 μg/m <sup>3</sup>                                 | 100                | 30                  | Yellow        | Pale reddish purple | +T   | 2                 |
|                              |                                                                 | 131TP           | Vinyl chloride      | 3.0-9.6<br>0.2-3.0                                        | 50<br>100          | 10<br>10            | Yellow        | Reddish purple      | T    | 3                 |
| Xylene                       | C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>   | 122P            | Toluene             | 540-13500 μg/m <sup>3</sup>                               | 200                | 30                  | White         | Pale brown          | +    | 2                 |
|                              |                                                                 | 123TP           | Xylene              | 2-80                                                      | 100                | 10                  | White         | Brown               | +    | 2                 |

T: Temp Correction   H: Humidity Correction   +: Twin Tubes   \*: Refrigerated Storage   Mesh: Correction Factor  
 See page 36 for additional symbols and definitions.

■
 Automatic Air Sampling Pump GSP-300FT-2

The Model GSP-300FT-2 has been designed small and compact air sampling pump available with an integrated flowmetre for Hand-held, Personal or site sampling. This small size air sampling pump can be possible to carry on constant flow rate for 10 hours continuous sampling. This air sampling pump employs an extremely low noise air pump and automatic shut-off air pump by preset timer or volume for integrated flow rate and accumulated time.

■
 GSP-300FT-2   Specification

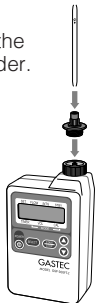
|                                          |                                                                                                                                                                                                                          |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Spot Flow Rate & Measuring Range         | 0~250mL/min                                                                                                                                                                                                              |
| Constant Flow Rate Sampling Range        | 50mL/min : 0.0~34.5kPa 200mL/min : 0.0~21.0kPa 100mL/min : 0.0~30.0kPa 250mL/min : 0.0~16.5kPa 150mL/min : 0.0~25.0kPa"                                                                                                  |
| Operating Mode                           | Timer mode : Automatic shut-off of air pump by a preset timer and digital display of integral flow rate.<br>Constant volume mode : Automatic shut-off of air pump by a preset timer and digital display of elapsed time. |
| Indicator                                | L.C.D. Read-out (equipped Light Switch )<br>Flow Rate Indicator : mL/min<br>Accumulated Sampling Volume Indicator : 0.000~9.999 L, 10.00~99.99 L, 100.0~999.9 L<br>Maximum Sampling Time Indicator : 0~999 min           |
| Construction & Performance               | Mass flow sensor(Temperature Correction Function attached), Diaphragm sampling pump, Dust-proof, Water drop-proof, Auto Start Function, Equipped with initial flow rate maintaining electric circuit                     |
| Accuracy of spot and accumulated volume  | ±5%(at higher than 50mL/minspot flow rate under constant temperature and relative humidity)                                                                                                                              |
| Operating temperature and humidity range | Temperature : 0~40℃   Humidity : 10~90%RH(without dews)                                                                                                                                                                  |
| Power source                             | 2 pcs. Type AA Alkali Dry Cell Battery lasts 10 continuous hours (20℃)                                                                                                                                                   |
| Dimension & weight                       | 80(W)×40(D)×140(H)mm · 300g(with batteries)                                                                                                                                                                              |
| Approval                                 | CE-marking (2004/108/EC )                                                                                                                                                                                                |

■
 Measuring Procedure

- ① Break tips off the detector tube by tube tip holder.



- ② Insert the detector tube to the inlet of the rubber tube holder.



- ③ Put the power switch to ON. Adjust the flow rate, confirm the timer of the air sampling pump is set, then push the start button.
- ④ After sampling, remove the detector tube from the rubber tube holder and read the concentration of the tube.

\* Please read carefully the instruction sheet of the detector tube to be used for timer and flow rate.

**GASTEC NUMERICAL INDEX GAS DETECTOR TUBE LIST**

| Gastec Tube No. | Gas or Vapour to be Measured                        | Measuring Range (ppm)     |
|-----------------|-----------------------------------------------------|---------------------------|
| 1A              | Carbon monoxide (Airtec tube)                       | 5-50                      |
| 1HH             | Carbon monoxide                                     | 1-50%                     |
| 1H              |                                                     | 0.1-10%                   |
| 1M              |                                                     | 0.05-4%                   |
| 1LM             |                                                     | 25-2000                   |
| 1L              |                                                     | 2.5-2000                  |
| 1La             |                                                     | 8-1000                    |
| 1LK             |                                                     | 5-600                     |
| 1LKC            |                                                     | 5-100                     |
| 1LL             |                                                     | 5-50                      |
| 1LC             |                                                     | 1-30                      |
| 1M              | Gasoline (Petrol)                                   | 0.1-2%                    |
| 1D              | Carbon monoxide (Dosi tube)                         | 1.04-2000                 |
| 1DL             |                                                     | 0.4-400                   |
| 2A              | Carbon dioxide (Airtec tube)                        | 250-3000                  |
| 2Ag             |                                                     | 200-3000                  |
| 2HT             | Carbon dioxide (Injection tube)                     | 10-100%                   |
| 2HH             | Carbon dioxide                                      | 2.5-40%                   |
| 2H              |                                                     | 0.5-20%                   |
| 2L              |                                                     | 0.13-6%                   |
| 2LL             |                                                     | 300-5000                  |
| 2LC             |                                                     | 100-4000                  |
| 2D              | Carbon dioxide (Dosi tube)                          | 0.02-12%                  |
| 3H              | Ammonia                                             | 0.2-32%                   |
| 3HM             |                                                     | 0.05-3.52%                |
| 3M              |                                                     | 10-1000                   |
| 3La             |                                                     | 2.5-200                   |
| 3L              | Dimethylamine                                       | 0.5-78                    |
| 3H              |                                                     | 1.2-19.2%                 |
| 3M              | Trimethylamine                                      | 25-250                    |
| 3D              | Ammonia (Dosi tube)                                 | 2.5-1000                  |
| 3DL             |                                                     | 0.1-10                    |
| 3D              | Dimethylamine (Dosi tube)                           | 1.9-750                   |
| 3D              | Hydrazine (Dosi tube)                               | 1.6-650                   |
| 3D              | N,N-Dimethylethylamine (Dosi tube)                  | 4-1600                    |
| 3D              | Triethylamine (Dosi tube)                           | 5.3-2100                  |
| 3DL             | Methylamine (Dosi tube)                             | 0.19-19                   |
| 3DL             | Trimethylamine (Dosi tube)                          | 0.23-23                   |
| 4HT             | Hydrogen sulphide                                   | 1-40%                     |
| 4HP             |                                                     | 0.25-20%                  |
| 4HH             |                                                     | 0.1-4%                    |
| 4H              |                                                     | 10-4000                   |
| 4HM             |                                                     | 25-1600                   |
| 4M              |                                                     | 12.5-500                  |
| 4L              |                                                     | 1-240                     |
| 4LL             |                                                     | 0.25-120                  |
| 4LK             |                                                     | 1-40                      |
| 4LB             |                                                     | 0.5-12                    |
| 4LT             |                                                     | 0.05-4.0                  |
| 4TP             | Hydrogen sulphide (for Automatic Air Sampling Pump) | 0.5-16.0                  |
| 4D              | Hydrogen sulphide (Dosi tube)                       | 0.2-200                   |
| 5H              | Sulphur dioxide                                     | 0.05-8%                   |
| 5M              |                                                     | 20-3600                   |
| 5L              |                                                     | 1.25-200                  |
| 5La             |                                                     | 0.5-60                    |
| 5LC             |                                                     | 0.1-25                    |
| 5Lb             |                                                     | 0.05-10                   |
| 5La             | Thionyl chloride                                    | 1.44-21.6                 |
| 5DH             | Sulphur dioxide (Dosi tube)                         | 10-600                    |
| 5D              |                                                     | 0.2-100                   |
| 6AH             | Water vapour (Airtec tube)                          | 500-5000                  |
| 6A              |                                                     | 20-80mg/m <sup>3</sup>    |
| 6Ag             |                                                     | 150-3000mg/m <sup>3</sup> |
| 6               | Water vapour                                        | 0.5-32mg/L                |
| 6L              |                                                     | 0.05-2mg/L                |
| 6LP             |                                                     | 3-100LB/MMCF              |
| 6LLP            |                                                     | 2-10LB/MMCF               |
| 7H              | Phosphine                                           | 200-5500                  |

| Gastec Tube No. | Gas or Vapour to be Measured                                                                            | Measuring Range (ppm) |
|-----------------|---------------------------------------------------------------------------------------------------------|-----------------------|
| 7J              | Phosphine                                                                                               | 2.5-1000              |
| 7               |                                                                                                         | 2.5-100               |
| 7L              |                                                                                                         | 0.15-5                |
| 7LA             |                                                                                                         | 0.05-9.8              |
| 8HH             | Chlorine                                                                                                | 0.25-10%              |
| 8H              |                                                                                                         | 25-1000               |
| 8La             |                                                                                                         | 0.1-16                |
| 8LL             |                                                                                                         | 0.025-2               |
| 8HH             | Hydrogen chloride                                                                                       | 1.5-30%               |
| 8H              | Chlorine dioxide                                                                                        | 25-250                |
| 8La             | Bromine                                                                                                 | 0.05-0.8              |
| 8La             | Chlorine dioxide                                                                                        | 0.3-4.8               |
| 8TP             | Chlorine (for Automatic Air Sampling Pump)                                                              | 0.05-0.6              |
| 8D              | Chlorine (Dosi tube)                                                                                    | 0.08-100              |
| 9L              | Nitrogen dioxide                                                                                        | 0.5-125               |
| 9L              | Iodine                                                                                                  | 0.2-12                |
| 9P              | Nitrogen dioxide (for Automatic Air Sampling Pump)                                                      | 0.02-0.20             |
| 9D              | Nitrogen dioxide (Dosi tube)                                                                            | 0.1-30                |
| 9DL             |                                                                                                         | 0.01-3.0              |
| 10              | NO & NO <sub>2</sub> (Separate quantification)                                                          | 2.5-200               |
| 11A             | Nitrogen oxides (Airtec tube)                                                                           | 0.02-2                |
| 11HA            | Nitrogen oxides (Total quantification)                                                                  | 50-2500               |
| 11S             |                                                                                                         | 5-625                 |
| 11L             |                                                                                                         | 0.04-16.5             |
| 12H             | Hydrogen cyanide                                                                                        | 0.05-1.6%             |
| 12M             |                                                                                                         | 17-2400               |
| 12L             |                                                                                                         | 0.5-150               |
| 12LL            |                                                                                                         | 0.2-10                |
| 12L             | Acetone cyanohydrin                                                                                     | 2.5-60                |
| 12L             | Boron trichloride                                                                                       | 2.25-54               |
| 12TP            | Hydrogen cyanide (for Automatic Air Sampling Pump)                                                      | 0.3-9.0               |
| 12D             | Hydrogen cyanide (Dosi tube)                                                                            | 1-200                 |
| 13M             | Carbon disulphide                                                                                       | 20-4000               |
| 13              |                                                                                                         | 0.63-100              |
| 13L             |                                                                                                         | 0.1-8.1               |
| 14R             | Hydrogen chloride (for Low Humidity)                                                                    | 50-5000               |
| 14M             | Hydrogen chloride                                                                                       | 10-1000               |
| 14L             |                                                                                                         | 0.2-76                |
| 14D             | Hydrogen chloride (Dosi tube)                                                                           | 1-100                 |
| 14D             | Hydrogen fluoride (Dosi tube)                                                                           | 2.5-250               |
| 14D             | Nitric acid (Dosi tube)                                                                                 | 0.8-80                |
| 15L             | Nitric acid                                                                                             | 0.1-40                |
| 15L             | Hydrogen bromide                                                                                        | 0.8-16                |
| 15L             | Trichloroacetic acid                                                                                    | 1-37.5                |
| 16              | Phosgene                                                                                                | 0.05-20               |
| 17              | Hydrogen fluoride                                                                                       | 0.25-100              |
| 17L             |                                                                                                         | 0.09-72               |
| 17LL            |                                                                                                         | 0.05-24               |
| 17              | Fluorine                                                                                                | 0.5-50                |
| 17TP            | Hydrogen fluoride (for Automatic Air Sampling Pump)                                                     | 0.05-9.0              |
| 17D             | Hydrogen fluoride (Dosi tube)                                                                           | 1-100                 |
| 17D             | Nitric acid (Dosi tube)                                                                                 | 0.32-32               |
| 18M             | Ozone                                                                                                   | 4-400                 |
| 18L             |                                                                                                         | 0.025-3               |
| 19LA            | Arsine                                                                                                  | 0.04-10               |
| 21              | Carbonyl sulphide                                                                                       | 5-200                 |
| 21LA            |                                                                                                         | 2-125                 |
| 22              | Diborane                                                                                                | 0.02-5                |
| 23M             | Chlorine dioxide                                                                                        | 0.1-10                |
| 23L             |                                                                                                         | 0.025-1.2             |
| 25              | (NH <sub>3</sub> ,SO <sub>2</sub> ,H <sub>2</sub> S,CO,NO <sub>2</sub> , )                              | Qualitative           |
| 26              | (NH <sub>3</sub> ,H <sub>2</sub> S,CnHm)                                                                | Qualitative           |
| 27              | (NH <sub>3</sub> ,HCl,H <sub>2</sub> S,NO <sub>2</sub> ,SO <sub>2</sub> ,CO,CO <sub>2</sub> )           | Qualitative           |
| 28              | HCl, COCl <sub>2</sub> , SO <sub>2</sub> , NO <sub>2</sub> , H <sub>2</sub> S, HCN, CO, CO <sub>2</sub> | Qualitative           |
| 30              | Hydrogen                                                                                                | 0.5-2%                |
| 31B             | Oxygen                                                                                                  | 3-24%                 |
| 32              | Hydrogen peroxide                                                                                       | 0.5-10                |
| 32D             | Hydrogen peroxide (Dosi tube)                                                                           | 0.5-40                |

| Gastec Tube No. | Gas or Vapour to be Measured                               | Measuring Range (ppm)      |
|-----------------|------------------------------------------------------------|----------------------------|
| 35              | Sulphuric acid                                             | 0.5-5mg/m <sup>3</sup>     |
| 40              | Mercury vapour                                             | 0.05-13.2mg/m <sup>3</sup> |
| 45H             | H <sub>2</sub> S + SO <sub>2</sub> (Total Quantification)  | 0.02-8.0%                  |
| 45S             | H <sub>2</sub> S,SO <sub>2</sub> (Separate Quantification) | SO <sub>2</sub> : 0.25-20  |
| 45S             |                                                            | H <sub>2</sub> S: 1.25-120 |
| 51H             | 1,1,2-Trichloro-1,2,2-trifluoroethane (R113)               | 250-6000                   |
| 51H             | Chlorodifluoromethane (R22)                                | 0.1-2.4%                   |
| 51H             | Dichlorodifluoromethane (R12)                              | 325-7800                   |
| 51H             | 1,2-Dichloro-1,1,2,2-tetrafluoroethane (R114)              | 475-11400                  |
| 51H             | Halothane                                                  | 800-6400                   |
| 51H             | 1,1,2,2-Tetrachloro-1,2-difluoroethane (R112)              | 125-3000                   |
| 51H             | Trichlorofluoromethane (R11)                               | 275-6600                   |
| 51H             | 1,1,1-Trichloro-2,2,2-trifluoroethane (R113a)              | 200-4800                   |
| 51              | 1,1,2-Trichloro-1,2,2-trifluoroethane (R113)               | 10-400                     |
| 51              | 1,1-Dichloro-1-fluoroethane (R141b)                        | 10-1000                    |
| 51              | 2,2-Dichloro-1,1,1-trifluoroethane (R123)                  | 14-1600                    |
| 51              | Dichloropentafluoropropane (R225)                          | 20-800                     |
| 51              | Chlorodifluoromethane (R22)                                | 25-1000                    |
| 51              | Dichlorodifluoromethane (R12)                              | 11-440                     |
| 51              | 1,2-Dichloro-1,1,2,2-tetrafluoroethane (R114)              | 20-800                     |
| 51              | Enflurane                                                  | 20-1200                    |
| 51              | Halothane                                                  | 240-960                    |
| 51              | Methyl chloride                                            | 12-480                     |
| 51              | 1,1,2,2-Tetrachloro-1,2-difluoroethane (R112)              | 7-280                      |
| 51              | Trichlorofluoromethane (R11)                               | 8-320                      |
| 51              | 1,1,1-Trichloro-2,2,2-trifluoroethane (R113a)              | 10-400                     |
| 51              | 2-Chloro-1,1,1,2-tetrafluoroethane (R124)                  | 45-1800                    |
| 51L             | 1,1,2-Trichloro-1,2,2-trifluoroethane (R113)               | 1-54                       |
| 51L             | Chlorodifluoromethane (R22)                                | 2.5-135                    |
| 51L             | Dichlorodifluoromethane (R12)                              | 1.8-97.2                   |
| 51L             | 1,1-Dichloro-1-fluoroethane (R141b)                        | 1.1-22                     |
| 51L             | 1,2-Dichloro-1,1,2,2-tetrafluoroethane (R114)              | 1.8-97.2                   |
| 51L             | 2,2-Dichloro-1,1,1-trifluoroethane (R123)                  | 1.4-28                     |
| 51L             | Dichloropentafluoropropane (R225)                          | 1.4-28                     |
| 51L             | Enflurane                                                  | 25-145                     |
| 51L             | Halotane                                                   | 3-60                       |
| 51L             | Methyl chloride                                            | 1.6-86.4                   |
| 51L             | Methylene chloride                                         | 1-54                       |
| 51L             | 1,1,2,2-Tetrachloro-1,2-difluoroethane (R112)              | 1-54                       |
| 51L             | Trichlorofluoromethane (R11)                               | 0.8-43.2                   |
| 51L             | 1,1,1-Trichloro-2,2,2-trifluoroethane (R113a)              | 0.8-43.2                   |
| 52              | 1-Nitropropane                                             | 4.2-252                    |
| 52              | 2-Nitropropane                                             | 3.7-222                    |
| 52              | Acetonitrile                                               | 3-180                      |
| 52              | Nitrogen dioxide                                           | 0.5-30                     |
| 52              | Nitroethane                                                | 4-240                      |
| 52              | Nitromethane                                               | 5-300                      |
| 53              | Dimethyl sulphide                                          | 0.25-10                    |
| 53              | Dimethyl disulphide                                        | 0.3-6                      |
| 60              | Phenol                                                     | 0.4-187                    |
| 60              | Napthalene                                                 | 0.5-14                     |
| 61              | o-Cresol                                                   | 0.4-62.5                   |
| 61              | m-Cresol                                                   | 1-25                       |
| 61              | p-Cresol                                                   | 1-25                       |
| 70              | Mercaptans                                                 | 0.5-120                    |
| 70L             |                                                            | 0.1-8                      |
| 70              | Ethyl mercaptan                                            | 0.5-120                    |
| 70              | Isopropyl mercaptan                                        | 10-240                     |
| 70              | Methyl mercaptan                                           | 0.35-84                    |
| 70              | Propyl mercaptan                                           | 22.5-540                   |
| 70L             | Butyl mercaptan                                            | 0.16-12.8                  |
| 70L             | tert-Butyl mercaptan                                       | 0.1-8                      |
| 70L             | Ethyl mercaptan                                            | 0.1-8                      |
| 70L             | Methyl mercaptan                                           | 0.1-8                      |
| 70L             | Propyl mercaptan                                           | 0.12-9.6                   |
| 71H             | Methyl mercaptan                                           | 20-2700                    |
| 71              |                                                            | 0.25-140                   |
| 71H             | Ethyl mercaptan                                            | 100-3800                   |

| Gastec Tube No. | Gas or Vapour to be Measured                   | Measuring Range (ppm)    |
|-----------------|------------------------------------------------|--------------------------|
| 72              | Ethyl mercaptan                                | 0.5-120                  |
| 72L             | Ethyl mercaptan                                | 0.2-75                   |
| 75              | tert-Butyl mercaptan                           | 2.5-150mg/m <sup>3</sup> |
| 75L             | tert-Butyl mercaptan                           | 0.5-30mg/m <sup>3</sup>  |
| 75L             | 2-Mercaptoethanol                              | 0.5-7.5                  |
| 76H             | Tetrahydrothiophene                            | 10-200                   |
| 76M             |                                                | 10-100mg/m <sup>3</sup>  |
| 76              |                                                | 1-10                     |
| 77              | TBM,DMS                                        | 1-15mg/m <sup>3</sup>    |
| 80              | Acid gases                                     | 1-80                     |
| 80              | Chlorine                                       | 0.7-14                   |
| 80              | Hydrogen chloride                              | 8-160                    |
| 80              | Iodine                                         | 0.12-2.4                 |
| 80              | Nitric acid                                    | 5-100                    |
| 80              | Nitrogen dioxide                               | 0.2-4                    |
| 80              | Sulphur dioxide                                | 1.5-30                   |
| 81              | Acetic acid                                    | 1-100                    |
| 81L             |                                                | 0.125-25.0               |
| 81              | Acetic anhydride                               | 0.6-15                   |
| 81              | Acrylic acid                                   | 2-50                     |
| 81              | Formic acid                                    | 5.2-130                  |
| 81              | Isovaleric acid                                | 2-50                     |
| 81              | Maleic anhydride                               | 0.8-20                   |
| 81              | Methacrylic acid                               | 1.8-45                   |
| 81              | Propionic acid                                 | 3-75                     |
| 81L             | Acetic anhydride                               | 0.15-6                   |
| 81L             | Acrylic acid                                   | 0.45-18                  |
| 81L             | Butyric acid                                   | 0.325-13                 |
| 81L             | Formic acid                                    | 0.5-20                   |
| 81L             | Isovaleric acid                                | 0.38-15                  |
| 81L             | Methacrylic acid                               | 0.35-14                  |
| 81L             | Propionic acid                                 | 0.25-10                  |
| 81L             | Valeric acid                                   | 0.38-15                  |
| 81D             | Acetic acid (Dosi tube)                        | 0.5-100                  |
| 81D             | Acetic anhydride (Dosi tube)                   | 0.3-60                   |
| 81D             | Formic acid (Dosi tube)                        | 0.55-110                 |
| 91M             | Formaldehyde                                   | 8-6400                   |
| 91              |                                                | 2-100                    |
| 91L             |                                                | 0.1-40                   |
| 91LL            |                                                | 0.05-1                   |
| 91L             | Benzaldehyde                                   | 4-92                     |
| 91L             | Cyclohexanone                                  | 10-470                   |
| 91L             | Diisobutyl ketone                              | 0.58-29                  |
| 91L             | Methaldehyde                                   | 0.065-3.25               |
| 91L             | Propionaldehyde                                | 0.76-38                  |
| 91P             | Formaldehyde (for Automatic Air Sampling Pump) | 0.02-1.44                |
| 91PL            |                                                | 0.01-0.80                |
| 91TP            |                                                | 0.01-1.75                |
| 91D             | Formaldehyde (Dosi tube)                       | 0.1-20                   |
| 91D             | Acetaldehyde (Dosi tube)                       | 0.1-20                   |
| 91D             | Furfural (Dosi tube)                           | 0.3-60                   |
| 91D             | Methyl ethyl ketone (Dosi tube)                | 0.125-25                 |
| 92              | Acetaldehyde                                   | 5-750                    |
| 92M             |                                                | 2.5-100                  |
| 92L             |                                                | 1-20                     |
| 92              | Diacetyl                                       | 25-1500                  |
| 93              | Acrolein                                       | 3.3-800                  |
| 100A            | LPG (Liquified petroleum gas)                  | 0.02-0.8%                |
| 100A            | Olefines                                       | 0.34-13.6%               |
| 100A            | Propylene                                      | 0.02-0.8%                |
| 100A            | Xylene                                         | 0.1-1.2%                 |
| 100B            | Propane (Injection tube)                       | 0.1-2%                   |
| 101             | Gasoline (Petrol)                              | 0.015-1.2%               |
| 101L            |                                                | 30-2000                  |
| 101             | Heptane                                        | 0.015-1.2%               |
| 101             | Isooctane                                      | 0.027-0.54%              |
| 101             | Octane                                         | 0.036-0.72%              |
| 101L            | Allyl chloride                                 | 0.1-3.4%                 |

| Gastec Tube No. | Gas or Vapour to be Measured                        | Measuring Range (ppm)    |
|-----------------|-----------------------------------------------------|--------------------------|
| 101L            | Heptane                                             | 30-2000                  |
| 101L            | Isobutene                                           | 0.07-2.2%                |
| 102H            | Hexane                                              | 0.015-1.2%               |
| 102L            | Hexane                                              | 4-1200                   |
| 102H            | Cyclohexane                                         | 0.015-1.2%               |
| 102H            | Methylcyclohexane                                   | 0.04-0.84%               |
| 102L            | Acrylonitrile                                       | 600-14400                |
| 102L            | Chlorocyclohexane                                   | 50-1200                  |
| 102L            | Cyclohexane                                         | 60-1440                  |
| 102L            | Diisobutyl ketone                                   | 0.2-1%                   |
| 102L            | tert-Butyl alcohol                                  | 500-12000                |
| 102TP           | Hexane (for Automatic Air Sampling Pump)            | 2-80                     |
| 103             | Hydrocarbons (Lower class)                          | 0.05-2.4%                |
| 103             | Acetylene                                           | 0.075-3.6%               |
| 103             | Butane                                              | 0.035-1.68%              |
| 103             | Ethylene                                            | 0.35-16.8%               |
| 103             | Heptane                                             | 0.035-1.68%              |
| 103             | Isobutane                                           | 0.035-1.68%              |
| 103             | Isopentane                                          | 0.045-2.16%              |
| 103             | Hexane                                              | 0.025-1.2%               |
| 103             | Pentane                                             | 0.0375-1.8%              |
| 103             | Propane                                             | 0.05-2.4%                |
| 104             | Butane                                              | 25-1400                  |
| 104             | Isobutane                                           | 55-3080                  |
| 104             | Pentane                                             | 30-1680                  |
| 105             | Hydrocarbons (Higher class)                         | 100-3000                 |
| 105             | Heptane                                             | 90-2700                  |
| 105             | Hexane                                              | 80-2400                  |
| 105             | Nonane                                              | 130-3900                 |
| 105             | Octane                                              | 100-3000                 |
| 105             | Decane                                              | 200-6000                 |
| 106             | Petroleum naphtha                                   | 0.5-28mg/L               |
| 106             | Petroleum benzine                                   | 0.5-28mg/L               |
| 106             | Petroleum ether                                     | 0.5-28mg/L               |
| 107             | Unknown Gases                                       | Qualitative              |
| 108             | Kerosene,Gasoline                                   | Qualitative              |
| 109AD           | Oil mist (Airtec tube)                              | 0.2-5mg/m <sup>3</sup>   |
| 109A            |                                                     | 0.3-1.5mg/m <sup>3</sup> |
| 111             | Methanol                                            | 0.002-4.5%               |
| 111L            |                                                     | 20-1000                  |
| 111LL           |                                                     | 2-56                     |
| 111L            | Ethylene chlorohydrin                               | 80-200                   |
| 111TP           | Methanol (for Automatic Air Sampling Pump)          | 20-300                   |
| 112             | Ethanol                                             | 0.01-7.5%                |
| 112L            |                                                     | 50-2000                  |
| 112D            | Ethanol (Dosi tube)                                 | 100-25000                |
| 113             | Isopropyl alcohol                                   | 0.02-5.0%                |
| 113L            |                                                     | 20-800                   |
| 113LL           |                                                     | 20-460                   |
| 113             | Propyl alcohol                                      | 0.04-2.5%                |
| 113L            | Divinyl methoxysilane                               | 6.5-25.0                 |
| 113L            | Ethylene glycol monobutyl ether                     | 200-1000                 |
| 113L            | Ethylene glycol monoethyl ether                     | 110-1000                 |
| 113L            | Ethylene glycol monomethyl ether                    | 75-760                   |
| 113L            | Ethylene glycol monomethyl ether acetate            | 300-1300                 |
| 113L            | Propyl alcohol                                      | 130-560                  |
| 113L            | Vinyl trimethoxysilane                              | 6.5-25.0                 |
| 113LL           | Ethylene glycol monobutyl ether                     | 60-400                   |
| 113LL           | Ethylene glycol monoethyl ether                     | 46-460                   |
| 113LL           | Ethylene glycol monomethyl ether                    | 44-440                   |
| 113LL           | 1-Methoxy-2-propanol                                | 26-260                   |
| 113LL           | Propyl alcohol                                      | 55-170                   |
| 113TP           | Isopropyl alcohol (for Automatic Air Sampling Pump) | 20-400                   |
| 114             | 1-Butanol                                           | 10-150                   |
| 115             | 2-Butanol                                           | 5-150                    |
| 116             | Isobutyl alcohol                                    | 10-150                   |
| 117             | Isoamyl alcohol                                     | 5-300                    |
| 118             | Cyclohexanol                                        | 5-100                    |

| Gastec Tube No. | Gas or Vapour to be Measured                        | Measuring Range (ppm)      |
|-----------------|-----------------------------------------------------|----------------------------|
| 119             | Methylcyclohexanol                                  | 5-100                      |
| 120             | Aromatic hydrocarbons                               | 0.4-200                    |
| 121S            | Benzene                                             | 2-312                      |
| 121             |                                                     | 2.5-120                    |
| 121SL           |                                                     | 1-100                      |
| 121L            |                                                     | 0.1-65                     |
| 121SP           | Diisobutylene                                       | 0.2-66                     |
| 121             |                                                     | 45-540                     |
| 121             | α -Pinene                                           | 95-1140                    |
| 121L            | Methylene iodide                                    | 0.22-22                    |
| 121L            | Methyl iodide                                       | 0.32-32                    |
| 121P            | Benzene (for Automatic Air Sampling Pump)           | 250-3000μg/m <sup>3</sup>  |
| 122             | Toluene                                             | 5-690                      |
| 122L            |                                                     | 1-100                      |
| 122             | Ethyl benzene                                       | 11-330                     |
| 122L            | Cumene                                              | 2-100                      |
| 122L            | Diethyl benzene                                     | 2-150                      |
| 122L            | Ethyl benzene                                       | 1-70                       |
| 122L            | Xylene                                              | 2-200                      |
| 122P            | Toluene (for Automatic Air Sampling Pump)           | 100-7000μg/m <sup>3</sup>  |
| 122TP           | Ethyl benzene (for Automatic Air Sampling Pump)     | 2-80                       |
| 122P            |                                                     | 110-2750μg/m <sup>3</sup>  |
| 122P            | Xylene (for Automatic Air Sampling Pump)            | 540-13500μg/m <sup>3</sup> |
| 122DL           | Toluene (Dosi tube)                                 | 2-500                      |
| 122DL           | Benzene (Dosi tube)                                 | 2.4-600                    |
| 122DL           | Cumene (Dosi tube)                                  | 3.4-850                    |
| 122DL           | Ethyl benzene (Dosi tube)                           | 2.8-700                    |
| 122DL           | Xylene (Dosi tube)                                  | 3.4-850                    |
| 122DL           | Styrene (Dosi tube)                                 | 26-6500                    |
| 123             | Xylene                                              | 5-625                      |
| 123L            |                                                     | 2-200                      |
| 123             | Trimethyl benzene                                   | 10-300                     |
| 123TP           | Xylene (for Automatic Air Sampling Pump)            | 2-80                       |
| 124             | Styrene                                             | 10-1500                    |
| 124L            |                                                     | 2-100                      |
| 124L            | Divinyl benzene                                     | 1-15                       |
| 126             | Chlorobenzene                                       | 2-500                      |
| 126L            |                                                     | 0.5-43                     |
| 127             | o-Dichlorobenzene                                   | 2.5-300                    |
| 127             | m-Dichlorobenzene                                   | 2.5-300                    |
| 127             | p-Dichlorobenzene                                   | 2.5-300                    |
| 127P            | p-Dichlorobenzene (for Automatic Air Sampling Pump) | 100-3000μg/m <sup>3</sup>  |
| 128             | Stoddard solvent                                    | 50-8000mg/m <sup>3</sup>   |
| 130L            | Vinylidene chloride                                 | 0.4-40.6                   |
| 131             | Vinyl chloride                                      | 0.025-2%                   |
| 131La           |                                                     | 0.25-54                    |
| 131L            |                                                     | 0.1-6.6                    |
| 131LB           | 1,1,2,2-Tetrachloroethane                           | 0.25-70                    |
| 131L            |                                                     | 2-30                       |
| 131L            | Allyl chloride                                      | 3.2-48                     |
| 131La           | 1,3-Dichloropropene                                 | 0.5-10                     |
| 131La           | 1,2,4-Trichlorobenzene                              | 0.65-13                    |
| 131La           | 2-Methyl allyl chloride                             | 2.8-55                     |
| 131La           | Ethyl chloroformate                                 | 7-140                      |
| 131La           | Methyl chloroformate                                | 58-1160                    |
| 131La           | p-Ethyl benzylchloride                              | 2.5-50                     |
| 131La           | Propylene dichloride                                | 40-800                     |
| 131P            | Vinyl chloride(for Automatic Air Sampling Pump)     | 50-1500μg/m <sup>3</sup>   |
| 131TP           |                                                     | 0.2-9.6                    |
| 132HH           | Trichloroethylene                                   | 0.05-2.5%                  |
| 132HA           |                                                     | 20-1300                    |
| 132M            |                                                     | 2-250                      |
| 132L            |                                                     | 1-70                       |
| 132LL           | Tetrachloroethylene                                 | 0.125-8.8                  |
| 132HH           |                                                     | 0.075-1.5%                 |
| 132HA           | 1,2-Dichloroethylene                                | 80-800                     |
| 132HA           | 1,3-Dichloropropene                                 | 45-450                     |
| 132L            | Benzyl chloride                                     | 1.6-20                     |

| Gastec Tube No. | Gas or Vapour to be Measured                          | Measuring Range (ppm)          |
|-----------------|-------------------------------------------------------|--------------------------------|
| 132LL           | 1,2-Dichloroethylene                                  | 0.375-6                        |
| 132LL           | Dichlorvos                                            | 0.11-1.8                       |
| 132P            | Trichloroethylene (for Automatic Air Sampling Pump)   | 20-1200 $\mu$ g/m <sup>3</sup> |
| 132TP           |                                                       | 1-33                           |
| 132D            | Trichloroethylene (Dosi tube)                         | 3-300                          |
| 132D            | Chlorine (Dosi tube)                                  | 2.4-240                        |
| 132D            | 1,2-Dichloroethylene (Dosi tube)                      | 6-600                          |
| 132D            | Hydrogen chloride (Dosi tube)                         | 1.8-180                        |
| 132D            | Tetrachloroethylene (Dosi tube)                       | 1.5-150                        |
| 133HA           | Tetrachloroethylene                                   | 7-900                          |
| 133M            |                                                       | 2-250                          |
| 133L            |                                                       | 1-75                           |
| 133LL           |                                                       | 0.1-9                          |
| 133L            | Pentachloroethane                                     | 40-500                         |
| 133P            | Tetrachloroethylene (for Automatic Air Sampling Pump) | 20-720 $\mu$ g/m <sup>3</sup>  |
| 133TP           |                                                       | 5-80                           |
| 133D            | Tetrachloroethylene (Dosi tube)                       | 3-150                          |
| 134             | Carbon tetrachloride                                  | 0.5-60                         |
| 134L            |                                                       | 0.25-12                        |
| 134             | Chloropicrin                                          | 2.5-60                         |
| 134L            | Chloropicrin                                          | 0.125-2.5                      |
| 135             | 1,1,1-Trichloroethane(Methyl chloroform)              | 100-2000                       |
| 135L            |                                                       | 6-900                          |
| 135             | 1,1,2-Trichloroethane                                 | 220-750                        |
| 135             | 1,1-Dichloroethane                                    | 90-450                         |
| 135             | Chlorobromomethane                                    | 22-110                         |
| 135             | Ethylene dichloride                                   | 400-2000                       |
| 135L            | 1,1,2,2-Tetrabromoethane                              | 0.92-9.2                       |
| 135L            | 1,2,3-Trichloropropane                                | 36-360                         |
| 135L            | Ethylene dichloride                                   | 104-1040                       |
| 136H            | Methyl bromide                                        | 10-600                         |
| 136L            |                                                       | 2.5-200                        |
| 136LA           |                                                       | 1-36                           |
| 136LL           |                                                       | 0.1-3.0                        |
| 136H            | n-Butyl bromide                                       | 24-360                         |
| 136H            | Chloro bromomethane                                   | 18-270                         |
| 136H            | Ethylene dibromide                                    | 14-210                         |
| 136L            | 1,1-Dibromoethane                                     | 7-70                           |
| 136L            | Benzyl bromide                                        | 10-100                         |
| 136L            | Bromoform                                             | 1-50                           |
| 136L            | n-Butyl bromide                                       | 10-100                         |
| 136L            | Chlorobromomethane                                    | 11-110                         |
| 136L            | Dibromomethane                                        | 5-50                           |
| 136L            | Ethyl bromide                                         | 2.5-200                        |
| 136L            | Ethylene dibromide                                    | 8-80                           |
| 136LA           | n-Butyl bromide                                       | 1-43.2                         |
| 136LA           | n-Propyl bromide                                      | 1-18                           |
| 136LA           | Chloro bromomethane                                   | 0.7-12.6                       |
| 137             | Chloroform                                            | 4-400                          |
| 137LA           |                                                       | 0.5-30                         |
| 137LL           |                                                       | 0.3-4.5                        |
| 138             | Methylene chloride                                    | 20-500                         |
| 138L            |                                                       | 4-150                          |
| 138             | Ethyl chloride                                        | 15-150                         |
| 139             | 1,2-Dichloroethylene                                  | 5-250                          |
| 140             | Aliphatic hydrocarbons                                | 6-3000                         |
| 141             | Ethyl acetate                                         | 0.1-1.5%                       |
| 141L            |                                                       | 20-800                         |
| 141             | Vinyl acetate                                         | 0.06-0.9%                      |
| 141L            | 2-Hexyl alcohol                                       | 60-2400                        |
| 141L            | Cymene                                                | 5.6-224                        |
| 141L            | Diisopropyl benzene                                   | 10-400                         |
| 141L            | Ethyl acrylate                                        | 8-320                          |
| 141L            | Isopropyl ether                                       | 18-720                         |
| 141L            | Mesityl oxide                                         | 27-1080                        |
| 141L            | Methyl acrylate                                       | 8-320                          |
| 141L            | Methyl isothiocyanate                                 | 50-400                         |
| 142             | Butyl acetate                                         | 0.05-0.8%                      |

| Gastec Tube No. | Gas or Vapour to be Measured                          | Measuring Range (ppm)   |
|-----------------|-------------------------------------------------------|-------------------------|
| 142L            | Butyl acetate                                         | 10-300                  |
| 142L            | Butyl acrylate                                        | 7-210                   |
| 142L            | Isobutyl acrylate                                     | 2.6-78                  |
| 143             | Vinyl acetate                                         | 5-250                   |
| 144             | Isobutyl acetate                                      | 10-300                  |
| 145             | Propyl acetate                                        | 20-500                  |
| 146             | Isopropyl acetate                                     | 10-500                  |
| 147             | n-Amyl acetate                                        | 10-200                  |
| 148             | Isoamyl acetate                                       | 10-200                  |
| 149             | Methyl methacrylate                                   | 10-500                  |
| 149             | Allyl Isothiocyanate                                  | 5-200                   |
| 151             | Acetone                                               | 0.05-2.0%               |
| 151L            |                                                       | 50-12000                |
| 151             | Cyclohexene                                           | 0.05-0.8%               |
| 151L            | Methyl ethyl ketone                                   | 21-1680                 |
| 151L            | Propionaldehyde                                       | 24-1880                 |
| 151TP           | Acetone (for Automatic Air Sampling Pump)             | 25-800                  |
| 151D            | Acetone (Dosi tube)                                   | 5-1500                  |
| 151D            | Acetaldehyde (Dosi tube)                              | 4-1200                  |
| 151D            | Methyl ethyl ketone (Dosi tube)                       | 6.5-1950                |
| 151D            | Methyl isobutyl ketone (Dosi tube)                    | 11.5-3450               |
| 152             | Methyl ethyl ketone                                   | 0.02-0.6%               |
| 152L            |                                                       | 10-384                  |
| 152TP           | Methyl ethyl ketone (for Automatic Air Sampling Pump) | 20-300                  |
| 152D            | Methy ethyl ketone (Dosi tube)                        | 2-600                   |
| 152D            | Acetaldehyde (Dosi tube)                              | 1.2-360                 |
| 152D            | Acetone (Dosi tube)                                   | 1.4-420                 |
| 152D            | Methyl isobutyl ketone (Dosi tube)                    | 4-1200                  |
| 153             | Methyl isobutyl ketone                                | 0.05-0.6%               |
| 153L            |                                                       | 2.5-130                 |
| 153             | Styrene                                               | 0.075-0.9%              |
| 154             | Cyclohexanone                                         | 2-75                    |
| 154             | Diacetone alcohol                                     | 2.5-100                 |
| 154             | Furfural                                              | 2-30                    |
| 154             | Isophorone                                            | 2-30                    |
| 155             | Methylcyclohexanone                                   | 2-100                   |
| 159             | Tetrahydrofuran                                       | 20-800                  |
| 159L            |                                                       | 5-232                   |
| 159             | 1,4-Dioxane                                           | 25-140                  |
| 161             | Ethyl ether                                           | 0.04-1.0%               |
| 161L            |                                                       | 10-1200                 |
| 161             | Isopropyl ether                                       | 0.018-0.45%             |
| 161             | Methyl ether                                          | 0.03-0.85%              |
| 161             | Tetrahydrofuran                                       | 0.056-1.4%              |
| 161             | Toluene                                               | 0.02-0.8%               |
| 163             | Ethylene oxide                                        | 0.05-3.0%               |
| 163L            |                                                       | 0.4-350                 |
| 163LL           |                                                       | 0.1-10                  |
| 163             | 1,4-Dioxane                                           | 0.1-6.0%                |
| 163             | Propylene oxide                                       | 0.065-3.9%              |
| 163L            | Epichlorohydrin                                       | 1.2-120                 |
| 163L            | Propylene oxide                                       | 1-100                   |
| 163TPM          | Ethylene oxide (for Automatic Air Sampling Pump)      | 1-50                    |
| 163TP           |                                                       | 0.1-5                   |
| 165L            | Ethylene glycol                                       | 10-100mg/m <sup>3</sup> |
| 171             | Acetylene                                             | 0.05-4.0%               |
| 171             | Benzene                                               | 0.03-0.6%               |
| 171             | Ethylene                                              | 0.1-2.0%                |
| 171             | 1,1,1-Trichloroethane                                 | 0.06-1.2%               |
| 172             | Ethylene                                              | 25-1680                 |
| 172L            |                                                       | 0.2-100                 |
| 172             | Acetylene                                             | 32.5-1040               |
| 174             | 1,3-Butadiene                                         | 50-800                  |
| 174L            |                                                       | 2.5-100                 |
| 174LL           |                                                       | 0.5-5                   |
| 174             | 1,3-Pentadiene                                        | 250-4000                |
| 174L            | 1,3-Pentadiene                                        | 42.5-850                |
| 174D            | 1,3-Butadiene (Dosi tube)                             | 1.3-200                 |

| Gastec Tube No. | Gas or Vapour to be Measured           | Measuring Range (ppm) |
|-----------------|----------------------------------------|-----------------------|
| 174D            | Ethylene (Dosi tube)                   | 1.5-240               |
| 174D            | Isoprene (Dosi tube)                   | 2.5-400               |
| 174D            | trans-1,2-Dichloroethylene (Dosi tube) | 3.8-600               |
| 174D            | Vinyl chloride (Dosi tube)             | 1.5-240               |
| 180             | Amines                                 | 5-100                 |
| 180L            |                                        | 0.5-10                |
| 180             | Allyl amine                            | 8.5-170               |
| 180             | Ammonia                                | 1.5-30                |
| 180             | Butylamine                             | 8-160                 |
| 180             | tert-Butylamine                        | 5.5-110               |
| 180             | Di-n-Butylamine                        | 5-100                 |
| 180             | Cyclohexylamine                        | 7-140                 |
| 180             | Diethylamine                           | 5.5-110               |
| 180             | Diethylethanamine                      | 6-120                 |
| 180             | Diisopropylamine                       | 5-100                 |
| 180             | Dimethyl ethanolamine                  | 6.5-130               |
| 180             | Dimethylamine                          | 5.5-110               |
| 180             | Dimethylaminopropylamine               | 8-160                 |
| 180             | Dipropylamine                          | 4-80                  |
| 180             | N,N-Dimethylethylamine                 | 4-80                  |
| 180             | N-Ethyl morpholine                     | 5-100                 |
| 180             | Ethylamine                             | 5-100                 |
| 180             | Ethylenediamine                        | 14-280                |
| 180             | Hexylamine                             | 9-180                 |
| 180             | Isopropyl amine                        | 5.5-110               |
| 180             | Methylamine                            | 5-100                 |
| 180             | N-Methyl morpholine                    | 5-100                 |
| 180             | N-Methyl pyrrolidone                   | 13.5-270              |
| 180             | Monoethanolamine                       | 7-140                 |
| 180             | Morpholine                             | 9-180                 |
| 180             | Propylamine                            | 6-120                 |
| 180             | Propylene imine                        | 5.5-110               |
| 180             | Tetramethylenediamine                  | 8.5-170               |
| 180             | Triethylamine                          | 4.5-90                |
| 180             | Trimethylamine                         | 3.5-70                |
| 180L            | Allyl amine                            | 0.4-8                 |
| 180L            | Butylamine                             | 0.55-11               |
| 180L            | Cyclohexylamine                        | 0.5-10                |
| 180L            | Di-n-butylamine                        | 0.4-8                 |
| 180L            | Diethylamine                           | 0.45-9                |
| 180L            | Diethylaminoethanol                    | 0.6-12                |
| 180L            | Diethylenetriamine                     | 0.95-19               |
| 180L            | Diisopropylamine                       | 0.3-6                 |
| 180L            | Dimethylamine                          | 0.45-9                |
| 180L            | 2-Dimethylaminoethanol                 | 0.65-13               |
| 180L            | Dimethylaminopropylamine               | 0.6-12                |
| 180L            | N,N-Dimethylethylamine                 | 0.3-6                 |
| 180L            | Dipropylamine                          | 0.35-7                |
| 180L            | Ethanolamine                           | 1.95-39               |
| 180L            | Ethylamine                             | 0.45-9                |
| 180L            | Ethylenediamine                        | 0.9-18                |
| 180L            | N-Ethyl morpholine                     | 0.3-6                 |
| 180L            | Hexamethylenediamine                   | 1.55-31               |
| 180L            | Hexylamine                             | 0.65-13               |
| 180L            | Isopropylamine                         | 0.45-9                |
| 180L            | Methylamine                            | 0.5-10                |
| 180L            | Morpholine                             | 0.5-10                |
| 180L            | N-Methyl morpholine                    | 0.3-6                 |
| 180L            | Pentamethylenediamine                  | 0.75-15               |
| 180L            | Propylamine                            | 0.5-10                |
| 180L            | Propylene imine                        | 0.35-7                |
| 180L            | Tetramethylenediamine                  | 0.8-16                |
| 180L            | Triethylamine                          | 0.3-6                 |
| 180L            | Trimethylamine                         | 0.25-5                |
| 181             | Aniline                                | 1.25-60               |
| 181             | N,N-Dimethylaniline                    | 2.5-30                |
| 181             | N-Methyl aniline                       | 3.5-42                |
| 181             | o-Toluidine                            | 5-60                  |

| Gastec Tube No. | Gas or Vapour to be Measured                   | Measuring Range (ppm) |
|-----------------|------------------------------------------------|-----------------------|
| 182             | Pyridine                                       | 0.2-35                |
| 182             | 4-Methyl pyridine                              | 0.38-10.5             |
| 183             | N,N-Dimethyl formamide                         | 0.8-90                |
| 184             | N,N-Dimethyl acetamide                         | 1.5-240               |
| 185             | Hydrazine                                      | 0.05-2                |
| 185             | Dimethylhydrazine                              | 0.1-2                 |
| 185             | Methyl hydrazine                               | 0.6-12                |
| 191             | Acrylonitrile                                  | 2-360                 |
| 191L            |                                                | 0.1-18                |
| 191             | Propionitrile                                  | 50-1200               |
| 191L            | 2-Methyl-3-butenenitrile                       | 0.4-12                |
| 191L            | 2-Pentenitrile                                 | 0.24-7.2              |
| 191L            | 3-Pentenitrile                                 | 0.4-12                |
| 191L            | Butyronitrile                                  | 6-180                 |
| 191TP           | Acrylonitrile(for Automatic Air Sampling Pump) | 0.2-12.6              |
| 192             | Methacrylonitrile                              | 0.2-32                |
| 193             | 2-Pentenitrile                                 | 0.5-15                |
| 211H            | Sulphide ion in solution                       | 10-1000               |
| 211M            |                                                | 2-300                 |
| 211             |                                                | 1-100                 |
| 211LL           |                                                | 0.5-20                |
| 218             | Ozone in solution                              | 1-10mg/L              |
| 221L            | Chloride ion in solution                       | 25-1000mg/L           |
| 221LL           |                                                | 10-200mg/L            |
| 221L            | Bromide ion in solution                        | 55-2200mg/L           |
| 221LL           | Bromide ion in solution                        | 24-480mg/L            |
| 222             | Free residual chlorine                         | 0.1-10mg/L            |
| 230H            | Methyl iodide                                  | 100-34800             |
| 230             |                                                | 0.5-108               |
| 231             | Sulphuryl fluoride                             | 1-20                  |
| 232             | 1,2-Dichloroethane                             | 1-39                  |
| 233             | Chloropicrin                                   | 0.045-22              |
| 271             | Mercury in solution                            | 1-20mg/L              |
| 273             | Chromium( VI )ion in solution                  | 0.5-50mg/L            |
| 281             | Iron ion in solution                           | 5-50mg/L              |
| 284             | Copper ion in solution                         | 1-20mg/L              |
| 285             | Zinc in solution                               | 3-20mg/L              |
| 291             | Nickel in solution                             | 5-50mg/L              |

## ■ About operating environment

Most tubes can be used in the temperature range of 0 -40°C and relative humidity range of 0 -90%. However a few tubes have different temperature range or humidity range. Please refer instruction manuals when use.

## ■ Storage and disposal of Gastec detector tubes

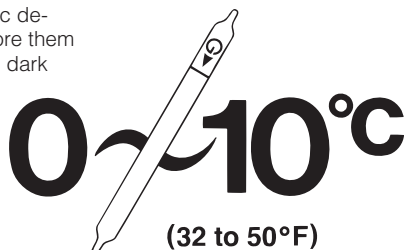
As detector tubes contain sensitive reagents that are ready to react, and some reagents might be corrosive, care should be taken for their storage and disposal.

### ● Storage of detector tubes

To keep the high quality of Gastec detector tubes, it is necessary to store them in a cool (0 to 10°C (32 to 50° F), dark place (never expose them to the direct sunlight). Never store tubes above normal room temperature. Keep them in a safe place and out of reach of children.

### ● Disposal of detector tubes

Used or date-expired detector tubes should be disposed properly in accordance with your local regulations. For further information, consult your Gastec representative.



## ■ Units of concentrations

% (Per cent)

Ratio of the volume of a substance to the volume of its medium expressed in percentage:

$$= \frac{\text{Volume of substance}}{\text{Volume of medium}} \times 100$$

ppm (parts per million)

Ratio of the volume of a substance to the volume of its medium expressed in parts per million:

$$= \frac{\text{Volume of substance}}{\text{Volume of medium}} \times 10^6$$

ppb (parts per billion)

Ratio of the volume of a substance to the volume of its medium expressed in parts per billion:

$$= \frac{\text{Volume of substance}}{\text{Volume of medium}} \times 10^9$$

mg/m<sup>3</sup> (milligrams per cubic metre)

Ratio of the weight of a substance expressed in mg to the volume of its medium of 1 m<sup>3</sup> (1,000L). This unit is mainly used for concentrations of particulate substances, but can also be applied to gases and vapours.

mg/L (milligrams per litre)

Ratio of the weight of a substance expressed in mg to the volume of its medium of 1L. This unit is mainly used for concentrations of particulate substances, but can also be applied to gases and vapours.

LB/MMCF (pounds per million cubic feet)

Ratio of the weight of a substance expressed in LB to the volume of its medium of 1,000,000 cubic feet.

$$1\text{mg/L} = 1000\text{mg/m}^3 = 1358\text{ppm} = 62.3\text{LB/MMCF} \quad (25^\circ\text{C}, 1013\text{hPa})$$

### ● Relations between concentration units

$$\text{ppm} = \% \times 10,000$$

$$\% = \text{ppm} \times 0.0001$$

$$\text{ppb} = \% \times 10,000,000$$

$$\% = \text{ppb} \times 0.0000001$$

$$\text{mg/m}^3 = \text{ppm} \times \frac{M}{22.4} \times \frac{273}{(273+t)} \times \frac{P}{1013}$$

$$\text{ppm} = \text{mg/m}^3 \times \frac{22.4}{M} \times \frac{(273+t)}{273} \times \frac{1013}{P}$$

$$\% = \text{mg/L} \times \frac{22.4}{M} \times \frac{(273+t)}{273} \times \frac{1}{10}$$

$$\text{mg/L} = \% \times \frac{M}{22.4} \times \frac{273}{(273+t)} \times 10$$

Where :

M: Molecular weight

22.4 (L) : Volume of 1 mol at 0°C (32°F) under 1 atmospheric pressure

273 (°K) : °K represents an absolute temperature.  
 $0^\circ\text{C} \div 273^\circ\text{K}$ ,  $t^\circ\text{C} = (273 + t)^\circ\text{K}$

1013 (hPa) : 1 atmospheric pressure in hectopascal

P : Atmospheric pressure at the time of measurement in hectopascal

**Quantity of tubes per box:** 10 tubes each

### Tube No. & Name:

Gastec Detector Tube to be used.

### Measuring Range:

Measuring ranges can be obtained by multiple or half pump strokes taken.

### TLV:

Threshold Limit Value (TLV) for 2014 adopted by American Conference of Governmental Industrial Hygienists (ACGIH).

### TLV-TWA:

Threshold Limit Value-Time Weighted Average -the time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

### TLV-C:

The concentration that should not be exceeded during any part of the working exposure.

### Note:

- T Tubes need a temperature correction factor or table for the true concentration.
- H Tubes need a humidity correction factor or table for the true concentration.
- + Five tests (tubes) per box. Twin tubes to be combined with primary and analyzer tubes.
- ++ Nine tests (tubes) per box.
- M Tube 121SP Benzene tube in the mixture of other Hydrocarbons.
- ⊕ Five tests (tubes) and long size glass detector tube for tube 31B only.

### Shelf Life (year):

Actual shelf life (the term of validity) is printed on the tube box in final inspection process.

### Refrigerated Storage:

\* Tubes to be stored at 10°C (50°F) or below.

### No. of Pump Strokes:

Number in circle means standard pump strokes. One ① stroke of the sampling pump draws a 100ml air sample. One half ①/2 pump strokes draw a 50ml air sample.

### Correction factor/chart:

Mesh means a correction factor or chart for the true concentration which is enclosed with each box of detector tubes.

Detector tubes are primarily designed to measure specific gases. But it is also possible to measure other substances of similar chemical properties with the aid of a correction factor or chart. A correction factor is a figure which is multiplied by the concentration interpreted from the colour starting on the detector tube. The correction may also be presented as a chart on tube if the correction relationship is nonlinear. Therefore, please make use of the correction factor/chart measuring ranges as a reference. Moreover, this factor may vary slightly between production batches. For a more precise factor please contact your Gastec distributor.

### Tube 72P

Tube No.72P works directly off regulated residential LP gas line pressure.

### Warning

1. Use only Gastec detector tubes with a Gastec Pump.
2. Do not interchange or use non-Gastec parts or components in Gastec's detector tube and pump system.
3. The use of non-Gastec parts or components in Gastec's detector tube and pump system or use of a non-Gastec detector tube with a Gastec pump or use of a Gastec detector tube with a non-Gastec pump may result in property damage, serious bodily injury, and death; voids all warranties; and voids all performance and data accuracy guaranties.

