MONITORING & CONTROL FOR YOUR ENVIRONMENT

A1-CBISS Limited
Part of the Diploma Holdings PLC Group

t: +44(0)151 666 8300 f: +44(0)151 666 8329 e: sales@a1-cbiss.com w: www.a1-cbiss.com

Gastec GV-100S and GV-110S Sampling Pump Manual

GV-100S Sampling Pump

GV-110S Sampling Pump With Counter

The Gastec precision pump (GV-100S) and Gastec Precision Pump with a counter (GV-100S) is designed specifically to be used with Gastec standard and polytec tubes. Using this range you can monitor up to 600 gases and vapours.

The Gastec precision pump and Gastec Precision Pump with a counter can precisely collect a sample volume for a detector tube. The full-stroke (100ml) and the half stroke (50ml) positions are marked exactly by the red line on the pump shaft, and the handle is precisely locked at those positions. If you pump fully n times by allowing for sampling time intervals, a volume of 100ml x n can be sampled. Each detector tube is calibrated based upon a prescribed (standard) volume of sample. Also the pump piston has been designated with a smaller diameter so the handle can be pulled out with even less effort. The Gastec precision pump design proves you with advanced and non sparking design and superior features.

MONITORING & CONTROL FOR YOUR ENVIRONMENT

A1-CBISS Limited
Part of the Diploma Holdings PLC Group

t: +44(0)151 666 8300 f: +44(0)151 666 8329 e: sales@a1-cbiss.com w: www.a1-cbiss.com

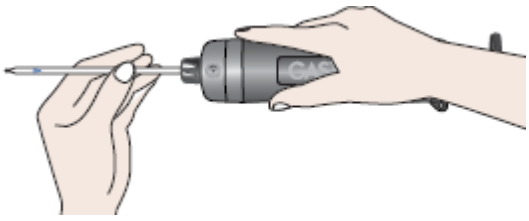
Operating Procedures for GV-100S and GV-110S

Inspecting the air-tightness of the sampling pump

△ NOTE: When there is a leak in the sampling pump, you cannot obtain the correct measurement values e.g. measured values may be lower than the actual values. Be sure to check the sampling pump for air-tightness before doing any measurements. Also, check the operation of the flow finish indicator at this time.

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.



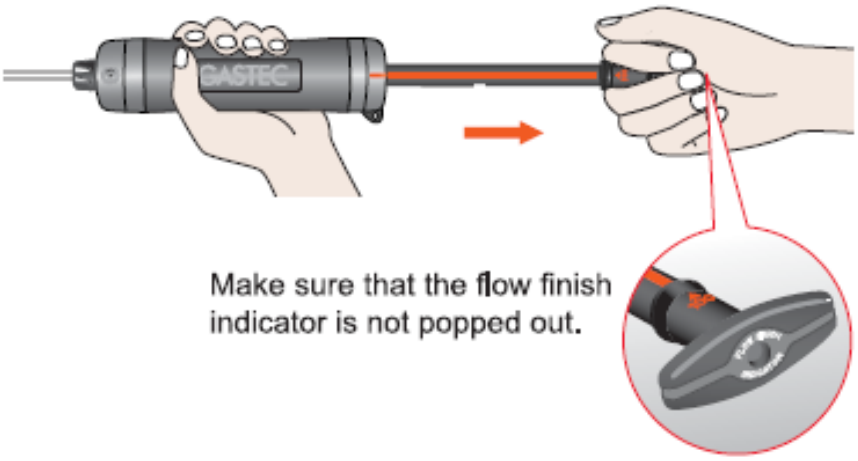
3) Align the guide mark (red line) on the back plate and the guide mark (▲100) on the handle. At this time, make sure that the flow finish indicator is popped out.

NOTE: When you use the GV-110 pump, align the guide mark with the guide line (red line) below the wh△e mark at the counter.

t: +44(0)151 666 8300 f: +44(0)151 666 8329 e: sales@a1-cbiss.com w: www.a1-cbiss.com

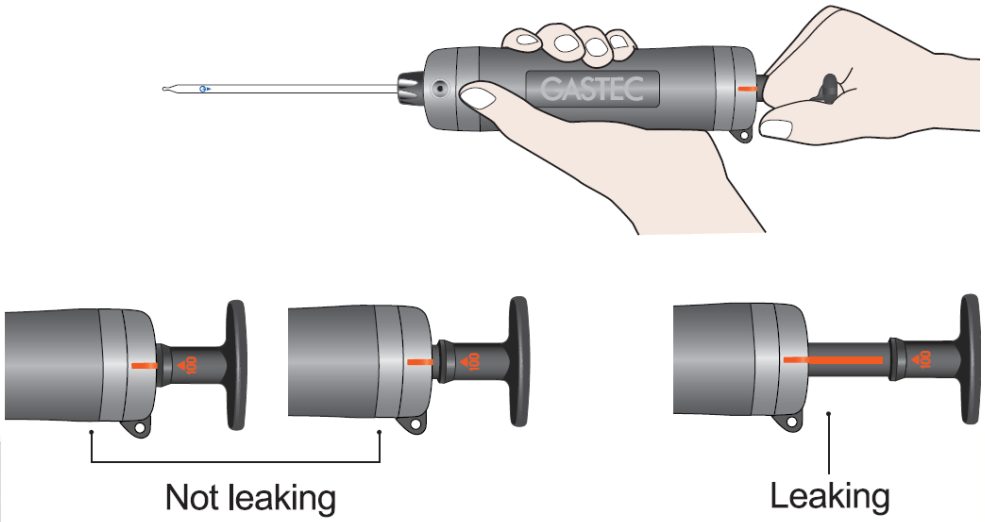
4) Securely hold the cylinder of the sampling pump. Then, pull out the handle fully along the red guide line on the pump shaft to the lock position, and wait 1 minute. At this time, make sure that the flow finish indicator is not white.

NOTE: Never hold the counter when using a GV-110. It may hamper proper operation of the counter and may cause a malfunction.



5) Unlock the handle by turning it more than ¼ turn and guide it back gradually. Confirm the handle returns to the initial position and the guide line on the pump shaft is not seen. Also confirm the finish indicator has been popped out again.

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 or injure yourself.



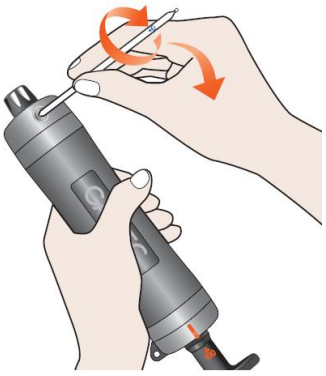
MONITORING & CONTROL FOR YOUR ENVIRONMENT

A1-CBISS Limited
Part of the Diploma Holdings PLC Group

t: +44(0)151 666 8300 f: +44(0)151 666 8329 e: sales@a1-cbiss.com w: www.a1-cbiss.com

Sampling Using the Pump

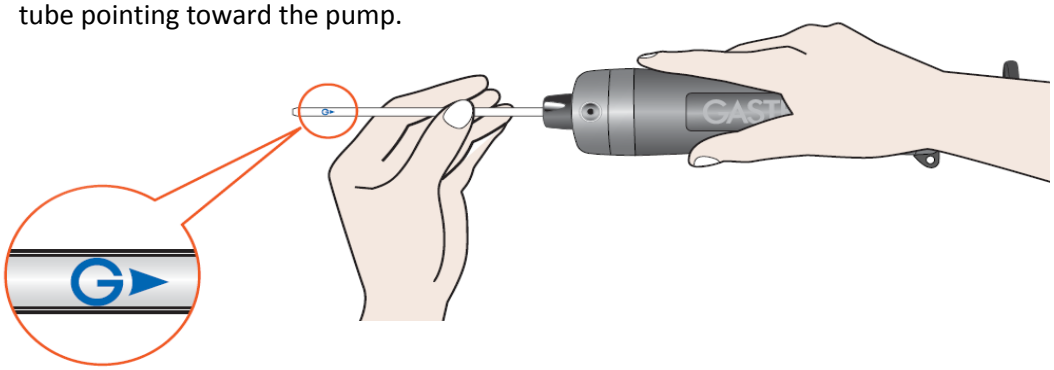
1) Break off both ends (tips) of the detector tube by using the provided tube tip breaker or the tube tip holder (GAS721). In the case of a twin tube, break off both ends of both tubes and connect the ends of the tubes marked with a © using the rubber connector.



How to break off the tube tip

Insert the detector tube end straight into the tube tip breaker, and rotate the tube for one full turn so that the diamond cuter of the tube tip breaker scratches the surface of the tube end. Hold the detector tube firmly at a point close to the tube tip breaker and bend the tube toward the handle to break the tube tip.

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.

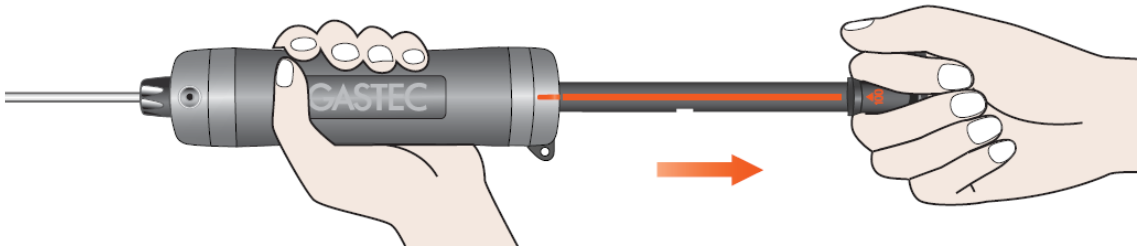


3) Align the guide mark (red line) on the back plate and the guide mark (▲100 or ▲50) depending on the handle.
NOTE: The guide mark ▲100 means a full pump stroke (100ml) and the guide mark ▲50 means ½ a pump stroke (50ml). You can confirm the number of pump strokes of a given detector tube by referring to the guide marks on the tube body or by referring to the detector tubes operation manual (HBE)/Instruction leaflet supplied in a pack of tubes.

t: +44(0)151 666 8300 f: +44(0)151 666 8329 e: sales@a1-cbiss.com w: www.a1-cbiss.com

If you are using the GV-110S pump with a counter, please follow the instructions on page 9.

4) 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.
NOTE: If you are using the GV-110S pump with a counter, do not grasp the counter, otherwise the counter will not operate properly and may result in a malfunction.



5) Wait until the specified sampling time has elapsed. The completion of the sampling of 100ml or 50ml can be confirmed by the flow finish indicator on the handle. Unlock the handle by turning it more than ¼ turn and restore it to the initial position.

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

The time necessary for one sample is shown in the operation insert of each pack of detector tubes.

Repeat the above steps if one or more pump strokes are required.

During sampling Sampling completed

t: +44(0)151 666 8300 f: +44(0)151 666 8329 e: sales@a1-cbiss.com w: www.a1-cbiss.com

6) Remove the detector tube from the pump. This completes the sampling process.

NOTE: Remove broken glass tips in the pump head before it becomes full. Open the dust cap (on the opposite side of the tube tip breaker of the pump head block) and shake out the broken glass tips carefully and dispose safely of them. After disposing the broken glass tips, securely close the cap. If you do not securely close the cap, broken glass tips may fall from the dust cap hole when monitoring.

How To Operate the GV-110S pump with a counter

The GV-110S pump with a counter can make up to 10 samples. Do the following steps to set the counter:

1) Align the zero (0) on the counter ring with the white △ mark. Rotate the outer ring of the counter to align the number with the white △ mark.

2) Each time you do a sample, the number will increase by one. After you have completed sampling, the number at the white △ mark which indicates the actual number of samplings you have done.

The maximum number of samplings that can be counted is ten. The number will not increase when the white △ mark indicates “10”

3) To reset the counter to zero, rotate the counter ring in the direction of the arrow as shown to the right. Align the zero (“0”) on the counter ring with the white mark. Once this has been done you can count a sample again.

When you do not want to use the counter:

Turn the counter ring in the direction of the arrow as shown on the right. Align the letter “N” with the white mark. You can now use the pump without the counter increasing.

t: +44(0)151 666 8300 f: +44(0)151 666 8329 e: sales@a1-cbiss.com w: www.a1-cbiss.com

NOTE: The counter will not increase if the handle mark is at ▲50 (50ml)

The counter ring cannot be rotated while the handle is pulled out. Do not try to force it to rotate because you may break the counter.

Do not grasp the counter when sampling. Otherwise, the counter will not operate properly resulting in a malfunction.

How To Take Readings and Calculate The Results

Follow the procedures below on how to read the scale, correct for external factors and record the results. For correction factors, firstly correct the temperature or humidity against the reading, then correct for the number of samplings (refer to the manual of each detector tube), and correct for the ambient pressure.

Also check for any interference gases present in the measuring environment. If there are any external influences such as gas that may affect the detector tube.

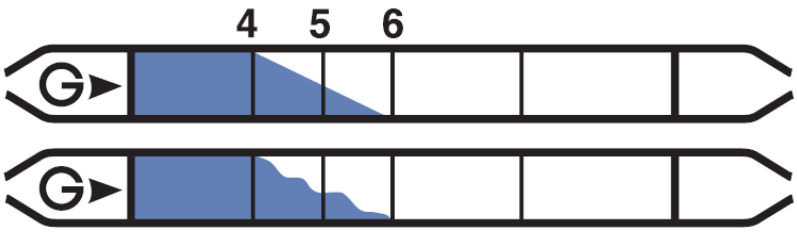
How To Read The Scale

After completing sampling, immediately read the scale at the end of the colour change layer. Marking the end of the colour change with a pen may be useful for easy reading and later confirmation.

Hints for detector tube reading

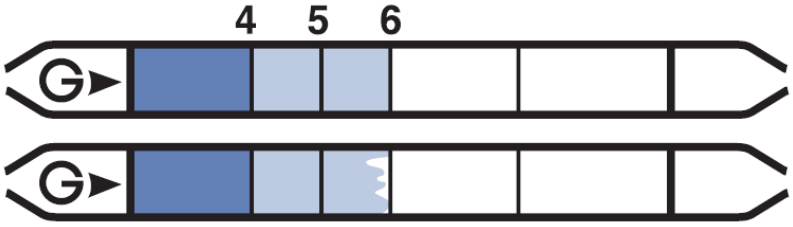
When the end of the colour change layer is flat

Read the value at the end of the layer. In this example, the reading should be 5



When the end of the colour change is slanted

Read the value in the middle of the slanted portion of the slant. In this exaggerated example, the reading should be 5, which is in the middle of 4 and 6.



t: +44(0)151 666 8300 f: +44(0)151 666 8329 e: sales@a1-cbiss.com w: www.a1-cbiss.com

When 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, which is in the middle between 4 and 6.

Correction for Temperatures

If the tube reading requires temperature correction within the measurement temperature of 0°C to 40°C (32°F to 104°F), read the temperature of the sample point at the increment of 5°C (9°F). The measurement temperature refers to the tube temperature, and not the sample temperature, but this is usually the ambient temperature, since the tube temperature must be assimilated of the ambient temperature before measurement.

Example 1: Temperature correction using correction factor

To find the true concentration when the tube reading is 2.5ppm at 15°C (59°F), first using the table below obtain the correction factors for the temperatures 10°C (50°F) and 20°C (68°F). Then add these two factors and divide the result by 2 (known as proportional allocation). Finally, multiply the reading by the calculated factor.

Temperature °C (°F)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)
Compensation factor	1.45	1.20	1.00	0.90	0.85

Proportional allocation: (1.20 + 1.00) ÷ 2 = 1.10
True concentration = 2.5 (ppm) x 1.10 = 2.75 (ppm)

Example 2: Temperature correction using the correction table

To find the true concentration when the tube reading is 0.5% at 35°C (95°F), first using the table below, obtain the true concentration factors for the tube reading at 0.6% at the temperatures of 30°C (86°F) and 40°C (104°F). Then add these two factors and divide the result by two (known as the proportional allocation). Repeat the step again for the tube reading at 0.4%.

	True concentration		
Tube reading	20°C(68°F)	30°C(86°F)	40°C(104°F)
0.6%	0.6	0.55	0.5
0.4%	0.4	0.35	0.3

t: +44(0)151 666 8300 f: +44(0)151 666 8329 e: sales@a1-cbiss.com w: www.a1-cbiss.com

Next, add the two true concentration values obtained from above and divide them by 2 (known as proportional allocation). The resulting value shown in the shading area in the table on the next page is 0.425%. This is the true concentration factor at 35°C (95°F) at a reading of 0.5%

	True concentration		
Tube reading	30°C(86°F)	35°C(95°F)	40(104°F)
0.6%	0.55	0.525	0.5
0.5%		0.425	
0.4%	0.35	0.325	0.3

Correction for Humidity

If the tube reading requires humidity correction with the measurement temperature of 0°C to 40°C (32°F to 104°F), read the ambient humidity at the sample point using the no.6 Gastec Water Vapour detector tube.

Example of Humidity Correction

If the reading on the nitric acid detector tube (No. 15L) is 5ppm and the measured value on the water vapour detector tube is 6mg/l, calculate the true concentration by multiplying the reading with the appropriate correction factor in the table below.

Absolute humidity (mg/L)	4	6	8	10	12	14
Correction factor (f)	0.55	0.68	0.85	1.0	1.13	1.3

True concentration = 5ppm x 0.68 = 3.4(ppm)

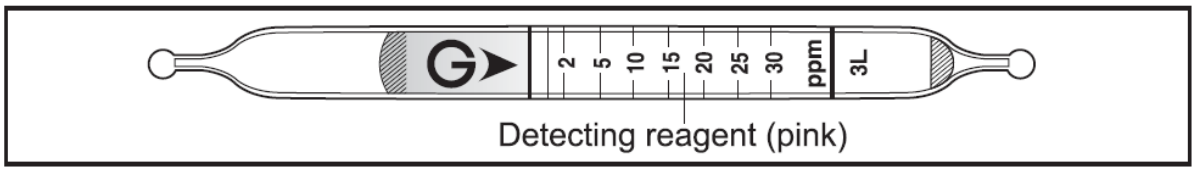
t: +44(0)151 666 8300 f: +44(0)151 666 8329 e: sales@a1-cbiss.com w: www.a1-cbiss.com

Correction for the number of pump strokes

Make the following correction when measurements were made for a number of strokes other than the specified number.

Some detector tubes can measure concentrations beyond the printed scale. The Gastec Technical Handbook (HBE) shows each available tube range of concentration for measurement (measuring range), the number of pump strokes (n) required and if applicable the stroke correction factors. (see example GAS3L on the next page below). Multiply the indicated value by an appropriate factor to obtain the true concentration. However, since the correction factors are fixed in specific numerical values, precise results may not be obtained as in the case of measurement with the standard number of strokes when measurement is made by a number of strokes other than the standard number. Use the results obtained using a correction factor as a reference only.

Example) No.3L



Measurement range	0.5～1ppm	1～30ppm	30～78ppm
Number of strokes (n)	2	1 (standard)	1/2
Stroke correction factor	1/2	1	2.6
Sampling time	Approx. 2 min.	Approx. 1 min.	Approx. 30 sec

t: +44(0)151 666 8300 f: +44(0)151 666 8329 e: sales@a1-cbiss.com w: www.a1-cbiss.com

Correction for Atmospheric Pressure

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

True concentration

$$= \text{Tube reading} \times \frac{1013\ (\text{hPa})}{\text{Atmospheric pressure (hPa)}}$$

or

$$= \text{Tube reading} \times \frac{760\ (\text{mmHg})}{\text{Atmospheric pressure (mmHg)}}$$

Possible effects from interference gases

Detector tubes use chemical reactions to indicate colour changes. Therefore, indications on the detector tubes may be affected when there is an interference gas that has similar chemical properties as the target gas. If such interference gas exists, measurement will be incorrect. Be sure to check if interference gases are present in the measurement environment and if present, confirm before measurement with the operation manual of the detector tube and its possible effects on the measurement.

The table on the leaflet included in each pack detector tubes shows interference properties of each gas monitored (if applicable). Some materials of specific concentration are not shown on the leaflet may affect the reading under specific conditions.

Maintenance

Frequent use of the Gastec precision pump can cause an air leak which can be easily resolved. Most common problems are loose inlet clamping nut, damaged or deteriorated rubber inlet, and deteriorated or insufficient lubricant. The table below shows the possible causes and solutions:

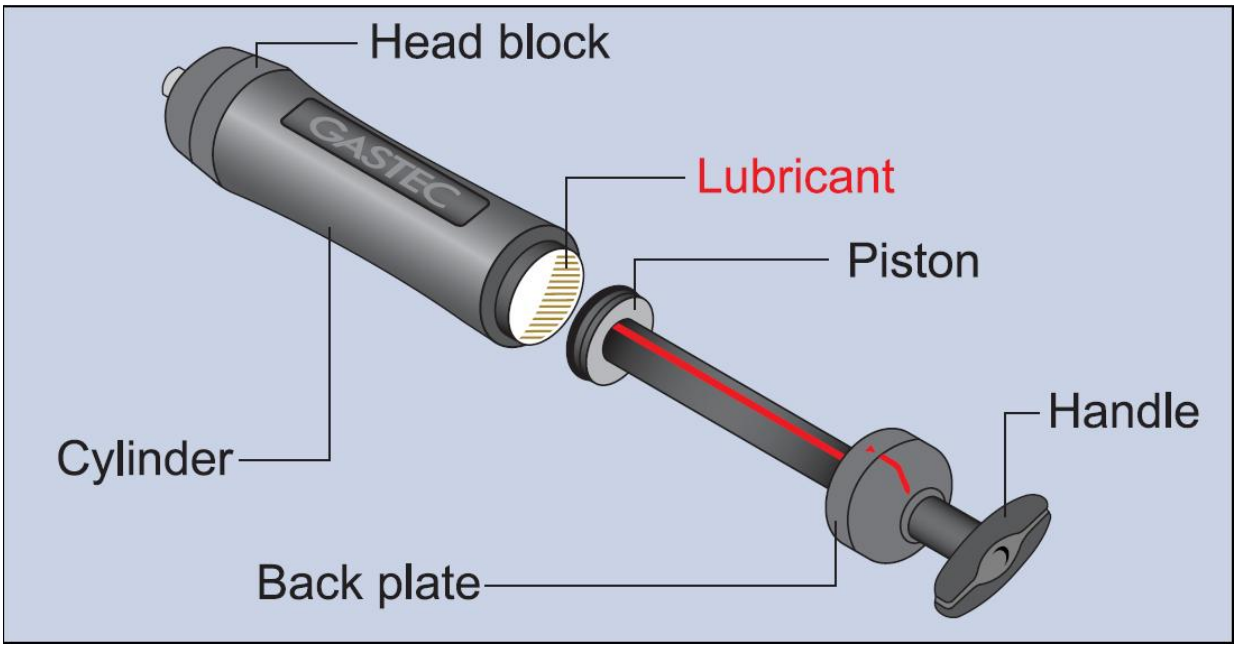
Source of air leak	Possible causes	Countermeasures
Inlet clamping nut	Loose due to insufficient tightening	Re-tighten the nut
Rubber inlet	Damaged or deteriorated	Replace with a new rubber inlet
Cylinder or Piston	Deteriorated or insufficient lubricant	Follow the lubrication procedures.

t: +44(0)151 666 8300 f: +44(0)151 666 8329 e: sales@a1-cbiss.com w: www.a1-cbiss.com

If you are still experiencing problems please call a1-cbiss for more technical advice or replace your pump.

Maintenance Procedures

1) Turn the back plate anti-clockwise to remove the piston from the cylinder.
2) Remove the old lubricant from inside the cylinder and around the perimeter of the piston with a soft cloth
3) Apply the lubricant evenly on the inside of the wall at the opening of the cylinder.
4) Push the piston into the cylinder and then turn the back plate clockwise to tighten.
5) Move the handle back and forth approximately 10 times to coat the entire cylinder with lubricant.
6) Check the sampling pump for air-tightness to make sure there are no leaks.



t: +44(0)151 666 8300 f: +44(0)151 666 8329 e: sales@a1-cbiss.com w: www.a1-cbiss.com

The parts listed below are important for proper air-tightness. Therefore, repairs and replacement parts should be repaired by a1-cbiss if required.

- **Repair of the flow finish indicator**

A malfunctioning flow finish indicator may lead to air leaks in the sampling pump. If any abnormality is found, please contact us.

- **Replacement of the head block**

  The file in the tube tip breaker can be used for up to 20,000 detector tubes. When it becomes ineffective for breaking off tube tips, please contact us for a replacement head block.

- **Repair of the counter**

  When any abnormality is found with the counter, please contact us.

Never give a gastec precision pump any strong shock, otherwise a malfunction may result.

NOTE:

- Do not modify the sampling pump. Tampering with the pump may invalidate warranty conditions.
- Do not disassemble pump components such as head the block, back plate, flow finish indicator and piston. If assembled incorrectly an air leak may result and this may also invalidate warranty conditions.
- Only use Gastec components for maintenance only. Use of other parts will invalidate warranty conditions.