GASTEC

Operation Manual

Gastec Model GV-100 Gas Sampling Pump

for

Gastec Detector Tube Systems

IMPORTANT !

Read this manual and the instruction manual of your Gastec Detector Tubes Carefully. Observe special information marked with warning symbols ⚠ **CAUTION** and △ **NOTE** for safe and accurate measurements.

Warning symbols used in this manual

⚠ **CAUTION** or ⚠: If not observed, injuries to the operator or damage to the product may result.

△ **NOTE** or △: Operational tips for proper use of the product to prevent functional failures.

Use the Model GV-100 Gas Sampling Pump together with Gastec Detector Tubes only for the purposes specified in the instruction manual of the detector tube and this manual. The Pump is provided together with its accessories as the Gastec GV-100S Gas Sampling Pump Kit. Gastec detector tubes are available in more than 484 applications, regarding target substances and their concentrations. Select the most appropriate ones for your measurements from the separate brochure "List of the Gastec Detector Tubes."

Figures used in this manual are for explanatory purposes and will not necessarily be the same as the actual devices in their appearances, sizes, positions, or colors.

⚠ **CAUTION : For Safe Operations**

⚠ :**Keep out of reach of children.**

Detector tubes are made of glass and their reagents may contain hazardous chemical substances. If this system is used in schools, teachers should be responsible for the safety of the children.

⚠ **: Direct the detector tube downward when conducting the leak check.**

When conducting the leak check, direct the tube downward to avoid injuring other persons with the tube end.

⚠ : **Put a tube cap on the uncovered tube end with tip broken.**

To avoid injuries, we strongly recommend to use an optional tube cap on the inlet end of detector tube connected to the Pump. This tube cap is made of rubber and can be used repeatedly.

⚠ : **Hold the tube near the rubber inlet when removing the tube from the rubber inlet.**

To avoid injuries, hold the tube firmly near the rubber inlet and pull it out straight. Never bend the tube when pulling out, or the tube may be broken and you might be injured by broken pieces of the tube.

⚠ : **Do not touch the broken tubes with bare hands.**

Should the detector tube broken, **do not touch** the broken pieces and reagents spilled out of the tube with bare hand(s). In case the reagents contact the skin, wash it out quickly. Sweep up the broken pieces and reagents and then scrub with a damp cloth.

The following items are included in the Gastec GV-100S Gas Sampling Pump Kit. If any of these items are missing, please contact your Gastec representative.

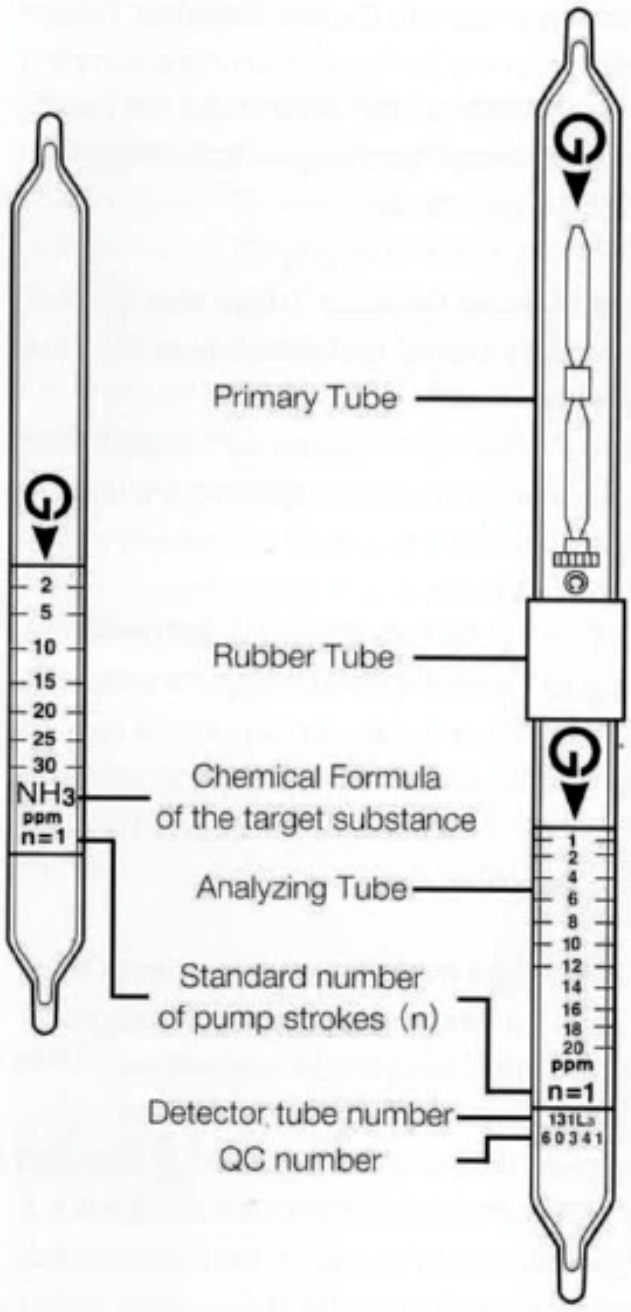
1. Model GV-100 Gas Sampling Pump
2. Accessories (3 rubber inlets and lubricant)
3. "Operation Manual, Gastec Model GV-100 Gas Sampling Pump for Gastec Detector Tube Systems" (this manual)
4. Container box

Model GV-100 Gas Sampling Pump and Gastec Detector Tube Systems

1. General

Model GV-100 Gas Sampling Pump

Detector Tube



2. Operating Procedures

△Notes

△ **Use appropriate Gastec Detector Tubes** designed for the Gastec vacuum-type sampling pumps capable of 100 ml aspiration with one full stroke. Otherwise erroneous measurement results will be obtained.

△ **Use Gastec Detector Tubes that are properly stored and effective at the time of use.**
Improperly stored or date-expired detector tubes may produce inaccurate measurement results. Gastec detector tubes must be properly stored in a cool, dark place or in a refrigerator (0 ° to 10 ° C or 32 ° to 50 ° F) as specified in individual detector tube packages. A cool, dark place refers to a place such as within a drawer or cabinet at an ambient temperature of 15 ° to 25 ° C (77 ° to 122 ° F) and protected from the direct sunlight or fluorescent light.

△ **Assimilate the tube temperature to the ambient temperature before measuring.** When the tube temperature is significantly different from the ambient temperature, inaccurate measurements may result. Therefore, the tubes just taken out of a cool storage like a refrigerator should be kept in the measurement place for about 15 minutes before using them to assimilate the tube temperature to the ambient temperature.

△ **Break both ends (tips) of the detector tube immediately before the measurement.**
Use of a detector tube opened for an extended period of time may produce an inaccurate measurement result.

△ **Read the tube immediately after the completion of sampling.**
As time passes, the color change layer might be prolonged or discolored resulting in a wrong indication.

Each of the detector tubes can be used only once. Measurements with used detector tubes will produce wrong results.

2.1 Inspecting the Pump before measurement (air leak check)

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

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

(3) Align the guide mark (red line) on the tailblock 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 turn and guide it back gradually.

△ **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.

(6) Confirm the handle returns to the initial position and the guide line on the pump shaft is not seen. If this is not confirmed, follow the maintenance procedures explained in "Section 4," Maintenance of the Model GV-100 Gas Sampling Pump."

2.2 Selecting the detector tube(s)

(1) Select the Gastec detector tube type most appropriate for your target substance and presumed concentrations.

(2) Confirm the standard number of pump strokes (n) and the sampling time for the tube, and the connection sequence if a twin tube is selected.

(3) Check if the detector tube requires correction for temperature, humidity, or atmospheric pressure to the tube reading. If required, read and record the necessary ambient data at the time of measurement. (See "**2.4. Corrections of the tube reading."**

(4) Check to see if interference gases are present. If so measure their concentrations to see if they are present at a concentration that will affect the detector tube indication.

△ **DO NOT USE THE SAME TUBE MORE THAN ONCE.**

2.3 Measuring

(1) Break off both ends (tips) of the detector tube by using the tube tip breaker provided in the Model GV-100 Gas Sampling Pump. In the case of a twin tube, break off both ends of both tubes and connect the ends of the tubes marked with a "C" using the rubber connector provided as specified in the instruction sheet included with the detector tube package.

How to break the tube tip:

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

Disposal of tube tips in the tube tip breaker storage

The tube tip breaker can break and store tips of about 60 tubes. Remove these tips before the storage becomes full by opening the rubber cap on the back of the tube tip breaker.

Replacement of the headblock

The diamond cutter of the tube tip breaker can cut about 20,000 tube tips. If you find the cutter has become dull, ask your Gastec representative to replace the headblock. The replacement will be performed only by an authorized Gastec dealer.

(2) 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.

(3) Align the guide mark (red line) on the tailblock and the guide mark (▲100 or ▲50 depending on the detector tube) on the handle.

(4) Direct the tube end to the point of measurement and pull out the handle fully (for 100 ml sampling) or halfway (for 50 ml sampling) along the guide line to the lock position.
(5) Wait until the sampling time has elapsed. The completion of the sampling of 100 ml or 50 ml can be confirmed by the flow finish indicator on the handle.

How to confirm the completion of sampling

When the Pump handle is pulled out, the white indicator of the flow finish indicator is pulled in by the vacuum generated in the pump cylinder. It pops out when the prescribed volume (100 ml or 50 ml) has been fully sampled.

(6) Unlock the handle by turning it more than 1/4 turn and restore it to the initial position. If more than one pump stroke is required, repeat the above procedures from step (3) as many times as required.

(7) Remove the tube from the Pump. Then read and record the indication at the end of the color change layer. Marking the end of the color change layer with a pen may be useful for easy reading or later confirmation. If the tube requires correction(s) of the reading, conduct appropriate correction(s) as described in the next section "2.4". Corrections of the tube reading." Used detector tubes should be disposed as described in "Section 6", Disposal of Gastec Detector Tubes."

Tips for detector tube reading

(a) When the end of the color change layer is flat:
Read the value at the end of the layer. In this example, the reading should be 5 %.

(b) When the end of the color change layer is slanted: Read the value in the middle of the slant. In this exaggerated example, the reading should be 5 %.

(c) When the demarcation of the color 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 %.

2.4. Corrections of the tube reading

After reading the tube, perform appropriate corrections if necessary, and record the result. Necessary correction information is provided in the instruction sheets for individual detector tubes. If more than one correction is necessary, use the following sequence:

(1) Correction for temperature or humidity

(2) Correction for the number of strokes

(3) Correction for atmospheric pressure

2.4.1 Correction for temperature

If the tube reading requires temperature correction within the measurement temperature of 0 to 40 ° C (32 to 104 ° F), read the temperature of the sample point at the increment of 5 ° C (9 ° F). The measurement temperature means the tube temperature, the sample temperature, but this usually is the ambient temperature since the tube temperature must be assimilated to the ambient temperature before measurement.

(1) Temperature correction using correction factor

Ex.: To find the true concentration when the tube reading is 2.5ppm at 15 ° C:
Calculate the correction factor for the temperature 15 ° C from the provided correction factor table by proportional allocation.

Temperature	0 ° C	10 ° C	15 ° C	20 ° C	30 ° C	40 ° C
Correction factor	1.45	1.20	CF	1.00	0.90	0.85

Correction factor for 15 ° C : CF = (1.20 + 1.00) / 2 = 1.10

True concentration = (tube reading) x (correction factor)

= 2.5 ppm x 1.10 = 2.75 ppm.

(2) Temperature correction using correction table

Ex.: To find the true concentration when the tube reading is 0.5 % at 35 ° C .

	True concentration			
Tube reading	**20 ° C**	**30 ° C**	**35 ° C**	**40 ° C**
0.6 %	0.6 %	0.55 %	C1	0.5 %
0.5 %			**C3**	
0.4 %	0.4 %	0.35 %	C2	0.3 %

(a) Find the true concentration (C1) for the tube reading 0.6 % at 35 ° C from the provided correction table by proportional allocation.

C1 = (0.55 % + 0.5 %) / 2 = 0.525 %

(b) Also find the true concentration (C2) for the tube reading 0.4 % at 35 ° C.

C2 = (0.35 % + 0.3 %) / 2 = 0.325 %

(c) Find the true concentration for the tube reading 0.5 % at 35 ° C (95 ° F):

C3 = (C1 + C2) /2 = (0.525 % + 0.325 %) / 2 = 0.425 %

2.4.2 Correction for humidity

If the tube reading requires humidity correction with the measurement temperature of 0 ° to 40 ° C (32 ° to 104 ° F), read the ambient humidity at the sample point using the No.6 Gastec water vapor detector tube. To find the true concentration from the tube reading, conduct an appropriate correction using the provided correction factor table by proportional allocation in a similar manner as described in **"2.4.1 Correction for temperature."**

True concentration = Tube reading x Correction factor

2.4.3 Correction for the number of pump strokes

Correction factors according to the number of pump strokes for individual Gastec detector tubes are provided in their instruction sheets. Use this correction factor to obtain the true concentration.

True concentration = Tube reading x Correction factor

2.4.4 Correction for atmospheric pressure

The tube reading is affected by a significant fluctuation of the atmospheric pressure. All Gastec detector tubes are calibrated based on normal atmospheric pressure of 1013 hPa (760 mmHg) and their indications will not be affected over the range of ±10 % of normal pressure (912 to 1114 hPa or 684 to 836 mmHg). If the pressure at the time of measurement is not within this range, correct the tube reading as follows:

True concentration = Tube reading x 1013 (hPa) / Atmospheric pressure (hPa)

or = Tube reading x 760 (mmHg) / Atmospheric pressure (mmHg)

3. Maintenance of the Model GV-100 Gas Sampling Pump

△ NOTES

△ **Never modify the Model GV-100 Gas Sampling Pump.** A tampered model is not covered by the warranty even if it is within the warranty period.

△ **Never dissemble the pump portions such as the headblock, flow finish indicator and the piston.** If disassembled, an air leak might result and the pump is not covered by the warranty.

△ **Use genuine Gastec Maintenance parts only.** If not, the pump is not covered by the warranty.

Major causes of air leak with the Pump are loosened inlet clamping nut, damaged or deteriorated rubber inlet, and discolored lubricant or insufficient t of lubricant. The following table shows the possible causes of air leak and available countermeasures. If these countermeasures will not work, ask your Gastec representative for repair.

Source of air leak	Status	Countermeasure
Inlet clamping nut	Loosened	Firmly tighten the nut.
Rubber inlet	Damaged or deterio-rated	Replace with the new one.
Cylinder or Piston	Discolored lubricant or insufficient of lubricant	Perform the lubrication as described in the following lubrication procedures.

3.1 Lubrication procedures

(1) Turn the back plate to the left and remove the handle-back plate-piston assembly from the pump cylinder.
(2) Clean the inside of the pump cylinder and the perimeter of the piston with a soft cloth or paper.
(3) Apply a small amount of lubricant evenly on the inside wall of the entrance of the pump cylinder.
(4) Restore the handle-back plate-piston assembly slowly into the pump cylinder, and turn the tailblock to the right and firmly tighten it up.
(5) Work the piston back and forth slowly about ten times to apply the lubricant thinly throughout the inside wall of the pump cylinder.
(6) Perform the Pump's air leak check as described in **"Section 2.1 Inspecting the Pump before measurement"** to confirm the air tightness of the Pump.

3.2 Maintenance parts

Item	Order No	Quantity
Rubber inlets	GV100-3P10	10 pcs/package
Lubricant	GV100-2	1
Inlet clamping nut	GV-100-6P10	10 pcs/package

4. Optional tools useful for measurements using the Model GV-100 Gas Sampling Pump

4.1 DTP-1-20 (blue) and DTP-2-20 (pink) Tube Caps

Rubber caps to be put on the opened inlet end of the detector tube to prevent accidental injuries. The blue caps are for the tubes with the largest outer diameter (7 mm), and the pink caps are for other detector tubes. Each of them can be used repeatedly. These caps are available in a package of twenty pieces of the same color.

4.2 No.340 Hot Probe and No.345A Hot Probe Holder

Used to sample very hot gases such as automobile exhaust or flue gases at approximately 60 to 600 ° C (140 to 1,112 ° F). The No.340 Hot Probe can rapidly cool a sample down to an ordinary temperature before the sample enters into the connected detector tube. The hot probe holder firmly supports the hot probe.

4.3 No.350A and No.350A-10 Extension Hoses with No.357 Tube Holder

Synthetic rubber hoses useful for safe and accurate remote sampling of gases and vapors in tanks or manholes. The detector tube is connected to the No.357 Tube Holder at the end of the No.350A (5 m in length) or No.350-10 (10 m in length) Extension Hose. The other end of the Extension Hose is connected to the Pump.

4.4 No.500 Air Flow Indicator Kit

Used to test air flows. Just break off both ends of a No.501 smoke generation tube (6 tubes/package) and connect the tube to the rubber bulb. Squeezing the bulb absorbs the atmospheric moisture that reacts with the reagent in the tube, generating a white smoke. A single No.501 tube can be used repeatedly for 50 to 100 tests by sealing the tube ends with the rubber caps after each test.

4.5 Gastec Handbook

Provides very useful information for a wide variety of people from beginners to the professionals who are interested in health and hygiene programs of the working places and public buildings, including air, water and the soil. It also introduces an assortment of Gastec detector tube systems, Gastec detector tubes' specifications, high-precision calibration tools, tips for effective measurements as well as properties of substances to be measured.

5. Disposal of Gastec Detector Tubes

⚠ Caution: Used or date expired detector tubes should be disposed properly in accordance with your local regulation.

Detector tubes contain sensitive reagents that are ready to react, and may contain some substances that are specified as hazardous industrial wastes. For further information, consult your Gastec representative.

6. Warranty

The warranty period of the Model GV-100 Gas Sampling Pump is one year from the original date of purchase. If the Pump proves to be defective during the warranty period, we will, without charge, repair it provided that the defect is not caused by accident, misuse or tampering with the Pump. For detailed information on warranty service or information, contact your Gastec representatives.

Specifications and appearance are subject to change without notice for improved performance.

For all types of gas and vapour SINCE 1970

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GASTEC CORPORATION

8-8-6 Fukayanaka, Ayase-city, Kanagawa 252-1195, Japan
Tel.+81(0)467-79-3910 Fax.+81(0)467-79-3979
URL: http://www.gastec.co.jp/