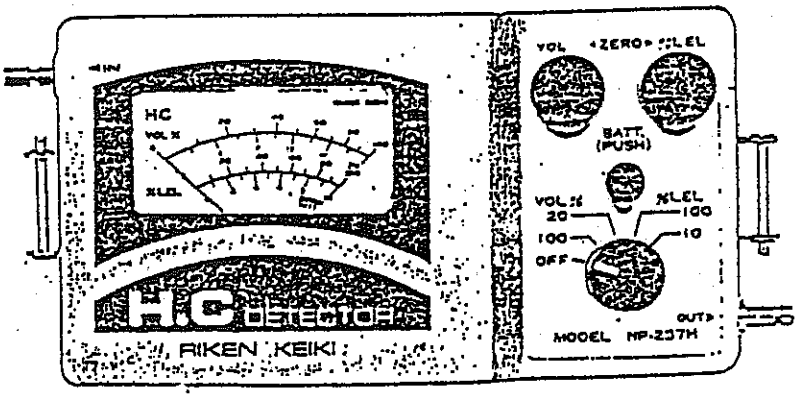
INSTRUCTION MANUAL

FOR

RIKEN PORTALE HYDROCARBON DETECTOR

MODEL NP-237H

(Marine version)



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To operate the instrument properly, we kindly wish you to read this instruction manual carefully.

1. Introduction

The model NP-237H is designed for measurement of hydrocarbon gas/vapours of crude oil gas etc in inert gas or air, and can accurately measure the concentration of hydrocarbon gas/vapours with a wide range of 0 to 100 vol% by mainpulation of 4-selector switch.

The element to detect the sample gas consists of 2 types; a catalytic combustion element and a thermal conductivity; the gas concentration up to the lower explosive limit (LEL) is measured by the catalytic combustion element, and the gas concentration up to 100 vol% over LEL, by the thermal conductivity element.

2. Detection principle

1) Catalytic combustion method

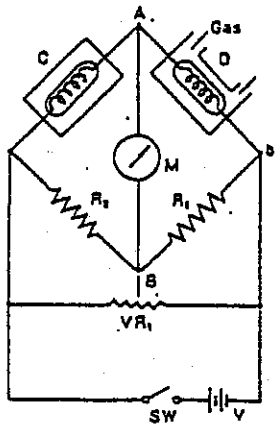
The values of LEL concentration of combustible gas vary with the kinds of gases, but the calorific values of combustion of thoses gases at LEL concentration are almost the same except for some cases.

$Ce.Q \fallingdotseq$ const...
(Burgers wheeler Law)

Ce : Concentration at the lower explosive limit (LEL)

Q : Calorific value of combustion per mol (kcal/mol)

As a detection principle of combustible gas detector which is used for prevention of explosion, a method to measure the calorific value of combustion is most suitable and ideal.



D : Detecting element
C : Compensating element
R1,R2: Fixed resistor (R1, R2 modulized)
M : Meter
Vr1: Zero adj. potentiometer

Combustible gas is introduced to the element preheated to an appropriate temperature so that its catalytic combustion is caused, and the changes in electric resistance of platinum filament due to the then generated heat of combustion are detected on the wheatstone bridge. This electric output is directly in proportion to the concentration of combustible gas in air.

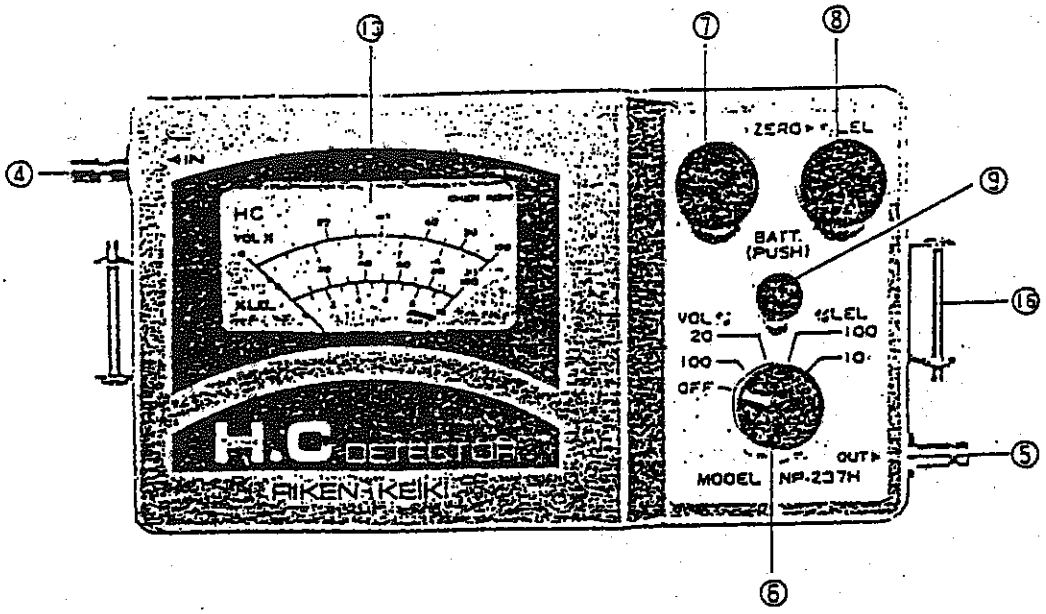
2) Thermal conductivity method

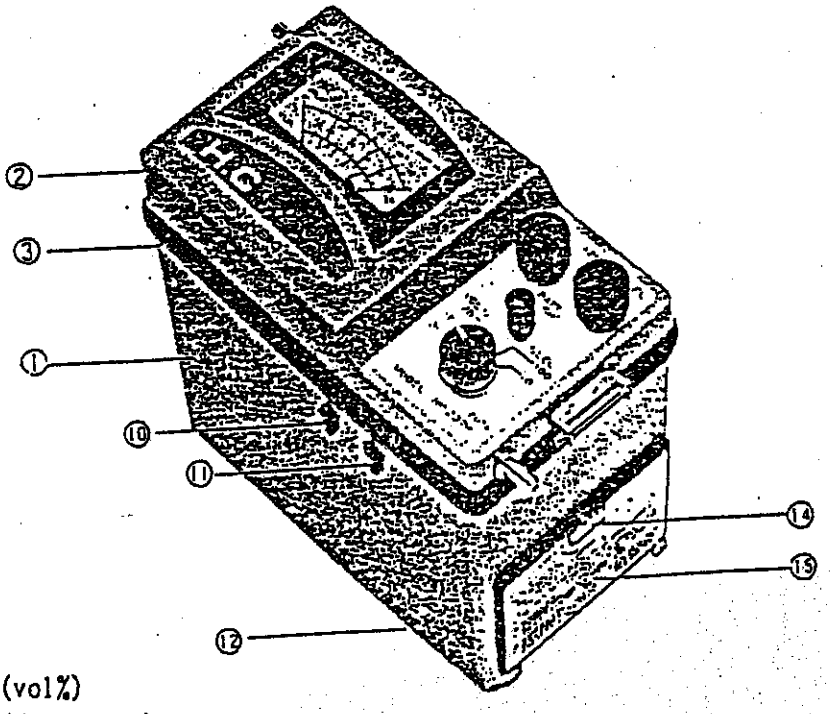
The thermal conductivity method is to measure the thermal conductivity of gas. Like the catalytic combustion method, the platinum filament is heated to a fixed temperature, and when introduce combustible gas to the filament, the heat radiation from the platinum filament increased because the thermal conductivity of combustible gas is greater than that of air. The temperature of the filament decreases due to this change (increase in the heat radiation), and the electric resistance decreases. If measure this change in the electric resistance, it is possible to know the gas concentration is combustible gas mixture.

The make-up of the bridge circuit is the same as that of the catalytic combustion system.

3. Basic Specifications

1) Model	: NP-237H
2) Measurable gas	: HC (Crude oil vapors) * LPG or LNG available on request
3) Detection principle	: %LEL range : Catalytic combustion (HC in air) vol% range : Thermal conductivity (HC in air or inert gas)
4) Measuring range	: 0-10%LEL, 0-100%LEL 0-20vol%, 0-100vol%
5) Accuracy	: Better than ±20% FS in the range of 0-10%LEL 〃 ± 5% FS in the range of 0-100%LEL 〃 ± 5% FS in the range of 0-20% vol% ±20% against reading in the range of 0-100vol% (At constant temp.)
6) Response time	: Within 20 sec to 90% response (Instrument only)
7) Ambient temp	: -10℃ to 40℃
8) Explosion-proof	: Intrinsically safe id2G3 in Japan. (Approval No. 29781 by Ministry of Labour and by NK-Ship Classification Society of Japan)
9) Power source	: Dry cell x 4 pcs.
10) Continuous operation	: Above 7 hrs.
11) Output dimension	: Approx. 160(W) x 90(H) x 150(D) mm
12) Weight	: Approx. 2.7 kgs (Instrument only)





① Bottom case
② Top case
③ Packing
④ Gas inlet
⑤ Gas outlet
⑥ Selector switch
⑦ Zero adjusting knob (vol%)
⑧ Zero adjusting knob (%LEL side)
⑨ Battery-voltage check push-button switch
⑩ Span adjusting screw (vol% side)
⑪ Span adjusting screw (%LEL side)
⑫ Bottom case-fixing screw (2 places)
⑬ Meter
⑭ Battery cover screw mounting knob
⑮ Battery cover
⑯ Hanging belt guide

4. Measuring Method of HC Vapour in Tank
The measurement should be rightly performed in the order of the following paragraphs 4-1, 4-2, 4-3 and 4-4.

4-1. Check before use :

1) Check if the measuring instrument is damaged, especially, whether the meter window is cracked or the meter needle indicates the zero point.

2) Next, check the accessories. Particulary important are the checks of the filter tube with flow monitor installed to the side of the carying case, and the gas sampling tubes(30m) of 2 colors (orange and green).

〈Check points of filter tube with flow monitor 〉
* Check if there is a crack adversely affecting the suction of gas.
(If any small crack is found, cover it with cellophane adhesive tape.)
* Check if the internal cotton-wool filter is fouled.
(If fouled, replace it with new one.)
* Check if waterdrops are sucked.
(If they are sucked, wipe them off.)
* Check if the caps with nipple at both side ends are loosened.
(If loosened, re-tighten them.)
〈Check points of gas sampling tube 〉
* Check if the tube is bent, twisted or there is a hole in the tube.
(If it is twisted or there is a hole in it, reinforce it with vinyl tape and repair it so that it becomes round.)
* Check if the "one-touch" coupler for connection to the instrument at the end of tube is normally fitted to the hose.
(If it should be about to be disconnected, repair it with vinyl tape for makeshift so that no leak occurs, but make arrangements for prompt replacement.)

3) Check that no crack occurs in the junction tube between the gas inlet of the instrument and the filter tube with flow monitor, and they are normally connected.
(Carry out check acording to the check points of the sampling tube as described in paragraph 2.)

4-2. Preparation
1) Check of battery voltage:
After setting the selector switch at the position of 100 vol%, press the "BATT." push-button, and the meter needle deflects. Then, if the needle needle indicates within "BATT" mark of the battery zone at the right lower part of the meter scale, the battery voltage is OK. If the meter needle shifts below "BATT" mark of the battery zone, replace the battery with new one. After this check of the battery voltage, turn the selector switch to the position of "OFF".

2) Connection of gas sampling hose:
Accurately connect the gas sampling hose (30m) to the filter tube with flow monitor at the side of the carrying case.
The gas sampling hose consists of 2 types, one of which is orange and the other is green. Use them properly according to the concentration of each measureable gas. The gas sampling hoses are composed of the materials of less gas adsorption, but unless they are properly used according to the above, the zero adjustment and the indicating accuracy may be adversely affected. The orange tube is used for measurement of "vol% range". The green tube is used for measurement of "%LEL range".

3) Air cleaning of gas sampling hose:
The air cleaning is performed by setting the selector switch to the measuring range corresponding to the concentration of the measurable gas under the condition that the gas sampling hose is connected to the filter tube with flow monitor.
Then, take proper care to use the gas sampling hose as described in the preceding paragraph.

① When the orange gas sampling tube is used (vol% measurement)
* After setting the selector switch to 100 vol% or 20 vol%, have the hose suck fresh air for about 10 minutes. Then, check watching the flow monitor, that the air is normally sucked.
* The meter needle will deflect immediately after the selector switch is set from OFF to 100 vol% or 20 vol%.
* This deflection of meter needle will deflect combustible vapour which is absorbed in the gas sampling hose and stays in it. Therefore, the absorbed combustible gas vapours decreases as the time passes. So that the tube is almost entirely cleaned about 10 minutes later. At this time, make the zero adjustment according to the following paragraph 4).
* Warming-up of the instrument is performed concurrently with the suction of air for about 10 minutes, and then the time should not be shortened even when a new gas sampling hose is used.

② When the green gas sampling tube is used (%LEL measurement)
* After setting the selector switch to 100%LEL or 20%LEL, have the hose suck fresh air for about 5 minutes. Then, check watching the flow monitor, that the air is normally sucked.
* The meter needle will deflect immediately after the selector swtich is set from OFF to 100%LEL or 20%LEL.
This deflection of meter needle will deflect HC vapour which is absorbed in the gas sampling hose and stays in it is sucked. Therefore, the adsorbed HC vapour decreases as the time passed. So that the tube is almost entirely cleaned about 5 minutes later. At this time, make the zero adjustment according to the following paragraph 4).

* Waming-up of the isntrument is performed concurrently with the suction of air for about 5 minutes, and then the time should not be shortened even when a new gas sampling hose is used. If the time is shortened, the accuracy during operation may sightly be dropped.

4) Zero-adjustment:

① Zero adjustment of vol% range measurement:
After the selector switch is set to the position of 20vol% and the air cleaning time (about 10 minutes) according to paragraph 3) has passed, the meter needle should be set to the zero point by the zero adjusting knob at vol% side under the condition that the meter needle comes to be stabilized. Once the zero adjustment is made, absolutely do not touch the zero adjustment knob.

② Zero adjustment of %LEL range measurement:
After the selector switch is set to the position of 10%LEL and the air cleaning time (about 5 minutes) according to paragraph 3) (2) has passed, the meter needle is set to the zero point by the zero adjusting knob at %LEL side under the condition that the meter needle comes to be stabilized. Once the adjustment is made, absolutely do not touch the zero adjusting knob until the measurement is finished. If the zero adjusting knob should be moved by mistake, carry out the air cleaning of the gas sampling hose of paragraph 3), and then make the zero adjustment.

4-3. Measurement

1) To put the gas sampling hose down into the tank ;
Take care that the orange (for vol% measurement) or green (for %LEL measurement) gas sampling hose(30m) is free from bending or twisting, gradually put it down into the tank through the sampling hole.
As the length of the sampling hose is marked every 5m, checking the distance of putting it down into the tank, stop the hose-falling at a position where you intend to carry out the measurement. Then, pay full attention to oxygen deficiency etc., which may be caused by ejection of the inert gas.

2) Check of flow monitor ;
After the gas sampling hose is put down to the position where you intend to carry out the measurement as described in paragraph 1), look at the flow monitor installed to the case side by way of precaution and check that the gas is certainly sucked.

3) Measurement

After the gas sampling hose is stopped at the position where you intend to carry out the measurement, and more than 2 minutes have passed from the stop, read the indication of the meter scale corresponding to the measuring range of the selector switch.
When carry out the measurement by changing the measuring position of the gas sampling hose, stop the hose at a position where you intend to carry out the measurement as the described above, and after more than 2 minutes have passed from the stop, read the indication of the meter scale. In this case, the cleaning of the gas sampling hose is unnecessary. If it is intended to find 90% response of the true reading only, read the indication of the meter scale after about 70 seconds. However, it is dangerous to estimate the indication of calculation, and then absolutely do not make such estimation. As the meter is equipped with a LED lamp, it is possible to distinctly read the indication of the meter even at night.

4-4. Action to be taken after measurement;

1) Wind up the gas sampling hose.
After the completion of the measurement, take case so that the gas sampling hose should not be broken or twisted. And take the hose out of the tank and then bundle it round.

2) Carry out the air cleaning of the gas sampling hose.
In the case of the orange gas sampling tube (for vol% measurement), set the selector switch to the position of 20vol%, and in the case of green gas sampling tube (for %LEL measurement), set the selector switch to the position of 0 to 10%LEL.
Under this condition, carry out the gas cleaning with fresh air until the indication of the meter needle returns to nearly the zero point.
If neglecting the air cleaning of the gas sampling after the complection of measurement, mist collects in the hose or a complete adsorption of HC vapour occurs, so there may be a case that the succeeding measurement is hampered.

3) Set the selector switch at "OFF" position and turn off the power source.

4) After the measurement, store the instrument in a room where vibration is not great and it is free from direct exposure to the sunlight. When the instrument is not used for a long period of more than a month, take the dry cells out of it.

5. Caution

1) When, in the middle of the measurement, making a selector switch from vol% range to %LEL range, or vice versa, repeat the replacement of the gas sampling hose, air cleaning and zero adjustment in order.

2) In the case of the measurement of %LEL range, be sure to carry out the measurement under the condition that oxygen of 13vol% or more is present. Where the concentration of oxygen in 12vol% or less, no accurate indications are provided, and in some cases, the meter needle hardly deflects. When it is intended to carry out the measurement under the condition that the concentration of oxygen is low, refer to the paragraph of "Gas measurement under special conditions" as described later.

3) Take full care so as not to have this instrument suck water or oil. If water or oil should be sucked into the instrument, it may occur that the element becomes unable to be used.

4) Do not give a great shock to this instrument; this will cause a trouble.

5) As this instrument is used at a dangerous place, use it with carrying case on.

6) Be sure to replace battery with new one at safety area.

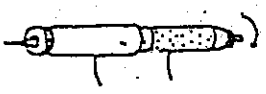
7) Where special instructions concerning the use and the like of this instrument are provided by the Ship Classification Association, obseve them.

6. Maintenance and Inspection

1) Air filter (Replacement of cotton wool):
Replace the cotton wool in the filter tube with flow monitor every 8 hours operation time as a standard. Ideally, it is recommended that the cotton wool be replaced before measurement once a day.

2) Gas sensitivity (span) adjusting method:
Make the span adjustment approximately once a month by the following method. For the span adjustment, use the gas smapling bag set, canned gas (option) and humidifier. Even within the span adjustment period, if a change in temprature is 10 ℃ or higher, it is recommended that the span adjustment be made. (For example, when the equipment is used in the tropics after adjusted in Japan.)

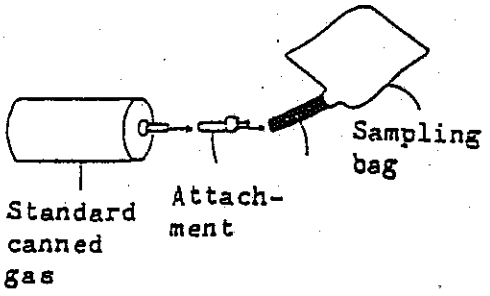
① Preparation:
After taking our the sponge in the humidifier and dipping it in water, wring the sponge and return it into the humidifier. When returning the sponge into the humidifier, make sure to put it therein uniformly.



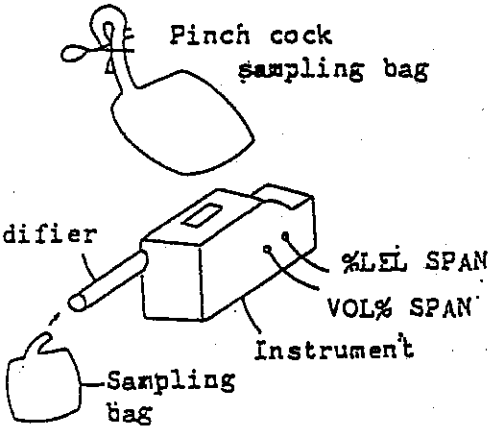
Humidifier Sponge

② Span adjustment:

a) Adjustment of 0 to 20vol% range:
After pushing the air out of the orange sampling bag for adjustment of 0 to 20 vol% range, connect the orange sampling bag, attachment and standard canned gas (with an orange label) to each other as shown in the right figure. When pressing the nozzle of the standard canned gas to the attachment, the span gas in the standard canned gas can be taken out into the smaping bag. When the sampling bag is filled with the span gas, stop pressing the nozzle to the attachment, bend the rubber tube and nip it by a pinch cock. Next, pull off the attachment from the rubber tube.



* After installation the humififier to the instrument, Set the selector swtich to 20%vol and perform the battery voltage check.
* After warming-up for about 10 minutes, If the meter needle becomes stable, set it to the zero point.
* Remove the pinch cock nipping the sampling Bag and apply it to tip of humidifier.
* After the meter needle is stabilized, rotate the variable resistor of vol% span, and set the meter needle to the value of gas concentration written on the standard canned gas.



b) Adjustment of 0 to 100%LEL range:
Use the green samping bag and the standard canned gas (with a green label) and rotate the variable resistor of "%LEL SPAN" by the selector switch, "0 to 100%LEL", to make adjustment in the same way as that of vol% side.

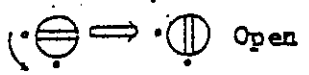
* If it is impossible to se the meter needle at the indication of the standard canned gas thought the variable registor is rotated at both vol% side and %LEL side, the element is deteriorated, and then the element should be replaced with new one according to the pargraph of the replacement method of element unit.

③ Cautions:

* The span adjustment of vol% side should be made at safety area with no fire in the surroundings and well ventilated.
* The standard canned gas which is not yet used can be sampled more that 5 times into the standard gas sampling bag.

3) Replacement method of battery (Dry-cell x 4 pcs): (Make sure to replace the battery at a place free from explosion.

* Take the instrument out of the carrying case.



* After putting the tip of a minus screw driver or a coin in the slot of the knob for mounting the cell cover at the right side of the body and turning the knob rightly 90 ℃ counterclockwise while pushing the knob by the screw driver or coin, remove the cover in such a manner that it is pulled upward.

* After replacing the batteries with new onces set them by a procedure reverse to that of the removal.

4) Replacement method of element unit: (Make sure to replace the sensor unit at a place free from explosion.)

* Take the instrument out of the carrying case, and then take out 4 dry cells according to pragraph 3) of "Replacement method of dry cell".

* After loosening and removing 2 screws on the bottom of the bottom case, remove the bottom case.

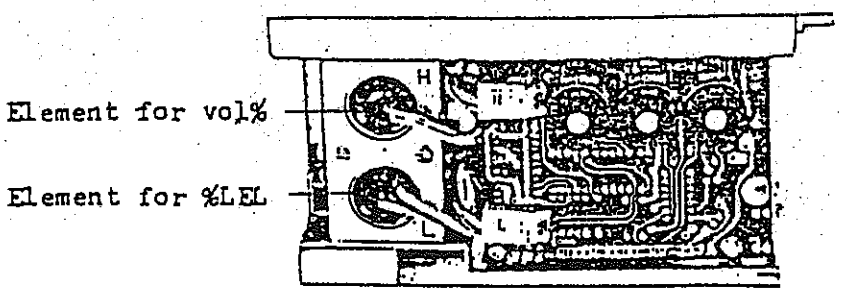
* Pick up the plastic part of the element connector (3P) on the P.C. board of instrument with fingers and pull it off.

* Loosen and remove 2 screws for stopping the fixer plate of the element unit, and remove the fixer plate.

* Pick up the lead wire of the element and pull off the latter, then replace it with new one.

* Mount the sensor fixer plate and the bottom case by the procedure reverse to that of the removal, then set the dry cells.

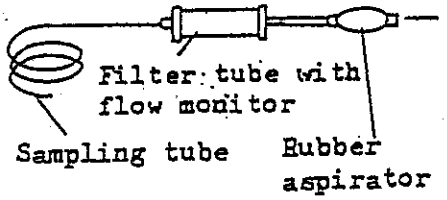
(Note) After replacing the element, make sure to carry out the span check according to the separate procedure.
(Refer to paragraph of the span adjusting method.)



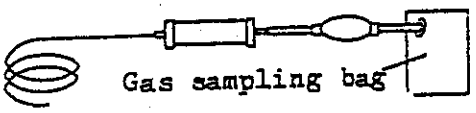
7. Measurement of Gas Under Special Conditions (By use of optional accessories)

7-1. Where the concentration of oxygen is less than 12vol% the diluter is used for %LEL range measurement. So that the accuracy of measurement will be dropped. Therefore, this method should not be used except for where circumstances are compelled to do.

1) Connect the gas sampling hose the filter tube with flow monitor and the rubber aspirator as shown in the right figure, and fall the sampling tube through into the tank.



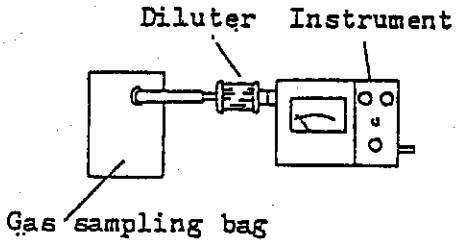
2) After more than 10 times' suction by means of the rubber aspirator, connect the air-purged green gas sampling bag to the outlet side of the rubber aspirator, and further carry out the suction about 20 times. However, if there is internal pressure in the tank, the sampling bag is promptly filled up, and then the suction should be stopped at that time.



3) Connect the dilluter to the gas inlet (4) of the instrument, and set the selector switch(6) to "0 to 10% LEL".

4) Set the meter needle at Zero by means of the zero adjusting knob(8) at %LEL side.

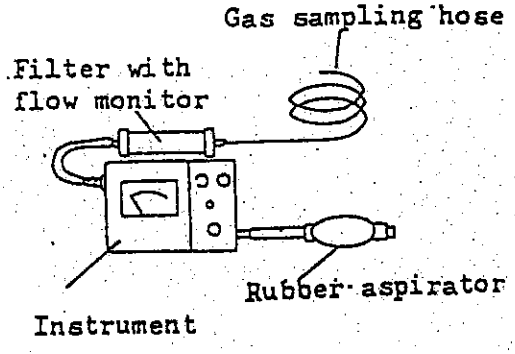
5) Connect the gas sampling bag to the end of the diluter, and carry out the measurement of gas concentration.



6) The relatiuon between the reading value and the concentration is as follows.

Concentration of gas (%LEL) = Reading value (%LEL) x 10

7-2. If the suction pump of the instrument should be out of order, connect the attached rubber aspirator to the gas outlet of the instrument, and have it suck the gas by the rubber aspirator. After the suction by the rubber aspirator is performed just 15 times, read the indication. Others are according to the ordinary measuring method.



8. Standard accessories

①	Gas sampling hose (for vol%)	1 pce/30m
②	Gas sampling hose (for %LEL)	1 pce/30m
③	Rubber aspirator	1 pce
④	Filter tube with flow monitor	1 pce
⑤	Junction tube	1 pce/200mm
⑥	Cotton wool	1 pce/ 50 g
⑦	Diluter	1 pce
⑧	Dry cell	4 pcs
⑨	Canned gas (for vol%)	1 pce
⑩	Canned gas (for %LEL)	1 pce
⑪	Gas sampling bag (for vol%)	1 pce
⑫	Gas sampling bag (for %LEL)	1 pce
⑬	Humidifier	1 pce
⑭	Screw driver	1 pce
⑮	Carrying case (Hanging belt)	1 pce
⑯	Spare box for ship use	1 pce
	Instruction manual	1 copy
	Test certificate	1 copy