



# GASTEC

## GAS DETECTION SYSTEM

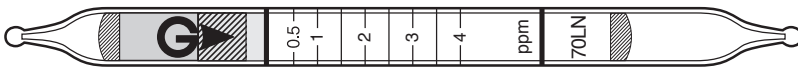
### Detector Tube List

# 25<sup>th</sup>

edition

## NEW tubes

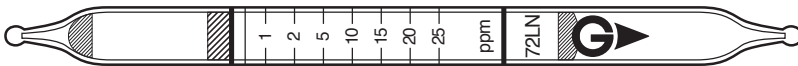
### Mercaptans No.70LN



No.70LN is an improved version of the existing No.70L.  
This environmentally-friendly version does not contain any mercury substances.

|                 |                                   |
|-----------------|-----------------------------------|
| Scale range     | 0.5 - 4 ppm                       |
| Measuring range | 0.1 - 8 ppm                       |
| Colour change   | Yellow → Pink                     |
| Shelf life      | 2 years<br>(Refrigerated storage) |

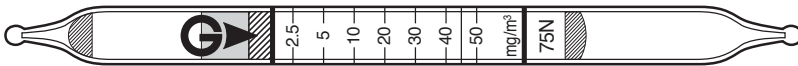
### Ethyl mercaptan No.72LN



No.72LN is an improved version of the existing No.72L.  
This environmentally-friendly version does not contain any mercury substances.

|                 |                 |
|-----------------|-----------------|
| Scale range     | (0.5) - 25 ppm  |
| Measuring range | 0.15 - 57.5 ppm |
| Colour change   | Yellow → Pink   |
| Shelf life      | 2 years         |

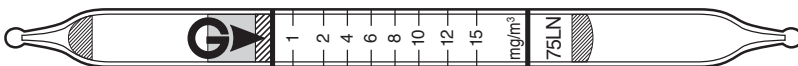
### tert-Butyl mercaptan No.75N



No.75N is an improved version of the existing No.75.  
This environmentally-friendly version does not contain any mercury substances.

|                 |                  |
|-----------------|------------------|
| Scale range     | 2.5 - 50 mg/m³   |
| Measuring range | 1.25 - 250 mg/m³ |
| Colour change   | Yellow → Pink    |
| Shelf life      | 2 years          |

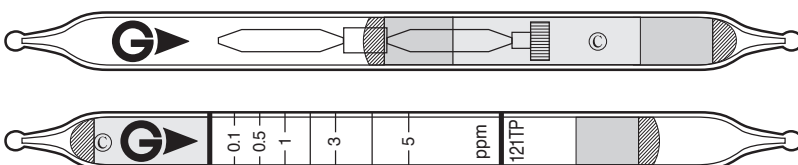
### tert-Butyl mercaptan No.75LN



No.75LN is an improved version of the existing No.75L.  
This environmentally-friendly version does not contain any mercury substances.

|                 |                                   |
|-----------------|-----------------------------------|
| Scale range     | 1 - 15 mg/m³                      |
| Measuring range | 0.5 - 39 mg/m³                    |
| Colour change   | Yellow → Pink                     |
| Shelf life      | 2 years<br>(Refrigerated storage) |

### Benzene No.121TP

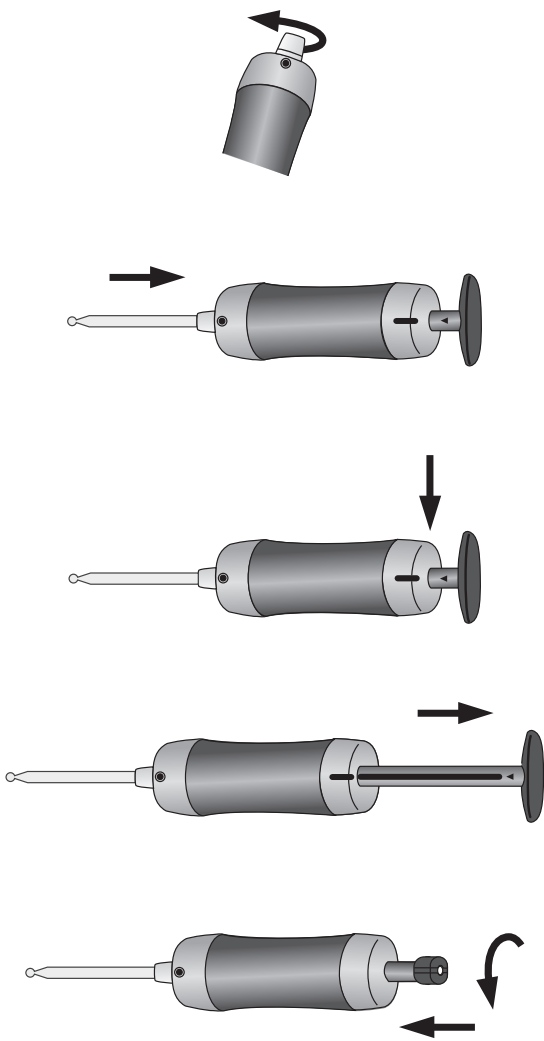


The above tubes need GASTEC automatic air sampling pump Model GSP-300FT-2.

|                 |                |
|-----------------|----------------|
| Scale range     | 0.1 - 5 ppm    |
| Measuring range | 0.1 - 14.5 ppm |
| Colour change   | White → Brown  |
| Shelf life      | 2 years        |

# PREPARATION

## Inspecting the pump model GV-100/110 before measurement (air leak check)



**△ 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.

(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.

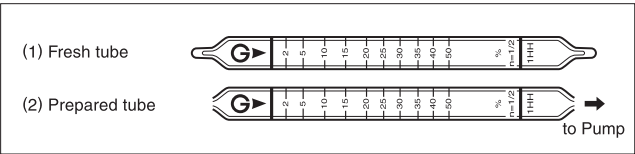
(4) Pull out the handle fully along the red guide line on the pump shaft to the lock position, and wait 1 minute.

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

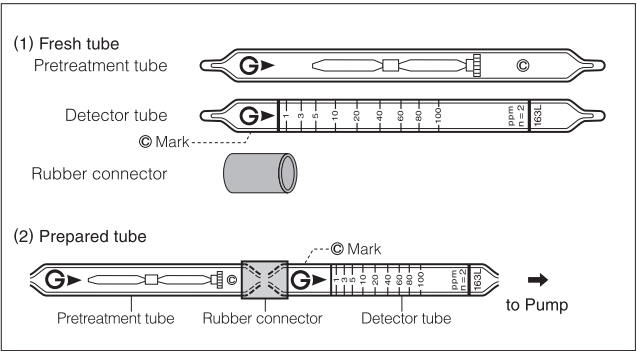
(6) Confirm the handle returns to the initial position and the guide line on the pump shaft is not seen.

### Detector Tube

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

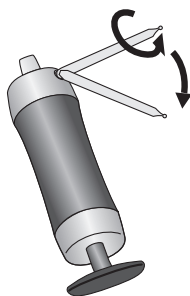


■Twin tube (Example: No.163L Ethylene Oxide)

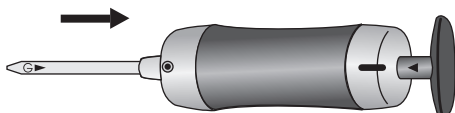


# OPERATION

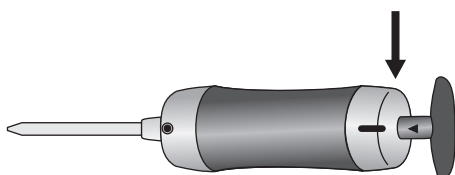
## Simple and accurate measurements with the Gastec standard detector tube system



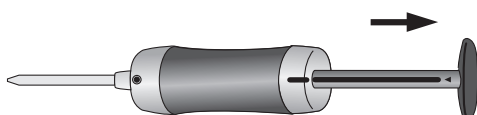
- Insert the detector tube end straight into the tube tip breaker of the Pump.
- Rotate the detector tube so that the diamond cutter of the tube tip breaker scratches the surface of the tube end.
- Hold the detector tube firmly near the tube tip breaker and bend the tube toward you to break the tube tip.



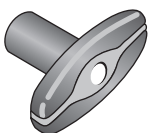
- Confirm the pump handle is fully pushed in (therefore, the guide line on the pump shaft is not seen). Then insert the detector tube into the rubber inlet of the Pump with the arrow (▶) on the tube pointing toward the pump.



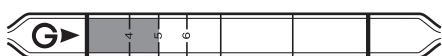
- Align the guide mark (red line) on the back plate and the guide mark (▲100 or ▲50 depending on the detector tube) on the handle.



- 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 following two options.
  - Use the built in flow finish indicator
  - Use handle play function
 For details, see the instruction manual provided with the pump.



### How to read the detector tube

- The end of the colour change layer is 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 is 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 is 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/110S 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                    | Yellowish brown    | Greenish brown        | 3                       | T    | 250                            |
|                                                                   | 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                         | Yellowish brown    | Greenish brown        | 3                       |      |                                |
| Aliphatic hydrocarbons                                            | 140                      | Aliphatic hydrocarbons            | 1000-3000<br>20-1000<br>6-20         | 1/2<br>①<br>2             | Yellow             | Blackish brown        | 2                       | T    |                                |
| 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 yellowish 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 40 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                       | Yellowish brown | Greenish brown                                       | 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 yellowish<br>orange 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            | Greenish gray                                        | 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                              |
| Aromatic hydrocarbons                                                                           | 120              | Aromatic hydrocarbons | 100-200<br>2-100<br>0.4-2                | 1/2<br>①<br>2-5           | White           | Brown                                                | 3                       |      |                                |
| 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                          |
| 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                       | +    |                                |
|                                                                                                 | 121SP            | Benzene               | 20-66<br>0.2-20                          | 1<br>③                    | White           | Brown                                                | 2                       | +M   |                                |
|                                                                                                 | 121L             | Benzene               | 10-65<br>0.1-10                          | 1<br>⑤                    | White           | Dark green                                           | 3                       | +    |                                |
|                                                                                                 | 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                       | +    |                                |

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 40 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    | C 0.7                          |
| 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                         | Yellowish brown | Greenish brown        | 3                       |      | STEL<br>1000 <sup>(EX)</sup>   |
|                                                                                                  | 103                           | Hydrocarbons (Lower class)                                                | 0.84-1.68%                                                                      | 1/2                       | Yellowish brown | Greenish brown        | 2                       | ++   |                                |
|                                                                                                  |                               |                                                                           | 0.07-0.84%<br>0.035-0.07%                                                       | 1<br>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          | Greenish brown        | 3                       | T    | 50                             |
|                                                                                                  | 142L                          | Butyl acetate                                                             | 10-300                                                                          | 2                         | Yellow          | Blackish brown        | 2                       | T    |                                |
| tert-Butyl alcohol<br>(CH <sub>3</sub> ) <sub>3</sub> COH                                        | 102L                          | Hexane                                                                    | 500-12000                                                                       | 2                         | Yellowish brown | Greenish brown        | 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          | Blackish 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 yellowish 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    |                                |
|                                                                                                  |                               |                                                                           |                                                                                 |                           |                 |                       |                         |      |                                |
|                                                                                                  |                               |                                                                           |                                                                                 |                           |                 |                       |                         |      |                                |
|                                                                                                  | 75N                           | tert-Butyl mercaptan                                                      | 50-250mg/m <sup>3</sup><br>2.5-50mg/m <sup>3</sup><br>1.25-2.5mg/m <sup>3</sup> | 1/2<br>①<br>2             | Yellow          | Pink                  | 2                       | TH   |                                |
|                                                                                                  |                               |                                                                           |                                                                                 |                           |                 |                       |                         |      |                                |
|                                                                                                  |                               |                                                                           |                                                                                 |                           |                 |                       |                         |      |                                |
| 75L                                                                                              | tert-Butyl mercaptan          | 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                                                                   | Yellow                    | 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 40 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                                  |                         |      |                                |
| tert-Butyl mercaptan<br>(CH <sub>3</sub> ) <sub>3</sub> CSH                       | 75LN            | tert-Butyl mercaptan             | 15-39mg/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             | Yellow         | Pink                                   | 2 *                     | TH   |                                |
|                                                                                   | 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                       |      |                                |
|                                                                                   | 70LN            | Mercaptans                       | 1-40                                                                      | 1                         | Yellow         | Pink                                   | 2 *                     |      |                                |
|                                                                                   |                 |                                  |                                                                           |                           |                |                                        |                         |      |                                |
| 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 vermilion | Orange                                 | 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<br>(in Hydrogen) | 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    |                                |

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 40 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 monoxide<br>CO                                  | 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                       |      | 25                             |
|                                                        | 1KLC            | 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    |                                |
| Carbon tetrachloride<br>CCl <sub>4</sub>               | 134             | Carbon tetrachloride                               | 2.5-60<br>0.5-2.5                 | ①<br>2-5                  | White              | Yellow                                 | 1 *                     | +    | 5                              |
|                                                        | 134L            | Carbon tetrachloride                               | 5-11<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>Cl <sub>2</sub>                            | 8HH             | Chlorine                                           | 0.5-10%<br>0.25-0.5%              | ①②<br>1                   | Reddish purple     | Yellow                                 | 3                       |      | 0.1                            |
|                                                        | 8H              | Chlorine                                           | 500-1000<br>50-500<br>25-50       | 1/2<br>①<br>2             | White              | Reddish orange                         | 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>ClO <sub>2</sub>                   | 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                       |      | C 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                                           | 45-450                            | 1                         | White              | Reddish orange                         | 3                       |      |                                |
|                                                        | 8La             | Chlorine                                           | 0.3-4.8                           | 1                         | White              | Pale pink                              | 3                       |      |                                |
| Chlorobenzene<br>C <sub>6</sub> H <sub>5</sub> Cl      | 126             | Chlorobenzene                                      | 200-500<br>5-200<br>2-5           | 1/2<br>①<br>2             | White              | Grayish brown                          | 3                       |      | 10                             |
|                                                        | 126L            | Chlorobenzene                                      | 10-43<br>0.5-10                   | 1<br>③                    | Yellow             | Pale bluish purple                     | 2 *                     | T    |                                |
| Chlorobromomethane<br>CH <sub>2</sub> BrCl             | 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>C <sub>6</sub> H <sub>11</sub> Cl | 102L            | Hexane                                             | 50-1200                           | 2                         | Yellowish brown    | Greenish brown                         | 3                       |      |                                |

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| 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                 |                         |      |                                |
| Chlorodifluoromethane (R22)<br>CHClF <sub>2</sub>                           | 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 |                                       |                                      |                           |                 |                       |                         |      |                                |
| 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>                            | 233                       | Chloropicrin                          | 10-22<br>0.1-10<br>0.045-0.1         | 1/2<br>①<br>2             | White           | Yellow                | 1                       | +    | 0.1                            |
|                                                                             | 134                       | Carbon tetrachloride                  | 2.5-60                               | 1                         | White           | Yellow                | 1 *                     | +    |                                |
|                                                                             | 134L                      | Carbon tetrachloride                  | 0.28-5.5                             | 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> (FV)       |
| 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> (FV)       |
| 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> (FV)       |
| 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             | Yellowish brown | Greenish brown        | 3                       |      | 100                            |
|                                                                             | 102L                      | Hexane                                | 60-1440                              | 1                         | Yellowish brown | Greenish brown        | 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                         | Yellowish brown | Greenish brown        | 3                       | T    | 300                            |
| Cyclohexylamine<br>C <sub>6</sub> H <sub>13</sub> N                         | 180                       | Amines                                | 7-140                                | 1                         | Pink            | Pale yellowish orange | 3                       | T    | 10                             |
|                                                                             | 180L                      | Amines                                | 0.5-10                               | 1                         | Pink            | Pale yellowish orange | 2                       | T    |                                |
| Cymene<br>C <sub>10</sub> H <sub>14</sub>                                   | 141L                      | Ethyl acetate                         | 2.4-96                               | 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                       |      |                                |

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P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 40 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                 |                         |      |                                |
| 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 *                     |      | 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                            |
| 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 yellowish 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   |                                |
| 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-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                           |

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 40 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                                                              |                         |      |                                |
| 1,2-Dichloro-1,1,2,2-tetrafluoroethane (R114)<br>CClF <sub>2</sub> CClF <sub>2</sub>                                         | 51                         | Fluorochlorocarbons<br>(Pyrotec tube) | 20-800                      | 1                         | Yellow          | Reddish purple                                                     | 3                       | +P   | 1000                           |
|                                                                                                                              | 51L                        | Fluorochlorocarbons<br>(Pyrotec tube) | 36-97.2<br>1.8-36           | 1<br>2                    | Yellow          | Reddish purple                                                     | 3                       | +P   |                                |
| 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 yellowish 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 yellowish 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 yellowish orange at the end of staining)*1 | 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                       |      |                                |
| Diisobutyl ketone<br>[(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> ] <sub>2</sub> CO                                    | 102L                       | Hexane                                | 0.2-1%                      | 2                         | Yellowish brown | Greenish brown                                                     | 3                       |      | 25                             |
|                                                                                                                              | 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 yellowish 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                         | 16.5-108                    | 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                      | 1                         | Pink            | Pale yellow                                                        | 3                       | T    | 10                             |
|                                                                                                                              |                            |                                       | 5-60                        | ②                         |                 |                                                                    |                         |      |                                |
|                                                                                                                              |                            |                                       | 1.5-5                       | 4                         |                 |                                                                    |                         |      |                                |
| 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            | Pale yellowish orange                                              | 3                       | T    |                                |
|                                                                                                                              | 180L                       | Amines                                | 0.45-9                      | 1                         | Pink            | Pale yellowish orange                                              | 2                       | T    |                                |
| 2-Dimethylaminoethanol<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 yellowish 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 yellowish 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                                                                                                         | See 2-Dimethylaminoethanol |                                       |                             |                           |                 |                                                                    |                         |      |                                |
| 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 yellowish orange                                              | 2                       | T    |                                |
| N,N-Dimethyl formamide<br>HCON(CH <sub>3</sub> ) <sub>2</sub>                                                                | 183                        | N,N-Dimethyl formamide                | 30-90                       | 1/2                       | Pink            | Pale vermilion                                                     | 3                       | T    | 5                              |
|                                                                                                                              |                            |                                       | 2-30                        | ①                         |                 |                                                                    |                         |      |                                |
|                                                                                                                              |                            |                                       | 0.8-2                       | 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 yellowish orange when low concentration  
See page 40 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                                                                 |                         |      |                                |
| 2,6-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                           |
| Dimethyl sulphide<br>(CH <sub>3</sub> ) <sub>2</sub> S                                                       | 53                    | Dimethyl sulphide<br>(Pyrotec tube)   | 0.5-10<br>0.15-0.5          | ③<br>5                    | Bluish purple   | White                                                                 | 2                       | +TP  | 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                         | Pale vermillion | 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 yellowish 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                         | Pale vermillion | Pale blue                                                             | 3                       | T    |                                |
| Enflurane (2-Chloro-1,1,2-<br>trifluoroethyl difluoromethyl ether)<br>CHClFCH <sub>2</sub> OCHF <sub>2</sub> | 51                    | Fluorochlorocarbons<br>(Pyrotec tube) | 100-1230                    | 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%                    | 1/2                       | Pale vermillion | Pale blue                                                             | 3                       | T    | STEL<br>1000                   |
|                                                                                                              |                       |                                       | 0.05-2.5%                   | ①                         |                 |                                                                       |                         |      |                                |
|                                                                                                              |                       |                                       | 0.01-0.05%                  | 2                         |                 |                                                                       |                         |      |                                |
|                                                                                                              | 112L                  | Ethanol                               | 100-2000<br>50-100          | ①<br>2                    | Pale vermillion | Pale blue                                                             | 3                       | T    |                                |
| Ethyl alcohol                                                                                                | See Ethanol           |                                       |                             |                           |                 |                                                                       |                         |      |                                |
| Ethanolamine<br>(Monoethanolamine)<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 yellowish orange at<br>the end of staining)※1 | 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                         | Yellowish brown | Greenish brown                                                        | 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                         | 8.4-336                     | 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 yellowish 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    |                                |

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 yellowish orange when low concentration  
See page 40 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>                                                                           | 103                        | Hydrocarbons (Lower class) | 8.4-16.8%                                    | 1/2                       | Yellowish brown | Greenish brown        | 2                       | ++             | 200                            |        |      |   |   |
|                                                                                                                        |                            |                            | 0.7-8.4%                                     | 1                         |                 |                       |                         |                |                                |        |      |   |   |
|                                                                                                                        |                            |                            | 0.35-0.7%                                    | 2                         |                 |                       |                         |                |                                |        |      |   |   |
|                                                                                                                        | 171                        | Acetylene                  | 0.1-2.0%                                     | 1                         | White           | Brown                 | 3                       | T              |                                |        |      |   |   |
| Ethylene chlorohydrin<br>ClCH <sub>2</sub> CH <sub>2</sub> OH                                                          | 111L                       | Methanol                   | 80-200                                       | 3                         | Pale vermilion  | 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 yellowish 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*                      | +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*                      | +T             | 25 <sup>(V)</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                         | Pale vermilion  | Pale blue             | 3                       | T              | 20                             |        |      |   |   |
|                                                                                                                        | 113LL                      | Isopropyl alcohol          | 60-400                                       | 2                         | Pale vermilion  | 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                         | Pale vermilion  | Pale blue             | 3                       | T              | 5                              |        |      |   |   |
|                                                                                                                        | 113LL                      | Isopropyl alcohol          | 46-460                                       | 2                         | Pale vermilion  | 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                         | Pale vermilion  | Pale blue             | 3                       | T              | 0.1                            |        |      |   |   |
|                                                                                                                        | 113LL                      | Isopropyl alcohol          | 44-440                                       | 2                         | Pale vermilion  | 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                                      | 1                         | Yellow          | Reddish brown         | 1*                      | +T             |                                |        |      |   |   |
|                                                                                                                        |                            |                            | 1-100                                        | ②                         |                 |                       |                         |                |                                |        |      |   |   |
|                                                                                                                        |                            |                            | 0.4-1                                        | 4                         |                 |                       |                         |                |                                |        |      |   |   |
| 163LL                                                                                                                  | Ethylene oxide             | 5-10<br>0.1-5              | 2<br>④                                       | Yellow                    | Pale orange     | 1*                    | +T                      |                |                                |        |      |   |   |
| Ethyl ether<br>(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> O                                                         | 161                        | Ethyl ether                | 0.04-1.0%                                    | 1                         | Yellowish brown | Greenish brown        | 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                            |        |      |   |   |
|                                                                                                                        | 72L                        | Ethyl mercaptan            | 30-75<br>0.5-30<br>0.2-0.5                   | 1/2<br>①<br>2             | Yellow          | Red                   | 2                       | T              |                                |        |      |   |   |
|                                                                                                                        |                            |                            | 25-57.5<br>0.5-25<br>0.15-0.5                | 1/2<br>①<br>2             |                 |                       |                         |                |                                | Yellow | Pink | 2 | T |
|                                                                                                                        |                            |                            | 70                                           | Mercaptans                |                 |                       |                         |                |                                |        |      |   |   |
|                                                                                                                        | 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                       |                |                                |        |      |   |   |

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 40 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                                                                 |                         |      |                                |
| Ethyl mercaptan<br>C <sub>2</sub> H <sub>5</sub> SH                                     | 70LN                             | Mercaptans                            | 4.4-10.4                                | 1/2                       | Yellow          | Pink                                                                  | 2 *                     |      | 0.5                            |
|                                                                                         |                                  |                                       | 0.55-4.4                                | 1                         |                 |                                                                       |                         |      |                                |
|                                                                                         |                                  |                                       | 0.25-0.55                               | 2                         |                 |                                                                       |                         |      |                                |
|                                                                                         |                                  |                                       | 0.13-0.25                               | 4                         |                 |                                                                       |                         |      |                                |
|                                                                                         | 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 yellowish orange                                                 | 2                       | T    |                                |
| Fluorine<br>F <sub>2</sub>                                                              | 17                               | Hydrogen fluoride                     | 0.5-50                                  | 1                         | Yellow          | Brown                                                                 | 3                       | H    | 0.1                            |
| Fluorotrichloromethane                                                                  | See Trichlorofluoromethane (R11) |                                       |                                         |                           |                 |                                                                       |                         |      |                                |
| Formaldehyde<br>HCHO                                                                    | 91M                              | Formaldehyde                          | 2000-6400<br>20-2000<br>8-20            | 1/2<br>①<br>2             | Yellow          | Red                                                                   | 2 *                     | T    | 0.1                            |
|                                                                                         | 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 | Pale pink                                                             | 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            | Pale 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    | 0.2                            |
| 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             | Yellowish brown | Greenish brown                                                        | 3                       |      | 300                            |
|                                                                                         | 101L                             | Gasoline (Petrol)                     | 1000-2000<br>30-1000                    | 1<br>②                    | Yellowish brown | Greenish brown                                                        | 3                       |      |                                |
|                                                                                         | 1M                               | Carbon monoxide                       | 0.1-2%                                  | 1                         | White           | Pale brown                                                            | 3                       |      |                                |
| Halothane (2-Bromo-2-chloro-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             | Yellowish brown | Greenish brown                                                        | 3                       |      | 400                            |
|                                                                                         | 101L                             | Gasoline (Petrol)                     | 1000-2000<br>30-1000                    | 1<br>2                    | Yellowish brown | Greenish brown                                                        | 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 yellowish orange at<br>the end 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             | Yellowish brown | Greenish brown                                                        | 3                       |      | 50                             |
|                                                                                         | 102L                             | Hexane                                | 50-1200<br>4-50                         | ①<br>5                    | Yellowish brown | Greenish brown                                                        | 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                       | ++   |                                |

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 yellowish orange when low concentration  
See page 40 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                      |                         |      |                                |
| Hexane<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>4</sub> CH <sub>3</sub>                | 105                        | Hydrocarbons (Higher class)             | 160-2400<br>80-160                       | 1<br>2                    | White              | Blackish brown             | 3                       |      | 50                             |
| 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                           | 168-1680                                 | 2                         | Yellow             | Blackish brown             | 2                       | T    |                                |
| Hexylamine<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>5</sub> NH <sub>2</sub>            | 180                        | Amines                                  | 9-180                                    | 1                         | Pink               | Pale orange                | 3                       | T    |                                |
|                                                                                          | 180L                       | Amines                                  | 0.65-13                                  | 1                         | Pink               | Pale yellowish 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                       |      |                                |
|                                                                                          | 8HH                        | Chlorine                                | 1.5-30%                                  | 1/2                       | Reddish purple     | Yellow                     | 3                       |      |                                |
|                                                                                          | 80                         | Acid gases                              | 8-160                                    | 2                         | Pale bluish purple | Pale reddish purple        | 2                       |      |                                |
| 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                       |      |                                |
|                                                                                          |                            |                                         |                                          |                           |                    |                            |                         |      |                                |
|                                                                                          | 12L                        | Hydrogen cyanide                        | 60-150<br>2.5-60<br>1.25-2.5<br>0.5-1.25 | 1/2<br>①<br>2<br>5        | Yellow             | Pink                       | 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 40 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                       |      |                                |
| 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 <sup>(IFV)</sup>          |
|                                                                                                                      | 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                       | ++   | STEL<br>1000 <sup>(EX)</sup>   |
|                                                                                                                      | 104                   | Butane                                                             | 55-3080                                        | 1                         | Yellowish brown    | Greenish brown    | 3                       |      |                                |
| Isobutene<br>(CH <sub>3</sub> ) <sub>2</sub> C:CH <sub>2</sub>                                                       | 101L                  | Gasoline (Petrol)                                                  | 0.07-2.2%                                      | 1                         | Yellowish brown    | Greenish brown    | 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    | 50                             |
| 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             | Blackish brown    | 2                       | T    |                                |
| Isobutyl alcohol<br>(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> OH                                             | 116                   | Isobutyl alcohol                                                   | 10-150<br>4-10                                 | ②<br>4                    | 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                         | Yellowish brown    | Greenish brown    | 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%<br>0.09-1.08%<br>0.045-0.09%        | 1/2<br>1<br>2             | Yellowish brown    | Greenish brown    | 2                       | ++   | 1000                           |
| Isopentyl acetate                                                                                                    | See Isoamyl acetate   |                                                                    |                                                |                           |                    |                   |                         |      |                                |

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 40 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             | Pale vermilion  | Pale blue             | 3                       | T    | 200                            |
|                                                                                                 | 113L                 | Isopropyl alcohol                  | 50-800<br>20-50                                                                  | ①<br>2                    | Pale vermilion  | Pale blue             | 3                       | T    |                                |
|                                                                                                 | 113LL                | Isopropyl alcohol                  | 200-460<br>20-200                                                                | 1<br>②                    | Pale vermilion  | 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            | Pale yellowish orange | 3                       | T    | 5                              |
|                                                                                                 | 180L                 | Amines                             | 0.45-9                                                                           | 1                         | Pink            | Pale yellowish 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                      | 17.6-704                                                                         | 2                         | Yellow          | Blackish brown        | 2                       | T    | 250                            |
|                                                                                                 | 161                  | Ethyl ether                        | 0.018-0.45%                                                                      | 2                         | Yellowish brown | Greenish brown        | 3                       | T    |                                |
| Isopropyl mercaptan<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                         | Yellowish brown | Greenish brown        | 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                       |      |                                |
|                                                                                                 |                      |                                    |                                                                                  |                           |                 |                       |                         |      |                                |
|                                                                                                 |                      |                                    |                                                                                  |                           |                 |                       |                         |      |                                |
| 70LN                                                                                            | 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                    | Pink            | 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                      | 72-1080                                                                          | 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                              |
| Metaldehyde<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        | Pale vermilion  | Pale blue             | 3                       | T    | 200                            |
|                                                                                                 | 111L                 | Methanol                           | 40-1000<br>20-40                                                                 | ①<br>2                    | Pale vermilion  | Pale blue             | 3                       | T    |                                |
|                                                                                                 | 111LL                | Methanol                           | 20-56<br>2-20                                                                    | 2<br>④                    | Pale yellow     | Pale bluish green     | 2                       | T    |                                |

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P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 40 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-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                         | Pale vermillion | 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                         | Pale vermillion | Pale blue             | 2                       | T    | 50                             |
| Methyl alcohol                                                                                             | See Methanol              |                                       |                             |                           |                 |                       |                         |      |                                |
| Methyl acrylate<br>CH <sub>2</sub> :CHCO <sub>2</sub> CH <sub>3</sub>                                      | 141L                      | Ethyl acetate                         | 7.2-288                     | 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 to Yellow  | 3                       | T    | 5                              |
|                                                                                                            | 180L                      | Amines                                | 0.5-10                      | 1                         | Pink            | Pale yellowish 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                     | 1                         | Yellow          | Reddish purple        | 3                       | +P   |                                |
|                                                                                                            |                           | 1.6-32                                | 2                           |                           |                 |                       |                         |      |                                |
| 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                      | Hexane                                | 0.04-0.84%                  | 1                         | Yellowish brown | Greenish brown        | 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                      | 2                         | Pale yellow     | Yellow                | 2 *                     | T    | 50                             |
|                                                                                                            |                           |                                       | 2-50                        | ③                         |                 |                       |                         |      |                                |
| Methylene chloride<br>CH <sub>2</sub> Cl <sub>2</sub>                                                      | 138                       | Methylene chloride                    | 50-500                      | ①                         | White           | Pale pink             | 3                       | +T   | 50                             |
|                                                                                                            |                           |                                       | 20-50                       | 2                         |                 |                       |                         |      |                                |
|                                                                                                            | 138L                      | Methylene chloride                    | 60-150                      | 1                         |                 |                       |                         |      |                                |
|                                                                                                            |                           | 10-60                                 | ②                           |                           |                 |                       |                         |      |                                |
|                                                                                                            |                           |                                       | 4-10                        | 4                         |                 |                       |                         |      |                                |
|                                                                                                            | 51L                       | Fluorochlorocarbons<br>(Pyrotec tube) | 20-54                       | 1                         | Yellow          | Reddish purple        | 3                       | +P   |                                |
|                                                                                                            |                           |                                       | 1-20                        | 2                         |                 |                       |                         |      |                                |
| 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                           | 0.034-0.85%                 | 1                         | Yellowish brown | Greenish brown        | 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                         | Yellowish brown | Greenish brown        | 3                       | T    | 200                            |
|                                                                                                            | 152L                      | Methyl ethyl ketone                   | 120-384                     | 1/2                       | Yellow          | Reddish purple        | 2 *                     | +T   |                                |
|                                                                                                            |                           |                                       | 10-120                      | ①                         |                 |                       |                         |      |                                |
|                                                                                                            | 151L                      | Acetone                               | 21-1680                     | 5                         | Yellow          | Red                   | 2 *                     | T    |                                |

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| 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             | Greenish brown        | 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                                                        | 5.4-216                               | 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                       |      |                                |
|                                                                                               | 70LN              | 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             | Pink                  | 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 yellowish 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 yellowish 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 reddish 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                | Nitrogen oxides (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                       |      |                                |

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| 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                      | Nitrogen oxides (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 (NO+NO <sub>2</sub> )<br>(Total quantification)      | 50-2500                                      | 1                         | White           | Green                                                                 | 2                       |      | NO : 25<br>NO <sub>2</sub> : 0.2                                                                                       |
|                                                                                          | 11S                     | Nitrogen oxides (NO+NO <sub>2</sub> )<br>(Total quantification)      | 250-625<br>10-250<br>5-10                    | 1/2<br>①<br>2             | White           | Pale green                                                            | 2                       |      |                                                                                                                        |
|                                                                                          | 11L                     | Nitrogen oxides (NO+NO <sub>2</sub> )<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                                     | 1                         | White           | Blackish brown                                                        | 3                       |      | 200                                                                                                                    |
|                                                                                          |                         |                                                                      | 130-260                                      | 2                         |                 |                                                                       |                         |      |                                                                                                                        |
| 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                         | Yellowish brown | Greenish brown                                                        | 3                       |      | 300                                                                                                                    |
|                                                                                          | 105                     | Hydrocarbons(Higher class)                                           | 200-3000<br>100-200                          | 1<br>2                    | White           | Blackish brown                                                        | 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<br><br>Heavy,moderate,or<br>light workloads<br>(≤2hours):0.20 |
|                                                                                          | 18L                     | Ozone                                                                | 3-6<br>0.6-3<br>0.05-0.6<br>0.025-0.05       | 1/2<br>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 yellowish orange at<br>the end of staining)※1 | 2                       | T    |                                                                                                                        |
| n-Pentane<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> CH <sub>3</sub>             | 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                       | ++   | 1000                                                                                                                   |
|                                                                                          | 104                     | Butane                                                               | 30-1680                                      | 1                         | Yellowish brown | Greenish brown                                                        | 3                       |      |                                                                                                                        |
| 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                       | +    |                                                                                                                        |
| Pentyl acetate                                                                           | See n-Amyl acetate      |                                                                      |                                              |                           |                 |                                                                       |                         |      |                                                                                                                        |
| Perchloroethylene                                                                        | See Tetrachloroethylene |                                                                      |                                              |                           |                 |                                                                       |                         |      |                                                                                                                        |

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 yellowish orange when low concentration

See page 40 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          |                         |      |                                |
| Petroleum benzine                                                                                 | 106                   | Petroleum naphtha         | 14-28mg/L<br>1-14mg/L<br>0.5-1mg/L        | 1/2<br>1<br>2             | Yellowish brown | Greenish brown | 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             | Yellowish brown | Greenish brown | 3                       |      |                                |
| Petroleum naphtha                                                                                 | 106                   | Petroleum naphtha         | 14-28mg/L<br>1-14mg/L<br>0.5-1mg/L        | 1/2<br>①<br>2             | Yellowish brown | Greenish brown | 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          | Blackish brown | 2                       | T    | 0.05                           |
|                                                                                                   | 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                       | ++   |                                |
| 1-Propanethiol                                                                                    | See Propyl mercaptan  |                           |                                           |                           |                 |                |                         |      |                                |
| 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    | 100                            |
| Propyl alcohol<br>CH <sub>3</sub> (CH <sub>2</sub> ) <sub>2</sub> OH                              | 113                   | Isopropyl alcohol         | 0.04-2.5%                                 | 1                         | Pale vermillion | Pale blue      | 3                       | T    | 100                            |
|                                                                                                   | 113L                  | Isopropyl alcohol         | 130-560                                   | 1                         | Pale vermillion | Pale blue      | 3                       | T    |                                |
|                                                                                                   | 113LL                 | Isopropyl alcohol         | 55-170                                    | 2                         | Pale vermillion | 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 40 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               | Pale yellowish orange | 3                       | T    |                                |
|                                                                                | 180L            | Amines                                                             | 0.5-10                                        | 1                         | Pink               | Pale yellowish 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                         | Yellowish brown    | Greenish brown        | 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 yellowish 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                         |                    |                       |                         |      |                                |
|                                                                                | 70LN            | Mercaptans                                                         | 1-25                                          | 1                         | Yellow             | Pink                  | 2 *                     |      |                                |
| 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                                             | 0.15-2.3%                                     | 2                         | Orange             | Greenish brown        | 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                       |      | STEL<br>0.25                   |
|                                                                                | 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>(Separate 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                       |      |                                |

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P: Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.  
See page 40 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(T)</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                          | 3.0-9.0<br>0.2-3.0<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                    | Pale vermilion  | 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                         | Yellowish brown | Greenish brown                                                        | 3                       | T    |                                |                       |             |       |       |   |  |
| Tetrahydrothiophene<br>C <sub>4</sub> H <sub>8</sub> S                                               | 76H                      | Tetrahydrothiophene                          | 10-200                            | 1                         | Pink            | Pale yellow                                                           | 2                       | +T   |                                |                       |             |       |       |   |  |
|                                                                                                      | 76                       | Tetrahydrothiophene                          | 1-10                              | 4                         | Pink            | Pale yellow                                                           | 2                       | +T   |                                |                       |             |       |       |   |  |
|                                                                                                      | 76M                      | Tetrahydrothiophene                          | 10-100mg/m <sup>3</sup>           | 2                         | 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 yellowish orange at<br>the end of staining)※1 | 2                       | T    |                                |                       |             |       |       |   |  |
| Thionyl 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                             |                       |             |       |       |   |  |
|                                                                                                      |                          |                                              | 122L                              | Toluene                   |                 |                                                                       |                         |      |                                | 50-100<br>2-50<br>1-2 | 1<br>②<br>4 | White | Brown | 3 |  |
|                                                                                                      |                          |                                              |                                   |                           |                 |                                                                       |                         |      |                                | 161                   | Ethyl ether |       |       |   |  |
|                                                                                                      |                          |                                              |                                   |                           |                 |                                                                       |                         |      |                                |                       |             |       |       |   |  |

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 yellowish orange when low concentration  
See page 40 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   | 0.005                          |
| 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 40 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    | 0.5                            |
|                                                                                      | 180L                    | Amines              | 0.3-6                       | 1                         | Pink               | Pale yellowish 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 yellowish orange | 2                       | T    |                                |
| Trimethyl benzene<br>C <sub>6</sub> H <sub>3</sub> (CH <sub>3</sub> ) <sub>3</sub> N | 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                         | Yellowish brown    | Greenish brown        | 3                       | T    |                                |
| Vinyl benzene                                                                        | See Styrene             |                     |                             |                           |                    |                       |                         |      |                                |
| Vinyl chloride<br>CH <sub>2</sub> :CHCl                                              | 131                     | Vinyl chloride      | 1-2%                        | 1/2                       | Yellowish brown    | Greenish brown        | 3                       |      | 1                              |
|                                                                                      |                         |                     | 0.05-1%                     | ①                         |                    |                       |                         |      |                                |
|                                                                                      |                         |                     | 0.025-0.05%                 | 2                         |                    |                       |                         |      |                                |
|                                                                                      | 131LB                   | Vinyl chloride      | 20-70                       | 1                         | Yellow             | Purple                | 2*                      | T    |                                |
|                                                                                      |                         |                     | 1-20                        | ②                         |                    |                       |                         |      |                                |
|                                                                                      |                         |                     | 0.25-1                      | 4                         |                    |                       |                         |      |                                |
|                                                                                      | 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                         |                    |                       |                         |      |                                |
|                                                                                      |                         |                     | 3-6.6                       | 1                         | Yellow             | Reddish brown         | 2*                      | +T   |                                |
|                                                                                      |                         |                     | 0.2-3                       | ②                         |                    |                       |                         |      |                                |
| 0.1-0.2                                                                              | 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                         | Pale vermilion     | 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                           |                           |                    |                       |                         |      |                                |
| 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                         | Yellowish brown    | Greenish brown        | 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 40 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    | 250                            |
|                                                                                          | 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 vermilion | 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                       |      | 0.1                            |
|                                                                                          | 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                       |      | STEL<br>1000                   |
| 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 *                     |      | 0.1                            |
| 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 *                     |      | 0.2                            |
| 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    |                                |
|                                                                                          | 17D             | Hydrogen fluoride    | 0.4-40                      | 1-10                         | Yellow         | Purple        | 3                       | TH   |                                |
| Hydrogen cyanide<br>HCN                                                                  | 12D             | Hydrogen cyanide     | 1-200                       | 1-10                         | Yellow         | Pink          | 2                       |      | C 4.7                          |
| Hydrogen fluoride<br>HF                                                                  | 17D             | Hydrogen fluoride    | 1-100                       | 1-10                         | Yellow         | Purple        | 3                       | TH   | 0.5                            |
|                                                                                          | 14D             | Hydrogen chloride    | 2.5-250                     | 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                              |

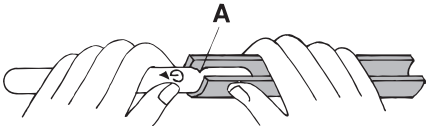
T: Temp Correction   H: Humidity Correction   \* Refrigerated Storage   Mesh: Correction Factor/Chart

| 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    | STEL<br>0.25                   |
|                                                                                               | 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    | 0.5                            |
| 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                            |

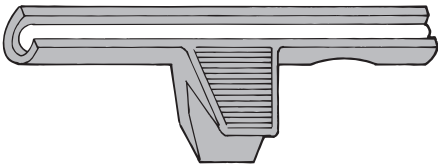
T: Temp Correction   H: Humidity Correction   \* Refrigerated Storage   Mesh: Correction Factor/Chart  
 See page 40 for additional symbols and definitions.

### 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.

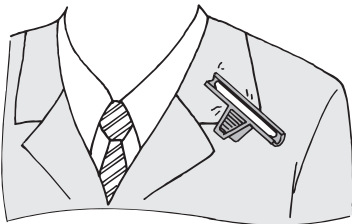


- Insert the Dosi-tube fully into the Tube holder.



- Attach the Tube Holder with the Dosi-tube 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.

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



**30m Extension hose No.351A-30**

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

\* For twin tube operation, order the Extension hose guard rubber (No.358). When the extension hose tip needs to be replaced, order the Replacement extension hose guard rubber (No.359).

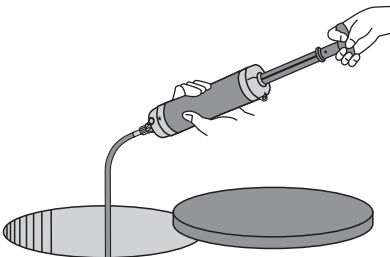
Currently only the detector tubes listed below are applicable to No. 351A-30. If you need to use other tube, please contact your Gastec representatives.

| 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                 |      |
| tert-Butyl mercaptan         | (CH <sub>3</sub> ) <sub>3</sub> CSH                             | 75N             | tert-Butyl mercaptan       | 1.25—250mg/m <sup>3</sup> | 2                 | TH   |
|                              |                                                                 | 75LN            | tert-Butyl mercaptan       | 0.5—39mg/m <sup>3</sup>   | 2*                | THF  |
| 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       | 0.28—5.5                  | 1*                | +F   |
|                              |                                                                 | 233             | Chloropicrin               | 0.045—22                  | 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 dichloride          | ClCH <sub>2</sub> CH <sub>2</sub> Cl                            | 232             | 1,2-Dichloroethane         | 1—39                      | 1*                | +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   |
|                              |                                                                 | 72LN            | Ethyl mercaptan            | 0.15—57.5                 | 2                 | T    |
| 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                 |      |

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  |
|------------------------------|----------------------------------------------------------------------|-----------------|-----------------------|----------------------------|-------------------|-------|
| Hydrogen sulphide            | H <sub>2</sub> S                                                     | 4LB             | Hydrogen sulphide     | 0.5—12                     | 2                 |       |
|                              |                                                                      | 4LT             | Hydrogen sulphide     | 0.05—4.0                   | 2*                |       |
| Isoamyl alcohol              | (CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> CH <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                 |       |
|                              |                                                                      | 70LN            | 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         | 5.4—216                    | 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                 |       |
|                              |                                                                      | 5LC             | Sulphur dioxide       | 0.1—25                     | 3                 | T     |
|                              |                                                                      | 5Lb             | Sulphur dioxide       | 0.05—10.0                  | 3                 | F     |
| 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     |
|                              |                                                                      | 131LB           | Vinyl chloride        | 0.25—70                    | 2*                | TF    |
|                              |                                                                      | 131La           | Vinyl chloride        | 0.25—54                    | 2*                | +     |
|                              |                                                                      | 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     |

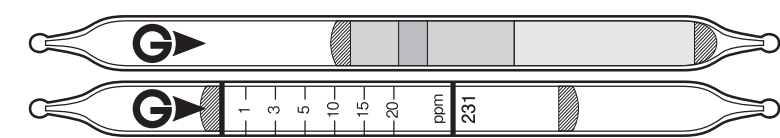
T: Temp Correction    H: Humidity Correction    +: Twin Tubes    ++: Nine Tubes    \* Refrigerated Storage    ※6:for four test  
F: Correction factors might be applied when using No. 351A-30. See No. 351A-30 instruction manual for details.  
Measuring ranges above will be changed in case correction factors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



■ Sulphuryl fluoride measurement system

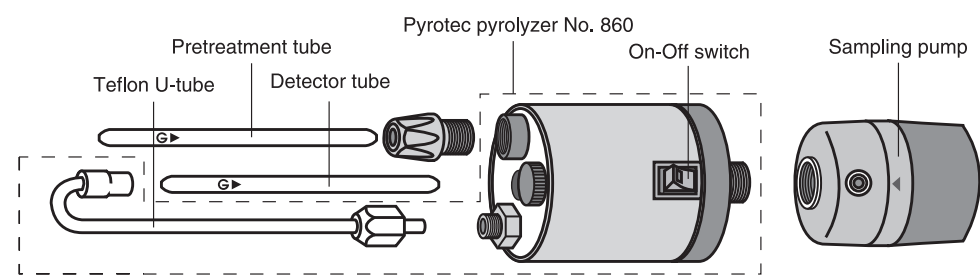
GASTEC developed the Pyrotec pyrolyzer system to enable precise and easy detection of Sulphuryl fluoride. It converts Sulphuryl fluoride (using a process known as thermal cracking) into an easily measurable gas.

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



| Gas or Vapour<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  |
|------------------------------------------------------|-----------------|--------------------|-----------------------------|---------------------------|---------------|-------|-------------------------|-------|
|                                                      |                 |                    |                             |                           | 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



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

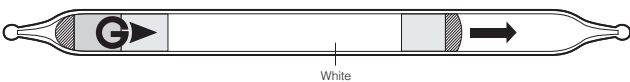
| Gas or Vapour to be Measured                                                                            | Tube No. & Name |                                                  | Measuring Range (ppm) | No. of Pump Strokes | Colour Change        |       | Shelf Life (year) |
|---------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------|-----------------------|---------------------|----------------------|-------|-------------------|
|                                                                                                         |                 |                                                  |                       |                     | 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.

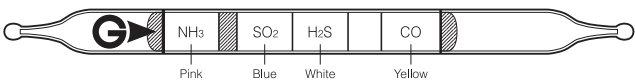
**Polytec I (No. 107)**



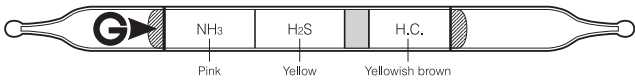
**Qualitative analysis tube for fire investigation (No. 108)**



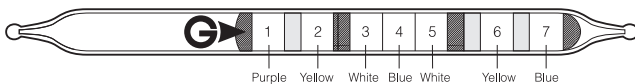
**Polytec II (No. 25)**



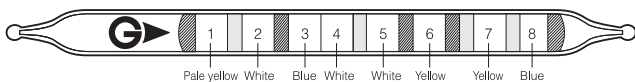
**Polytec III (No. 26)**



**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 |

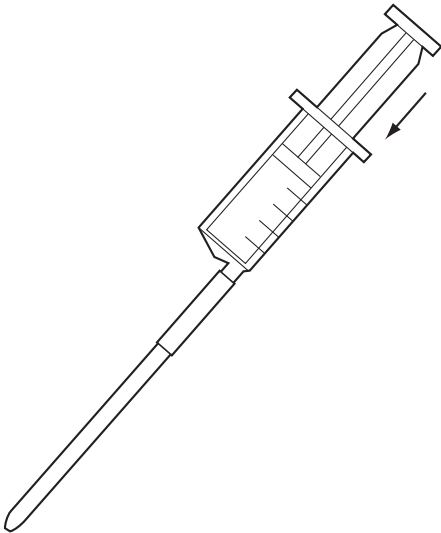
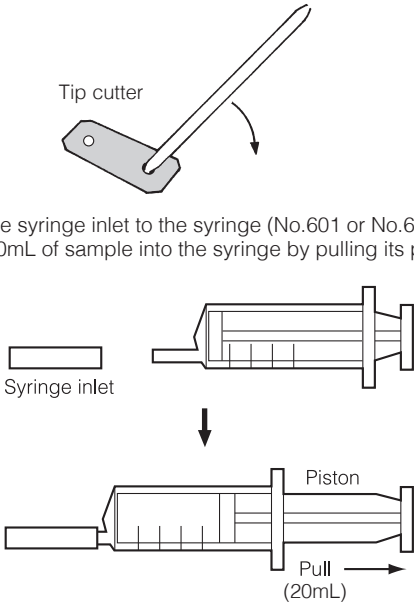
**Polytec IV (No. 27)**

| 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 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 cutter.
- 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.

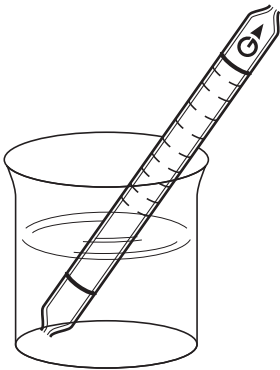


Detector tubes for dissolved substances in solution

| 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 <sup>2+</sup>                  | 271             | Mercury tube                | 1-20mg/L              | Immersion       | Pale orange   | Bluish purple  | 3                 |
| Chromium( VI) in solution | Cr <sup>6+</sup>                  | 273             | Chromium (VI) tube          | 0.5-50mg/L            | Immersion       | White         | Yellow         | 3                 |
| Iron in solution          | Fe <sup>2+</sup>                  | 281             | Iron tube                   | 5-50mg/L              | Immersion       | White         | Orange         | 3                 |
| Copper in solution        | Cu <sup>+</sup> +Cu <sup>2+</sup> | 284             | Copper tube                 | 1-20mg/L              | Immersion       | White         | Orange         | 2 *               |
| Zinc in solution          | Zn <sup>2+</sup>                  | 285             | Zinc tube                   | 3-20mg/L              | Immersion       | Pale orange   | Reddish purple | 3                 |
| Nickel in solution        | Ni <sup>2+</sup>                  | 291             | Nickel tube                 | 5-50mg/L              | Immersion       | White         | Red            | 3                 |

\*Refrigerated Storage

Dissolved substance in solution can be measured by simply immersing the above Gastec tube into a solution. When the detector tube is immersed vertically, (▶) tube arrow pointing upward,the solution will rise up through the tube due to capillary action and react with the 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           | Blackish brown | 2                 |
| Carbon dioxide               | CO <sub>2</sub>    | 2A              | Carbon dioxide Airtec tube  | 250-3000                  | 100                | 5                   | Yellowish orange | 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    | 10-80mg/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 vermillion  | Pale blue      | 2                 |
|                              |                    |                 |                             | 0.1-0.2mg/m <sup>3</sup>  | 1000               | 40                  |                  |                |                   |
|                              |                    | 109A            | Oil mist Airtec tube        | 0.3-1.5mg/m <sup>3</sup>  | 1000               | 60                  | White            | Greenish brown | 2                 |

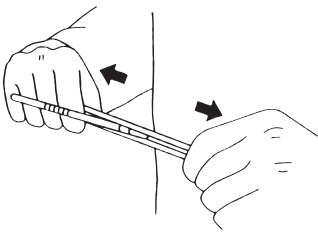
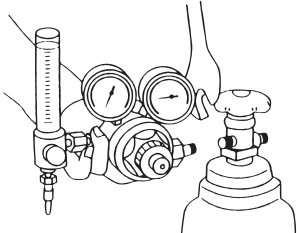
Gastec Airtec Tube allows anyone to simply, quickly, and quantitatively measure the quality of their compressed breathing air. Easy to use, the Airtec tube is an accurate and precise method for detecting CO, CO<sub>2</sub>, Water vapour, Nitrogen oxides and Oil mist. Using Airtec tube direct reading 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.

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.

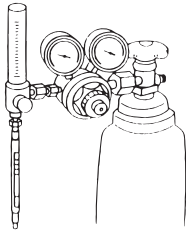
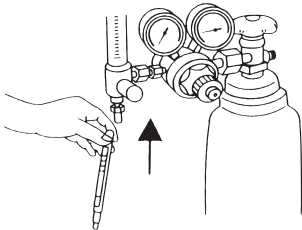
Airtec tube is a convenient economical system for testing the quality of your compressed breathing air. You do not have to learn how to operate and calibrate sophisticated instrumentation. With Airtec Tube, the measurement is quick and simple and does not require user calibration. Just snap off both “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)

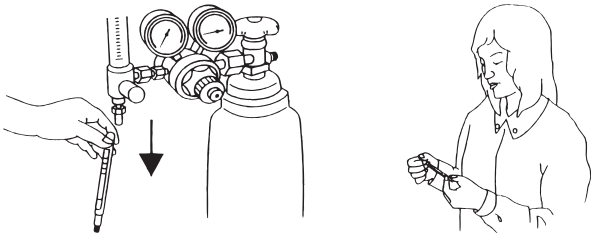
- ① Attach a pressure reducer with gauge and flow metre to a cylinder, compressor or air line and adjust the flow metre to the required setting.
- ② Break the tips off a fresh detector tube using the tube tip breaker and insert the tube into a tube holder.



- ③ Attach the rubber tube holder to the flow metre outlet. Make sure the tube arrow ➡ on the tube is pointing in the downward direction.
- ④ Turn on the cylinder or compressor and confirm the flow metre according to each Airtec tube specifications.



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



■ Compressed breathing air measurement kit (CG-1 System)

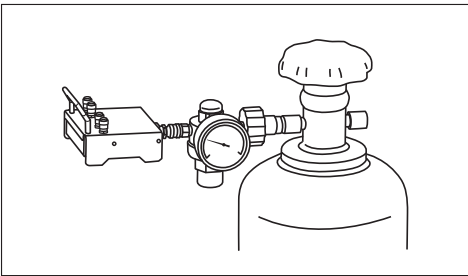
Gastec CG-1 system can simply, quickly, and simultaneously measure 4 kinds of harmful contaminants (CO, CO<sub>2</sub>, Water vapour, and Oil mist) contained in compressed breathing air (cylinder or compressor).

| 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                | 5                   | Yellow           | Blackish brown | 2                 |
| Carbon dioxide               | CO <sub>2</sub>  | 2A              | Carbon dioxide Airtec tube  | 250-3000                 | 190                | 5                   | Yellowish orange | Yellow         | 2                 |
| Water vapour                 | H <sub>2</sub> O | 6A              | Water vapour Airtec tube    | 10-80mg/m <sup>3</sup>   | 120                | 5                   | Yellow           | Green          | 2                 |
| Oil mist                     |                  | 109AD           | Oil mist Airtec tube        | 0.2-5.0mg/m <sup>3</sup> | 3000               | 10                  | Pale vermillion  | Pale blue      | 2                 |
|                              |                  |                 |                             | 0.1-0.2mg/m <sup>3</sup> | 3000               | 20                  |                  |                |                   |

■ Measurement procedure

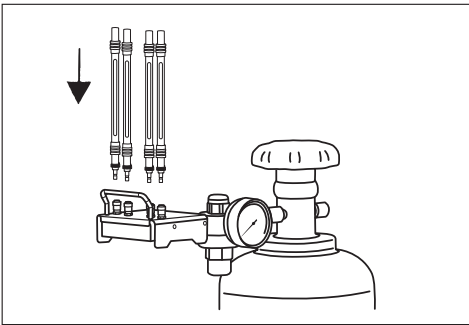
STEP.1

1. Connect the measuring device to the pressure reducer fully until it is locked. (Don't connect rubber shrouds)
2. Slowly open the compressed air supply and wait 1 minute.
3. Close the compressed air supply completely, and wait 6 minutes.
4. Confirm the pressure drop is less than 5%.



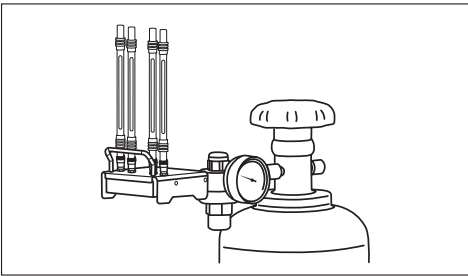
STEP.2

1. With the main valve closed, connect each Rubber shroud to the measuring device fully until it is locked. (Air escapes from the measuring device)



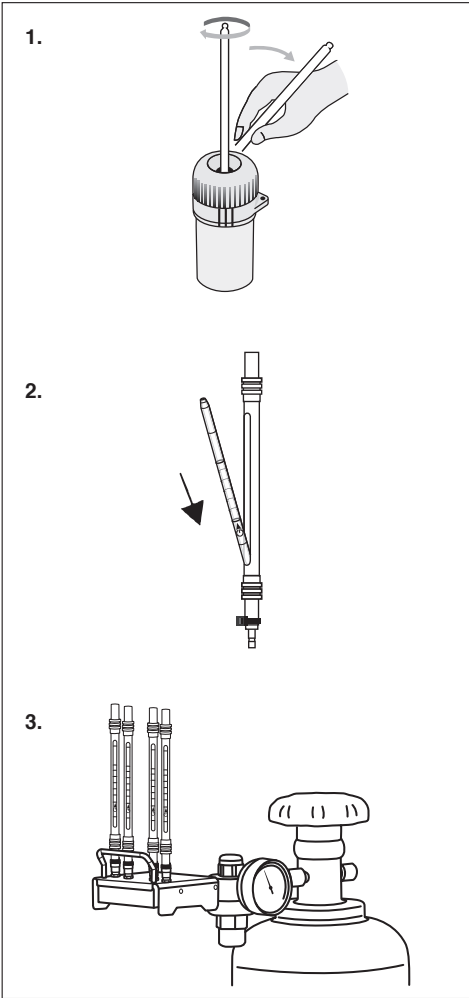
STEP.3

1. Slowly open the compressed air supply valve and clean the air supply system. (disperse compressed air)
2. Wait 5 minutes and close the valve.



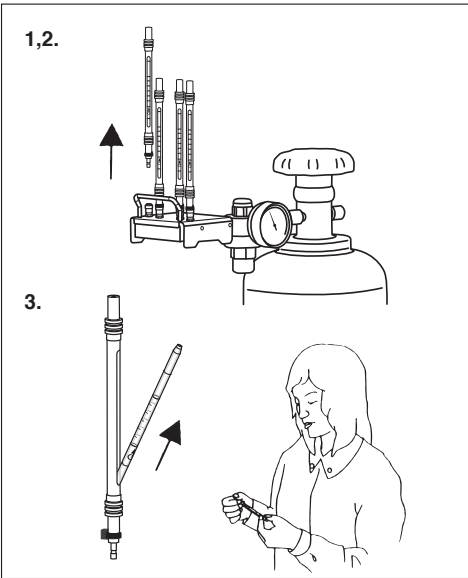
STEP.4

1. Break off both tips of the Gastec tube with the tube tip holder.
2. Set the Gastec tubes in the rubber shrouds according to the markings on the measuring device. Make sure that both ends of the tubes are firmly covered by the rubber shrouds.
3. Open the valve of the compressed air source to start the measurement. Time the sampling with the stopwatch.



STEP.5

1. After 5 minutes, disconnect the three rubber shrouds(No.1A,2A, and 6A) from the measuring device.
2. After 10 minutes, disconnect the rubber shroud (No.109AD) from the measuring device.
3. Remove the tubes from the rubber shrouds, and read the value of each tube 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               |      |                   |
| Acetone                      | CH <sub>3</sub> COCH <sub>3</sub>                               | 151TP           | Acetone             | 25-800                      | 100                | 10                  | Yellow          | Red                 | T    | 2 *               |
| Acrylonitrile                | CH <sub>2</sub> :CHCN                                           | 191TP           | Acrylonitrile       | 3.0-12.6                    | 50                 | 10                  | Yellow          | Pink                | +T   | 2                 |
|                              |                                                                 |                 |                     | 0.2-3.0                     | 100                | 10                  |                 |                     |      |                   |
| Benzene                      | C <sub>6</sub> H <sub>6</sub>                                   | 121P            | Benzene             | 250-3000 μg/m <sup>3</sup>  | 50                 | 60                  | White           | Brown               | +    | 2                 |
|                              |                                                                 | 121TP           | Benzene             | 5-14.5                      | 50                 | 10                  | White           | Brown               | +    | 2                 |
|                              |                                                                 |                 |                     | 0.1-5                       | 100                | 10                  |                 |                     |      |                   |
| 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                    | 200                | 10                  | Yellow          | Pink                | T    | 1 *               |
|                              |                                                                 |                 |                     | 0.02-0.4                    | 200                | 30                  |                 |                     |      |                   |
|                              |                                                                 | 91PL            | Formaldehyde        | 0.20-0.80                   | 200                | 10                  | Pale Yellow     | Pink                | T    | 1 *               |
|                              |                                                                 |                 |                     | 0.01-0.20                   | 200                | 30                  |                 |                     |      |                   |
|                              |                                                                 | 91TP            | Formaldehyde        | 0.50-1.75                   | 50                 | 10                  | Yellow          | Pale orange         | T    | 1 *               |
|                              |                                                                 |                 |                     | 0.01-0.50                   | 100                | 10                  |                 |                     |      |                   |
| Hexane                       | CH <sub>3</sub> (CH <sub>2</sub> ) <sub>4</sub> CH <sub>3</sub> | 102TP           | Hexane              | 2-80                        | 100                | 10                  | Yellowish brown | Greenish brown      |      | 3                 |
| Hydrogen cyanide             | HCN                                                             | 12TP            | Hydrogen cyanide    | 4.5-9.0                     | 50                 | 10                  | Yellow          | Pink                |      | 1                 |
|                              |                                                                 |                 |                     | 0.3-4.5                     | 100                | 10                  |                 |                     |      |                   |
| Hydrogen fluoride            | HF                                                              | 17TP            | Hydrogen fluoride   | 3.0-9.0                     | 50                 | 10                  | Yellow          | Brown               | TH   | 2                 |
|                              |                                                                 |                 |                     | 0.05-3.0                    | 100                | 10                  |                 |                     |      |                   |
| Hydrogen sulphide            | H <sub>2</sub> S                                                | 4TP             | Hydrogen sulphide   | 1.6-2.88                    | 50                 | 10                  | Yellow          | Pink                |      | 2                 |
|                              |                                                                 |                 |                     | 0.1-1.6                     | 100                | 10                  |                 |                     |      |                   |
| Isopropyl alcohol            | CH <sub>3</sub> CH(OH)CH <sub>3</sub>                           | 113TP           | Isopropyl alcohol   | 200-400                     | 100                | 5                   | Pale vermillion | Pale blue           | T    | 2                 |
|                              |                                                                 |                 |                     | 20-200                      | 100                | 10                  |                 |                     |      |                   |
| Methanol                     | CH <sub>3</sub> OH                                              | 111TP           | Methanol            | 20-300                      | 50                 | 10                  | Pale vermillion | 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           | Orangish brown      | T    | 2                 |
| Tetrachloroethylene          | Cl <sub>2</sub> C:CCl <sub>2</sub>                              | 133P            | Tetrachloroethylene | 300-720 μg/m <sup>3</sup>   | 100                | 15                  | Yellow          | Purple              | +T   | 2                 |
|                              |                                                                 |                 |                     | 20-300 μg/m <sup>3</sup>    | 100                | 30                  |                 |                     |      |                   |
|                              |                                                                 | 133TP           | Tetrachloroethylene | 40-84                       | 50                 | 10                  | Yellow          | Reddish purple      | +T   | 2                 |
|                              |                                                                 |                 |                     | 2.5-40                      | 100                | 10                  |                 |                     |      |                   |
| Toluene                      | C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>                   | 122P            | Toluene             | 2500-7000 μg/m <sup>3</sup> | 200                | 10                  | White           | Pale brown          | +    | 2                 |
|                              |                                                                 |                 |                     | 100-2500 μg/m <sup>3</sup>  | 200                | 30                  |                 |                     |      |                   |
|                              |                                                                 | 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>  | 100                | 15                  | Yellow          | Purple              | +T   | 2                 |
|                              |                                                                 |                 |                     | 20-500 μg/m <sup>3</sup>    | 100                | 30                  |                 |                     |      |                   |
|                              |                                                                 | 132TP           | Trichloroethylene   | 15-33                       | 50                 | 10                  | Yellow          | Reddish purple      | +T   | 2                 |
|                              |                                                                 |                 |                     | 1-15                        | 100                | 10                  |                 |                     |      |                   |
| 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                     | 50                 | 10                  | Yellow          | Reddish purple      | T    | 3                 |
|                              |                                                                 |                 |                     | 0.2-3.0                     | 100                | 10                  |                 |                     |      |                   |
| Xylene                       | C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>   | 123TP           | Xylene              | 2-80                        | 100                | 10                  | White           | Brown               | +    | 2                 |
|                              |                                                                 | 122P            | Toluene             | 540-13500 μg/m <sup>3</sup> | 200                | 30                  | White           | Pale brown          | +    | 2                 |

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

See page 40 for additional symbols and definitions.

■ Automatic Air Sampling Pump GSP-300FT-2

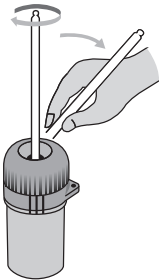
The Model GSP-300FT-2 has been designed to be a small and compact air sampling pump available with an integrated flowmeter for Hand-held, Personal or site sampling. With this small size air sampling pump it is possible to carry on constant flow rate for 10 hours continuous sampling. This air sampling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

■ GSP-300FT-2 Specification

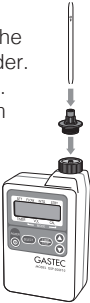
|                                          |                                                                                                                                                                                                                          |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Spot Flow Rate & Measuring Range         | 0 - 250mL/min                                                                                                                                                                                                            |
| Constant Flow Rate Sampling Range        | 50mL/min : 0.0 - 34.5kPa    100mL/min : 0.0 - 30.0kPa    150mL/min : 0.0 - 25.0kPa<br>200mL/min : 0.0 - 21.0kPa    250mL/min : 0.0 - 16.5kPa                                                                             |
| 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/min spot 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

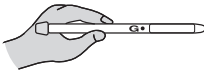
- ① Break tips off the detector tube using the tube tip holder.



- ② Insert the detector tube to the inlet of the rubber tube holder. Put the power switch to ON. Adjust the flow rate, confirm that the timer of the air sampling pump is set, then push the start button.



- ③ 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              |                                                     | 0.5-78                    |
| 3H              | Dimethylamine                                       | 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) | 0.1-2.88                  |
| 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              |                                                     | 10-80mg/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                                                                                        | 45-450                |
| 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             | Hydrogen chloride (Dosi tube)                                                                           | 0.4-40                |
| 17D             | Nitric acid (Dosi tube)                                                                                 | 0.32-32               |
| 18M             | Ozone                                                                                                   | 4-400                 |
| 18L             |                                                                                                         | 0.025-6               |
| 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                |

| Gastec Tube No. | Gas or Vapour to be Measured                               | Measuring Range (ppm)      |
|-----------------|------------------------------------------------------------|----------------------------|
| 32D             | Hydrogen peroxide (Dosi tube)                              | 0.5-40                     |
| 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                                                  | 100-1230                   |
| 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                                          | 0.15-10                    |
| 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                   |
| 70LN            | Mercaptans                                                 | 0.1-8                      |
| 70LN            | Methyl mercaptan                                           | 0.1-8                      |

| Gastec Tube No. | Gas or Vapour to be Measured                   | Measuring Range (ppm)     |
|-----------------|------------------------------------------------|---------------------------|
| 70LN            | Ethyl mercaptan                                | 0.13-10.4                 |
| 70LN            | tert-Butyl mercaptan                           | 1-40                      |
| 70LN            | 1-Propanethiol (Propyl mercaptan)              | 1-25                      |
| 71H             | Methyl mercaptan                               | 20-2700                   |
| 71              |                                                | 0.25-140                  |
| 71H             | Ethyl mercaptan                                | 100-3800                  |
| 72              | Ethyl mercaptan                                | 0.5-120                   |
| 72L             |                                                | 0.2-75                    |
| 72LN            |                                                | 0.15-57.5                 |
| 75              | tert-Butyl mercaptan                           | 2.5-150mg/m <sup>3</sup>  |
| 75N             |                                                | 1.25-250mg/m <sup>3</sup> |
| 75L             |                                                | 0.5-30mg/m <sup>3</sup>   |
| 75L             | 2-Mercaptoethanol                              | 0.5-7.5                   |
| 75LN            | tert-Butyl mercaptan                           | 0.5-39mg/m <sup>3</sup>   |
| 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             | Metaldehyde                                    | 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            | Propylene                                      | 0.02-0.8%                 |

■ GASTEC NUMERICAL INDEX GAS DETECTOR TUBE LIST

| Gastec Tube No. | Gas or Vapour to be Measured               | Measuring Range (ppm)    |
|-----------------|--------------------------------------------|--------------------------|
| 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%                 |
| 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)                     | 0.1-5mg/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                   |

| Gastec Tube No. | Gas or Vapour to be Measured                        | Measuring Range (ppm)      |
|-----------------|-----------------------------------------------------|----------------------------|
| 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                                    | 4-150                      |
| 117             | Isoamyl alcohol                                     | 5-300                      |
| 118             | Cyclohexanol                                        | 5-100                      |
| 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           |                                                     | 0.2-66                     |
| 121             | Diisobutylene                                       | 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>  |
| 121TP           |                                                     | 0.1-14.5                   |
| 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           |                                                     | 2-80                       |
| 122P            | Ethyl benzene (for Automatic Air Sampling Pump)     | 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           |                                                     | 0.25-70                    |
| 131L            | 1,1,2,2-Tetrachloroethane                           | 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                    |



| Gastec Tube No. | Gas or Vapour to be Measured                          | Measuring Range (ppm)          |
|-----------------|-------------------------------------------------------|--------------------------------|
| 132HH           | Trichloroethylene                                     | 0.05-2.5%                      |
| 132HA           |                                                       | 20-1300                        |
| 132M            |                                                       | 2-250                          |
| 132L            |                                                       | 1-70                           |
| 132LL           |                                                       | 0.125-8.8                      |
| 132HH           | Tetrachloroethylene                                   | 0.075-1.5%                     |
| 132HA           | 1,2-Dichloroethylene                                  | 80-800                         |
| 132HA           | 1,3-Dichloropropene                                   | 45-450                         |
| 132L            | Benzyl chloride                                       | 1.6-20                         |
| 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           |                                                       | 2.5-84                         |
| 133D            | Tetrachloroethylene (Dosi tube)                       | 3-150                          |
| 134             | Carbon tetrachloride                                  | 0.5-60                         |
| 134L            |                                                       | 0.25-11                        |
| 134             | Chloropicrin                                          | 2.5-60                         |
| 134L            | Chloropicrin                                          | 0.28-5.5                       |
| 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 (1,2-Dichloroethane)              | 400-2000                       |
| 135L            | 1,1,2,2-Tetrabromoethane                              | 0.92-9.2                       |
| 135L            | 1,2,3-Trichloropropane                                | 36-360                         |
| 135L            | Ethylene dichloride (1,2-Dichloroethane)              | 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 (1,2-Dibromoethane)                | 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 (1,2-Dibromoethane)                | 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%                      |

| Gastec Tube No. | Gas or Vapour to be Measured                          | Measuring Range (ppm)   |
|-----------------|-------------------------------------------------------|-------------------------|
| 141L            | 2-Hexyl alcohol                                       | 168-1680                |
| 141L            | Cymene                                                | 2.4-96                  |
| 141L            | Diisopropyl benzene                                   | 16.5-108                |
| 141L            | Ethyl acrylate                                        | 8.4-336                 |
| 141L            | Isopropyl ether                                       | 17.6-704                |
| 141L            | Mesityl oxide                                         | 72-1080                 |
| 141L            | Methyl acrylate                                       | 7.2-288                 |
| 141L            | Methyl isothiocyanate                                 | 5.4-216                 |
| 142             | Butyl acetate                                         | 0.05-0.8%               |
| 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             | 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                                               | 0.15-2.3%               |
| 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                                          | 0.034-0.85%             |
| 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%               |



| Gastec Tube No. | Gas or Vapour to be Measured           | Measuring Range (ppm) |
|-----------------|----------------------------------------|-----------------------|
| 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               |
| 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             | Diethylethanolamine                    | 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 (Ethanolamine)        | 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               |

| Gastec Tube No. | Gas or Vapour to be Measured                   | Measuring Range (ppm) |
|-----------------|------------------------------------------------|-----------------------|
| 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                  |
| 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) in solution                      | 0.5-50mg/L            |
| 281             | Iron in solution                               | 5-50mg/L              |
| 284             | Copper in solution                             | 1-20mg/L              |
| 285             | Zinc in solution                               | 3-20mg/L              |
| 291             | Nickel in solution                             | 5-50mg/L              |

■ About operating environment

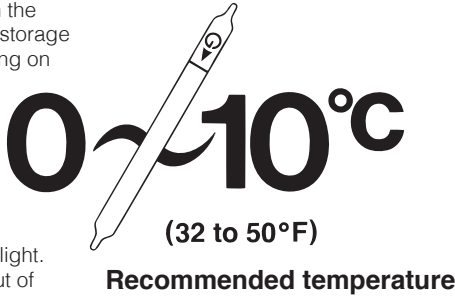
Most tubes can be used in the temperature range of 0 - 40°C and relative humidity range of 0 - 90%. However a few tubes have a different temperature range or humidity range. Please refer to the instruction manuals for use.

■ 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

Detector Tubes must be stored in the specified storage condition. Two storage conditions are specified depending on the detector tube; in a cool and dark place (15 to 25°C(59 to 77°F)) or in a refrigerator (0 to 10°C(32 to 50°F)). But it is preferably recommended to store all detector tubes in a refrigerator. Do not expose them to direct sunlight. 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.  
1mg/L = 1000mg/m<sup>3</sup> = 1358ppm = 62.3LB/MMCF (25°C, 1013hPa)

● Relations between concentration units

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

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

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

$$\% = \text{ppb} \times 0.000001$$

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

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

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

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

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°C ≡ 273°K, t°C=(273 + t)°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 2019 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.
- P Use Pyrotec pyrolyzer No. 840 and GASTEC gas sampling pump.
- 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.

Changes on the Tube List

Changes from 24th edition as of September 2018 to 25th edition as of August 2019

| Page in 24th edition | Changes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Page 4               | <ul style="list-style-type: none"><li>• Benzene Detection Tube publication order swapped.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Page 8               | <ul style="list-style-type: none"><li>• The measuring range of Cymene 141L(Ethyl acetate) was changed (5.6-224→2.4-96).</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Page 10              | <ul style="list-style-type: none"><li>• The measuring range of Diisopropyl benzene 141L(Ethyl acetate) was changed (10-400→16.5-108).</li><li>• The number of pump strokes of Diisopropyl benzene 141L(Ethyl acetate) was changed (1/2→2).</li></ul>                                                                                                                                                                                                                                                                                                                                                                                     |
| Page 11              | <ul style="list-style-type: none"><li>• The measuring range of Ethyl acrylate 141L(Ethyl acetate) was changed (8-320→8.4-336).</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Page 14              | <ul style="list-style-type: none"><li>• Hydrogen chloride Detection Tube publication order swapped.</li><li>• The measuring range of 2-Hexyl alcohol 141L(Ethyl acetate) was changed (60-2400→168-1680).</li><li>• The number of pump strokes of 2-Hexyl alcohol 141L(Ethyl acetate) was changed (3→2).</li></ul>                                                                                                                                                                                                                                                                                                                        |
| Page 16              | <ul style="list-style-type: none"><li>• The measuring range of Isopropyl ether 141L(Ethyl acetate) was changed (18-720→17.6-704).</li><li>• The measuring range of Mesityl oxide 141L(Ethyl acetate) was changed (27-1080→72-1080).</li></ul>                                                                                                                                                                                                                                                                                                                                                                                            |
| Page 17              | <ul style="list-style-type: none"><li>• The measuring range of Methyl acrylate 141L(Ethyl acetate) was changed (8-320→7.2-288).</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Page 18              | <ul style="list-style-type: none"><li>• The measuring range of Methyl isothiocyanate 141L(Ethyl acetate) was changed (50-400→5.4-216).</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Page 22              | <ul style="list-style-type: none"><li>• Tetrahydrothiophene Detection Tube publication order swapped.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Page 24              | <ul style="list-style-type: none"><li>• Vinyl chloride Detection Tube publication order changed.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Page 27-28           | <ul style="list-style-type: none"><li>• Sulphuryl fluoride measurement system moved to Page 29.</li><li>• 30m Extension Hose additional Detector Tubes:<ul style="list-style-type: none"><li>Mercaptans 70LN</li><li>Ethyl mercaptan 72LN</li><li>tert-Butyl mercaptan 75N</li><li>tert-Butyl mercaptan 75LN</li><li>1,2-Dichloroethane 232</li><li>Chloropicrin 233</li></ul></li><li>• Sulphur dioxide Detection Tube publication order swapped.</li><li>• Vinyl chloride Detection Tube publication order swapped.</li><li>• The measuring range of Methyl isothiocyanate 141L(Ethyl acetate) was changed (50-400→5.4-216).</li></ul> |
| Page 30              | <ul style="list-style-type: none"><li>• “Chromium(VI)ion” changed to “Chromium(VI)”.</li><li>• “Iron ion” changed to “Iron”.</li><li>• “Copper ion” changed to “Copper”.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Page 31,32           | <ul style="list-style-type: none"><li>• Oil mist 109AD additional measurement range.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Page 35-39           | <ul style="list-style-type: none"><li>• Changes in the index according to the above changes.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

