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**LIFE GEM**

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## **INSTRUCTION MANUAL**

**SELF-CONTAINED BREATHING APPARATUS**

**LIFE GEM KS-4E**

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**For Ship**

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- You will please read this INSTRUCTION MANUAL carefully before you use the BREATHING APPARATUS, and keep it safe after reading through, so as to fully exert the functions of your BREATHING APPARATUS safely for yourself.
- We sincerely hope that this INSTRUCTION MANUAL should be filed for immediate use.

If this manual has been lost, please contact with our sales agents.

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LIFE GEM, MODELS KS-4E is a Self-contained Breathing Apparatus, exclusively designed for Ship use, approved by Japan Ministry of Land, Infrastructure and Transport.



The Air Breathing Apparatus is exclusively so designed as to serve at such places or under conditions in a ship as follows :

- At areas where are deficient in oxygen or filled with toxic gases.
- Escape from such areas mentioned above in an emergency.

Be careful not to use the Breathing Apparatus for other purposes except for the above evacuation in an emergency.

< **Indications shown every where in this INSTRUCTION MANUAL** >

The indications of “WARNING” and “CAUTION” are critical, and must be observed strictly.

 <b>WARNING</b>	<p>You must strictly observe conditions and procedures indicated by this <b>WARNING</b> ! without fail. If not, an unforeseen disaster might occur. In particular, if the accident is related to the human body, deaths and/or serious injuries might occur.</p>
 <b>CAUTION</b>	<p>You should carefully observe conditions and procedures indicated by this <b>CAUTION</b>. If you neglect the observation, or erroneously handle the Breathing Apparatus disregarding the indication, an accident might occur, resulting in human injuries and or property damages.</p>

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## 1. CAUTIONS TO BE TAKEN IN HANDLING

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In order to use the Breathing Apparatus correctly and safely, you will please strictly observe the below cautions and warnings.

If you carelessly handle the Breathing Apparatus in an erroneous manner, or you are not well trained in the handling of it, as well as if the Breathing Apparatus itself is not well inspected and maintained, not only the Breathing Apparatus can not exert its performance fully, but also, it might directly endanger the user's (wearer's) life.

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### WARNING

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<Cautions to be taken in actual use> :

- **Conduct inspection and maintenance periodically.**  
If you use the Breathing Apparatus without conducting the required check-up, it might result in the occurrence of an accident.
- **You are requested to be well trained for the evacuation from a dangerous place safely using this Breathing Apparatus.**  
If you use the Breathing Apparatus erroneously, it might result in the occurrence of an accident.
- **Don't use this Breathing Apparatus for a fire fighting work and/or other works.**  
If not, it might result in the occurrence of an accident.
- **Please note that a persons whose eardrum was medically ruptured must avoid from the use of the Breathing Apparatus.**  
This is because sufficient air-tightness can not be maintained.
- **Never use any oil and grease for the adjusting, maintenance, etc., of Breathing Apparatus.**  
It they were used carelessly, such substances are in danger of burning.
- **Don't modify and/or overhaul Breathing Apparatus without obtaining a permission.**  
If it was modified or overhauled, the normal function and safety can not be guaranteed.

(to be continued)

(continued)

- Use manufacturers' genuine parts.

If any parts other than the genuine parts were used, the normal function and safety can not be guaranteed.

<Cautions to be taken under the existing environmental conditions> :

- Be careful that this Breathing Apparatus can not be used in water.

If you carelessly use it in an underwater condition, you would be exposed yourself to danger.

- In case you need to wear the Breathing Apparatus under adverse conditions; such as under a toxic gas environmental condition, you must wear protective clothes, in addition to the Breathing Apparatus, so as to protect your skin from injuries caused by the infiltration of toxic gas.

- The Breathing Apparatus can not be used at extremely high-temperature (at 70°C or more) or extremely low-temperature (at less than -20°C).

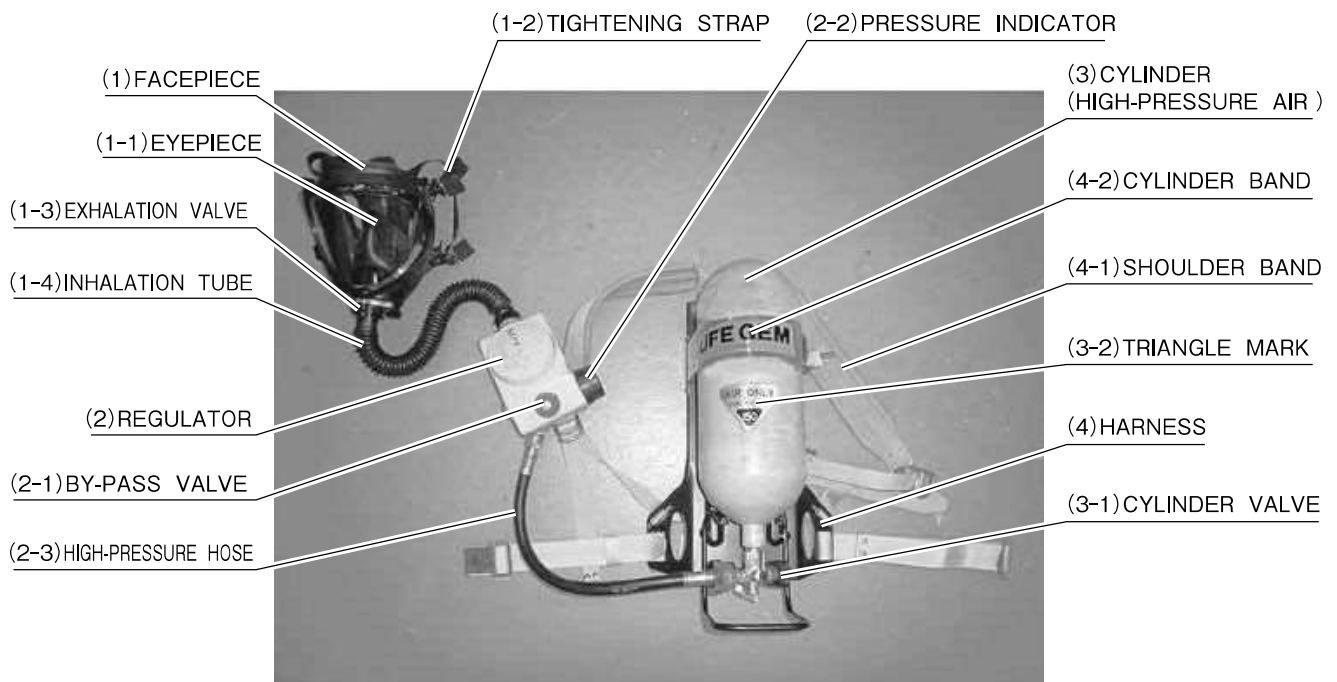
If it is prerequisite to use the Breathing Apparatus under such critical conditions, exclusively designed partial or full-fledged protective devices must be installed to the Breathing Apparatus.

- This Breathing Apparatus can not be used under a pressurized atmosphere.

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## 2. COMPONENT DESCRIPTION AND PERFORMANCE

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Overall Configuration of "LIFE GEM" KS-4E

### (1) FACEPIECE

There are two types, Model CS and Model SV.

#### (1-1) EYEPIECE

#### (1-2) TIGHTENING STRAP

#### (1-3) EXHALATION VALVE

This valve functions when you breathe; the valve opens when you exhale air, and closes when you inhale air.

#### (1-4) INHALATION TUBE

### (2) REGULATOR

The regulator consists of a pressure reducer, demand valve, etc., which is used to reduce high-air-pressure down to constant respirable atmospheric air pressure.

#### (2-1) BY-PASS VALVE

This is a manually operated air supply valve used in an emergency, such as when the demand valve does not perform properly.

#### (2-2) PRESSURE INDICATOR

(2-3) HIGH-PRESSURE HOSE

This is high-pressure hose so as to supply compressed air from the highly-compressed air cylinder to the regulator.

(3) CYLINDER(High-pressure air vessel)

(3-1) CYLINDER VALVE

This valve has been exclusively designed for the opening/closing of an air flow fed from the high-pressure air cylinder.

(3-2) TRIANGLE MARK

This is a matching mark so as to connect the high-pressure air cylinder with the harness easily and accurately by referring to this mark.

(4) HARNESS

This is used to for the wear to carry the Breathing Apparatus on the wearer' shoulder safely and well-balanced.

(4-1) SHOULDER BAND

(4-2) CYLINDER BAND

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### **3. ITEMS TO BE CONFIRMED AT PURCHASING**

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(1) Checking of component parts in a package:

First, check to see the contents of package item by referring to the packing list contained in the package.

Also check to see if the component is damaged.

If the content of the package is different from the specified item, immediately contact the fact with our nearest sales agent.

(2) Indication of the high-pressure air cylinder's owner.

You are requested to clearly indicate your name on the cylinder by the law according to the requirements of "Japanese High Pressure Gas Safety Law" and of "Cylinder Safe Inspection & Maintenance Regulation".

You will please clearly write your name (owner's name) on your cylinder referring to the Instruction sample attached to the cylinder.



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## 4. HOW TO USE YOUR BREATHING APPARATUS

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### 4. 1 Preparation for Use

First, assemble the components parts according to the following instructions, so that the assembled Breathing Apparatus can be used at all times.

If your Breathing Apparatus is a required to use at lower or higher temperature, Please refer to Section 6. "HANDLING AT LOW-& HIGH-TEMPERATURE ENVIRONMENTAL CONDITIONS", described in this INSTRUCTION MANUAL.

- (1) First, connect the High-pressure air cylinder with the harness according to the following procedures.
  - ① Put the Cylinder on the harness accurately so that the center of the triangle mark labeled on the outer surface of the Cylinder may be accurately placed rightly in the upward direction.
  - ② Hang the hook on the cylinder tightening band.  
Next, tighten the adjust screw manually (Turn the screw clockwise).
  - ③ Move the cylinder and check to see that the cylinder is firmly and accurately fixed with the harness.

 **CAUTION**

- **If the cylinder is not firmly tightened, the cylinder is in danger of disconnecting from the harness during use, resulting in the damage of wearer and the cylinder, etc.**

- ※ If already the Cylinder is put on a harness, make sure whether the cylinder is firmly installed on the harness or not to ensure safety.
- (2) Connect the high-pressure hose set with the cylinder valve.  
**(Refer to Fig. 1 next page)**

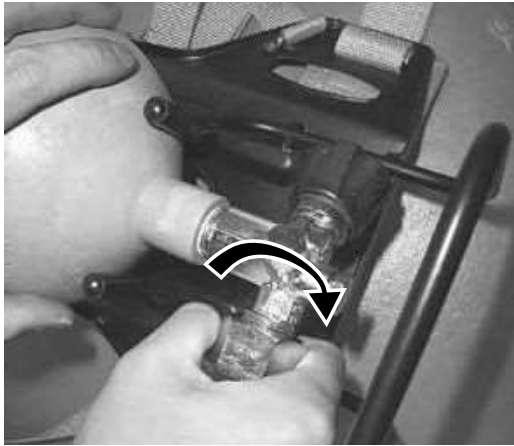


Fig. 1

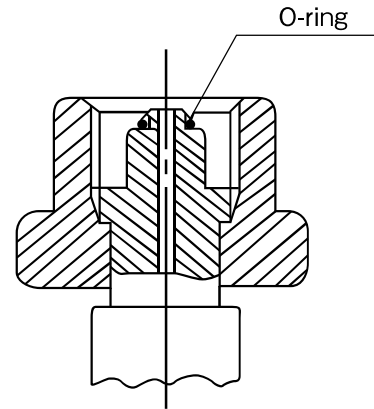


Fig. 2

On this occasion, make sure the following matters :

- ① Be sure that the connection of the cylinder valve with the high-pressure hose set is free from sticking of foreign matters.
- ② Be sure that the O-ring and the contacting surfaces with the O-ring are free from injuries. **(Refer to Fig. 2 above)**

If any abnormality has been found, follow the below procedures:

- ※1 Remove the foreign matters from the connector, etc.
- ※2 Don't use damaged parts.

Such parts can not maintain air-tightness.

(3) Conduct the following appearance inspection :

- ① Check to see if the component parts are damaged.
- ② Check to see if the inhalation tube, facepiece, straps and other rubber materials are aged (stickiness, fissures or other abnormalities), as well as check to see if the eyepiece, strap fittings and other small parts are damaged.

(4) Check to see if the exhalation valve is installed correctly.

Next, make sure whether the exhalation valve is free from any damage and/or sticking of foreign matters.

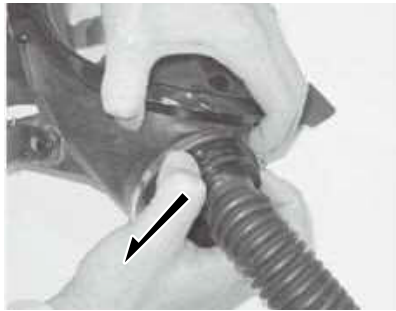
#### <How to inspect exhalation valve>

- ① First, open(remove) the exhalation valve cover.  
**(Refer to Fig. 3 next page)**

- ② Next, check to see that the exhalation valve is being firmly installed to the valve seat. **(Refer to Fig. 4 below)**

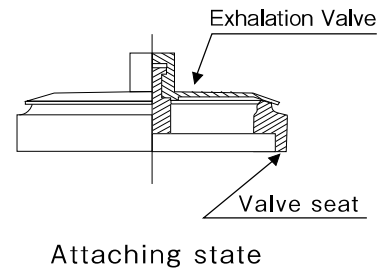


Opening of exhalation valve cover  
(In case of Model CS)



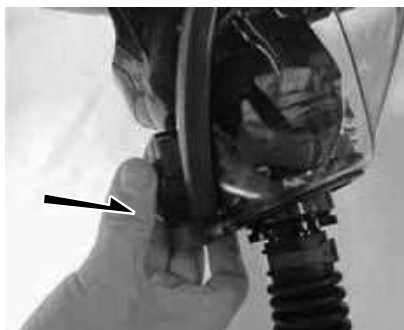
Removing of exhalation valve cover  
(In case of Model SV)

**Fig. 3**

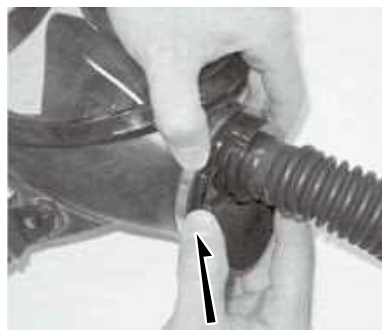


**Fig. 4**

- ③ Be sure that the clearance provided between the exhalation valve and valve seat is free from sticking of foreign matters. Checking must be conducted visually without lifting up the exhalation valve by means of your fingers or a screw driver, etc.
- ④ Upon completion of checking, re-install the exhalation valve cover as it was before. **(Refer to Fig. 5 below)**
- (5) Connect the inhalation tube with the regulator. On this occasion, accurately match the matching mark provided on the regulator with that of inhalation tube. Then connect firmly the regulator with the inhalation tube. **(Refer to Fig. 6 below)**

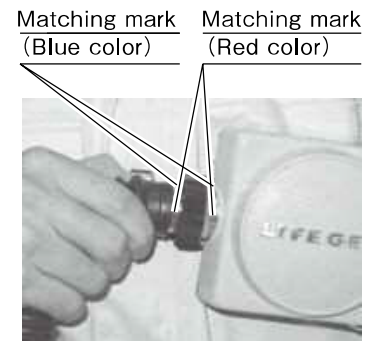


Closing of exhalation valve cover  
(In case of Model CS)



Attaching of exhalation valve cover  
(In case of Model SV)

**Fig. 5**



**Fig. 6**

 **WARNING**

- If any abnormality has found in the course of checking, don't wear the Breathing Apparatus.  
In this case, you are requested to ask for repair by the Breathing Apparatus Manufacturer.  
If you use your Breathing Apparatus under such an abnormal state, we are unable to guarantee the performance and function of your Breathing Apparatus.

## 4.2 How to Put on the Apparatus

(1) Put on the apparatus as follows :

- ① Put the apparatus onto your back.
- ② Pull down the armpit straps and adjust them until the apparatus can rest stably in a comfortable position on your back.  
**(Refer to Fig. 7 below)**
- ③ Connect, adjust and fasten the breast and waist belts.  
In this way, firmly and accurately wear the Breathing Apparatus.  
**(Refer to Fig. 8 below)**



Fig. 7



Fig. 8

- (2) Turn the cylinder valve slowly and open the valve carefully until the valve may be opened fully.

 **CAUTION**

- In order to use the Breathing Apparatus correctly and to exercise its performance sufficiently, turn the cylinder valve handle fully so as to ensure 100% valve opening.  
If you do not open the cylinder valve fully, you might have difficulty in breathing.

- (3) Put the facepiece on your face sequentially as follows:
- ① Fit and mate the facepiece tightly with your face profile.  
Next, put on the facepiece from the chin so that it may fit well.  
**(Refer to Fig. 9 below)**  
Then, do not catch hair between face and facepiece.
  - ② Stroke the two top head straps down to the back.  
**(Refer to Fig. 10 below)**



**Fig. 9**



**Fig. 10**

- ③ Adjust and fasten straps, until sufficient air-tightness is obtainable. (Model CS:4 straps, Model SV:6 straps)
- ※1 You can not put on the facepiece while you are wearing a helmet on your head.  
In other words, first, remove the helmet from your head.  
Then put on the facepiece on your face.

※2 If you wear glasses, please take off them, before to put on your facepiece, so as to maintain sufficient air-tightness.

Then put on the facepiece on your face.

(4) Conduct an air-tightness inspection on the facepiece.

① First, forcibly pinch (grasp) the inhalation tube.

**(Refer to Fig. 11)**

Next, while your head is nodding and shaking, attempt to breathe forcefully or weakly, if you attract the facepiece to your face with the inhalations, the air-tightness of your facepiece is OK.



Fig. 11

**⚠ WARNING**

- If you feel any air leakage from your facepiece, try again to put on it from the beginning.  
Be carefull that badly fitted facepiece endangers the wearer through the possible ingress of harmful ambient air.  
Therefore, on this occasion, you must not use your Breathing Apparatus.

※ Please note that if special hair-style of the head; the tuft of hair under the temple and heavy mustache, as well as a heavy scar, heavy wrinkle, high cheekbones, and other unfitted face profile might become the obstacle of the air-tightness between the wear's face and facepiece.

② Test the performance of the regulator by inhaling air strongly a few times after hands off from the pinching of inhalation tube. Make sure that you can breathe smoothly.

 **WARNING**

- If you hear any abnormal noise during inhalation, or you feel uncomfortable, take off the facepiece.  
Then you must not use this Breathing Apparatus so as to protect you from an accident.

③ Make sure that there is sufficient amount of compressed air in the Cylinder by observing the pressure indicator.

(5) If no abnormality is detected in the above items, the Breathing Apparatus may be ready for immediate service.

#### 4.3 Cautions to be Taken during Use

(1) Don't use this type of Breathing Apparatus except for escape purposes.

 **WARNING**

- Don't use this type of Breathing Apparatus for fire fighting or other working purposes.  
In other words, if the apparatus is used other than escape, this might result in an accident.

(2) The standardized serviceable time of the Breathing Apparatus is about 15 minutes.

But, this serviceable time may be shortened due to the following causes :

- Wearer's trained degree.
- Wearer's past experience, as well as physical and spiritual conditions.
- Amount of compressed air (pressure) in the cylinder.

- (3) Be careful that the unnecessary use of the by-pass valve wastes air and shortens the serviceable time of the Breathing Apparatus.  
In other words, the by-pass valve may be necessary only for avoiding any trouble with the regulator just in case it does not work properly.
- (4) You are requested to carefully observe the indication of pressure indicator for the regulator from time to time so as to make sure the amount of compressed air remaining in the cylinder.

#### 4.4 Taking off the Apparatus

- (1) Take off your Breathing Apparatus according to the following sequence :
- ① First, take away the facepiece from your face.
  - ② Second, close the cylinder valve fully.
  - ③ Third, take off the Breathing Apparatus carefully.  
On this occasion, be careful that the facepiece, regulator and other parts are not crushed under the heavy cylinder.

 **WARNING**

- **Do not carelessly throw or drop your Breathing Apparatus, as well as do not give a forcible shock to it.  
Moreover, do not leave it in a place where is exposed to water and direct sunshine.  
If not, this would become the cause of a trouble.**

- ④ Next, open the by-pass valve a little, and check to see that the pointer of the pressure indicator provided on the regulator points zero “0” scale.  
Then close the by-pass valve as it was before.



- ⑤ Finally, push the facepiece lightly toward your face and breathe lightly yourself once.

This is useful to release air from the inside of the regulator.

#### 4.5 Cleaning after Use

Whenever you used your Breathing Apparatus, the apparatus must not be left as it is without doing required maintenance.

In other words, Users are requested to do the following maintenance:

- Cleaning and disinfection of the facepiece
- Re-filling of compressed air into the Cylinder.

##### (1) Cleaning of facepiece:

The cleaning of your facepiece should be carried out as follows :

- ① First, disconnect the facepiece having a inhalation tube from the regulator by unscrewing the connection screw.

- ② Second, rinse the facepiece with fresh water.

Before the rince, you may wipe the stains off the facepiece using a piece of soft cloth, moistened by a small ammount of diluted neutral detergent with water.

- ※1 Do not use organic solution, alkaline detergent and other similar cleaners except diluted neutral detergent.

Do not use water whose temperature is more than 40°C.

- ※2 When you use fresh water for rinsing, you are recommended to wash such delicate parts in a fresh- water-contained basin.

On the contrary, if jet water discharged from a faucet is used, this might result in a failure of apparatus.

- ③ After thoroughly wipe off water using a piece of soft cloth from the surfaces of the facepiece, dry it in a well-ventilated and shady place.

 **CAUTION**

- **Never dry your facepiece in the direct sunshine, or by stove heating. If not, rubber parts and plastic parts will be deteriorated rapidly.**

(2) Disinfection of facepiece:

Disinfect your facepiece according to the below procedures :

- ① Carefully apply disinfectant alcohol moistened with a piece of soft cloth.
- ※ Do not use chemicals other than the disinfectant alcohol.

(3) For component parts other than the facepiece, stains should be removed with fresh-water-moistened a piece of soft cloth.

(4) After that, re-connect the inhalation tube with the regulator firmly and accurately. **(Refer to Fig. 6 above)**

(5) The used Cylinder must be promptly re-charged with air in the authorized facilities.

The air filling into the Cylinder should be carried out in accordance with the requirements specified in Section 7. 1 “How to Fill Compressed Air into an Air Cylinder” described later.

- ※ If your cylinder is empty, fully close the cylinder valve, so as to prevent the inside cylinder from entering harmful moisture and /or dust.

(6) To cope with immediately use at the next time, your Breathing Apparatus must be well inspected and maintained at all times.

For the inspection and maintenance of your Breathing Apparatus, please conduct them according to the procedures shown in Section 4. 1 “Preparation for Use” above.

- ※ If any abnormality has been found on your Breathing Apparatus, you are requested to check it according to the instructions described in Section 8 “INSPECTION & MAINTENANCE MANUAL FOR MODEL KS-4E.”

On this occasion, if any damage or abnormality has been observed, the defective parts must be repaired by the sales agents.



## **WARNING**

- If your Breathing Apparatus and its component parts are damaged or abnormal, immediately make them to repair by the nearest sales agent.

You must not neglect them, or carelessly reuse them.

If not, it might result in an accident.

- Never apply grease & oil to the Breathing Apparatus parts for the maintenance of them.

If erroneously grease & oil were used, such substances are in danger of burning.

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## 5. MAINTENANCE

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### 5. 1 Storage

- (1) Install a sufficiently air-filled cylinder to your Breathing Apparatus.
- (2) Open the by-pass valve, purge air and release pressure from the Breathing Apparatus line (except from the inside cylinder).  
After that, close the by-pass valve fully.
- (3) Finally, store your Breathing Apparatus safely in the storing box. Next, the Breathing Apparatus set shall be safely stored in a place where is free from dust, moisture, and direct sunshine at less than 40 °C.

### 5. 2 Inspection and Maintenance

- (1) The maintenance and inspection of the Breathing Apparatus shall be done periodically; at least once every three months in accordance with the requirements described below; so that the apparatus can be serviceable immediately at all times, in an emergency.
  - ① First, make sure that the by-pass valve is being closed fully. Next, turn the cylinder valve handle, and open the cylinder valve. Then read out the air-filling pressure in the cylinder indicated on the pressure indicator.  
As a result, if the pressure value indicated on the pressure indicator is less than 12.7 MPa {130 kgf/cm<sup>2</sup>}, re-fill compressed air into the cylinder.
  - ※ If the filled air pressure is lower than the specified pressure; the serviceable time of the Breathing Apparatus is shortened proportionally.

Upon completion of checking, surely open the by-pass valve, purge air from the inside parts of the Breathing Apparatus set (except from the inside cylinder).

Moreover, push the facepiece lightly toward your face and breathe lightly yourself once, and thus, release air from the inside of regulator.

- ② Check to see if aging of rubber parts including the inhalation tube, facepiece, strap, band and other small parts is occurring (stickiness, fissures and other defects).

Also, check to see if the eye-piece, strap fittings and other small parts are damaged.

If any damage or abnormality has found, it must be repaired or replaced with a sound part by sales agents.

- ③ Check up the exhalation valve in accordance with the instructions written in Section 4.1 (4) above.

If any abnormality has found on the exhalation valve, replace it with a new one selected from attached accessories.

**(Refer to Fig. 12 below)**



**In case of Model CS**

**In case of Model SV**

**Fig. 12**

- (2) After that, the Breathing Apparatus set shall be periodically, at least once every year, inspected as specified in Section 8 “INSPECTION & MAINTENANCE MANUAL FOR MODEL KS-4E.”

- (3) After elapsing one year from your purchasing of your Breathing Apparatus, the inhalation tube, exhalation valve and other small parts made of rubber materials used for the Breathing Apparatus should be visually checked for fissures, stickiness and other external damages.

If required, immediately make replace such a defective part with a new one by sales agents.

In addition, after elapsing three years from your purchasing of your Breathing Apparatus, all rubber parts must be replaced with new ones.

 **WARNING**

- If your Breathing Apparatus and its component parts are damaged or abnormal, immediately make them to repair by the nearest sales agent.

You must not neglect them, or carelessly reuse them.

If you are neglectful or careless on the above matter, you might suffer an accident.

(4) Overhauling:

The degree of damages of component parts of the Breathing Apparatus is, depending upon the frequency of service, good or bad maintenance after use, or storing conditions, these component parts shall be overhauled every three years after your purchasing of the Breathing Apparatus, by the manufacturer of the Breathing Apparatus.

By the way, the repairable period of the component parts of the Breathing Apparatus is within fifteen' (15) years counted from their manufactured date.

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## 6. HANDLING AT LOW-& HIGH-TEMPERATURE ENVIRONMENTAL CONDITIONS

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If you desire to use your Breathing Apparatus at extremely low ambient temperature, such as less than  $-20^{\circ}\text{C}$ , you are requested to make special provisions against the extreme cold for your Breathing Apparatus itself. On this occasion, you are recommended to wear an overcoat for cold weather or protections against the cold over the Breathing Apparatus. On the contrary, if you desire to use your Breathing Apparatus at extremely high ambient temperature, such as over  $70^{\circ}\text{C}$ , you are requested to wear protections against the heat over the Breathing Apparatus.

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 **WARNING**

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- **Do not use your Breathing Apparatus at extremely low ambient temperature, such as less than  $-20^{\circ}\text{C}$ , and also at extremely high ambient temperature, such as over  $70^{\circ}\text{C}$ .**

**Or, it might result in a trouble, such as the failure of the apparatus.**

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## 7. OTHERS

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### 7.1 How to Fill Compressed Air into an Air Cylinder

Make fill compressed air into your Cylinder in the authorized facilities. The composition standard of air to be filled into the Cylinder is as follows :

Item		Standard value
Oxygen	vol. %	<b>19.5 ~ 23.5</b>
Carbon Dioxide	vol. ppm	500 or less
Carbon Monoxide	vol. ppm	5 or less
Water Content at atmospheric Pressure		14.7 MPa Cylinder Pressure
	mg/m <sup>3</sup>	50 or less
	ppm	49.6 or less
	°C (dew point)	<b>under -49.5</b>
Volatile organic compound (as methane equivalent)		25ml/m <sup>3</sup> or less
Oil and Oil mist		No coloring observed
Odor and Impurities		No odor and no presence of dust, contaminants or metal particles



## 8. INSPECTION & MAINTENANCE MANUAL FOR MODEL KS-4E

ITEM	PARTS NAME	CHECKING METHOD	ACCEPTABILITY	ACTIONS TO BE TAKEN	REMARKS
1	Cylinder & Cylinder valve	<p>1. <u>Re-inspection</u> : Counting from the Cylinder manufacturing date, conduct the re-inspection every legal period.</p>	<p>The Cylinder must be acceptable in a test according to the High-pressure Gas Safety Law.</p>	<p>Ask to test by a Gas Cylinder Inspection Agent authorized by the prefectural governor.</p>	<p>① Cylinder manufacturing date is indicated on cylinder surface. ② Legal period of re-inspection is indicated on caution label.</p>
2	Cylinder valve	<p>1. <u>Opening/closing performance test on cylinder valve</u> : Check to see if compressed air may jet out vigorously from the outlet of the valve until the valve handle was turned fully one time.</p> <p>2. <u>Confirmation of cylinder charging air Pressure</u> : 1) Connect the high-pressure air hose to the cylinder valve and carefully open the valve by turning the handle. Then read the scale on the pressure indicator of the regulator. 2) Close the valve after checking, and remove the high-pressure air hose after releasing high-pressure air completely and safely by operating the by-pass valve.</p> <p>3. <u>Leakage test</u> (for valve seat portion only) After charging the cylinder with air, apply neutral soap-water solution over the surfaces of high-pressure air hose connectors.</p> <p>4. <u>Leakage test (Overall sections)</u> 1) First, connect firmly the accessory cap nut with cylinder valve. Next, turn the handle. (open the valve) and immerse them in water.</p>	<p>Be sure that the air can be jet out vigorously within one turning of the valve handle.</p>	<p>In case the air can not be jet out vigorously, make repair it.</p>	<p>Since the maximum air charging pressure is 14.7 MPa   150 kgf/cm<sup>2</sup>   at 35°C, if the pressure is less than the above, the Breathing Apparatus serviceable time will be shortened proportionally.</p>
			<p>Be sure that there is no air leakage. If any air-bubble has been observed, this means that air leakage is existed through swollen soapwater.</p>	<p>1. If the leakage has been confirmed, a little forcibly close the valve by turning the valve handle. 2. In spite of the above action has been taken, if the leakage does not stop, make repair it.</p>	<p>If the handle of the cylinder valve is turned forcibly, be careful that the valve might be broken, resulting in more air leak.</p>
			<p>Be sure that there is no air leakage. If any air-bubble has been observed continuously, this means that air leak is existed.</p>	<p>If the leakage has been confirmed, make repair the defective parts thus produced leak.</p>	<p>① Wipe off water drops from parts surfaces thoroughly after testing.</p>

(to be continued)

(continued)

ITEM	PARTS NAME	CHECKING METHOD	ACCEPTABILITY	ACTIONS TO BE TAKEN	REMARKS
2	Cylinder valve (cont'd)	2) Upon completion of the leakage test, close the handle firmly as it was before.			<p>② In cold district, water is not allowed to use for the leakage test. In lieu of this, neutral-type soap-water solution is recommended to use.</p> <p>③ If the pressure is required to release, first turn the handle and close the cylinder valve fully. Next, carefully loosen the cap nut from the high-pressure hose connectors.</p>
3	Regulator	<p>1. <u>Leakage test</u></p> <p>1) First, connect the regulator with the high-pressure cylinder charged with 12 MPa (122 kgf/cm<sup>2</sup>) or more compressed air, through high-pressure air hose. Next, turn the handle of the cylinder valve so as to open the valve until the pointer of the pressure indicator for the regulator shows the highest scale. Then closed the valve handle.</p> <p>2) Disconnect the inhalation tube from the regulator. Then apply neutral-type soap-water solution over the exit of the regulator and other connector, so as to check to see if any leakage is observed.</p>	<p>Be sure that there is no air leakage. (Keep this state at least for one minute. On this occasion, if the pointer does not fluctuate at all, this means that there is no air leakage from the regulator. But, a little pressure decrease; less than 1 MPa (10 kgf/cm<sup>2</sup>) (approx.1 scale) per one minute will be acceptable in actual use.)</p> <p>If any leakage is generated, soap-water bubbles will swell up in leaked position.</p> <p>-In case the air leaked location can not be detected: -In case air leakage occurs from the inhalation tube connectors :</p>	<p>If the pressure decrease actually exceeds 1 MPa (10 kgf/cm<sup>2</sup>) (approx.1 scale), the regulator is not acceptable and required to make repair.</p> <p>The leakage is preventable by simply retightening the component parts. On the contrary, if the leakage is not preventable by retightening, make the parts repair.</p> <p>If the repair of air leakage is unable to carry out at site, make the repair by the manufacturer.</p>	<p>① Make sure that an O-ring is inserted into the connector provided between the high-pressure air hose and the cylinder valve. If the O-ring is damaged excessively, replace it with a new one.</p> <p>② Check to see if the by-pass valve (provided with a red knob) is closed.</p> <p>③ Be careful not to immerse the regulator into water so as to check up leakage.</p> <p>④ Upon completion of the leakage test, fully wipe off residual soap-water and dry the surfaces of the regulator.</p>

(to be continued)

(continued)

ITEM	PARTS NAME	CHECKING METHOD	ACCEPTABILITY	ACTIONS TO BE TAKEN	REMARKS
3	Regulator (cont'd)	<p>2. <u>Functioning test</u> Turn the handle of cylinder valve fully and open the valve. Then inhale air intermittently, or forcibly, as well as weakly.</p> <p>3. <u>Functioning test of by-pass valve</u> Following the above procedure, carefully open the by-pass valve gradually.</p>	<p>The performance of the regulator is sophisticated and responds delicately with less fluctuations of the indicator pointer.</p> <p>Make sure that the gas splashes out within one turn of the by-pass valve handle.</p>	<p>If the pressure decrease actually exceeds 0.5 MPa (5 kgf/cm<sup>2</sup>) (approx. 1/2 scale), every time you breath, the regulator is not acceptable and required to make repair.</p> <p>If the gas does not splash out, make repair the by-pass valve.</p>	
4	High-pressure air hose	<p>1. <u>Appearance</u> Bend the hose several times and check to see if any fissure has been observed on the surfaces of the hose.</p> <p>2. <u>High-pressure and leakage tests</u> Whenever any leakage test is required to conduct on the regulator, apply soap-water solution all over the surfaces of the high-pressure air hose, so as to check to see if any harmful air leakage is observed. Pay special attention to the joints provided on both ends of hose; metal fitting and external rubber materials.</p>	<p>Be sure that there is no fissure.</p> <p>Be sure that there is no air leakage (Check to see if any swollen air bubbles are observed continuously).</p>	<p>If any fissure is observed on the surfaces of the hose, replace it with a new one.</p> <p>If any air leakage is observed on the surfaces of the hose, replace it with a new one.</p>	<p>When the high-pressure air hose has elapsed 3 years after purchasing it (rubber parts cure date over), it shall be replaced with a new one.</p>

(to be continued)

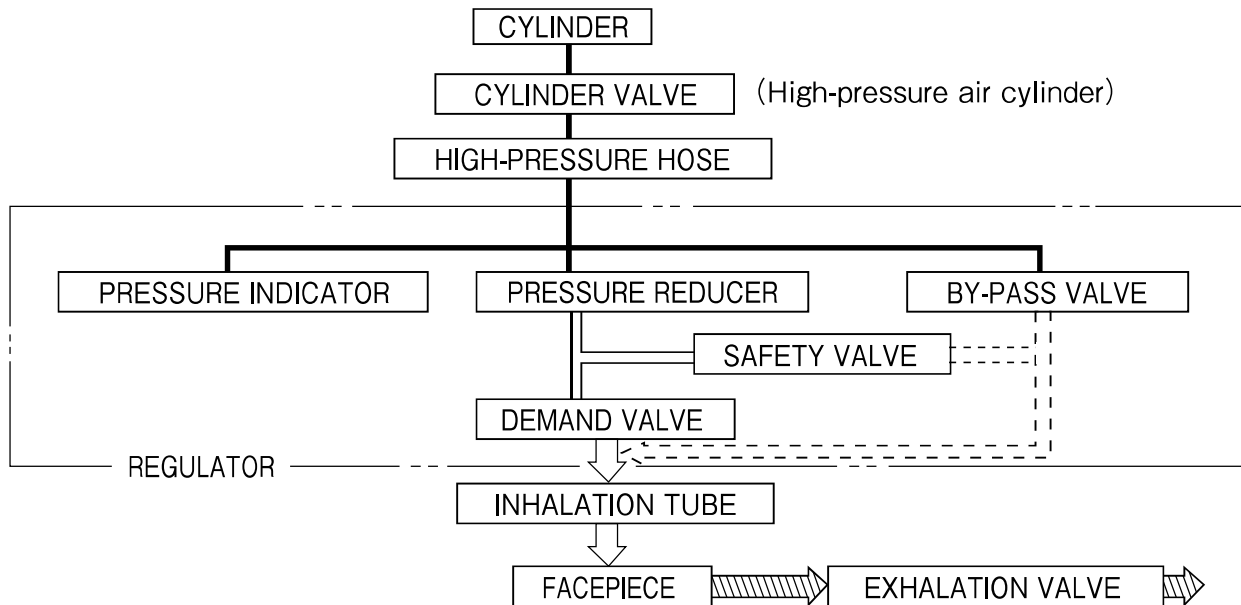
(continued)

ITEM	PARTS NAME	CHECKING METHOD	ACCEPTABILITY	ACTIONS TO BE TAKEN	REMARKS
5	Pressure indicator	1. <u>Index check on the pressure indicator</u> The index check shall be conducted from time to time as required	1) Be sure the the pointer is showing zero (0) scale. 2) The pointer must move smoothly without catching something. 3) The index must be accurate.	If any abnormality is observed, the defective portion shall make repair.	
		2. <u>Leakage test of pressure indicator</u> Whenever the leakage test of the regulator was conducted, this pressure indicator leakage test shall be conducted simultaneously.	Refer to the Section of "Regulator" above.		
6	Facepiece, Inhalation tube, Exhalation valve, and other Rubber parts	1. <u>Appearance</u> The appearance of rubber parts which were purchased more than one year ago shall be checked (on the stickiness, strength and existence of fissures, etc.).	Check to see if these rubber parts are durable for use.	If required, replace these rubber parts with new ones.	Pay special attention to the Exhalation valve.
		2. <u>Leakage test</u> ※ After wearing the facepiece, forcibly pinch off the exhalation tube, or once close the connection port with the regulator with the hands. Then try to inhale air.	If the wearer does not feel any air leakage, the rubber parts are acceptable.		
7	Harness	1. <u>Appearance</u> Check to see if belts, straps and their fittings are serviceable from time to time as required.	Check to see if these parts are durable for use.	If any defect has been found, make repair it, or replace it with a new one.	

Note : Those locations marked with ※ are recommended to be tested by using a circuit tester; TESTER Model 6 so as to ensure accuracy and convenience.

## 9. SYSTEM DIAGRAM AND MAJOR SPECIFICATIONS

### « System Diagram »



**BLOCK DIAGRAM**

where, — : High-pressure air line

== : Medium-pressure air line

⇨ : Low-pressure air (Inhalation) path

- - - - - : Air supply path through the By-pass valve  
(at Low-pressure air)

▨⇨ : Exhalation path

《Major Specifications》

The Major Specifications of LIFE GEM, Model KS-4E are as follows:

<b>Model</b>		<b>K S - 4 E</b>
<b>Type approval No.</b>		<b>No. 3013</b>
<b>Classification</b>		<b>Breathing Apparatus for escape in an emergency</b>
<b>Name of compressed gas</b>		<b>A i r</b>
<b>Serviceable time (minute) ※</b>		<b>15 or more</b>
<b>Carrying weight (kg)</b>		<b>Approx.10.5</b>
<b>Max. chargeable air volume(ℓ)</b>		<b>Approx.600</b>
<b>Air supply system</b>		<b>Self-Contained Compressed Air Supply System demand type</b>
<b>Cylinder</b>	<b>Material</b>	<b>Inter manganese steel</b>
	<b>Inner volume (ℓ)</b>	<b>4</b>
	<b>Max. air charging pressure (MPa {kgf/cm<sup>2</sup>})</b>	<b>14.7 {150}</b>
<b>Type of facepiece</b>		<b>Model CS (K2-CST-S) or Model SV (SVT-S) for ships (full facepiece with a nose cup)</b>

**(NOTE):**

※ : The Serviceable Time may be shortened due to the following causes:

- Wearer's trained degree.
- Wearer's past experience, as well as physical and spiritual conditions.
- Amount of compressed air (pressure) in the cylinder.

— END —



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