

**MODEL H<sub>2</sub>S-2 CALIBRATION GAS SET  
FOR  
HYDROGEN SULPHIDE  
INSTRUCTION MANUAL**

Calibration Gas Set has been developed to generate calibration gas easily for H<sub>2</sub>S detecting instruments or hydrogen sulphide detector. Read this instruction manual carefully prior to using this product. Don't discard this instruction manual until all the tubes in this box are used up.

**▲ CAUTION FOR SAFETY**

- 1) DON'T BREATHE HYDROGEN SULPHIDE. WHEN SUBJECTIVE SYMPTOM SUCH AS GIDDINESS CAUSED BY BREATHING HYDROGEN SULPHIDE, CONSULT A DOCTOR IMMEDIATELY.
- 2) SAFETY GLASSES AND GLOVES SHOULD BE WORN TO PREVENT INJURY FROM SPLINTERING GLASS OF GENERATION TUBE, ABSORBENT TUBE AND DETECTOR TUBE.
- 3) DON'T TOUCH GENERATING REAGENT, ABSORBENT AND DETECTING REAGENT DIRECTLY AS THEY CONTAIN SMALL AMOUNT OF CHEMICALS.
- 4) KEEP THE TUBES OUT OF THE REACH OF CHILDREN.
- 5) AIR PUMP IS NOT DESIGNED FOR AN EXPLOSION PROOF CONSTRUCTION.
- 6) DON'T DRINK GENERATING SOLUTION USED FOR GENERATION TUBE.
- 7) DON'T BREATHE GAS IN THE BOTTLE FOR WASTES.

**▲ CAUTION FOR USE**

- 1) NEVER FAIL TO READ INSTRUCTION MANUAL OF SET AND ALSO INSTRUCTIONS PACKED WITH GAS ASPIRATING PUMP, GENERATION TUBE, ABSORBENT TUBE AND DETECTOR TUBE CAREFULLY PRIOR TO USE.
- 2) STORE TUBES IN A COOL AND DARK PLACE (0 °C -25 °C /32-77 ° F), AND USE BEFORE EXPIRY DATE PRINTED ON TOP OF THE BOX.
- 3) DON'T PUT AIR PUMP INTO WATER AND WASH IT WITH WATER.
- 4) BOTTLE FOR GENERATING SOLUTION IS EXCLUSIVELY FOR WATER ONLY.
- 5) A PIECE OF GENERATION TUBE AND ABSORBENT TUBE ARE USABLE ONE TIME ONLY.

● **INFLUENCE OF HYDROGEN SULPHIDE TO BODY**

Stimulates eyes, nose and mucous of throat. High concentration of hydrogen sulphide gives nearly sweat smell, then the sense of smell will be paralyzed and loses sensuous caution against danger. If breathing in high concentration gas, headache, vertigo, trouble walking and breathing trouble will be caused. In case of serious condition, unconsciousness, spasm or paralysis in breathing may bring death.

**CONCENTRATION & OPERATION**

CONCENTRATION (ppm)	OPERATION
0.03	Lowest limit of sense of smell.
5	Unpleasant feeling.
50 ~ 100	Stimulates trachea, and conjunctivitis occurs.
100 ~ 200	The sense of smell will be paralyzed.
200 ~ 300	Come to serious condition of life after lapse of 1 hour.
600	After lapse of 1 hour, fatal acute poisoning is brought.
1000 ~ 2000	Death on the spot.

Reference book;     Danger of Chemicals • Harmful Substance Handbook  
                              (Issued by Japan Industrial Safety and Health Association)  
                              The third edition ; The first printing ISBN 4-8059-0391-0 C3043

● **FIRST-AID**

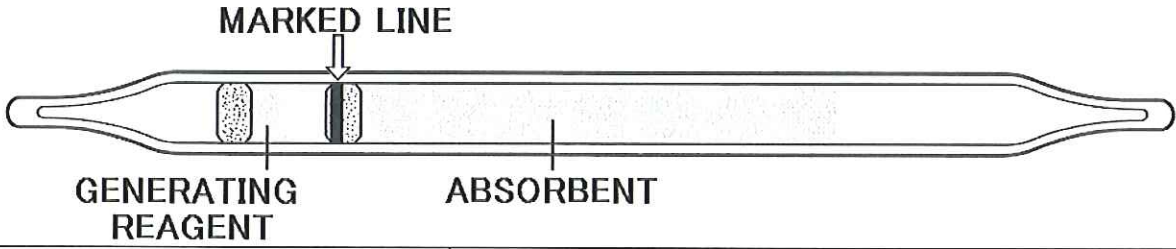
In case of unconsciousness by breathing in hydrogen sulphide.

→ Carry out mouth-to-mouth resuscitation and consult a doctor.

In case of self-objective symptoms such as vertigo.

→ Consult a doctor immediately.

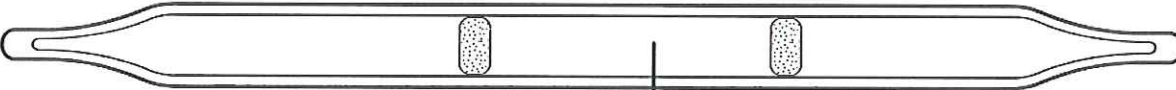
● SPECIFICATIONS OF GENERATION TUBE



GENERATING SOLUTION	Water (H <sub>2</sub> O)
GENERATION CONCENTRATION	20-40 ppm
FLOW RATE (ℓ /min)	0.5-2.0
FEEDING AMOUNT (ℓ )	5.0 approx. ※
ADOPTABLE DETECTOR TUBE	Tube No.120SB
GENERATION PRINCIPLE	Absorbent assimilates water, and acid is generated, then the acid reacts on calcium and calcium sulphide is produced.

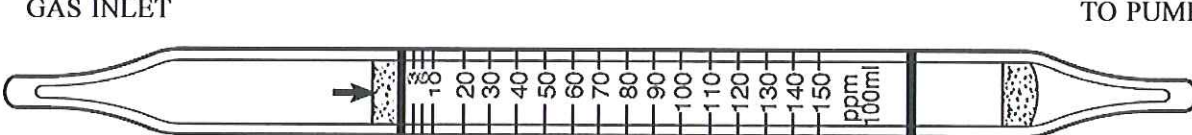
※ THE ABOVE-MENTIONED GENERATION CONCENTRATION EXPRESSES IN CASE OF 5.0 ℓ OF FEEDING AMOUNT OF AIR. CONCENTRATION DEPENDS ON FEEDING AMOUNT OF AIR. (Ex.) BY MAKING FEEDING AMOUNT HALF, GENERATED CONCENTRATION DOUBLES APPROXIMATELY.

● SPECIFICATIONS OF ABSORBENT TUBE



ABSORBING VOLUME	50 ppm × 6 ℓ
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● SPECIFICATIONS OF DETECTOR TUBE



CHEMICAL REAGENT (WHITE)				
MEASURING RANGE	3-150 ppm (Printed scale)	1-50 ppm (Reading × 1/3)	0.75-37.5 ppm (Reading × 1/3)	3-15 ppm (Reading × 2)
SAMPLING VOLUME	100 ml	300 ml	400 ml	50 ml
No. OF PUMP STROKES	1	3	4	1/2
SAMPLING TIME	1 minute / 100 ml			
COLOUR CHANGE	White → Dark brown			
DETECTABLE LIMIT	0.3 ppm (Sampling volume; 300 ml)			
OPERATING TEMPERATURE	0-40 °C (Not influenced by temperature)			
INFLUENCE BY HUMIDITY	Not influenced			
CHEMICAL REACTION	By reacting with lead acetate, lead sulphide is produced. $H_2S + Pb(CH_3CO_2)_2 \rightarrow PbS + 2CH_3CO_2H$			

## ● SPECIFICATIONS OF AIR PUMP

DRY BATTERIES	"D" size battery	2 pcs.
Battery life (Manganese battery)	H (High)	: 25 hrs approx.
	L (Low)	: 60 hrs approx.
Feeding amount of air without generation tube	H (High)	: 1.0 ℓ /min approx.
	L (Low)	: 1.0 ℓ /min approx.
Maintenance	Applicable to battery replacement only	

## ● CAUTION FOR USE OF AIR PUMP

### ▲ CAUTION FOR SAFETY

- 1) Don't confuse the connecting end of generation tube with that of absorbent tube.  
That may cause troubles.
- 2) Don't put main body into water and wash it with water. That may cause troubles.
- 3) Don't press the panel or checker button with nail. Otherwise panel sheet may occasionally be broken.
- 4) In case air pump is not used so often, remove batteries from main body and store them to avoid troubles of air pump.
- 5) Don't mix used batteries with new ones, or different kinds of ones.  
That may occasionally bring insufficient performance.
- 6) Used batteries should be taken away from air pump immediately.  
Otherwise that may cause troubles.
- 7) Don't leave air pump at high-temperature places for many hours; for example, at sunlit place or under the blazing sun.  
That may occasionally cause transformation or discolouration.
- 8) Don't take air pump apart or remodel.
- 9) This equipment is not an explosion-protected construction type.
- 10) In case generating comes into air pump through its "IN" side (airinlet), discharge generating solution from "OUT" side (air outlet) by shaking main body with keeping it lowering after power on.  
As hydrogen sulphide may be generated, pay attention to the followings.
  - ① Don't breathe in hydrogen sulphide.
  - ② Take care that reactor solution does not stick to skin or clothes.
  - ③ Take care that hydrogen sulphide does not proliferate.

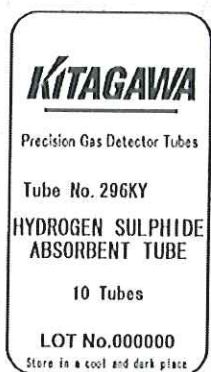
**1. Constituent of set**

Confirm the following constituent after opening package.



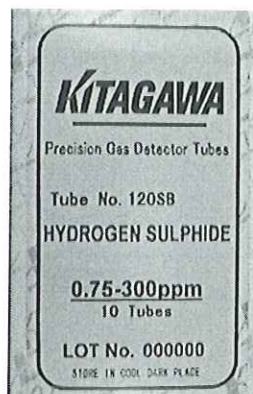
**GENERATION TUBE  
(No.296HA)**

1 box



**ABSORBENT TUBE  
(No.296KY)**

1 box



**DETECTOR TUBE  
(No.120SB H<sub>2</sub>S)**

1 box



**AIR PUMP**

1 set



**SILICONE TUBE**

1 pce



**TIP CUTTER**

1 pce



**BOTTLE FOR  
GENERATING SOLUTION**

1 pce



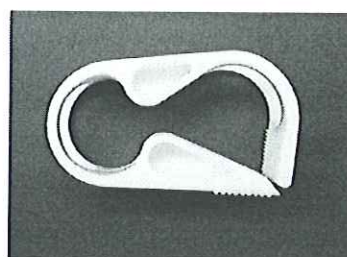
**BOTTLE FOR  
WASTE**

1 pce



**CALIBRATION BAG**

1 pce



**TUBE COCK**

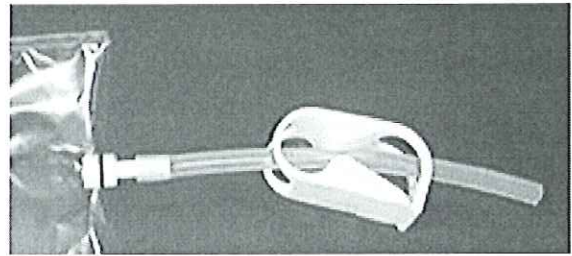
1 pce

- GAS ASPIRATING PUMP SET (AP-20)
- INSTRUCTION MANUAL FOR MODEL H<sub>2</sub>S-2
- PAPER TOWEL
- "D" SIZE DRY BATTERIES (2 PCS)

## 2. PREPARATION

### 1) Preparation of calibration bag

Connect securely a silicone tube packed in calibration gas set with calibration bag, and attach tube cock as shown in the picture.

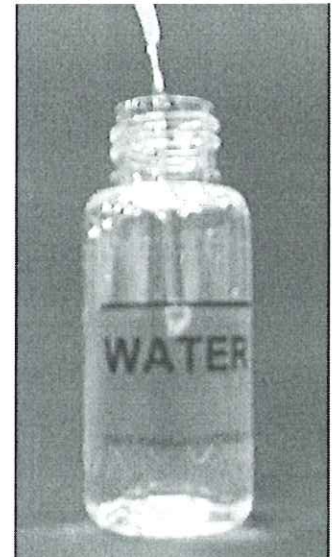


### 2) Preparation of air pump

- ① Take away rear lid by rotating fixing screw counterclockwise ("OPEN" marked direction).
- ② Put two "D" size dry batteries correctly with paying attention to polarity plus (+) and minus (-), and close the lid securely.



### 3) Pour water into bottle for generating solution up to marked line on it.

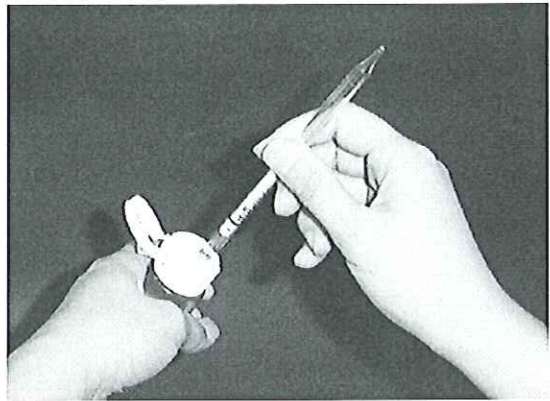


### 3. Generating procedure of hydrogen sulphide

- 1) Break both ends of generation tube with built-in tip cutter on gas aspirating pump, or with tip cutter attached to calibration gas set.

※ How to use tip cutter

Insert tip of generation tube, absorbent tube or detector tube into tip cutter, scratch away it by rotating one revolution, and lean it in the foreground with holding lower part of tube.



- 2) Put (A) side printed on the generation tube into generating solution (water).

- 3) Wait until generating solution reaches the marked line.

※ If it is difficult for the generation solution to reach the marked line, drop the generation tube in the bottle several time with raising generation tube a little.

※ Never suck up with mouth.

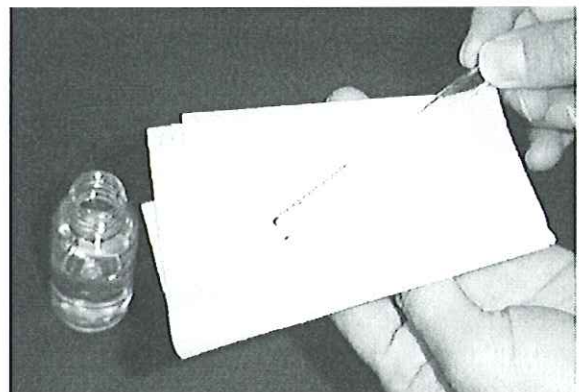


- 4) After generating solution has reached the marked line, take out the generation tube quietly from the bottle, and wipe off drops of water on the generation tube with paper towel, etc.

※ When taking out the generation tube from the bottle for generating solution, there will be a little smell of hydrogen sulphide.

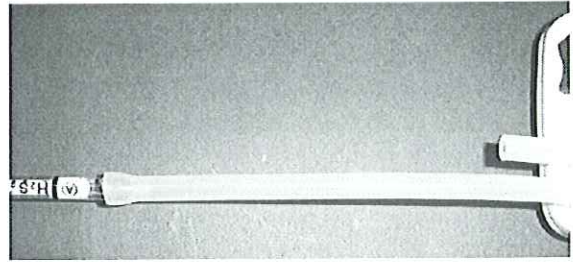
※ In case drops of water on the generation tube is not wiped off completely, there is a possibility that generation tube comes off from air pump while generating hydrogen sulphide. Therefore never fail to wipe off drops of water.

※ Close the lid of the bottle for generation solution.



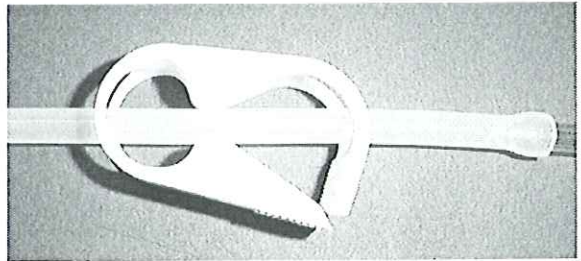


5) After wiping off drops of water on the generation tube, connect (A) side of the generation tube securely with the longer tube of air pump.



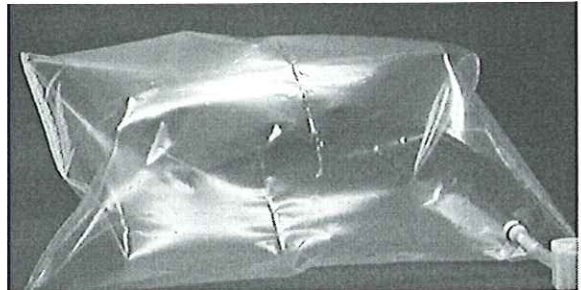
※ If generation tube is connected with air pump in the counter direction, it may cause a trouble in generating hydrogen sulphide. In addition, if generation tube is connected with the shorter silicone tube, generating solution will come into air pump, and it may cause trouble and also hydrogen sulphide is exhausted. Therefore never fail to connect generation tube certainly.

6) Connect the opposite side of generation tube with calibration bag, and confirm that tube cock is opened.



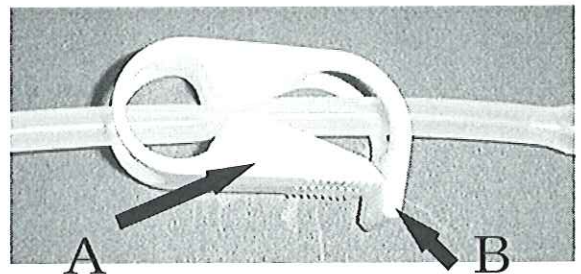
7) Turn on the switch of air pump, and feed air until bag is inflated completely.

8) After the bag is inflated completely, turn off the switch of air pump.



※ Turn on the switch to "H" side. Air feeding is possible by "L" side, but this gets longer time than "H" side.

9) Close tube cock with pressing A part of the tube.



10) Disconnect generation tube after air feeding is completed, and store it in bottle for wastes. (Pay attention not to be injured.)

※ Generation tube is usable one time only.

※ Do not breathe in the gas, since a little residual hydrogen sulphide is inside the bottle of wastes.

※ By putting hydrogen sulphide absorbent tube (used in order to absorb residual gas in the bag after using gas), or hydrogen sulphide detector tube together with hydrogen sulphide generation tube, hydrogen sulphide can be absorbed. However, hydrogen sulphide cannot be absorbed immediately.

※ When bottle of waste becomes full of tubes, dispose of generation tube and absorbent tube as "general industrial wastes" or as "rubbish of glass and of ceramics" in industrial wastes. In case of detector tubes, dispose of them as "rubbish and ceramics including lead" in industrial wastes.

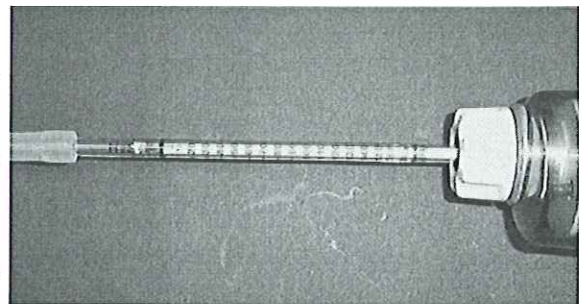


11) Break both ends of hydrogen sulphide detector tube with built-in tip cutter on gas aspirating pump, or with tip cutter attached to calibration gas set.

12) Insert the gas detector tube with the top of arrow mark directing gas aspirating pump, and connect the opposite side of the tube with calibration bag.

13) Open the tube completely with spreading out B part of tube cock.

14) Push in the handle until it stops, and bring the red line mark on the stopper in line with that on the shaft and pull the handle as far as it goes, then the handle will be locked, and wait for about one (1) minute.

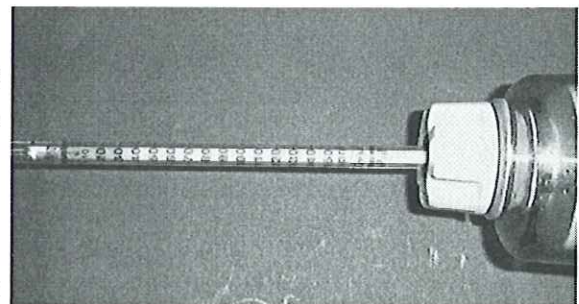


15) Close tube cock.

16) Remove the gas detector tube from the calibration bag and the gas aspirating pump and read the concentration of gas at the maximum end of the discoloured layer.

17) Detector tube which was readout already is to be stored in the bottle for wastes.

18) After confirmation of concentration, use this gas in the bag to calibrate instruments, etc.

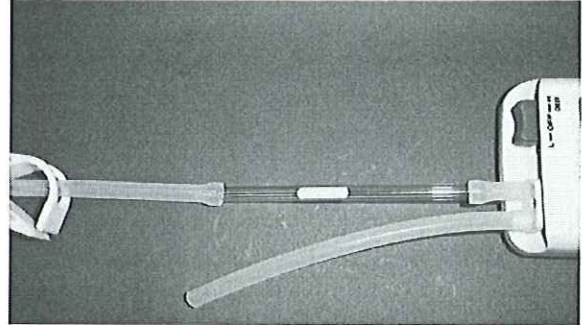


※ Measure and confirm a concentration of generated hydrogen sulphide just before calibration.

#### 4. Use of Hydrogen Sulphide Absorbent Tube

Disposing of exhausted gas (residual gas) .

- 1) Break both ends of absorbent tube with built-in tip cutter on gas aspirating pump, or with tip cutter attached to calibration gas set.
- 2) Connect one side of absorbent tube with "IN" side (shorter tube) , and the other side with calibration bag.
- 3) Open tube cock and turn on the air pump switch. Then, suck gas in the calibration bag until the bag becomes empty completely. The absorbent tube discoloured greyish yellow by hydrogen sulphide.



- ※ Absorbent tube is usable one time only.
- ※ Absorbent tube is discoloured to grayish yellow by hydrogen sulphide.
- ※ The left side of the absorbent tube is symmetric with respect to left side. Therefore, it is possible for absorbent tube to absorb hydrogen sulphide from any side of the tube.
- ※ If the absorbent tube is connected with wrongly, hydrogen sulphide cannot be absorbed, so never fail to connect it correctly.

- 4) After the gas in the calibration bag has been sucked completely, turn off switch of air pump.
- 5) After closing tube cock, remove absorbent tube from calibration bag and turn on air pump switch again to absorb air for about 20 seconds.
- 6) Remove absorbent tube from air pump, and store it in bottle for wastes.

- ※ Absorbent tube is usable one time only.
- ※ Do not breathe in the gas, since a little residual hydrogen sulphide is inside the bottle of wastes.
- ※ By putting hydrogen sulphide absorbent tube (used when absorbing residual gas in the bag) , or hydrogen sulphide detector tube together with hydrogen sulphide generation tube, hydrogen sulphide can be absorbed. However, hydrogen sulphide cannot be absorbed immediately.
- ※ When bottle of waste becomes full of tubes, dispose of generation tube and absorbent tube as "general industrial wastes" or as "rubbish of glass and of ceramics" in industrial wastes. In case of detector tubes, dispose of them as "rubbish and ceramics including lead" in industrial wastes.



## TROUBLE SHOOTING

- Generating solution does not reach the marked line.

Cause	Action
Bubbles are existing.	Give vibration in the bottle for generating solution

- Air pump does not operate.

Cause	Action
Batteries are not installed.	Install batteries.
Batteries has run down.	Replace batteries with new ones.
Failed.	Replace Air Pump.

- Battery Checker does not light.

Cause	Action
Batteries are not installed.	Install batteries.
Batteries has run down.	Replace batteries with new ones.
Switch position is "L".	Change over switch to "L" position.
Failed.	Replace Air Pump.

- Concentration of generated hydrogen sulphide is low.

Cause	Action
Generating solution level is not reaching the marked line.	Absorb generating solution to the level of the marked line. (Use new generation tube)
Incomplete connection of generation tube.	Connect generation tube certainly. (Use new generation tube)
Direction of connection is opposite.	Connect generation tube certainly. (Use new generation tube)
Generation tube is connected with "IN" side.	Connect generation tube certainly. (Use new generation tube)
There are holes on the silicon tube.	Replace the silicon tube with new one.
There are holes on the calibration bag.	Replace the calibration bag with new one.
Detector tube is broken.	Measure once again. (Use new generation tube)
Gas aspirating pump is leaked.	Carry out maintenance. (Refer to instruction manual of Model AP-20.)
More than thirty (30) minutes have passed after generating gas.	Generate hydrogen sulphide gas once again.
Shelf life is expired.	Replace generation tube with new one. (Use not-expired tube)

- ※ Pay attention to expiration date of absorbent tube.

- Concentration of generated hydrogen sulphide is high.

Cause	Action
Stop feeding hydrogen sulphide before the calibration bag is inflated fully.	Adjust concentration by feeding amount of air.

- Hydrogen sulphide cannot be generated.

Cause	Action
Incomplete connection or out of connection of generation tube.	Connect generation tube certainly. (Use new generation tube)
Direction of connection is opposite	Connect generation tube certainly. (Use new generation tube)
Generation tube is connected with "IN" side.	Connect generation tube certainly. (Use new generation tube)
There are holes on the silicone tube or it is broken.	Replace the silicone tube with new one.
Generating tube has not been immersed in generating solution.	Immerse generating tube in generating solution.
Shelf life is expired.	Replace generation tube with new one. (Use not-expired tube)

- Calibration bag is not inflated.

Cause	Action
There are holes on the silicone tube or it is broken.	Replace the silicone tube with new one. (Use new generation tube)
Tube cock is closed.	Open tube cock.
There are holes on the calibration bag or it is broken.	Replace calibration bag with new one.
Calibration bag is connected with "IN" side of air pump.	Connect calibration bag certainly. (Use new generation tube)
Generation tube is connected with "IN" side.	Connect generation tube certainly. (Use new generation tube)
Air pump is failed.	Replace air pump with new one.

- Tube cock cannot be opened and closed.

Cause	Action
Locking part is broken.	Replace tube cock with new one.

**OPTIONAL SUPPLY OF ITEMS IN THE SET**

<b>Name</b>	<b>Catalogue No.</b>
<b>Hydrogen sulphide Generation Tube for H<sub>2</sub>S-2 (10-time use)</b>	<b>Tube No. 296HA</b>
<b>Hydrogen sulphide Absorbent Tube for H<sub>2</sub>S-2 (10-time use)</b>	<b>Tube No. 296KY</b>
<b>Hydrogen sulphide detector tube to check concentration</b>	<b>Tube No. 120SB</b>
<b>Air Pump</b>	<b>H2S001</b>
<b>Calibration bag</b>	<b>H2S003</b>
<b>Bottle for reactor solution</b>	<b>H2S004</b>
<b>Bottle for wastes</b>	<b>H2S005</b>
<b>Silicone tube (150mm × 3 pcs)</b>	<b>H2S006</b>
<b>Tube cock</b>	<b>H2S007</b>
<b>Tip cutter</b>	<b>B-191 Tip cutter</b>
<b>Model AP-20 Gas aspirating pump with standard accessories</b>	<b>AP-20</b>

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