



GASTEC

Chapter 2

Specifications of Gastec Standard Detector Tubes

This chapter provides specifications of the standard detector tubes of the Gastec Standard Detector Tube System. Each of these detector tubes is to be connected to the Model GV-100 Gas Sampling Pump, the other major component of the System. They are used for short-term measurements of gases and vapours.

Explanation of the specification items

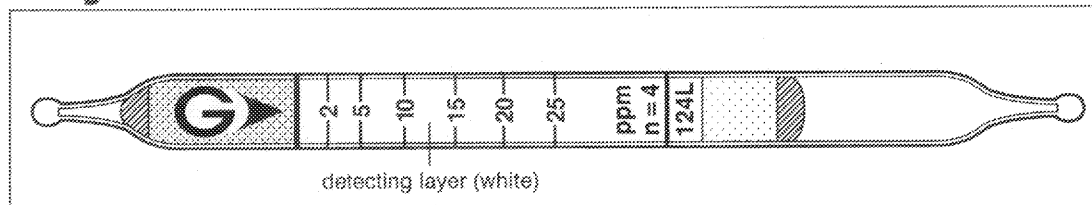
(Example)

①

Styrene $C_6H_5CH:CH_2$

②
No. 124L

③



Performance

④

⑤

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⑩

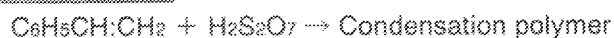
⑪

⑫

⑬

Measuring range	2 to 25 ppm	25 to 100 ppm
Number of pump strokes	4 (400 ml)	1 (100 ml)
Correction factor	1	4
Sampling time	2 min	30 sec
Detecting limit :	0.5 ppm (4 pump strokes)	
Colour change :	White → Yellow	
Corrections for temperature & humidity :	Unnecessary	
Relative standard deviation :	10 % (for 2 to 5 ppm), 5 % (for 5 to 25 ppm)	
Shelf life :	3 years	

Reaction principle



⑭

Possible coexisting substances and their interferences (NOTE : Page 2-5)

Substance	Concentration	Interference	Changes colour by itself to
Butadiene	≧ 5 ppm	+ (Bleaching)	Dark brown
Alcohols	≧ 10 times		
Aldehydes	≧ 10 times		No
Esters	≧ 10 times		
Ketones	≧ 10 times		

⑮

Other substance measurable with this detector tube

Substance	Correction	No. of pump strokes	Measuring range
Divinyl benzene	Factor : 0.6	3	1 to 15 ppm

⑯

Calibration gas generation

Diffusion tube method

⑰

Special note

A very low level concentration (0.2 to 4 ppm) of styrene can be measured by a Gastec special detector tube (No.124S) that is available with the Gastec Odorant Analysis System. For detail, see page 3-60.

⑱

TLV-TWA : 20 ppm

TLV-STEL : 40 ppm

Explosive range : 1.1 to 6.1 %

① **Name and chemical formula**

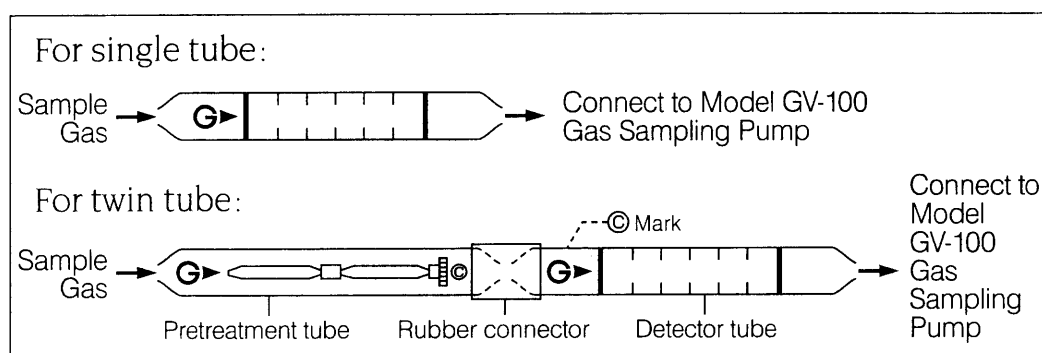
The name of the substance to be measured with this detector tube and its chemical formula.

② **Detector tube number**

The identification number of the detector tube.

③ **External appearance**

The external appearance of the detector tube(s) is briefly illustrated. Both ends of the tube(s) should be broken and prepared before measurements as shown below.



④ **Measuring range**

The range of the substance concentrations that can be measured with the detector tube. The standard measuring range, or range of the printed calibration scale is given in the shaded box. Some lower limit values of the standard measuring ranges are parenthesized when they are not printed on the tubes but only their scale lines are printed.

⑤ **Number of pump strokes**

The number of pump strokes required for measuring a given range of concentrations. The volume to be sampled with those strokes is given in the parentheses. The standard pump strokes and the standard sampling volume are given in the shaded box. With most Gastec detector tubes, the standard pump strokes are prescribed as 1 (the standard sampling volume is 100 ml).

⑥ **Correction factor**

When measuring an extended range of concentration, that is, when the measurement is performed with other than the standard number of pump strokes, the tube reading should be corrected by multiplying the reading by the prescribed correction factor.

⑦ Sampling time

A waiting time for 100 ml (or 50 ml for half strokes) to be sampled in the detector tube after the handle of the Model GV-100 Gas Sampling Pump is fully (or half way for 50 ml) pulled out. When you pump more than once (n times), the waiting time for you to read the tube, that is, the measuring time is:

Measuring time=sampling time \times n.

⑧ Detecting limit

The lower limit of the substance concentration that the detector tube can detect. This minimal concentration can be recognized by a slight colour change at the entrance of the detecting layer. This value is followed by the parenthesized number of pump strokes required for measuring this concentration.

⑨ Colour change

Indicates how the detecting layer of the detector tube will change its colour by the reaction with the target substance. This is shown in the form of:

Original colour \rightarrow Changed colour

⑩ Corrections for temperature & humidity

For detector tubes whose indications are affected $\pm 10\%$ or more by the fluctuation of temperature or humidity, the tube readings should be corrected. Whether or not such corrections are necessary are indicated here. The correction data, if necessary, is provided in the instruction sheets provided with the detector tubes.

⑪ Relative standard deviation

An indicator of the accuracy of the detector tube. It represents how the tube indications may deviate from their mean value in percentage:

Relative standard deviation = $\frac{\text{Standard deviation } (\sigma)}{\text{Mean value } (\bar{x})} \times 100 (\%)$

⑫ Shelf life

The period that Gastec will warrant the quality of the detector tubes, provided that they are stored under the prescribed conditions.

⑬ Reaction principle

The chemical reaction of the target substance with the reagent(s) in the detector tube is briefly stated.

⑭ Possible coexisting substances and their interferences

Substances that are liable to coexist with the target substance and their influences on the tube indications are listed here. The column "Concentration" lists the lowest concentration that may affect the indication $\pm 10\%$ or more, or the highest concentration that is assured of no influence to such extent. These concentration levels are expressed either as quantitative ratios of interferences to the target substance (e.g., $\geq 1/5$, ≥ 2 times) or concentrations of interferences themselves (e.g., $\geq 3\%$, $\leq 500\text{ppm}$). Where, \geq reads "equal to or higher than" and \leq reads "equal to or lower than". The presumed influence by coexistence is given in the column "Interference" where the "+" sign suggests 10% or higher indication, the "-" sign expresses -10% or lower indication, or "No" means no influence. "Bleaching" means that this interference will cause the reaction colour to be pale. For your reference, the column "Changes colour by itself to" is given to show how the interferences will change the colour of the detecting layer if they exist without the presence of the target gas. "No" represents that no colour change will be observed. The table of interference gases primarily expresses the interference of each coexisting gas in the gas concentration range, equivalent to the gas concentration by some of the other coexisting gases or vapours mentioned from the main purposes of using the detector tube. Therefore, the test result may be given positive result by the other substance not listed in the table. If more precise information is needed, please contact us or our distributors in your territory.

⑮ Other substance (s) measurable with this detector tube (Correction Factor/Chart)

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 range as a reference. Moreover, this factor may vary slightly between production batches. For a more precise factor please contact your Gastec distributor.

⑯ Calibration gas generation

The method of generating the calibration gas that is used for calibrating the detector tube or testing its accuracy.

⑰ Special note

Other important information about the detector tube is provided, if any.

⑱ Threshold limit values and explosive range

Some substances may be hazardous to health or dangerous to life depending on their concentrations or the duration of exposure, or may be combustible or explosive. For detector tubes for measuring those substances, the threshold limit values based upon the recommendations of the American Conference of Governmental Industrial Hygienists (ACGIH), as well as the explosive ranges are presented for your reference.

TLV-TWA: Threshold Limit Value-Time-Weighted Average

The time-weighted average concentration for a normal 8-hour workday or 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

TLV-STEL: Threshold Limit Value-Short-Term Exposure Limit

The maximum concentration, to which workers can be exposed for a period of not longer than 15 minutes continuously without suffering from:

- (1) irritation,
- (2) chronic or irreversible tissue damage, or
- (3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue, or materially reduce work efficiency, and provided that the daily TLV-TWA is not exceeded.

TLV-C: Threshold Limit Value — Ceiling

The concentration that should not be exceeded during any part of the working exposure. In conventional industrial hygiene practice if instantaneous monitoring is not feasible. The STEL/C can be assessed by sampling over a 15 minutes period except for those substances that may cause immediate irritation when exposures are short.

Explosive range:

The range of concentrations of the substance in which its gas or vapour mixed with air will be explosive. Concentrations are expressed by the percentage (%) of the substance in the mixed air.

2007 Notice of Intended Changes

* mark means 2007 Notice of Intended Changes (NIC)

These substances, with their corresponding values and notations, comprise those for which (1) a limit is proposed for the first time, (2) a change in the Adopted value is proposed, (3) retention as an NIC is proposed, or (4) withdrawal of the Documentation and adopted TLV® is proposed. In each case, the proposals should be considered trial values during the period they are on the NIC. These proposals were ratified by the ACGIH® Board of Directors and will remain on the NIC for approximately one year following this ratification. If the TLV Chemical Substances Committee neither finds nor receives any substantive data that change its scientific opinion regarding an NIC TLV®, the Committee may then approve its recommendation to the ACGIH® Board of Directors for adoption. If the Committee finds or receives substantive data that change its scientific opinion regarding an NIC TLV®, the Committee may change its recommendation to the ACGIH® Board of Directors for the matter to be either retained on or withdrawn from the NIC.