

# ***SENSIDYNE***<sup>®</sup>

## **Model AP-20S Gas Detection Pump *Instruction Manual***



Made in Japan for Sensidyne by Komyo Rikagaku Kogyo K.K.

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# FOREWORD

Thank you for purchasing the Model AP-20S sampling pump. The Model AP-20S pump is designed specifically for use with Kitagawa detector tubes. This system with the available Sensidyne/Kitagawa detector tubes can detect the presence of more than 300 airborne gases and vapors.

## FOR SAFE AND CORRECT USE

- Read carefully both this instruction manual and the instruction sheets for the individual detector tubes prior to use of this product.
- Ensure that this instruction manual is stored in a convenient location for easy reference at all times.
- If you have any questions regarding this manual, please contact your local distributor or manufacturer representative.

### The following symbols are used in this manual



**CAUTION:** Failure to observe this instruction can result in possible personal injury or damage to property.



**NOTE:** Indicates instruction or advice for the correct use of the product, to prevent problems with the product.



### CAUTIONS



- With a detector tube inserted and the handle drawn back, the pump cylinder is under a high vacuum. If the handle lock is released under vacuum conditions, it will pull back suddenly. Holding the pump by the extended shaft can lead to injury. Always hold the pump by the cylinder, never by the shaft.
- Broken glass tube tips can fall from the tip cutter or storage area when using the pump. To prevent glass contamination in restricted area (e.g., food processing plants) use the optional Deluxe Tip Cutter (PN<sup>o</sup> 7013601).
- Normal use of detector tubes requires the handling of broken glass tubes. Safety glasses and protective gloves are recommended.
- Avoid skin and eye contact with the internal chemical reagents.
- If the reagent is completely discolored (i.e., the detector tube is over-ranged) after measuring a high concentration toxic gas (e.g., a process measurement), the possibility exists for harmful gas residue inside the cylinder. This gas will exhaust from the back of the cylinder when the handle is pulled out for the next pump stroke. Whenever the tube has fully discolored, purge the air inside the cylinder by pulling and pushing the handle several times in a well-ventilated area.



## NOTES



- If the proper detector tube for a particular application is not chosen, correct readings cannot be obtained. Choose detector tubes carefully using the tube selection guide and pay strict attention to chemical names and measuring ranges.
- When gases other than the target gas are also suspected, refer to the tube instructions for a list of known interfering compounds and their relative affect on the reading. Consult the tube selection guide or handbook for tubes that can monitor those gases.
- A detector tube is designed for a single use; do not re-use detector tubes.
- A detector tube should be used immediately after breaking the ends. Detector tubes exposed to the air for a long time after breaking the ends will give erroneous readings, and may not respond to the target gas at all.
- Read the concentration immediately after completion of measurement. If not read immediately, the stain may lengthen or fade, which can lead to erroneous readings.
- A leaking pump will produce low readings. Always check the pump for leakage before use in accordance with section "CHECKING PRIOR TO USE".
- The temperature range for use of detector tubes in general is 0 to 40 degrees C. When using detector tubes at temperatures outside of the above range, refer to the section "MEASUREMENT UNDER SPECIAL CONDITIONS."
- Do not drop or strike the pump. If the cylinder is dented, it will impede the handle operation and possibly cause leakage.
- Should the pump be disassembled, hand tighten only on re-assembly. Over-tightening can damage threads.
- Clean the pump only with a dry paper towel. Do not use water or solvents.
- Do not store the pump in the areas of high temperature or high humidity. Do not store with the handle extended, as the pump shaft is susceptible to bending under stress.
- It is recommended that service repair be done only by authorized service centers. Any service or repair must be followed by a leak check prior to field use.
- Note that the AP-20S pump is a vacuum pump only, and it cannot be used for specialized detector tubes that require sample entry by pressure (Oxygen, Hydrogen, Propane, etc.)

### **DISPOSAL OF DETECTOR TUBES**

A detector tube contains a chemical reagent which reacts with the target gas. The chemical reagents used vary among different types of detector tubes, and may include substances regulated by laws for proper disposal. When discarding used detector tubes, dispose of them in accordance with local disposal regulations. For further information contact your local distributor or the manufacturer's head office or branches.

## AP-20S Pump Accessories

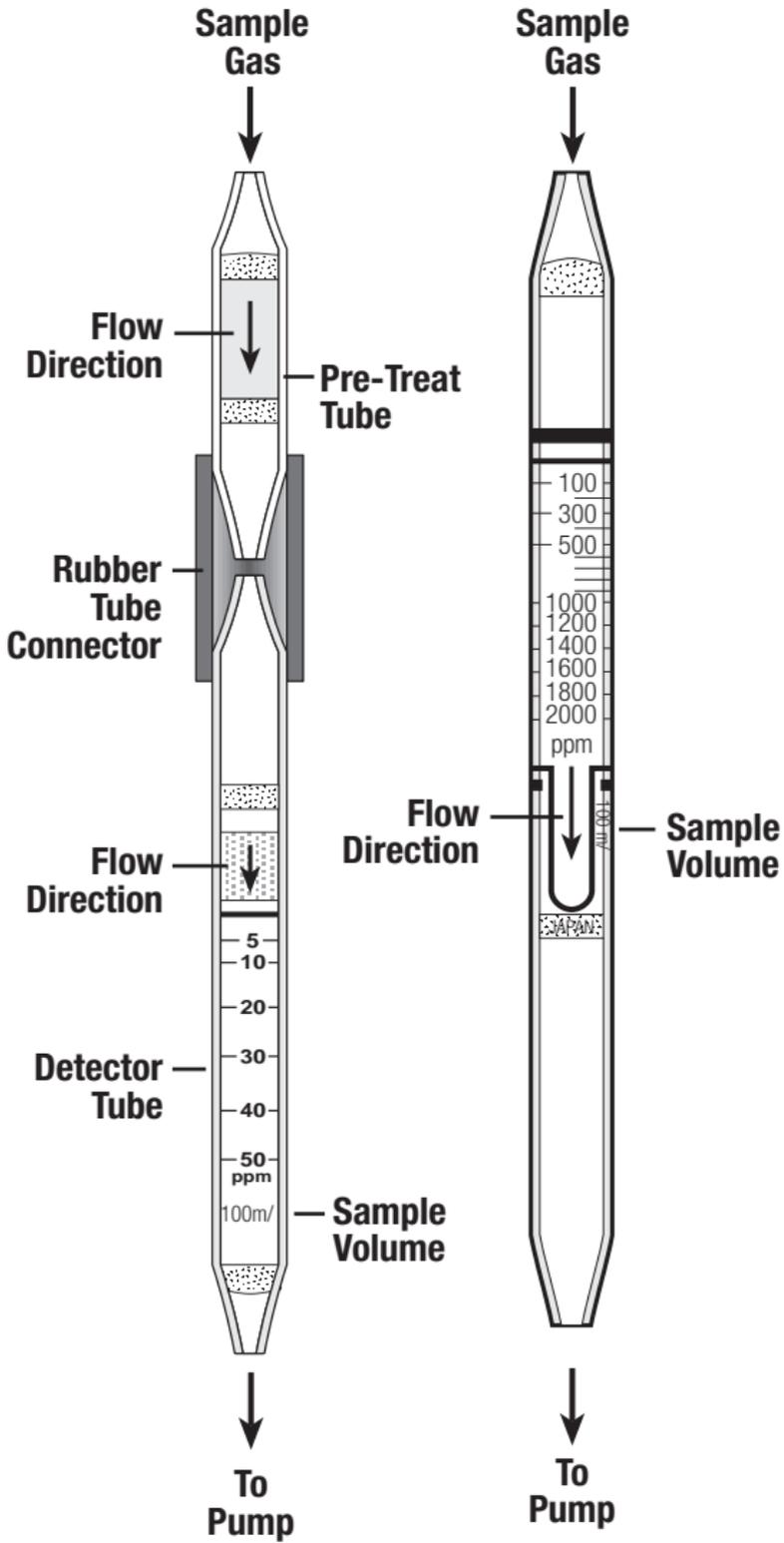


## AP-20S Pump Components



# DETECTOR TUBE COMPONENTS

## Dual Tube      Single Stage Tube



# Performing The Leak Test

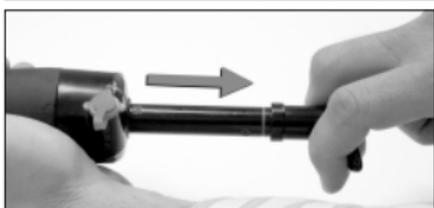
## NOTE

A leaking aspirating pump may cause lower readings or no response at all. **Always perform a leak check before using the pump.**

1



Insert a **sealed, unbroken detector tube** into the rubber tube connector. Align the red lines on the pump and shaft handle, and pull the handle to full stroke locked position.



2



Wait one minute. Unlock the handle by turning it 1/4 turn (90°). Hold the cylinder and handle **securely** while allowing the handle to **slowly** return to its initial position. The pump passes the leak test if the handle returns completely to its original position. If the red line on the pump shaft is visible, the pump has failed.

## CAUTION

When the lock is released under full vacuum the handle tends to snap back quickly

3



If the pump fails the leak test, the following are possible causes:

- A) A loose inlet connector holder.
- B) Cracks and deterioration of the rubber tube connector.
- C) Deterioration of the grease.



To correct a leaking pump, consult the **MAINTENANCE** section.

# MAINTENANCE

## • Lubricating The Pump

- 1** Pull the handle part way and turn the bottom case counterclockwise to remove it.
- 2** Pull the piston out from the cylinder.
- 3** Wipe off the old grease and dirt from the piston and inside the cylinder using a clean paper towel. Apply a thin coat of grease to the rubber gasket of the piston. When wiping off the old grease, be careful not to scratch the inside walls of the cylinder. Reassemble pump.



## • Replacing The Rubber Tube Connector

If the rubber tube connector appears cracked or deteriorated, remove the connector holder and replace it with new one.

Rubber Tube  
Holder



Rubber Tube  
Connector



Gas Detection  
Pump

# OPERATING PROCEDURE



## READ THESE NOTES PRIOR TO USING PUMP



- The operating procedure varies from one detector tube to another. Before proceeding, read carefully the individual instruction sheets provided in each box.
- Some detector tubes require temperature and/or humidity correction using tables provided in the instruction sheets. Be sure that the tube temperature has reached equilibrium with the sample area before drawing the sample.
- When using detector tubes at pressure other than normal atmospheric pressure, correction of the reading is necessary. Refer to the section “MEASUREMENT AND OPTIONS UNDER SPECIAL CONDITIONS.”
- To read the tube scale directly, it is necessary that the pressure of the sample gas is equal to that of the pump.
- When sampling high-pressure systems, first collect the sample in a gas sampling bag (non-adsorbent material), then use the pump to draw the sample from the bag.

## • Taking a Measurement



### NOTE



Always perform a leak check on the pump (page 7) before taking a sample.

1



**Cut both ends of the detector tube.** Insert the tip of a fresh gas detector tube into the tip cutter. Score the tip by rotating the tube one revolution. Pull the tube toward you at an angle to break the tip.

Repeat this for the tip at the other end of the tube.

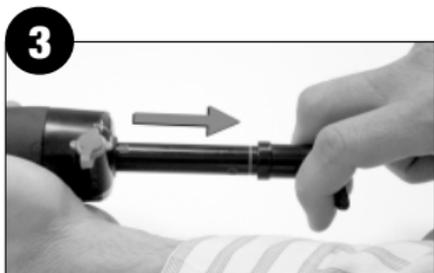


(The glass tip can be disposed by removing the tip cutter cap.)

## OPERATING PROCEDURE



**Insert detector tube.** Insert the gas detector tube into the rubber tube connector in the pump. Make sure the tube's arrow is pointing toward the pump.



**Pull the handle.** Align the two red marks on the pump and shaft handle. Pull the pump handle to its full 100cc locking position for a full stroke, or to the 50cc locking position for a half stroke.



**Draw the sample gas.** Take a sample for the specified time at the desired sampling point as shown in the tube instructions. The sample is complete when the flow finish indicator appears.



**Return the handle.** When the sample is complete, turn the handle 1/4 turn (90°) to unlock the handle. Confirm that the handle remains extended. (If the handle returns part way, the sample is incomplete, causing a low reading). If the detector tube requires more than one stroke, push back the handle and repeat the operation, as many times as required.

**6 Read the concentration.** After the prescribed sample volume has been drawn, remove the tube from the pump. Read the concentration and perform any temperature corrections as described on page 12 and in the tube instructions.

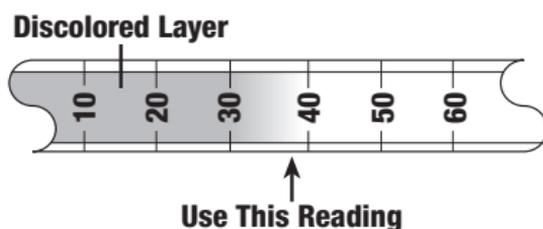
## Reading The Gas Concentration

For direct-reading tubes, read the gas concentration from the printed scale at the maximum end of the stain.

Two special cases are described below: Faint Discoloration and a Slanted Stain.

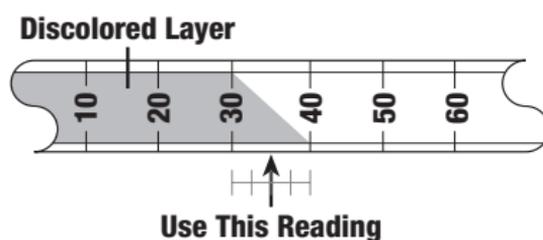
### • Faint Discoloration (Feathering)

For a faintly discolored (feathered) stain read the gas concentration at the maximum end of the stain.



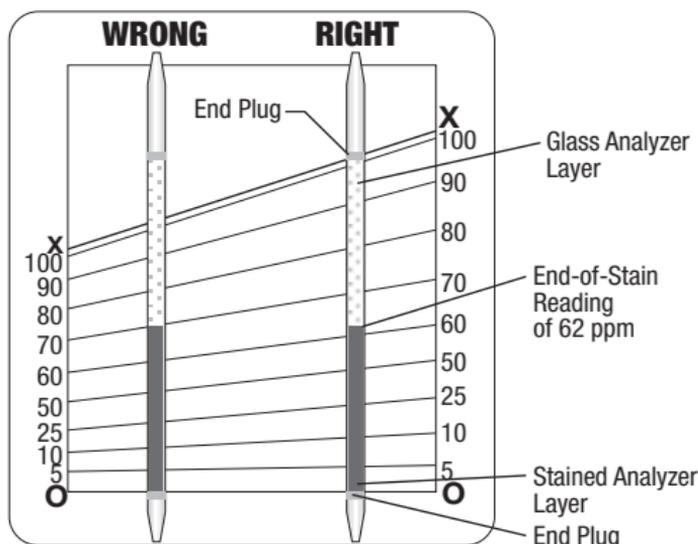
### • Slanted Stain

For a slanted stain read the gas concentration at the middle of the slanted layer.



### • Using A Conversion Chart

Align the zero end of the detecting reagent (inlet side of the tube) with the 0 - 0 line on the concentration chart. Align the other end of the same layer (exit side or pump side of the tube) with the X - X line respectively. Read the gas concentration at the maximum end of the stain against the scale on the card. If the end is slanted, read at the middle point of the slanted stain.



# TEMPERATURE CORRECTION

The temperature of concern is that of the detector tube (usually the temperature of the sample gas).

## • USING A CORRECTION TABLE

[Example] When the tube reading is 550 ppm at 25°C the true concentration is found by interpolating between the concentrations listed for 20° and 30°. In this example, the corrected value is 560 ppm.

Temperature Correction (at 20°C)					
Scale Reading (ppm)	True Concentration of Carbon Monoxide (ppm)				
	0°C	10°C	20°C	30°C	40°C
1000	870	930	1000	1030	1060
900	780	840	900	930	960
800	690	750	800	830	860
700	610	660	700	720	740
600	520	560	600	620	620
500	430	470	500	520	540
400	350	370	400	410	430
300	260	280	300	310	320
200	180	190	200	210	220
100	90	100	100	100	110

Scale readings °C	20°C	25°C	30°C
700	700	710	720
600	600	610	620
550	(550)	(560)	(570)
500	500	510	520
400	400	405	410

## • USING A CORRECTION COEFFICIENT

[Example] When the detector tube reading is 0.4 mg/ℓ at 23°C, the true concentration of water vapour is 0.36 mg/ℓ by the following calculation:  $0.4 \text{ mg/ℓ} \times 0.90 = 0.36 \text{ mg/ℓ}$

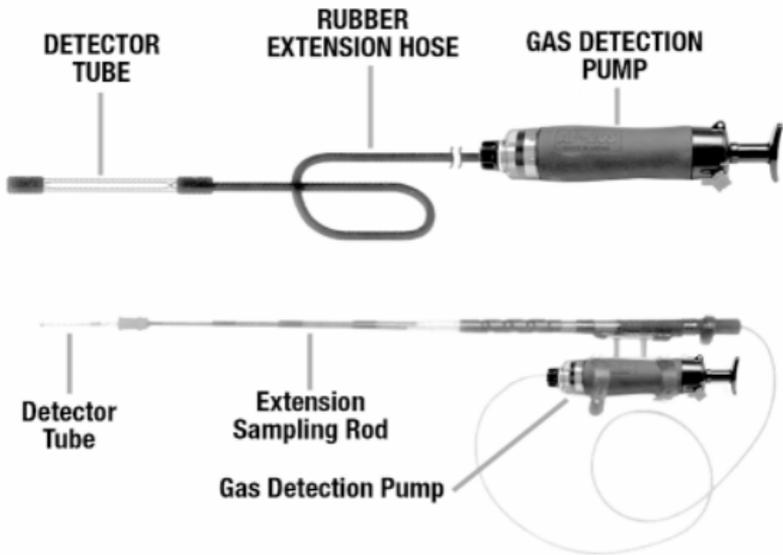
Temp. (°C)	0	1	2	3	4	5	6	7	8	9
0	1.85	1.81	1.77	1.72	1.68	1.63	1.59	1.54	1.49	1.45
10	1.40	1.36	1.31	1.27	1.23	1.19	1.15	1.11	1.07	1.03
20	1.00	0.96	0.93	0.90	0.87	0.84	0.81	0.78	0.76	0.73
30	0.71	0.68	0.66	0.64	0.62	0.60	0.58	0.56	0.55	0.53
40	0.51	—	—	—	—	—	—	—	—	—

Temp. (°C)	0	1	2	3	4
0	1.85	1.81	1.77	1.72	1.68
10	1.40	1.36	1.31	1.27	1.23
20	<del>1.00</del>	<del>0.96</del>	<del>0.93</del>	0.90	0.87
30	0.71	0.68	0.66	0.64	0.62

## Measurement under Special conditions

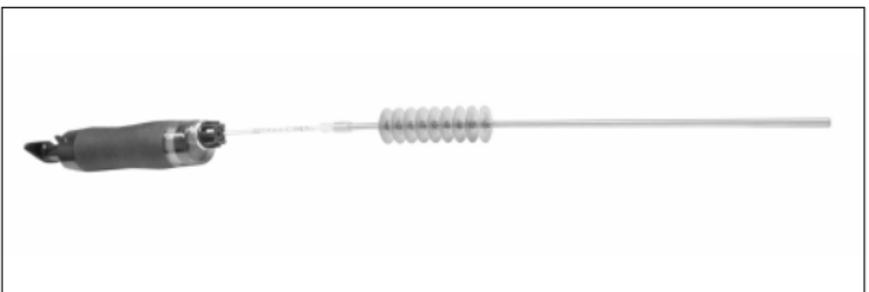
### • Remote Measurement

A rubber extension hose (shown below) is used for remote detection of potentially harmful gases prior to entering a confined space such as a manhole or tank. The extension hose is placed between the detector tube and the pump to eliminate the need for purging. The rubber extension hose is available in lengths of 5 or 10 meters.



### • High Temperature Gas Measurement

The allowable temperature range for detector tubes is generally, 0° to 40°C. When measuring gases at temperatures outside of 0° to 40° C, collect a volume of gas into a container, transport it to a moderate area (i.e., indoors) and allow it to equilibrate. Then draw the sample from the container. Care must be taken to choose a container of a material that is compatible with the target gas. (e.g., A glass syringe of 100cc or 200cc or a Tedlar bag of 1 to 2 liters is a suitable container). When flue gas or other high temperature gas is sampled, use the Hot Air Probe.



## Measurement under Special conditions

### • High Concentration Gas Measurement

High concentration gas exceeding the measuring range of the detector tube may be sampled as follows. Collect a volume of sample gas into a glass syringe and dilute with fresh air. (See photograph). The tube reading is then multiplied by the ratio of dilution to determine the actual concentration. Example: Draw



50cc of sample gas into a 100cc syringe. Complete the syringe draw with fresh air. Take a reading and multiply by 2.

### • Atmospheres With Non-ambient Pressure

If 100cc of gas is collected at a pressure that is two times atmospheric pressure, it is equivalent to 200cc of gas collected at normal atmospheric pressure. When measuring at pressures other than normal atmospheric pressure, a pressure correction is required.

A true concentration can be obtained by the following equation. However, if the tube's concentration scale is nonlinear, a correction error is produced. Therefore it is recommended to collect the sample in a gas sampling bag, then measure it at normal atmospheric pressure for more accurate readings.

When collecting gas in a high pressure atmosphere, please note that the bag can be ruptured by the expansion of the sample gas.

$$\text{Corrected value} = \frac{\text{Reading value on detector tube} \times 760 \text{ mmHg}}{\text{Atmospheric pressure in the measuring place [mmHg]}}$$

# Options & accessories

## Hazardous Material Detection Kit

The Hazmat III Kit (PN<sup>o</sup> 7013627) is a portable hazardous material detection kit that is lightweight, rugged, and capable of on-the-spot detection of numerous airborne contaminants. The kit utilizes a unique two-step approach and a special color chart to determine nearly 70 compounds in as little as 2–3 minutes. The kit requires no electrical power or user calibration and comes with a hard-shell, corrosion-resistant polyethylene case.

## One-Hand Adapter

The one-hand adapter for the Sensidyne Model AP-20S Pump is ideal for one hand sampling from a ladder or into hard-to-reach places. With the adapter installed and a tube inserted, the pump handle can be drawn and locked without actually taking a sample. The pump can then be extended into the sampling area and activated with one hand.

## Extension Hose

An extension hose of either 5 meters (PN<sup>o</sup> 830-1001-01) or 10 meters (PN<sup>o</sup> 830-1002-01) in length is available for use in confined space entry, as well as a rigid telescoping extension probe with up to 10 working feet of length (PN<sup>o</sup> 830-1003-01). The design of the tube holder at the free end of the hose permits a gas-tight fitting. Since the detector tube is located at the sampling end of the hose, there is no need to allow for the volume of air in the hose line.

## Hot Probe

The Hot Probe (PN<sup>o</sup> 7013602) allows sampling of gases at elevated temperatures (up to 250°C [482°F]) for applications such as auto exhaust or stack emissions testing. The Hot Probe rapidly cools the gas before it enters the detector tube.

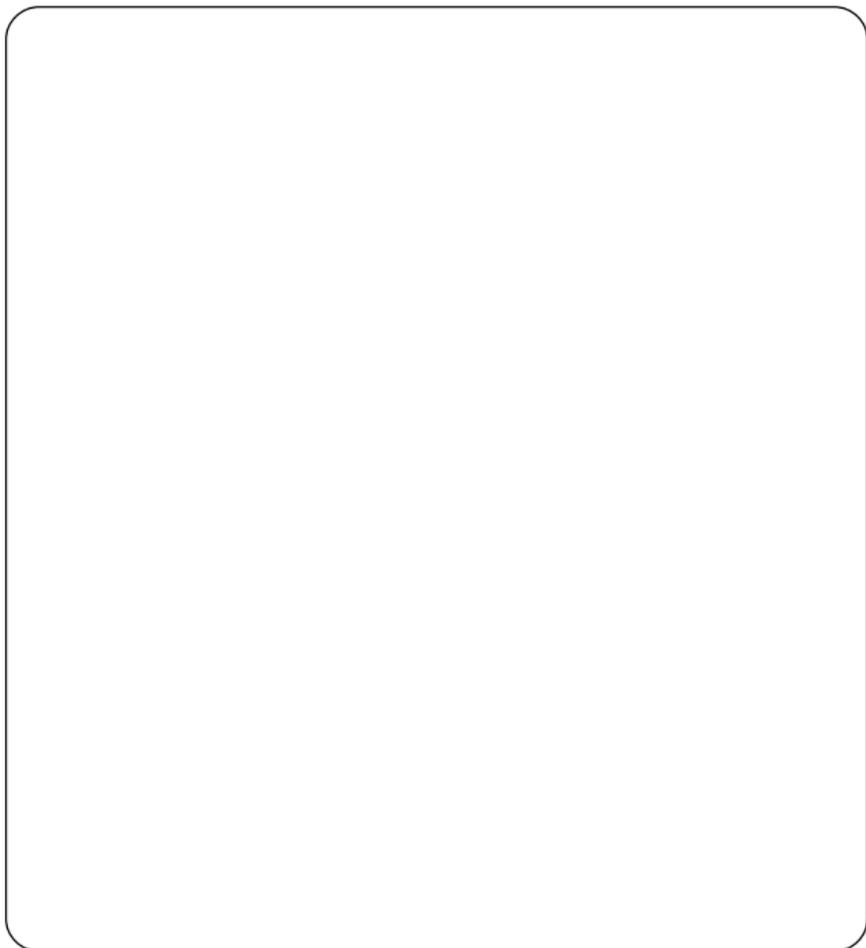
## Compressed Breathing Air Analysis Kit

The Compressed Breathing Air (CBA) Analysis Kit (PN<sup>o</sup> 7015406) allows anyone to simply, quickly, and quantitatively measure the quality of their compressed breathing air. Easy to use, the CBA Kit is an accurate and precise method for detecting carbon monoxide (PN<sup>o</sup> 600SP), carbon dioxide (PN<sup>o</sup> 601SP), oil mist (PN<sup>o</sup> 602SP), oxygen (PN<sup>o</sup> 604SP), and water vapor (PN<sup>o</sup> 6003SP) (*specific tubes not included*). The CBA Kit measures all four of the common contaminants in breathing air, plus oxygen deficiency.

## Tube Tip Breaker/Cutter

The Tube Tip Breaker/Cutter (PN<sup>o</sup> 7013601) is a convenient container for cutting and breaking detector tubes.

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