

# Using RAE Systems Colorimetric Gas Detection Tubes and Pumps



PROTECTION THROUGH DETECTION

# Important Cautions When Using Tubes

- Failure to wear protective equipment may lead to cuts and other severe injuries to eyes and hands



Wear safety glasses and gloves when opening or handling tubes with sharp edges

- Always test the pump for leaks immediately before using it for a series of measurements



Failure to test the pump for leakage may lead to dangerously inaccurate readings

# Important Cautions When Using Tubes

- Avoid contact with tube contents in case of accidental breakage



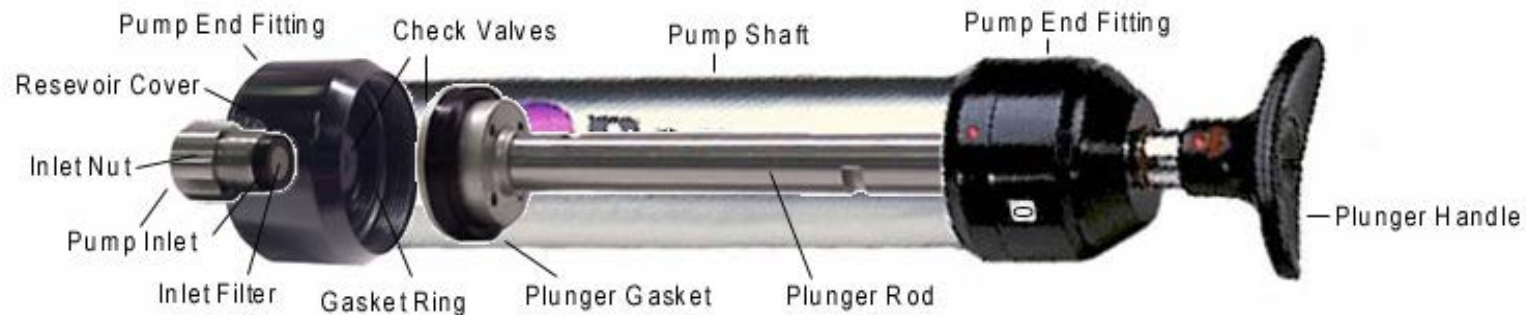
Exposure to tube contents can result in significant health hazards

- Dispose of spent tubes according to local regulations



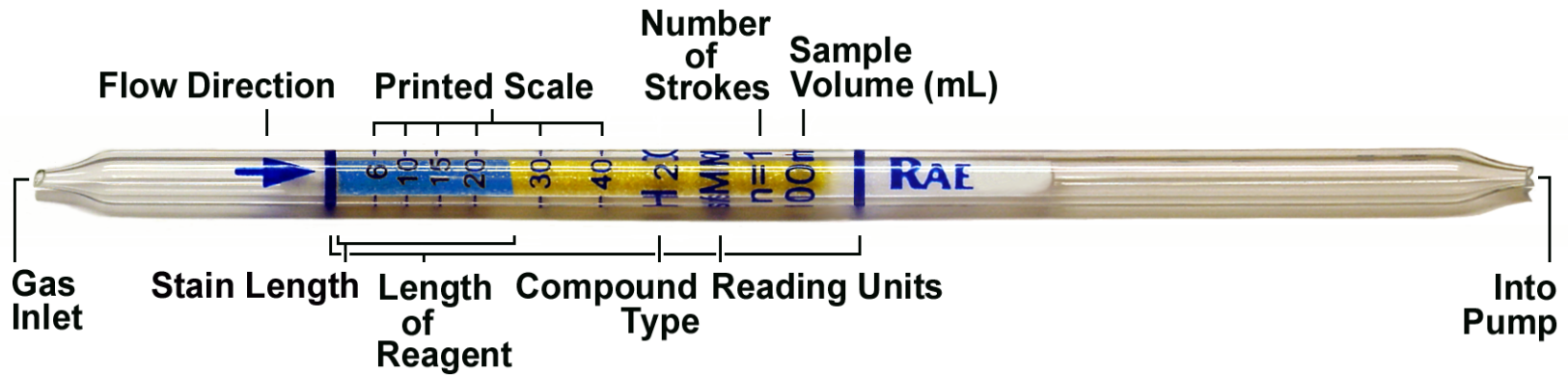
Review information listed in the Gas Detection Tube Data Sheet to identify materials that may require special disposal procedures.

# The LP-1200 piston-type hand-pump description



- Draws fixed volume of gas, either 50 or 100 mL
- Vacuum seal formed by a greased plunger gasket
- Tapered inlet accommodates wide range of tubes
- Inlet filter protects the shaft from particulates
- Handle houses an end-of-flow indicator
- Built-in counter keeps track of the number of strokes

# RAE Colorimetric Tube Description and Packaging



- Each box contains 10 tubes
- Instructions on back of box
- Arrow indicates direction of insertion and airflow
- Concentration scale and gas type printed on tube
- Number of strokes, total sample volume and units of measure also printed on tube

# Tube Data Sheet Description

- Each box packaged with a Tube Data Sheet that gives detailed information on tube performance
- Partial data sheet sample:

## Gas Detection Tube Data Sheet Hydrogen Sulfide H<sub>2</sub>S

**No. 103-18**

Part No.: 10-103-18-4M

	Extended Range	Standard Range	Extended Range
Range (ppmv)	12.5 - 125	25 - 250	50 - 500
No. of Pump Strokes	2	1	0.5
Sample Volume (mL)	200	100	50
Sample Time (min)	2 x 1	1	1
Correction Factor (CF)	0.5	1	2



PROTECTION THROUGH DETECTION

# Testing the Hand-Pump for Leaks

- Insert unopened tube in hand-pump inlet
- Pull one-full stroke on plunger
- Wait two-minutes
- While holding the pump and plunger, rotate the plunger to release
- Allow the plunger to be drawn gently back into the pump shaft
- The plunger should return to within three millimeters of its original position



# Measurement Procedure

- Step One:
  - Break both ends of a new detection tube using the tip breaker on the side of the pump



## ■ Step Two:

- *Insert the tube, arrow towards the pump*





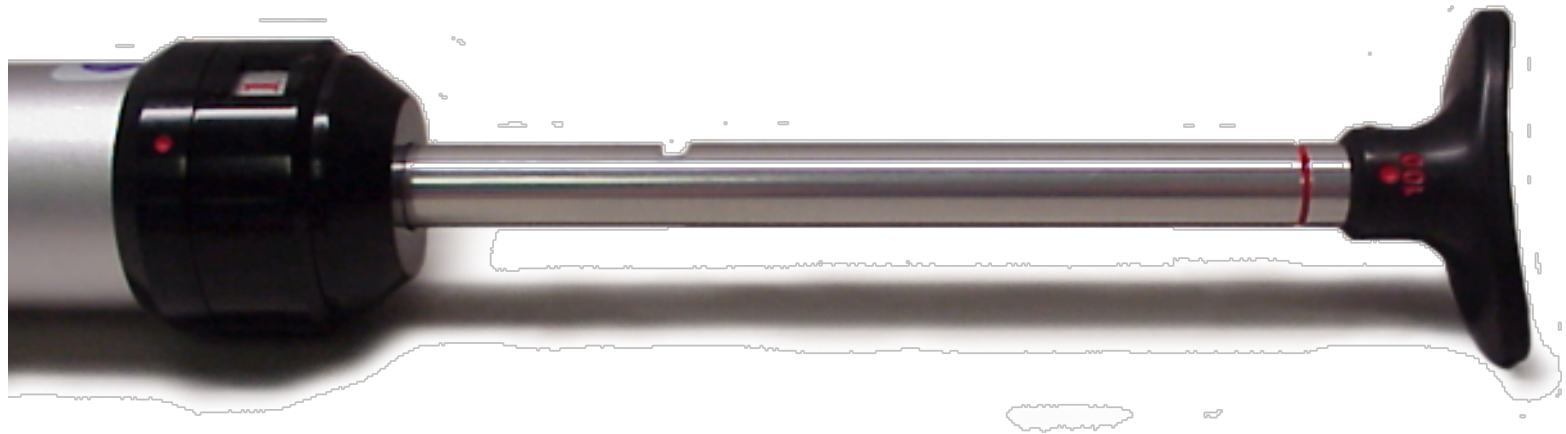
# Measurement Procedure

- Step Three:
  - Select the sample volume desired and align the red dot on the plunger with the red dot on the pump shaft



# Measurement Procedure

- Step Four:
  - Pull the handle sharply until it locks (50 or 100 mL)
  - Wait for the sampling time indicated on the data sheet to allow the air to be drawn through the tube



# Measurement Procedure

- Step Five:
  - Flow is complete when the end-of-flow indicator returns to its full brightness.
  - For additional strokes go to step six, otherwise read the tube



***End-of-flow indicator***

# Measurement Procedure

- Step Six:
  - For additional pump strokes, rotate the handle  $\frac{1}{4}$  turn.



***Push the plunger in without removing the tube.***

***Then repeat Step 4.***



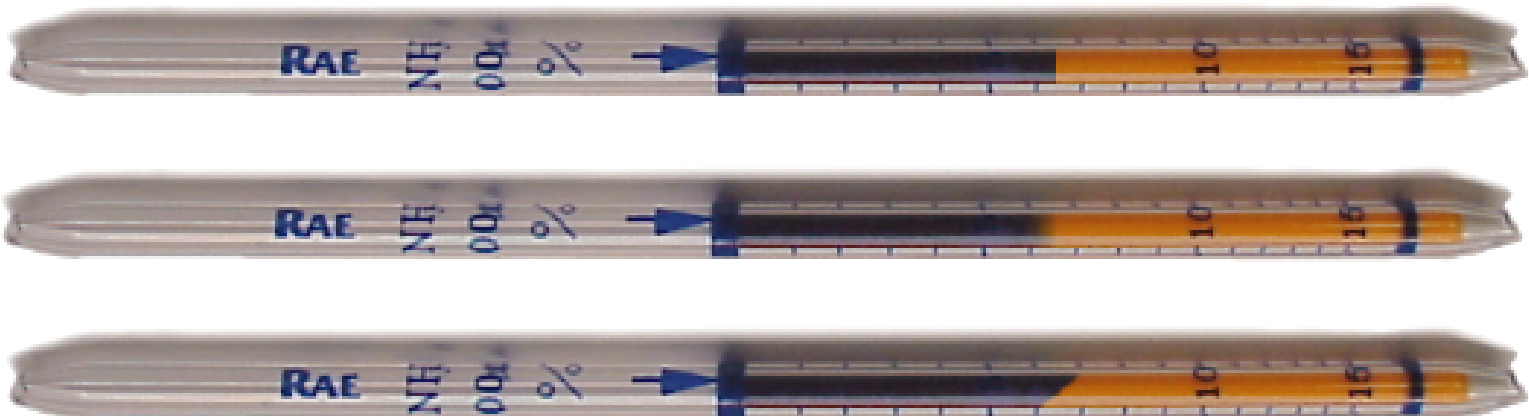
# Measurement Procedure

- Step Seven:
  - Empty broken glass bits from tube-tip reservoir as often as is necessary



# Reading Tubes

- The reading is the furthest point along the color change
- If the leading edge is diagonal or diffuse, use the average of the minimum and maximum values
- The three tubes shown below are all read as 6.5%



# Reading Tubes

- Read tube immediately after gas sampling, as colors may change, fade, or disperse with time
- If a non-standard number of pump strokes was used for sampling, multiply the reading by the correction factor given on the Tube Data Sheet
- If humidity and temperature corrections are necessary as indicated on the Data Sheets, multiply the observed readings by the given correction factor(s) (CF) to obtain the true concentration



# Sampling Volumes and Ranges

- Standard Sampling Volume and Ranges
  - Standard stroke requirements are printed on each tube
  - Gas concentrations can be measured by the scale printed on the tube
- Extended Sampling Volumes and Ranges
  - Varying the number of strokes (volume) allows measurement of lower and higher concentrations than printed
  - Varying the stroke means that the printed scale reading must be multiplied by a correction factor (CF)





# Cross-Sensitivity Cautions

- Colorimetric tubes are, by nature, selective;
- However, some compounds interfere with certain measurements



- Each Tube Data Sheet lists possible interfering compounds, but others may also exist



- Interfering compounds can increase or decrease the reading



- Be aware of potential interferences!

# Maintenance of the LP-1200 Piston Hand Pump

- Tube Tip Reservoir
  - Remove the tube tip reservoir cover as needed to empty the broken glass reservoir that is in the pump end fitting



***Tube-tip reservoir cover***


# Maintenance of the LP-1200 Piston Hand Pump

- Pump Inlet and Filter



- The rubber pump inlet can become worn with use and result in leaks
- Unscrew pump inlet nut and replace the rubber inlet
- If the inlet is not replaced, inspect the inlet filter and replace or clean the filter as necessary

# Maintenance of the LP-1200 Piston Hand Pump

- Plunger gasket may leak if worn or not well lubricated
  - To replace gasket, unscrew pump end fitting on the handle side, and pull plunger out of the pump shaft
  - After replacing gasket, carefully push plunger  back into the shaft
  - Use a fine screwdriver or tweezers to help ease the gasket into the shaft
  - Lubricate inside of shaft with vacuum grease to ensure a good seal
  - Caution: Do not over tighten the plunger gasket as it could cause a sudden loss of vacuum

# Maintenance of the LP-1200 Piston Hand Pump

- **Inlet Valve**

- Inlet check-valve may cause leaks if worn or not lubricated
- Unscrew the end-fitting on the inlet side, and pull out the disk-shaped rubber-inlet check-valve
- Replace as necessary, adding a light coat of grease around the hole

# Maintenance of the LP-1200 Piston Hand Pump

- **Outlet Valve**

- Replace outlet check-valve gasket if there is resistance on the return stroke
- Using the special tool or needle-nose pliers, unscrew the plunger tip from the plunger rod
- Replace O-ring and check-valve gasket as necessary, and reassemble
- Inspect gasket-ring in the inlet end-fitting, and replace if damaged before screwing the end-fitting back on

