1. Read and understand the instructions in this manual before operating this instrument.
2. Keep manual accessible at all times.
3. This instrument cannot be used for any other purpose than what is specified in this manual.
4. Follow all the instructions in this manual, deviation will compromise the safety, quality and performance of this instrument.
5. We accept no responsibility for an accident caused by the user not following the instructions in this manual.

Safety Precautions

Phone: 81-3-3966-1113
Fax: 81-3-3558-9110
E-mail: intdept@rikenkeiki.co.jp
2-7-6 Azusawa Itabashi-ku Tokyo, 174-8744 Japan
Thank you for purchasing our fixed type gas detector/transmitter Model SD-705EC. This is a gas detector to detect toxic gases leaking into the atmosphere and transmit its signal to the central monitoring station to prevent accidents caused by gas toxicity.

This manual is a guidebook for use of the SD-705EC. All persons who use this detector for the first time and who have ever used the detector are requested to read through the manual to understand the content before use.

This manual contains the following headings to ensure the safe and effective operation.

- **DANGER**
- **WARNING**
- **CAUTION**
- **NOTE**

**Means advice concerning handling and operation.**
1. 説明事項について
2. 仕様について
  2-1 仕様化の際の留意事項
  2-2 設備の管理・保存に際しての注意事項
  2-3 設備の利活用に際しての注意事項
  2-4 設備の使用に際しての注意事項
  2-5 設備の操作に際しての注意事項
  2-6 設備の保存に際しての注意事項
3. 設置方法
  3-1 インストールの際の注意事項
  3-2 インストールの際の注意事項
  3-3 インストールの際の注意事項
  3-4 インストールの際の注意事項
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4. 入力出力方法
  4-1 入力出力方法
  4-2 入力出力方法
  4-3 入力出力方法
  4-4 入力出力方法
  4-5 入力出力方法
  4-6 入力出力方法
  4-7 入力出力方法
  4-8 入力出力方法
  4-9 入力出力方法
  4-10 入力出力方法
  4-11 入力出力方法
5. 設備の保守管理
  5-1 設備の保守管理
  5-2 設備の保守管理
6. 難 POINT
7. 附記事項
8. 附記事項
The control key used for adjustment is made from a powerful magnet. If it is brought nearer to a credit card, ID card, other magnetic products, this key may damage the stored data.

WARNING:
‡A PW/TR light
Illuminates continuously when the equipment is working (power light). And flickers in the case of abnormality in the equipment.

‡B AL1 light
Illuminates when 1st alarm is activating.

‡C AL2 light
Illuminates when 2nd alarm is activating.

‡D SKIP light
Illuminated when point skip is selected. And flickers in the maintenance mode.

‡E AL-T(£) switch
Used to increase the value with the control key.

‡F LCD
Indicates the gas concentration and error code.

‡G AL/SET switch
Used for confirmation of preset alarm level. And used for decision in the maintenance mode.

‡H ZERO light
Flickers in the zero adjustment mode. (Steady light when the adjustment is over.)

‡I SPAN light
Flickers in the span adjustment mode. (Steady light when the adjustment is over.)

‡J mA light
Illuminates with the current output indicated on the LCD (during maintenance)

‡K mA (£) switch
Used for indicating current output on the LCD. And used to decrease the indication in the maintenance mode.
PT2E-1140

Internal View

- Terminal plate: Connected to power source and 4-20mA signal output.
- Fuse: Fuse for power (0.5A)
- Relay output terminal: Connected to alarm relay output cable.
- Earth terminal: Used to make grounding
- Cable inlet: Used to lead the cable from the indicating alarm unit (With the pressure proof packing gland)
- Relay output and communication cable inlet: Used to lead the cable from alarm relay output
- Sensor: Sensor connected
- Power switch: Power ON/OFF switch
- Seal packing: Used to protect equipment from water and dust
- 7P connector for detector: Connected to cable for detector (sensor)
- Packing: Used to protect equipment from water and dust
On detecting a toxic gas leakage, this unit shows the gas concentration on the LCD and outputs the gas concentration value in 4-20mA to the indicating alarm unit. When the concentration exceeds the preset level, the alarm contact activates.

In view of its duty, the gas detector must always be in the normal operation with the power supply ON. Therefore, it is essential to confirm its operation daily.

For the operation confirmation, refer to 4-1, Inspection Frequency and Items.

This detector may also be sensitive to gases other than the objective gas. When the detector detects the gas and issues an alarm, find out whether this is caused by the objective gas or other gases not covered by the detector.

CAUTION
- Cautions for Installation and Handling

Never use the detector in the following places.
- Place where the detector is splashed
- Place with water.
- (Use an optional drip-proof cover when the detector is to be installed outdoors.)
- Place with radio wave and noise.
- Place where the detector is dropped or exposed to strong impact readily.

2-2  2-1  2-2
Be sure to use an optional drip-proof cover when the detector is to be installed out of doors.

**Caution**

- Do not install the detector in places where the temperature is below -10°C or +40°C or more.

**CAUTION**

- When intending to open the lid, wait for 30 seconds or more after powered OFF and then, open the lid.

'Cautions for System Engineering'

- Unstable power supply and noise may cause error of performance and alarm.
- For the system to use this detector, it is required to make design based on this manual description.

1. **Stable power used**

   - While the system gets stable at power on and power failure, the external output and alarm light may be on and the care for it must be taken. In such case, use the standby battery or take an appropriate action in the receiver side.

   Supply the following power to this detector.
   - **Power voltage**: DC24V ±10%
   - **Power failure tolerance time**: Approx. 50msec or less
     (For power failure of more 50msec, it re-starts.)

     To warrant the continuous operation, install the standby battery outside.

2. **Noise measures according to installation circumstances.**

   - **Lightning/Thunder/surge measures**

     There is the problem point 'Lightning(Thunder)' when installing the detector outside of factory. If the lightning is a huge generation source, the cable is a reception antenna and there is the case that cable connecting instrument is broken. It is impossible to prevent the generation of lightning. If the cable should put in metal tube, laid in the underground, it is impossible to prevent the inductive lightning surge generating from the thunder.

     There is no complete countermeasure for it but the following method can be considered.

     - **Countermeasure by the lightning arrester (Cable safety retainer)**

       There is the way to install the lightning arrester just before the field apparatus and the central control station. The position of the lightning arrester installation is at each point of cable laid out from the outdoor to the indoor.

       The lightning arrester builds in the circuit to remove the surge voltage to be the source for the damage of field apparatus.
Following is available to reduce the influence of electromagnetic induction noise and electrostatic induction noise from power cable:

1. **Isolation from power cable**
   - Use signal cable with a shield and ground.
   - Make electrical isolation such as using metal installation pipe for power cable, installing isolation plate between power cable and electrostatic shield, and install them into exclusive metallic duct.

2. **Grounding the instrument**
   - Lightning (Thunder) and etc make surge noise. To protect an instrument from surge noise, be sure to ground an instrument. Refer to 2-6. Wiring Method for details.

### Maintenance Space

A certain maintenance space must be secured around the detector, so that the maintenance staff can perform the safe and correct maintenance and control operation of functions and performance. Pay due attention to secure this space during work plan and execution.

### 2-4 Wiring Method

- The following components are connected as shown in the figure. For the wiring method, refer to 2-6. Wiring Method. The figures are not drawn to scale and do not represent the actual size.
2-5 Installation Method

(1) Install the detector body to a firm surface (wall surface, etc.) with M6 bolts. Use an optional mounting piece when installing the detector to the 2B pipe. (For the installation method, refer to Fig.1 through 4 below)

During installation, take care not to drop or throw the detector. Otherwise, the strong impact may cause damage to the equipment.

CAUTION

(a) Installation without using drip-proof cover

Installation to the wall (Fig.1)
Install to the wall after fixing the detector to the detector mounting piece with screw as shown above.

Installation to the 2B pipe (Fig.2)
Secure the detector to the detector mounting piece with screw and fix it to the U-bolt (M10) for 2B pipe as shown above.
(b) Installation using a drip-proof cover (option)
When installing the cover, slide it from the top to downward along the groove and fix it with the bottom fixture.

*Installation to the wall* Fig.3

Install to the wall after fixing the detector to the detector mounting piece with screw as shown above.

*Installation to the 2B pipe* Fig.4

Secure the detector to the detector mounting piece with screw and fix it to the U-bolt (M10) for 2B pipe as shown above.
(2) Insert a packing gland (lower) ¨ washer ¨ packing ¨ packing grand (upper) in this order onto the cable. Lead the cable into the detector terminal box and attach a stick-type crimp terminal plate to the end of the cable.

<table>
<thead>
<tr>
<th>Cable finish O.D.</th>
<th>Packing inside diameter</th>
<th>Washer inside diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø11</td>
<td>ø12</td>
<td>ø13</td>
</tr>
</tbody>
</table>

If cable finish O.D. does not meet with above packing gland, please contact with us.

(3) Loosen the hexagonal socket headed screws (6 points) of the detector and remove the lid, and the power terminal plate (3 points) and relay output terminal plate (6 points) appears. The power terminal plate (3P) has +(DC24V), -(DC24V) and Sig marks from left to right. The -(DC24V) terminal is a common terminal (-) for the DC24V input and Sig output (DC4–20mA). Therefore, both the +(DC24V) and -(DC24V) terminals are for DC24V input and both the Sig and -(DC24V) are for DC4–20mA output.

<table>
<thead>
<tr>
<th>+</th>
<th>-</th>
<th>SIG</th>
</tr>
</thead>
</table>

The relay output terminal plate (6P) has First alarm relay output terminal (2P), Second alarm relay output terminal (2P) and trouble alarm relay terminal (2P).

Relay output for 1st alarm
Relay output for 2nd alarm
Relay output for trouble alarm (option)

Be careful not to damage the inner electronics circuit when making wiring construction.

**CAUTION**

- Make the cable end naked.

(For length, refer to following "Length of naked wires.")

- Insert the cable into plug of terminal and tighten it by minus screwdriver.

- After completion for connection of all cables, connect the plug onto the base of PCB.

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For connection of terminal plate

In case of direct connection:

- Peel length of cable end: 7 mm for 3p terminal, 7 mm for 6p terminal
- Do not make preliminary solder.

In case of using the compressed ground terminal:

- Bar terminal: Model Al series (Maker: Phoenix Contact)
- Terminal lug terminal: Model CRIMPFOX UD6 (Maker: Phoenix Contact)

- Torque for terminals:
  - 0.5 to 0.6 Nm for 3p terminal, 0.2 to 0.25 Nm for 6p terminal
  - Applicable tool: Minus screwdriver

- Be sure to use the exclusive use bar terminal. When used with other make bar terminal than above, the function of this detector cannot be warranted.

Caution:

- Power / Signal cable: CVVS 1.25 to 2.0 sq
- Alarm relay contact cable: CVVS 1.25 sq

During wiring work, take care not to damage the internal electric circuit.

Caution:

Refer to 'Q|U Wiring Method for connection of terminals.

Do not enter metals or other substances inside detector when opening the detector lid.

Remove them inside detector to avoid the detector trouble or loss of ability for explosion proof.

WARNING:

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2-6 Wiring Method

After installation of detector, confirm that there is no error in installation, and carry out connection between equipment as follows.

Connection of the 'r'c'O'T'd'b to the indicating alarm section ('d'b'T'W'Retc.)

CVVS-3C

1.25sq 'Å 1.25km MAX
2.0 sq 'Å 2.0 km MAX

SD-70'T'd'b

DC24V

100V

Pt-

EC-583

SD-70'T'd'b

DC24V

Pt-

100V

AC

DC24V (single case)
AC100V (multi-case)

Power input

Indicator

EC-583

Max 1.25km by 1.25sq.
Max 2.0km by 2.0sq.

Connection of 'S'20mA of the 'r'c'O'T'd'b to the 'c'b'r, etc. Example

CVV-2C

Pt-

Zq'ä

AC

DC24V

Pt-

Pt-

CVVS-3C

Isolator (if necessary)

DC24V (single case)
AC100V (multi-case)

Relayed terminal

POWER

AC100V

('Q) For safety and to protect an instrument from external noise, be sure to make ground before power on. Use cable as thin and short as possible in order to suppress resistance. Use internal of instrument or "E" bolt (Refer to Page 5) on the bottom of instrument for ground.
Be sure to make ground as the instrument is flame proof design.

Make ground with ground resistance is below 100Ω.

Be sure not to connect ground cable to gas pipes.

WARNING

I Connect alarm relay contacts as following.

SD-705EC

Relay contact terminal

1st alarm contact

2nd alarm contact

Trouble alarm contact

Trouble contact

is a option

Alarm contacts shall be used only for external buzzer and alarm light, and do not use it for the controlling use (such as solenoid valve control etc).

When control the external load, the bad influence may be given to the system according to the load characteristics.

In such case, the following countermeasure shall be taken to stabilize the action and protect the contents.

I Relayed by the low voltage relay and operate by connecting surge absorbing parts (Spark Killer, Diode, etc) suited for the rating of relay coil directly to relay.

Add surge absorbing parts to the load side of relay on the request.

The spec for alarm contact is described by the conditions of resistive load.

When use the inductive load for alarm contacts the very high reverse electromotive voltage may be generated and the following trouble tends to be produced.

Contact part of relay is melted adhesively and the contacts can no work.

As it is big noise, the trouble action may be taken by the reckless drive of CPU.

The inductive load shall not be used in principle.

When use the inductive load, make the contact amplification outside, but the outside relay coil belongs to the inductive load, use the relay driven by the low voltage and it is protected by an appropriate surge killer.

As the inductive load, there are following samples.

Patlight  *External relay  *Buzzer  *Siren  *Fan  *Fluorescent lamp  *Motor etc.

* Be sure to not use the inductive load for alarm contact.
Normally-closed contact (Break contact) at non-existing condition may change to open contact in a moment due to physical shock. Whenever alarm signals from gas detectors are used with normally-closed contact, please put delayed circuit (for about one second) to receiver side of normally-closed contact to avoid such phenomenon.

**CAUTION (FOR USE OF NORMALY-CLOSED CONTACT)**

Trouble alarm contact is an option. Please contact with our nearest agent or RIKEN KEIKI if it is intended to use.

**CAUTION**

(4) Install the lid and 6 hexagonal socket headed bolts and tighten these bolts firmly. Be sure to use the attached hexagonal socket headed bolts to secure the lid of detector. Be sure to secure the lid with 6 bolts. The use of bolts other than attached may cause loss of explosion proof performance.

Take care not to put metal or foreign material into the detector when installing the lid to the detector. Always remove any foreign material in the detector because it may cause failure or loss of explosion-proof performance.

Install the lid after confirming that the seal packing is not sticking out.

**WARNING**

(5) Make grounding with E bolt located at the bottom of detector (this detector is a flame-proof structure. It is required to make grounding).
3. 3-1 3-2 3-3

3- 1 操作方法

(1) 確認電源未接入機器，將6個六角螺栓和蓋子拆除。在機器內開電源開關。

在這種情況下，LED和LCD不會亮因為電源未接入機器。

(2) 將蓋子和6個六角螺栓安裝好。緊固這些螺栓，然後接入電源。

(3) 在機器開電源狀態下， PW/TR指示燈會亮，表示約25秒時間的加熱和自我診斷。在此期間，4-20mA輸出會提供2.5mA的輸出。

(4) 在約25秒後，LCD會顯示氣體濃度值（0等）。在自我診斷期間發現任何異常時，顯示E-XX。

在這種顯示E-XX的情況下，請參見5-1，故障指示和對策。

(5) 在顯示氣體濃度值後，進行3-2加熱，然後進行零點和滿程調整。

檢測器將在電源接通後約25秒準備好測量。

在這個期間，如果電池輸出不穩定時，可能會激活警報。若警報在電源接通時被觸發，請及時處理。

零點和滿程調整應在啟動調整和傳感器更換時進行。這些調整需要特殊工具。建議聯絡我們的經銷商或RIKEN KEIKI。

---

**注意**

請務必進行2~3小時的加熱操作時進行啟動調整或傳感器更換。

**注意**

在3-1設置方法後，將開始持續監測。

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3- 4 Gas Alarm Function

When gas concentration exceeds preset alarm level (alarm point), alarm relay contact and alarm light activates. Gas alarm has 1st alarm and 2nd alarm. And each alarm performs individually.

When gas concentration exceeds 1st alarm point, 1st alarm relay contact activates and AL1 light is lighting. When gas concentration decrease below 1st alarm point, 1st alarm relay contact is reset, and AL1 light is off (Self reset). Performance of 2nd alarm is same as 1st alarm.

The action at gas alarm shall follow to the client rule and immediate refuge shall be required. Generally, the following action is taken.

A. Based on gas alarm control concentration, it keeps the safety by keeping away people from the monitoring area.

B. When gas concentration display show, close the gas value and confirm that gas concentration gets lower enough.

C. That the leak gas is to remain and provide yourself with protection attire and tool away from danger, go to the leak site and check the gas residual condition by portable leak detector.

D. After checking that there is no danger, the treatment for gas leak shall be taken.

E. Instantaneous gas leak may get lower at confirmation time.

E. Except gas alarm, it gets alarm condition temporarily by noise or any other accidental conditions.

REMARK

- Trouble Alarm Function
- When the abnormality is detected in the instrument, trouble alarm light activates.
- When the abnormality is detected in the instrument, PW/TR light is flickering. All except for memory trouble (E-00) is self-restoration. When recovered from trouble condition into normal condition, make restart (initial clear) with power on again.
- For each trouble alarm, refer to 5-1, Trouble Indication and Countermeasure.

3- 5 Confirmation of Alarm Level

(1) Press AL/SET switch by control key. When the switch is being pressed, 1st alarm point and 2nd alarm point are indicated by turns in every 1 second on LCD. When 1st alarm is indicated, AL1 lamp is lighting. And 2nd alarm as well.

(2) When release the control key, indication goes back to gas concentration.

3- 6 Confirmation of Reading by this Detector

When the abnormality is detected in the instrument, trouble alarm light activates.
4. Maintenance and Inspection

The gas detection alarm is kept in continuous operation over a long period of time and must perform a vital role as a safety device. For this purpose, periodical inspection must be made. The High-pressure Gas Safety Act in Japan sets forth the obligation of periodical inspection of the gas detection alarm.

- Maintenance Contract -

To maintain the safety operation of detector, it is recommended to keep the maintenance contract with service agent for regular maintenance, adjustment and overhaul etc. including the gas sensitivity adjustment. For the detail of maintenance contract, contact nearest agent.

'SD|P Inspection Frequency and Items

The inspection includes a daily inspection which a person in charge of control and operation of the gas detection alarm performs inspection before work once a day, and periodical inspections conducted by the service personnel of a manufacturer. The inspection items are confirmation of the concentration indication on the detector side and confirmation of lights, concentration indication and alarm function on the indicating alarm side. It is also necessary to carry out gas calibration at least every 6 months. The law sets forth that the unit must issue the alarm during the circuit inspection related to alarm while providing normal operation, at least, once a month.

<table>
<thead>
<tr>
<th>Contents of inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inspection Point/item</strong></td>
</tr>
<tr>
<td>Status light check</td>
</tr>
<tr>
<td>Gas consent indication check</td>
</tr>
<tr>
<td>Equipment installation state check</td>
</tr>
<tr>
<td>Sensor check</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

4-1 Inspection Frequency and Items

The inspection includes a daily inspection which a person in charge of control and operation of the gas detection alarm performs inspection before work once a day, and periodical inspections conducted by the service personnel of a manufacturer. The inspection items are confirmation of the concentration indication on the detector side and confirmation of lights, concentration indication and alarm function on the indicating alarm side. It is also necessary to carry out gas calibration at least every 6 months. The law sets forth that the unit must issue the alarm during the circuit inspection related to alarm while providing normal operation, at least, once a month.
Contents of inspection

<table>
<thead>
<tr>
<th>Inspection point/item</th>
<th>Inspection by every 6 months</th>
<th>Yearly inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor sensitivity</td>
<td>Calibration with gas</td>
<td>Sensor replacement and calibration with gas</td>
</tr>
<tr>
<td></td>
<td>Adjust zero and span according to Gas Sensitivity Calibration Method</td>
<td></td>
</tr>
</tbody>
</table>

6 months inspection and yearly inspection include daily and monthly inspection respectively.

Following items are performed in periodical inspection.

- Daily check
- ACleaning of device
- BCalibration
- CFункция проверки
- DParts replacement
- Eetc.

To keep the safety performance of the instrument, recommend to make maintenance contract concerning to regular inspection, adjustments, repairing, etc. including gas calibration.

This is a safety instrument and the inspection every 6 months or more is mandatory to ensure the safety. If the unit is used by continuously without inspection, the sensor sensitivity may change, resulting in failure of correct detection.

Before zero adjustment, confirm with a portable gas detector that there is no gas in the neighborhood. If zero adjustment is made in an atmosphere containing gas, no correct calibration is expected. If gas leakage actually occurs, the unit shows the low concentration value, possibly leading to a hazardous state.

**WARNING**

Be sure to inform sections concerned beforehand when performing adjustment of the gas sensitivity.

**REMARKS**

- "S|"Q Maintenance Mode

Adjustment is performed by control key in maintenance mode without opening the lid.

Following is a menu of maintenance mode and common operation method.

In maintenance mode, 4-20mA output becomes 2.5mA and SKIP light is flickering.

All operation performed by control key.

4-2 4-2 4-2


<table>
<thead>
<tr>
<th>LCD indication</th>
<th>Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displays set potential</td>
<td>Add note about potential setup</td>
</tr>
<tr>
<td>Zero adjustment mode</td>
<td>Add note about zero adjustment</td>
</tr>
<tr>
<td>Span adjustment mode</td>
<td>Add note about span adjustment</td>
</tr>
<tr>
<td>4mA adjustment mode</td>
<td>Add note about 4mA adjustment</td>
</tr>
<tr>
<td>Alarm point set mode</td>
<td>Add note about alarm point setting</td>
</tr>
<tr>
<td>Alarm test mode</td>
<td>Add note about alarm testing</td>
</tr>
<tr>
<td>Point skip set mode</td>
<td>Add note about point skip setting</td>
</tr>
</tbody>
</table>

Common operation

- To enter maintenance mode, press MAINTENANCE switch by control key for 3 seconds in normal measuring mode.
- When entered maintenance mode after 3 seconds, 4-20mA output becomes 2.5mA and SKIP light is flickering. Release control key after entered.
- Change indication number with pressing UP or DOWN switch by control key. And press SET switch when the mode you want to enter is indicated.

Common operation

- Display goes to MENU when press MAINTENANCE switch during each mode.
- Change indication number with pressing UP or DOWN switch by control key. And press SET switch when the mode you want to enter is indicated.

Common operation

- Display goes to MENU when press MAINTENANCE switch during each mode.
- To recover measuring mode, press MAINTENANCE switch for 3 seconds during MENU.
- When entered measuring mode, SKIP light goes off and indicating as it is measuring mode.

'S' | 'R' Gas Sensitivity Calibration Method

The following tools and jigs are necessary for zero and span adjustments.

- Gas sampling bag
- Calibration adaptor
- Calibration gas
- Control key

4-3 Gas Sensitivity Calibration Method

The following tools and jigs are necessary for zero and span adjustments.

- Calibration gas
gas calibration
- Calibration gas
- Calibration gas
- Calibration gas
- Calibration gas
Zero adjustment method

Confirm with a portable gas detector that the atmosphere around the detector and measuring gas inlet is clean and does not contain any gas.

If any gas exists around the detector and measuring gas inlet, fill high-purity air or external fresh air into the gas sampling bag (separately available).

Attach the calibration adaptor and sampling bag filled with high-purity air to the sensor and allow for about 2 minutes.

Then, proceed to zero adjustment.

To make zero adjustment and span adjustment, enter the maintenance mode.

Press SET switch in LCD display and confirm the sensor set potential.

Press SET switch in MEMU.

Zero adjustment mode enters and ZERO light and indication value is flickering.

In this time, there is a case that the indication value is alternated. This is caused by the actual value is indicated with cancellation of zero suppression which is worked in normal measuring mode.

Confirm that fresh air is introduced and press SET switchZERO light is changed from flickering to lighting. And indicating that zero point is adjusted. (ZERO adjustment is completed).

If indication value does not become zero after zero adjustment, check the instrument and piping, and make zero adjustment again. But it cannot be still adjusted zero, gas sensor has trouble. Put the power off. And consult with our nearest agent.

Span adjustment

Be sure to adjust span after completion of zero adjustment.

Recommend to contact with our authorized agent for span adjustment, as it requires exclusive jigs.

Prepare about 5L of calibration gas whose concentration has been confirmed beforehand (the appropriate concentration is around 1.6 times of preset alarm level).

Make cover the sensor with calibration adaptor and fix it with knurling screw.

Connect gas sampling bag prepared in step ‡@ to IN side of calibration adaptor, flowmeter with flow control value and pump exhaust bag to OUT side respectively as shown in next figure.

Press SET switch in MENU display 2.5Pn. When span adjustment mode is entered, SPAN light and indication value on LCD are flickering.
‡D Operate the pump and adjust flowmeter at 1.5l/min.

‡E When the calibration gas is introduced into the sensor, the indication of the indicator rises. If the indication is not equal to the concentration value of calibration gas in 2 minutes after start of introduction, press the control key to the UP switch or DOWN switch to allow the indication to match to the calibration gas concentration.

‡F After adjustment, press SET switch to decide.

SPAN light is changed from flickering to lighting, indication value on LCD is changed from flickering to lighting and indicating that SPAN adjustment is completed.

‡G Upon completion of the span adjustment, remove the sampling bag from the IN side of the gas check adaptor and press the control key to MAINTENANCE switch. Then, proceed to the zero adjustment again.

If the reading cannot be adjusted to the calibration gas concentration, sensor life will be over. Put off the power switch and contact with our authorized agent. (It is recommendable to replace the sensor every one year). For sensor replacement, refer to "4-8 Sensor Replacement Method." Confirm that the replacement sensor is the same type as described in the sensor type seal sticked on the detector.

* CAUTION

Make zero and span adjustments again after sensor replacement.
Signal Output Adjustment Method

1. Press SET switch in MENU display.
2. When signal output adjustment mode is entered, "SP" is displayed on LCD, and signal output becomes 4mA (value : zero).
3. Adjust indication value to 4mA (zero) on indication part* of DSC and etc which is connected separately by pressing UP switch and DOWN switch.
4. After adjustment, press SET switch to decide. When it is decided, SPAN light is lighting.

* : If indication value cannot be confirmed on indication part, signal output can be confirmed by connecting a tester (Ammeter) to check pins between TP1(+) and TP1(-).

Alarm Point Change Method

1. 1st alarm and 2nd alarm can be alternated individually.
2. Press SET switch in menu display.
3. When alarm set mode is entered, AL light is on and current 1st alarm value is displayed on LCD.
5. Then, AL1 light is changed from lighting into flickering, and alarm point on LCD is changing as same. Press UP switch and DOWN switch to adjust.
6. After adjustment, press SET switch and return to 2.
7. Then, press UP switch.
8. Current 2nd alarm point is displayed on LCD. And AL2 light is lighting.
9. 2nd alarm point can be changed as same as 1st alarm point.
10. 2nd alarm point can be changed as same as 1st alarm point.

4- 5 Switching the Display
Alarm functions can be confirmed. When making alarm test (transmission test), announce it to the respective department beforehand. Carry it out after making proper treatment.

**CAUTION**

- Press the SET switch in menu display **SET**.
- Press the UP switch or DOWN switch to select whether alarm contact is activated or not. **ON** **OFF**
- Press the SET switch to decide.
- When alarm test mode is entered, test level (zero value) is flickered on LCD display. When **ON** is selected at this time, ZERO light and SPAN light are flickering simultaneously.
- To press the UP switch or DOWN switch, test level (between 0 to full scale, over scale) can be changed. (4-20mA output is also changed according to indication).
- Test level exceeds 1st alarm point, 1st alarm is activated. (After alarm delay time passed, AL1 light is lighting, and 1st alarm contact is activated if **ON** is chosen).
- Test level exceeds 2nd alarm point, 2nd alarm is activated. (After alarm delay time passed, AL2 light is lighting, and 2nd alarm contact is activated if **ON** is chosen).
4- 7 [Point Skip Set Method]

Maintenance mode can be set compulsorily.

20 mA     2.5 mA (Fix)

Alarm contact OFF

‡@ Press SET switch in menu display.

When point skip set mode is entered, current set condition is displayed on LCD.

‡A To set point skip condition, press UP switch or DOWN switch, and to cancel point skip condition, change as . Then, press SET switch to decide.

After decision, SPAN light is lighting.

4- 8 [Sensor Replacement Method]

Replace the gas sensor with following procedures.

(1) Turn OFF power supply to this unit.

(2) Remove the hexagonal socket head bolts of the sensor guard and remove the sensor guard.

(3) Remove the sintered metal and remove the sensor from the connector.

(4) Insert the new sensor to the connector softly and rotate it until it stops once. Push and rotate the sensor further until it is stopped.

(5) Mount the sintered metal.

(6) Make cover the sensor guard onto the sensor and rotate the guard clockwise to fasten. Tighten it with hexagonal socket headed bolt.

After completion of the sensor replacement, put on the power. Check with the portable gas detector that there is no gas around the detector. Then remove hexagonal socket headed bolts (6 pcs.) and the lid.

25
When open the lid, wait for more than 30 seconds after putting off the power supply. If not, explosion proof performance cannot be guaranteed.

It becomes measuring mode for about 25 seconds after powered ON. The detector may give an alarm if the sensor is not stable enough. Please make necessary treatment to prevent trouble outside even if an alarm is activated.

**CAUTION**

- Connect voltmeter to TP0(+) and TP3(-) on the printed circuit board inside the detector and confirm the sensor set potential.
- Adjust the set potential to the designated value with potentiometer VSET VR.

**NOTE**

- After sensor replacement, be sure to carry out zero and span adjustments.
- Accordingly, it is recommended to contact the local agent for sensor replacement.

'S|'X Fuse Change Method

When open the lid, wait for more than 30 seconds after putting off the power supply.

**CAUTION**

- Turn OFF power supply to the unit.
- Remove 6 hexagonal socket headed screws and lid in the front, and remove the fuse on the internal board. (For the fuse position, refer to Page 5. Internal View).
- Install the attached fuse (0.5A), install the lid and 6 hexagonal socket headed screws, and tighten these screws.
- Turn ON power supply to this unit. Confirm that the operation is normal. If not, refer to 5. Abnormality and Countermeasures.

4 - 9 爆発防止装置の設定

**WARNING**

- Do not install the detector in a place where flammable gas or vapor is present.
- Do not install the detector near the power supply or where the temperature is likely to exceed 50°C.
- Install the detector in a place where it is unlikely to be subjected to water, dust, or foreign objects.
- Do not install the detector in a place where it is likely to be subjected to shock or vibration.
- Do not install the detector in a place where it is likely to be exposed to direct sunlight.
- Do not install the detector in a place where it is likely to be subjected to high temperatures or low temperatures.

**NOTE**

- After sensor replacement, be sure to carry out zero and span adjustments.
- Accordingly, it is recommended to contact the local agent for sensor replacement.
4-10 Measures for Storage or Long-time Shutdown

1. Store the sensor as attached to the detector in a place not exposed to dust and water splash.
   The warm up time will be longer if the power is not supplied to the sensor for a long time.
   If the sensor is kept for more than one month without power supply, gas calibration may be required. So, it is recommendable to supply the power always.

2. Storage conditions
   - Temperature: -10°C to +50°C
   - Humidity: ≤90%RH
   - Environmental conditions: Place without organic solvent and gas generation.

Recommendable Spare Parts List

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Checking interval</th>
<th>Replacement interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sealing packing</td>
<td>1 year</td>
<td>5~6 years</td>
</tr>
<tr>
<td>2</td>
<td>Packing</td>
<td>1 year</td>
<td>5~6 years</td>
</tr>
<tr>
<td>3</td>
<td>Sensor</td>
<td>6 months</td>
<td>1 year</td>
</tr>
<tr>
<td>4</td>
<td>Printer circuit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Printed circuit board (Primarily)</td>
<td>-</td>
<td>5~6 years</td>
</tr>
<tr>
<td>6</td>
<td>Fuse</td>
<td>-</td>
<td>8 years</td>
</tr>
</tbody>
</table>

* The above replacement interval may vary depending on the conditions of actual use. It does not mean the warranty period.
* The replacement interval also may vary by the result of regular inspection.
* The main reason of the printed circuit board is the deterioration of capacitors.

4-11 Checks and Maintenance Chart

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Checking</th>
<th>Replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sealing packing</td>
<td>1 year</td>
<td>5~6 years</td>
</tr>
<tr>
<td>2</td>
<td>Packing</td>
<td>1 year</td>
<td>5~6 years</td>
</tr>
<tr>
<td>3</td>
<td>Sensor</td>
<td>6 months</td>
<td>1 year</td>
</tr>
<tr>
<td>4</td>
<td>Printer circuit</td>
<td></td>
<td>5~6 years</td>
</tr>
<tr>
<td>5</td>
<td>Printed circuit board (Primarily)</td>
<td>-</td>
<td>5~6 years</td>
</tr>
<tr>
<td>6</td>
<td>Fuse</td>
<td></td>
<td>8 years</td>
</tr>
</tbody>
</table>

* 1: The actual maintenance may be required according to the actual conditions of use or maintenance.
* 2: The maintenance may be required according to the actual conditions of use or maintenance.
5. 強化管内ガス検査とメンテナンスの管理

5-1 トロUBLE INDICATION AND COUNTERMEASURE

このセクションでは、故障の位置を判断する手順を列挙した。

### Indication: E-00
表示されるとき、検出器内に問題が発生している。

**Countermeasure:** 再点火してみてください。回復しない場合は、PCBを差し替えます。

### Indication: E-04

この状態は、ゼロ補正機能の問題を表しています。ゼロの変動が許容範囲を超えると、長期間の使用または環境条件の影響により。

**Countermeasure:** ポータブルガス検査器を使用して、ガス検出器周辺にガスが無いことを確認してください。

ゼロ調整を行います。回復しない場合には、または同じ問題が再度発生した場合には、RIKEN KEIKIまたは地域代理店にご相談ください。
Troubleshooting

PW/TR light is not ON

Yes

No

Confirm the power supply
and reset the normal state.

Supply voltage
DC24V ±10%?

No

Turn ON the power switch.

Power switch ON?

Yes

Yes

No

Replace the fuse.

Fuse normal?

Yes

There may be an abnormality in the electric circuit,
Turn OFF the power supply to this unit and contact our
local agent or RIKEN KEIKI.

No
Zero adjustment impossible

Yes

Zero adjustment mode with fresh air supplied?

No

Yes

Is voltage between TP 6(+) and TP O(-) within -120mV ~ +120mV?

No

Sensor deterioration. Since the sensor must be replaced, contact our local agent or RIKEN KEIKI.

Yes

There may be an abnormality in the electric circuit. Turn OFF the power supply to this unit and contact our local agent or RIKEN KEIKI.
6. Definition

Electrochemical method

This is a principle for the sensor integrated into this detector. For the details, refer to 8-2 Detection Principle.

Initial

The output from the detector fluctuates for a while after power application. The function is to suppress alarm during this period.

Full scale

The maximum value of the detection range.

Calibration

Matching the equipment indication to the calibration gas concentration value by the calibration gas.

ppm

The unit of gas concentration in Parts Per Million.
7. Sensing Methods

For used up sensors, be sure to return them to the manufacturer. The return is requested via our nearest agent or RIKEN KEIKI.

Should any leak sensors be found, do not touch the leak liquid for sure and put it in vinyl bag so that the liquid can not be leaked outside. Then should any leak be found from the sensor to detector, make power off the detector and contact our nearest agent or RIKEN KEIKI.

Regarding detector complete, treat it in the same as industrial scrap (Non-flammable goods).

As there is the electrolyte in the sensor, do not disassemble absolutely. When touch the electrolyte of it, the skin may be damaged and if goes into eyes, there will be possibility of losing sight. Then, if it sticks to clothes, the color of it may be changed or make a hole. If should touch it, clean the wet part enough with water.

**WARNING**

If the electrolyte is not mixed with distilled water, it may react with the metal and cause a change in the color of the sensor. Therefore, always use distilled water to mix the electrolyte.

If the sensor is exposed to high temperature or humidity, it may cause a change in the color of the sensor. Therefore, always store the sensor in a cool and dry place.

If the sensor is not used for a long time, it may cause a change in the color of the sensor. Therefore, always follow the instructions for storage and use when using the sensor.
### Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection principle</td>
<td>Electrochemical Cell method</td>
</tr>
<tr>
<td>Gas to be detected</td>
<td>Toxic gas</td>
</tr>
<tr>
<td>Detection method</td>
<td>Diffusion type</td>
</tr>
<tr>
<td>Detection range</td>
<td>Depends on gas</td>
</tr>
<tr>
<td>Response time</td>
<td>≤60 sec or less</td>
</tr>
<tr>
<td>Transmission method</td>
<td>R-wire type analog transmission (power, signal, common)</td>
</tr>
<tr>
<td>Transmission distance</td>
<td>1.25 km or less with CVVS (1.25 sq.) cable, 2 km or less with CVVS (2.0 sq.) cable</td>
</tr>
<tr>
<td>Alarm output</td>
<td>2 level alarm output</td>
</tr>
<tr>
<td>Contact output</td>
<td>1a or 1b</td>
</tr>
<tr>
<td>Contact rating</td>
<td>DC30V 1A</td>
</tr>
<tr>
<td>Preset alarm point</td>
<td>Depend on gas and range</td>
</tr>
<tr>
<td>External output</td>
<td>4-20mA (current discharge type), Resistive load: max 300Ω, 0.5mA at fault, 2.5mA in the maintenance mode and during initial operation</td>
</tr>
<tr>
<td>Gas concentration output</td>
<td>4-20mA, Note: Linear up to 22mA.</td>
</tr>
<tr>
<td>Indication function</td>
<td>Concentration indication: LCD 4 digits, 7-segment, Digital gas concentration indication, 4-20mA indication</td>
</tr>
<tr>
<td>PW/TR</td>
<td>Power/Trouble indication (Green/flickering or lighting)</td>
</tr>
<tr>
<td>AL1</td>
<td>1st alarm indication (Yellow/flickering or lighting)</td>
</tr>
<tr>
<td>AL2</td>
<td>2nd alarm indication (Red/flickering or lighting)</td>
</tr>
<tr>
<td>SKIP</td>
<td>Maintenance mode indication (Green/flickering or lighting)</td>
</tr>
<tr>
<td>ZERO</td>
<td>Zero adjust mode (Red/flickering or lighting), etc. (off)</td>
</tr>
<tr>
<td>SPAN</td>
<td>Span adjust mode (Red/flickering or lighting), etc. (off)</td>
</tr>
<tr>
<td>mA</td>
<td>mA indication, etc. (off)</td>
</tr>
<tr>
<td>Self-diagnosis function</td>
<td>Abnormality of zero correction. Indication: PW/TR (Green/flickering), LCD message: E-XX. Output: 4-20mA output, 0.5mA output (fix)</td>
</tr>
<tr>
<td>Initial clear</td>
<td>25 seconds after power ON, LCD indication</td>
</tr>
<tr>
<td>Feature</td>
<td>Specification</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Power supply</td>
<td>DC 24V ± 10%</td>
</tr>
<tr>
<td>Power consumption</td>
<td>Maximum 2.5W</td>
</tr>
<tr>
<td>Operating temperature/humidity</td>
<td>-10°C to +40°C, non-condensing 30% to 80% humidity</td>
</tr>
<tr>
<td>Setting &amp; adjustment</td>
<td>ZERO/SPAN adjustment (non-contact) with the control key</td>
</tr>
<tr>
<td>Over all dimensions</td>
<td>Approx. 205(W) ~ 134(H) ~ 90(D) mm</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 4 kg</td>
</tr>
<tr>
<td>Explosion proof</td>
<td>Flame-proof construction (Explosion-proof class: ExdIIBT4X)</td>
</tr>
</tbody>
</table>
The detection principle of this gas detector is electrochemical method. The sample gas is electrolyzed by the electrochemical cell added with bias voltage and detected from the electrolyzed current generated at that time.

The electrochemical sensor is designed to keep the interface between electrode and electrolyte at a constant potential (bias voltage) and is the method to electrolyze gas directly. Then as the gas has the bias voltage generating its own electrolyzation (oxidation-reduction potential) the bias voltage of sensor is determined by the oxidation-reduction potential.
Warranty

RIKEN KEIKI STANDARD WARRANTY
GAS DETECTION INSTRUMENTS

RIKEN KEIKI CO., LTD. warrants gas alarm equipment manufactured and sold by us to be free from defects in materials and workmanship for a period of one year from date of shipment from RIKEN KEIKI CO., LTD. Any parts found defective within that period will be repaired or replaced, at our option, free of charge, F.O.B. Factory. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired or replaced on a routine basis. Such items may include:

a) Lamp bulbs and fuses
b) Pump diaphragms and valves
c) Absorbent cartridges
d) Filter elements
e) Batteries

Warranty is voided by abuse including rough handling, mechanical damage, operation, alteration or repair procedures not in accordance with instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs, or contingent expenses incurred without our prior approval.

This warranty is expressly in lieu of any and all other warranties and representations, expressed or implied, and all other obligations or liabilities on the part of RIKEN KEIKI CO., LTD. INCLUDING BUT NOT LIMITED TO, THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL RIKEN KEIKI CO., LTD. BE LIABLE FOR INDIRECT, INCIDENTAL OR CONSEQUENTIAL LOSSES OR DAMAGE OF ANY KIND CONNECTED WITH THE USE OF ITS PRODUCTS OR FAILURE OF ITS PRODUCT TO FUNCTION OR OPERATE PROPERLY.

This warranty covers instruments and parts sold (to users) only by authorized distributors, dealers and representatives as appointed by RIKEN KEIKI CO., LTD.

We do not assume the indemnification for any accident or damage caused by the operation of this gas monitor and our warranty is limited to the replacement of parts or our complete goods.