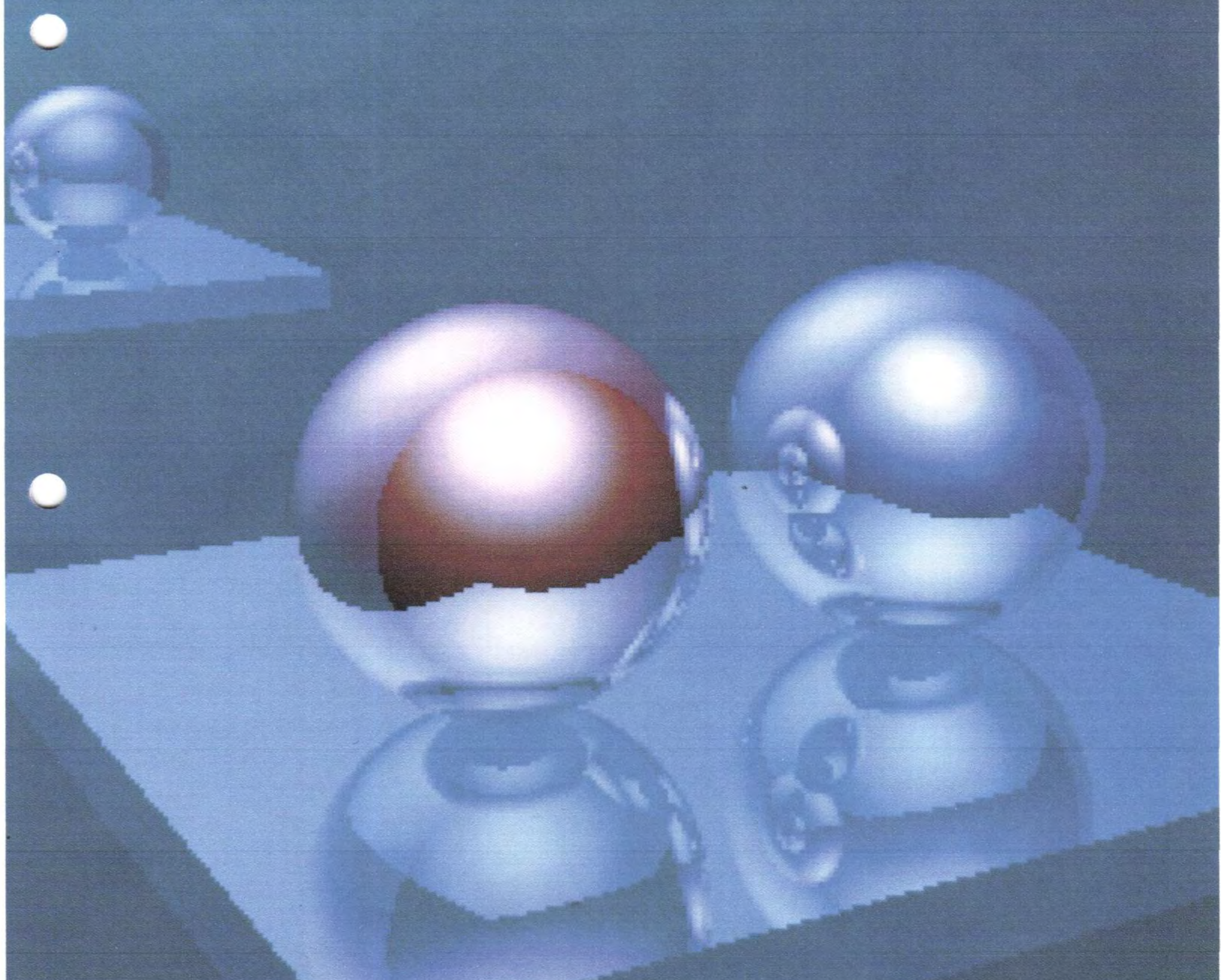


ELECTROSTATIC CAPACITY LEVEL SWITCH

# LIC-S45



# LIC-S45

The level switch, model LIC-S45 is a rugged model of mass production designed and manufactured by piling up many experiments, data and results on the basis of actual situations of a variety of automatic control plants and site requirements.



## ■ CONFIGURATION

### ① Electrode

By means of respective electrodes, the change of physical position is detected as the change of capacitance or as the synthetic impedance of capacitance and resistance.

### ② Transmitter body

It changes the change of capacitance from the electrode to the large or small oscillation voltage, and activates the relay.

### ③ Lead cable

(High-frequency coaxial cable RG-63U)

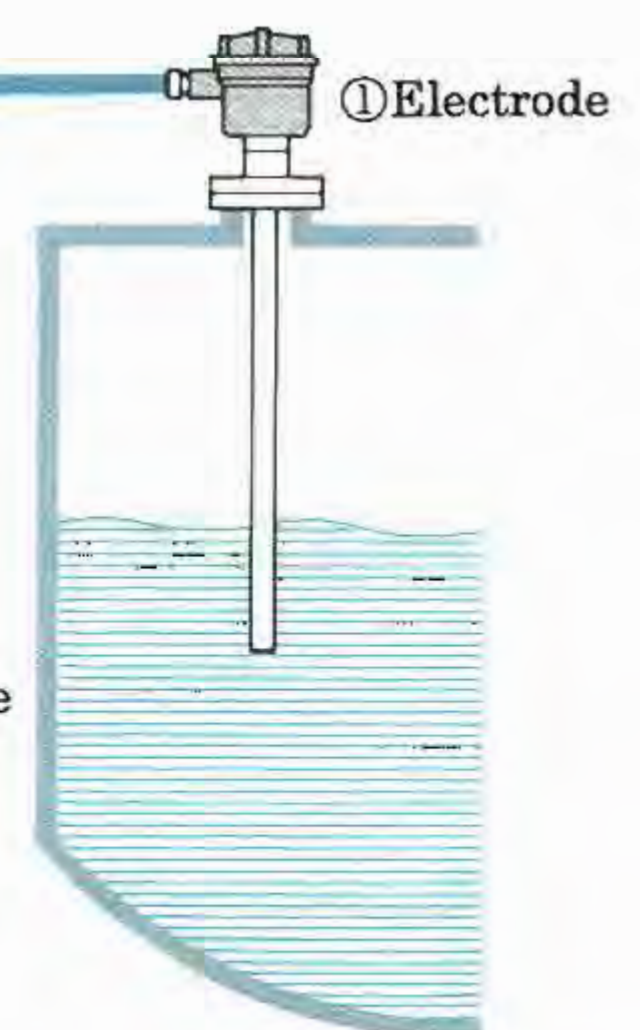
It performs the transmitter body and the electrode.

And, since it constitutes a part of circuit constant, care is paid for the length change.

### ② Transmitter body



### ③ Exclusive lead cable RG-63U



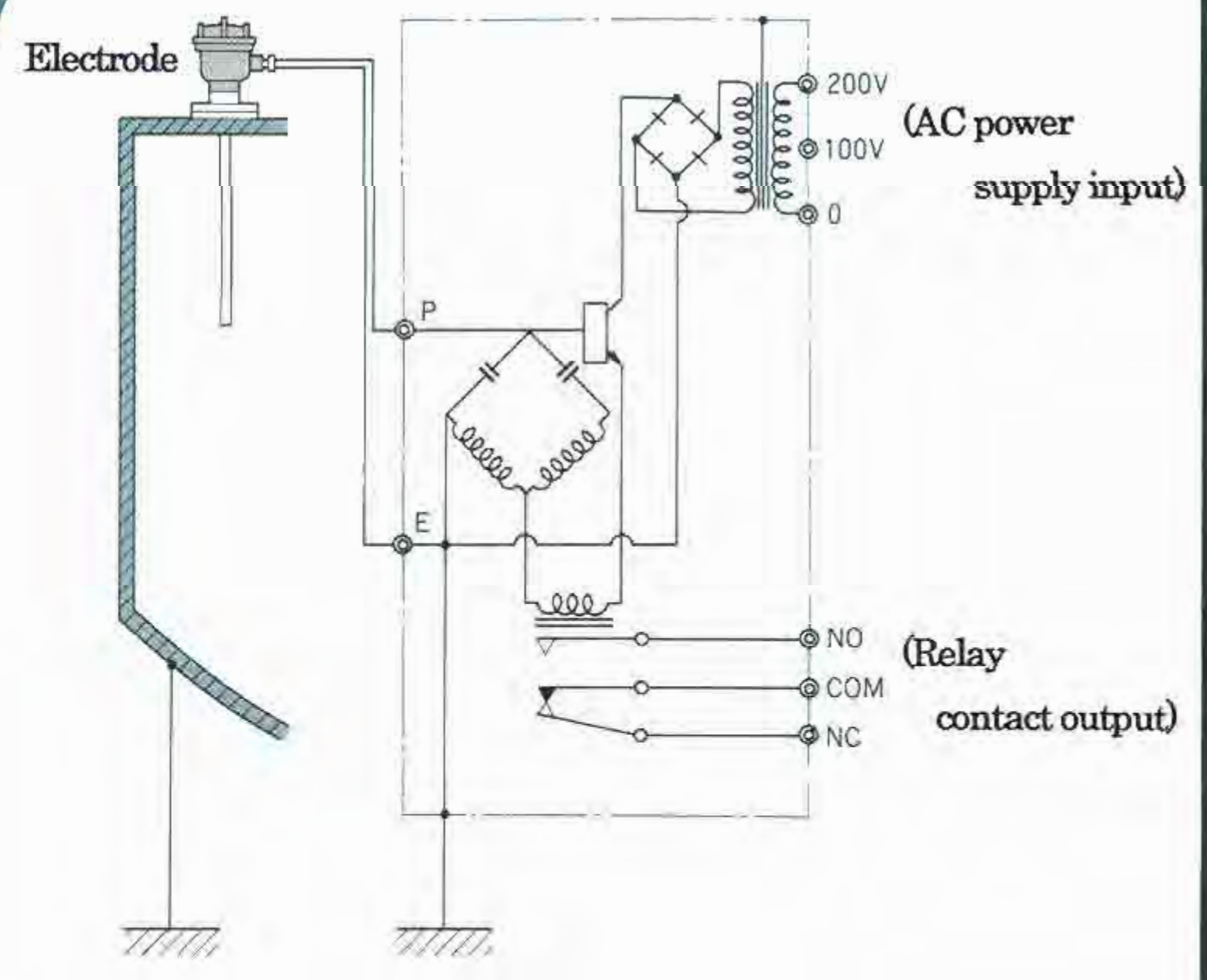


■ CHARACTERISTICS

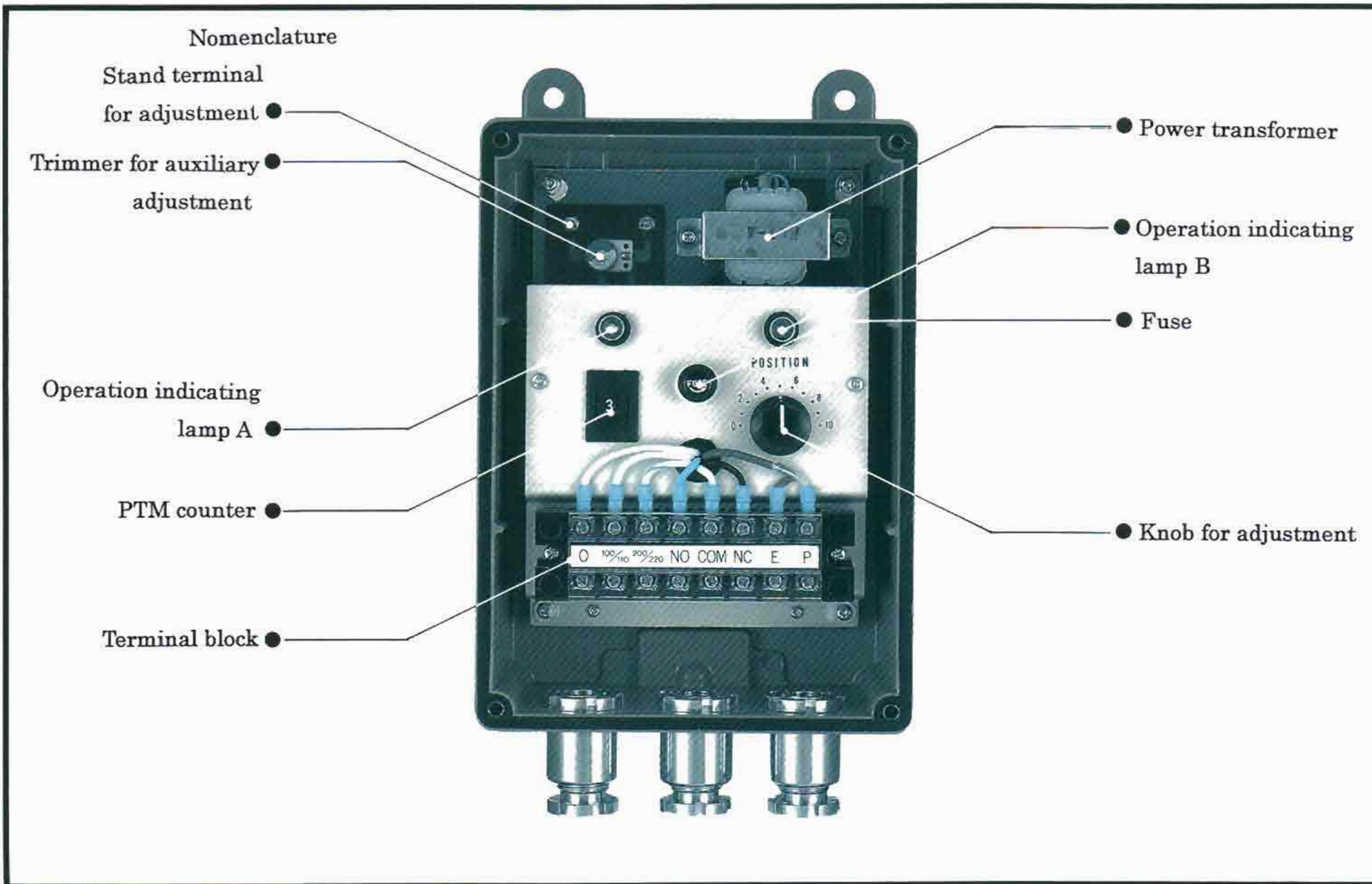
- ① Since there is no mechanical moving part, it is of long life, and the maintenance and inspection can be easily made.
- ② By the simple dial operation, the optimum sensitivity adjustment can be performed.
- ③ To prevent bad influences from the circumjacent environment, it is of waterproof sealed construction.
- ④ The electrostatic elimination circuit of our peculiarity is incorporated. The electronic circuit is protected from influences by the electrification of measuring material.
- ⑤ Influences by the adhesion of dust, water drops, etc. to the main section of maintained for a long time.
- ⑥ It is provided with the mechanical strength.
- ⑦ It can be used also for the high-temperature and high-pressure measuring material.
- ⑧ It can fully correspond also to the strength and weakness of hydrogen ion concentration and vibrations.
- ⑨ The acidproof and alkaliproof material is used in the wetting part, which is excellent in the corrosion resistance.
- ⑩ By the delay circuit (option), the malfunction by quick variations of physical position like waves, sprays, etc. is prevented, and it is properly attended.
- ⑪ For the electronic time, various kinds like 1 to 5 seconds, 1 to 4 minutes (variable by the knob), etc. are available.

■ PRINCIPLE OF OPERATION

The electrode as illustrated to the right forms a capacitor making the circumferential wall of hopper as the relative pole. The capacitor increases and decreases the capacity by the dielectric constant of an oscillating current is controlled, and output as the ON/OFF signals of power relay.



## ■ Nomenclature and Standard Specifications of Transmitter Body



## ■ OPERATION OF RELAY

The standard operation of relay internally installed in the model LIC-S45 can be made as shown in fig. 2 as required.

In case the operation in Fig. 2 is desired, designate it as the model LIC-S45A when placing an order.

Fig.1 Operation of Relay of Model LIC-S45

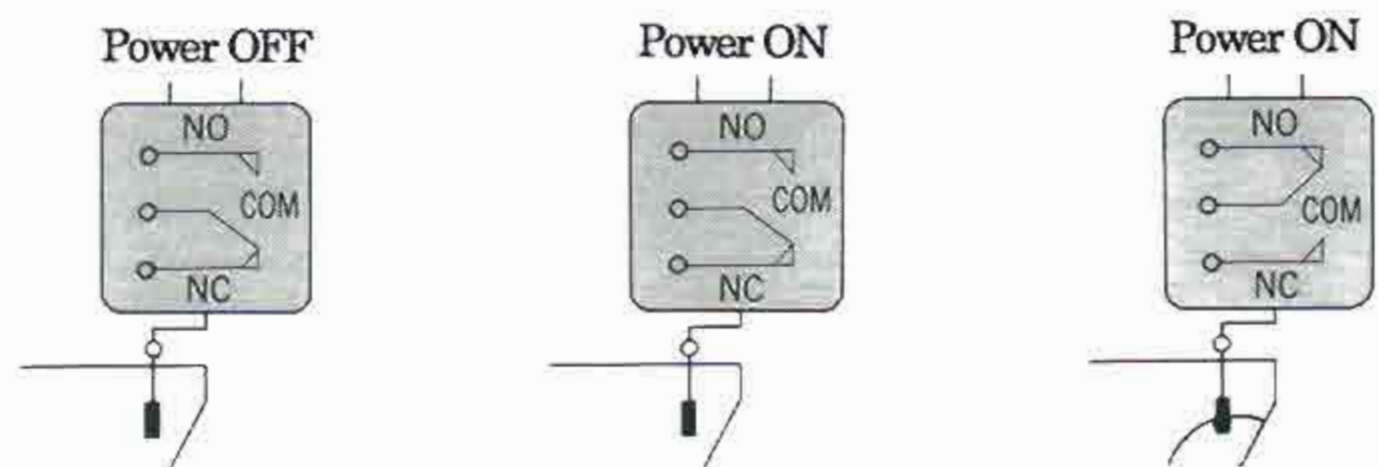
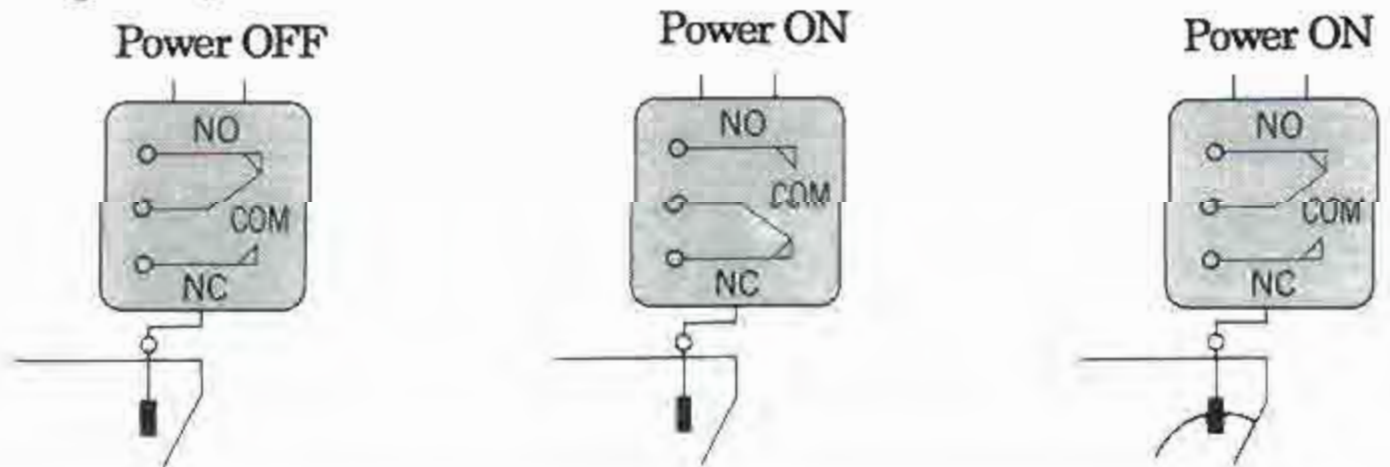
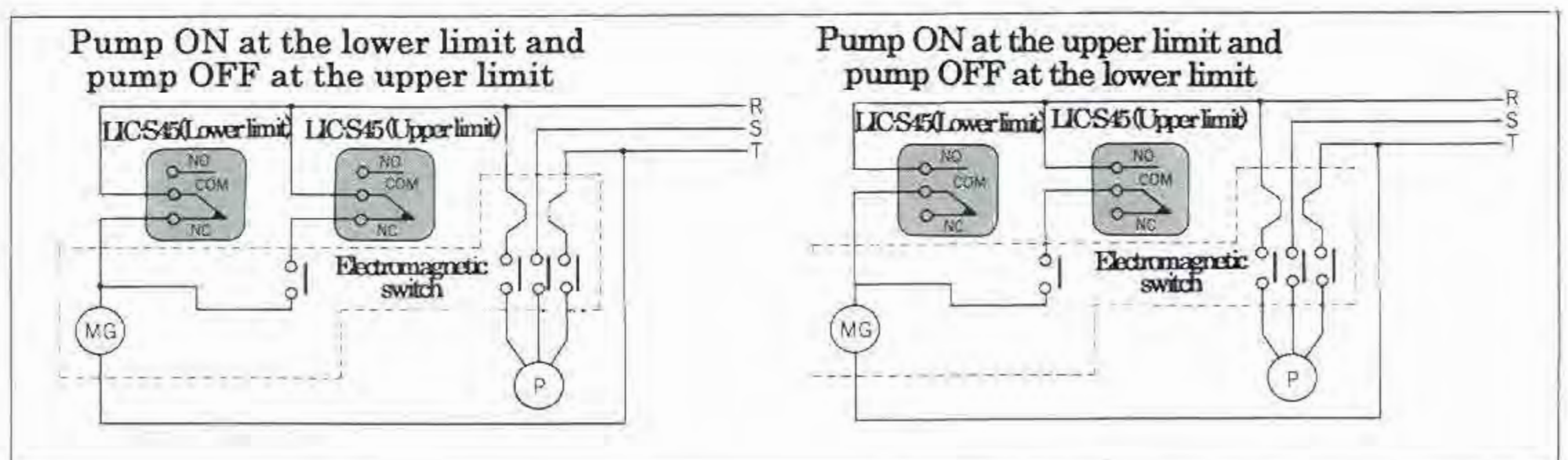


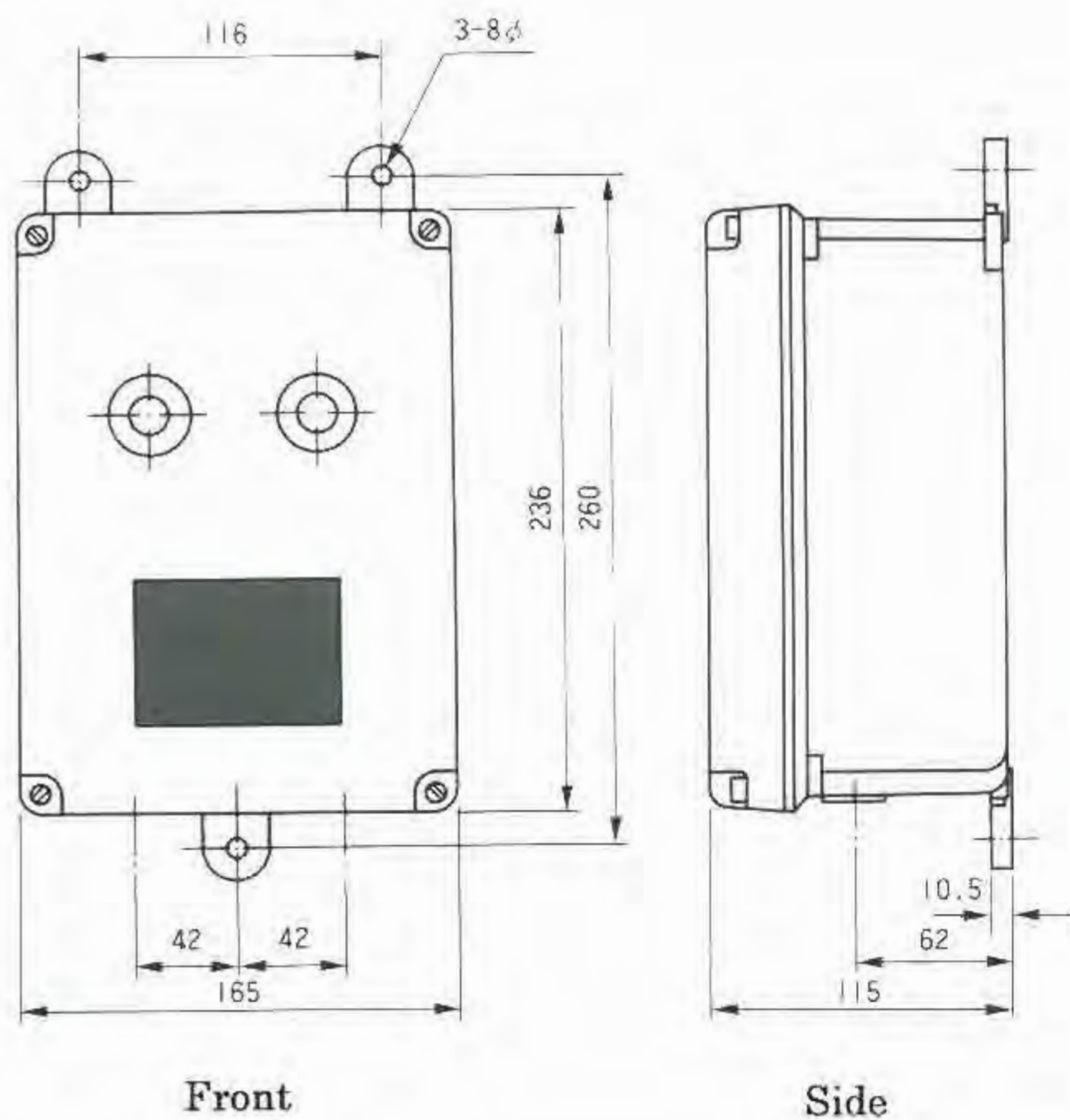
Fig.2 Operation of Relay of Model LIC-S45A



## ● Example of Level Control



**External dimensions**



**Specifications**

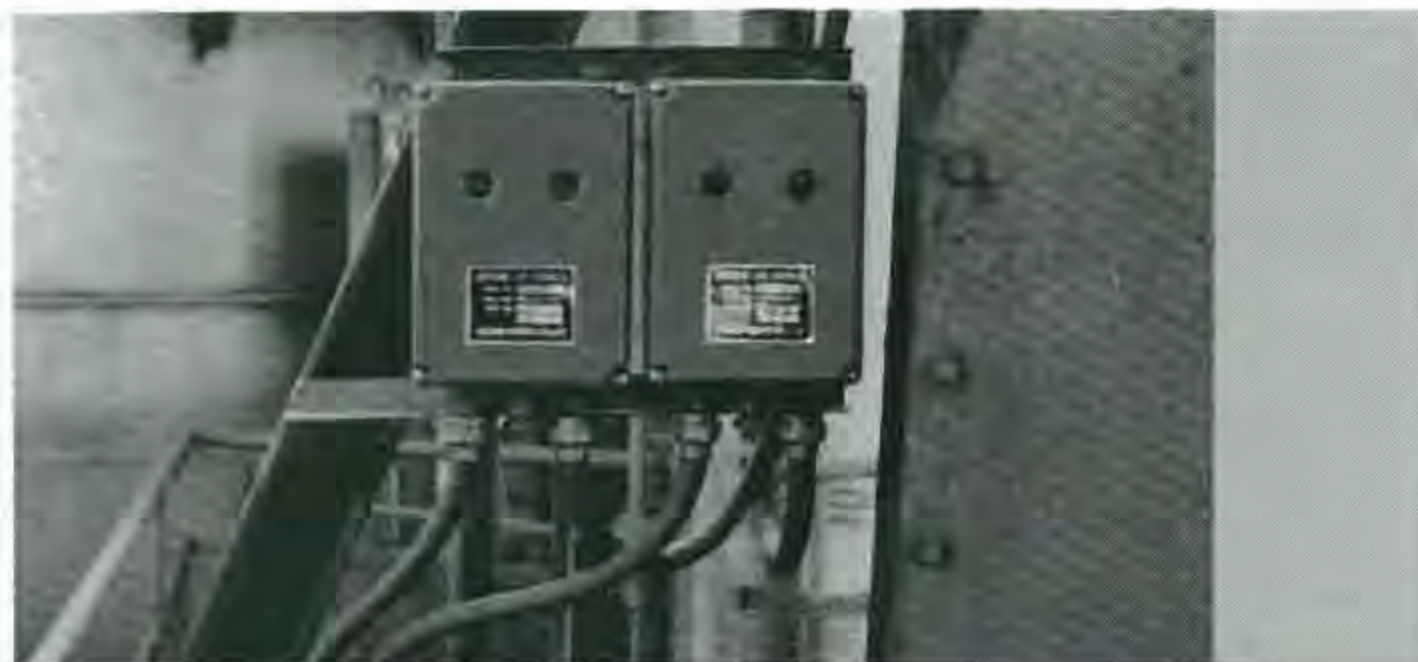
Sensitivity	0.5 pF and 400pF at fixation
Overall drift	1.0 pF
Ambient temperature	-10~+55°C
Power consumption	10VA
Pilot lamp	AC6.3V×2
Contact capacity	AC 250V, 2AIC contact
Power supply	AC 100/220,200/220V 50/60Hz
Weight	2.2 kg
Painting color	7.5BG 6/1.5
Delay operation	0.5 2 seconds

※The delay circuit is added only in case there is a request. Likewise, in case of electronic timer type, Designate it.

**MOUNTING**

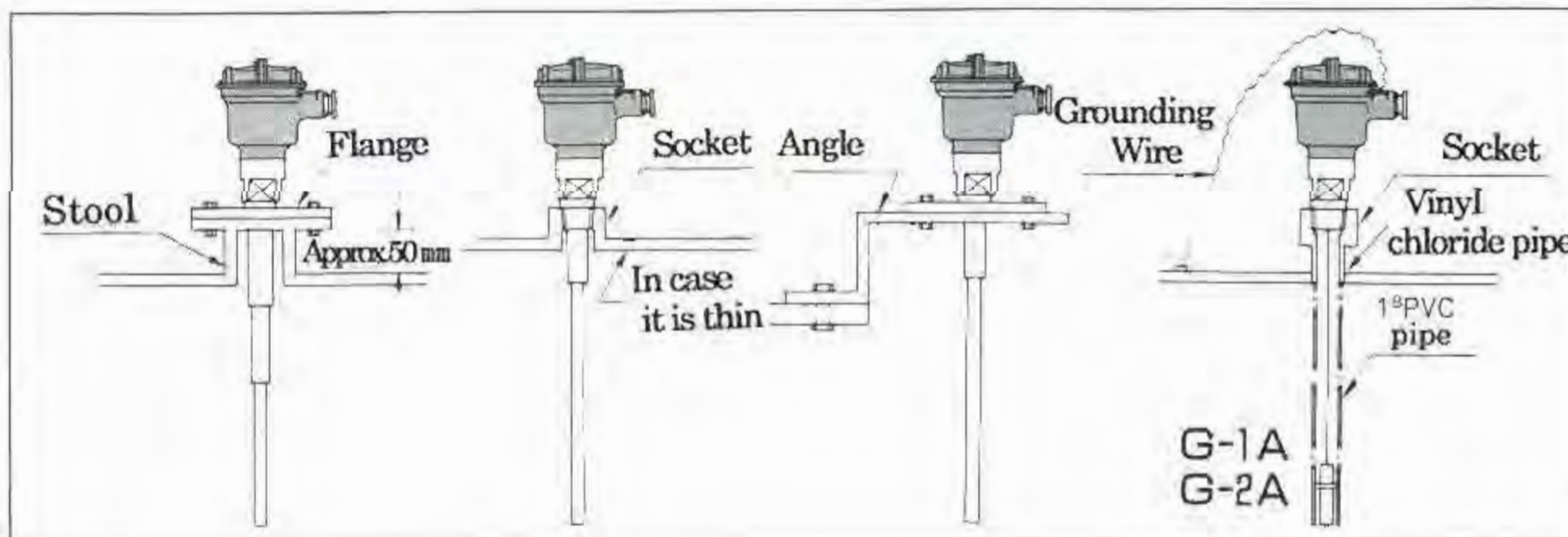
**Transmitter body, model LIC-S45**

The transmitter body is of out door construction, and in case it is installed in a place exposed to the rain or in place exposed to the direct rays of the sun, mount a cover.



**Electrode**

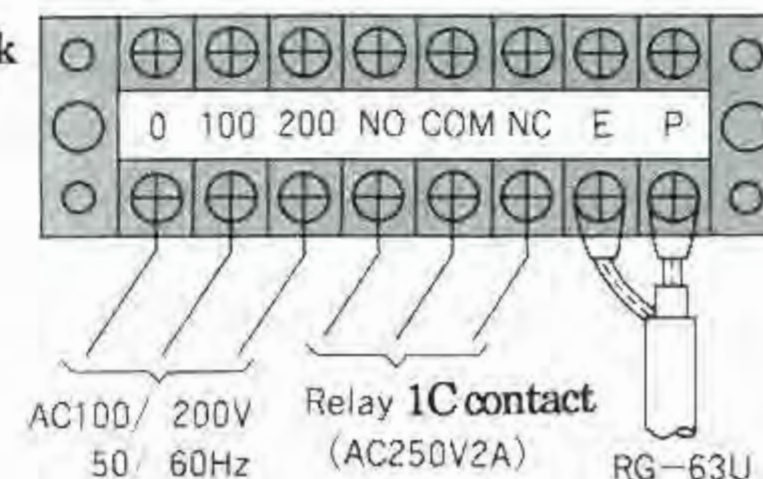
- ▶ In case some electrodes are mounted by putting them in a line, keep away the distance between electrodes by more than 200mm to a minimum. At that time, according to the type of electrode, the distance comes to be different a little. (For example, 500mm to a minimum in case of KP-10, etc.) Stool
- ▶ Install them keeping away the electrode mounting position as much as possible from the falling spot of an object.
- ▶ Make the distance between the electrode and the transmitter to approximately 10m.



**<Precautions on Connection>**

- Between the electrode and the transmission part, the exclusive coaxial cable is used.
- For cables used to the power line and signal line, use cables of 10φ to 15φ of external dimensions.

**Terminal block**



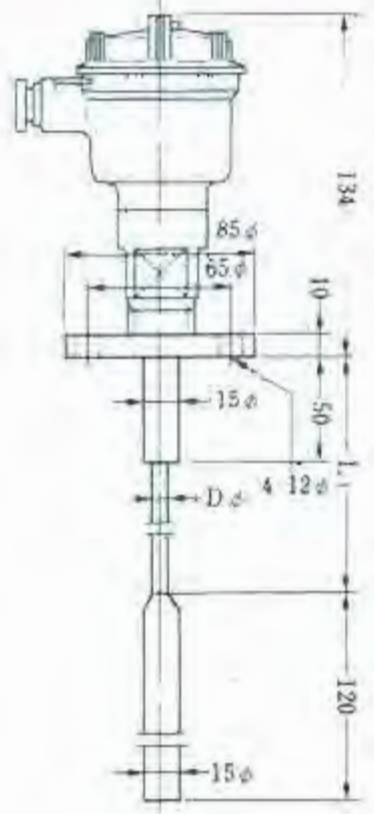
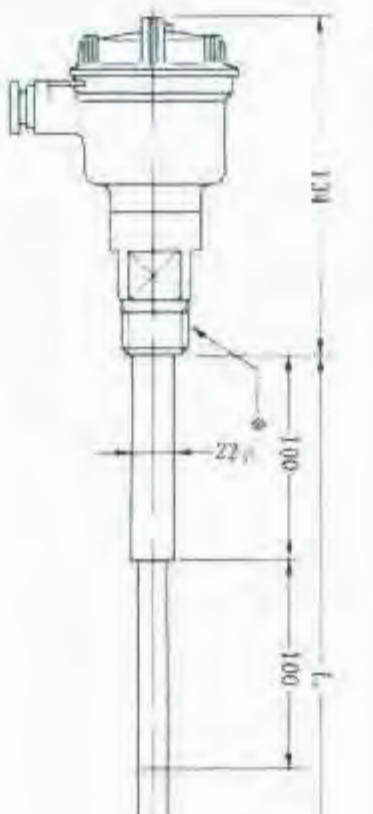
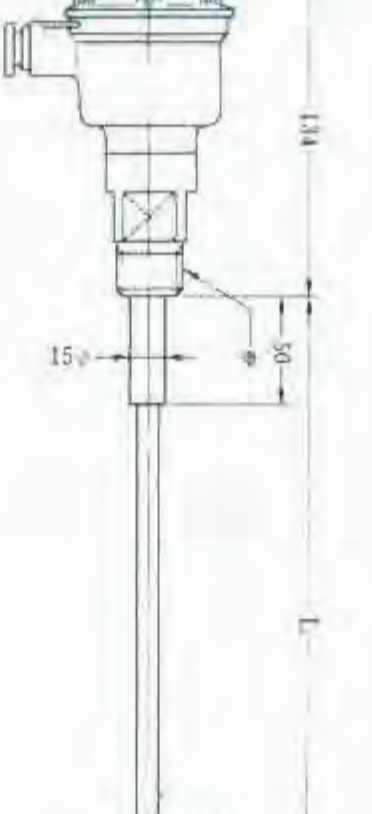
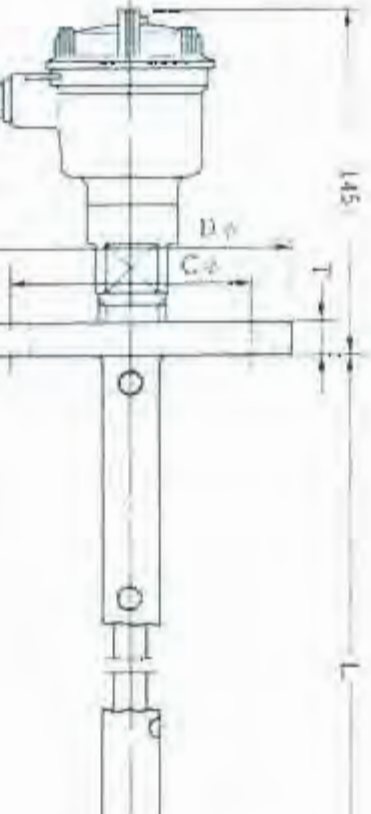
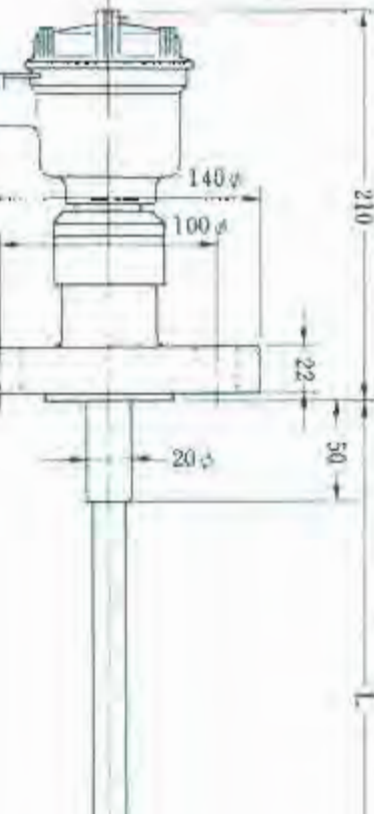
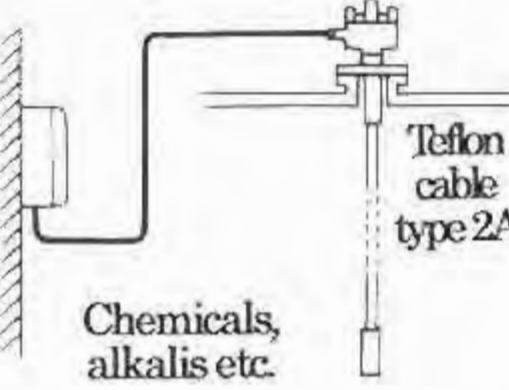
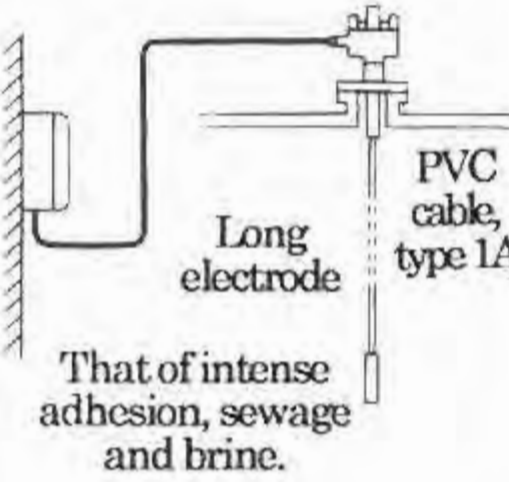
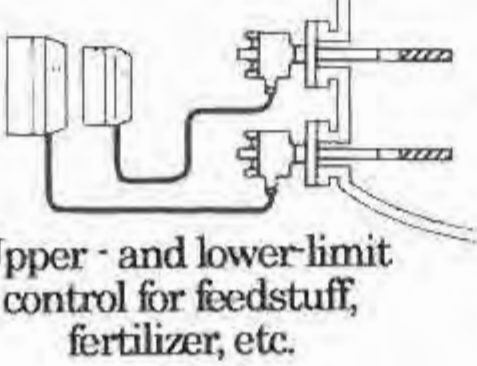
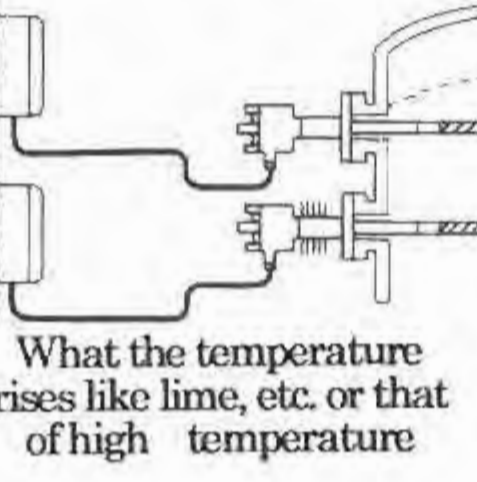
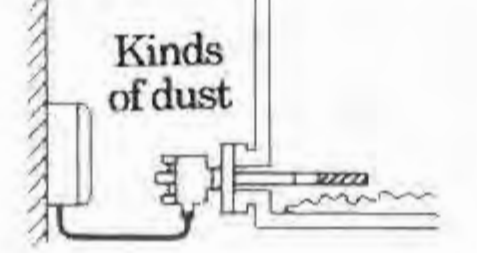
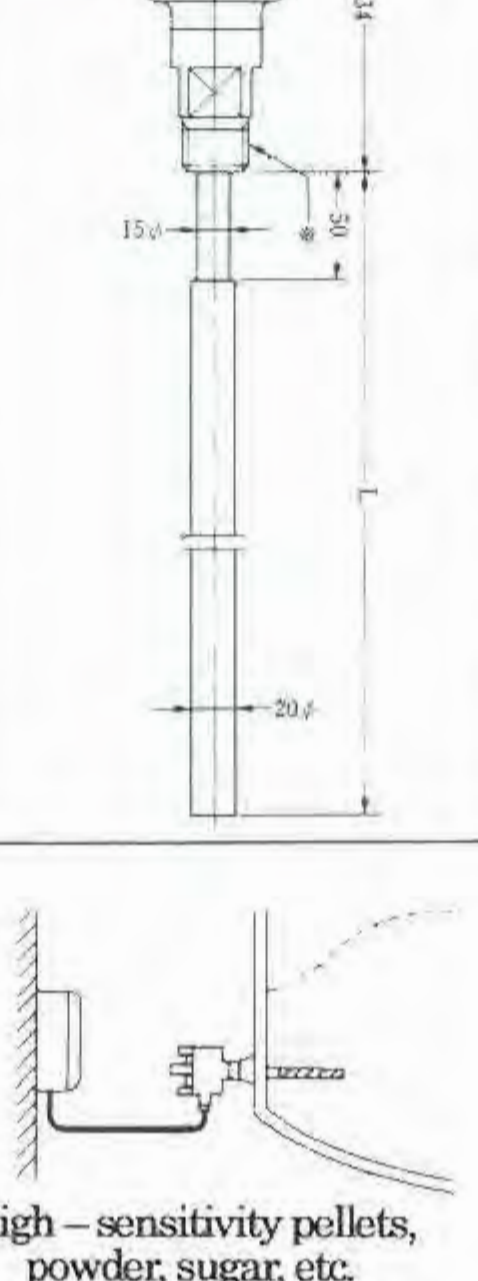
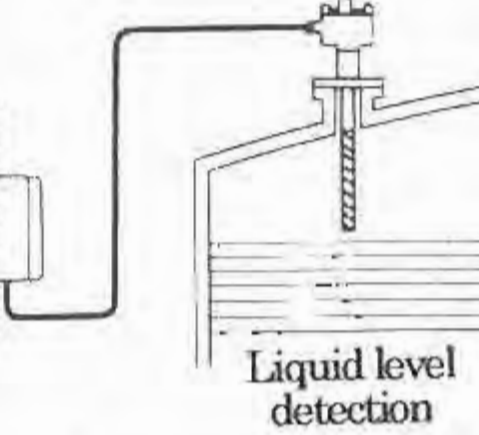
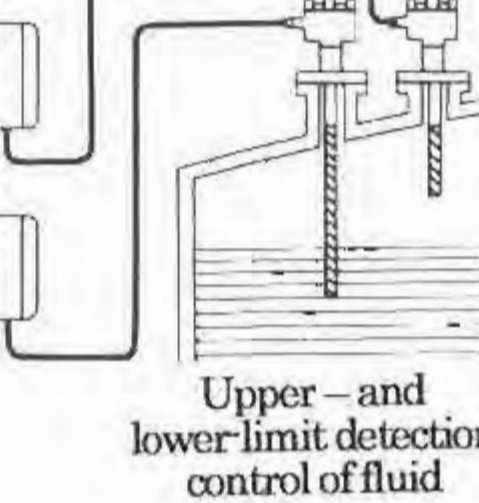
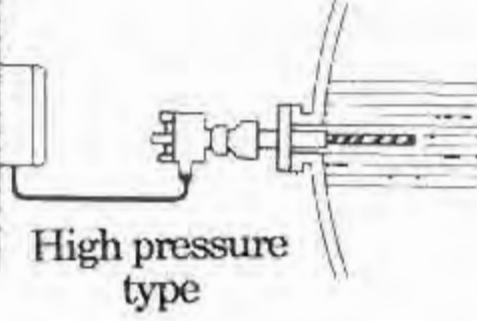
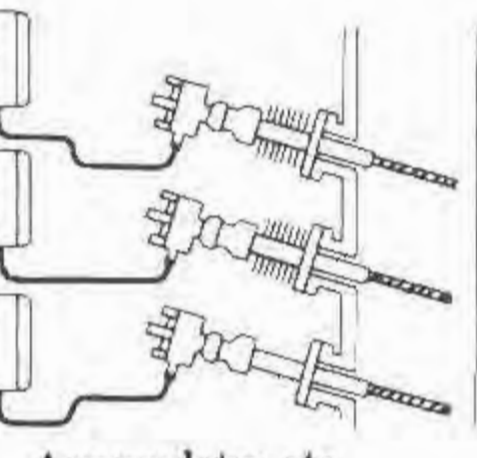
※The specifications, appearance, etc. described in this catalog are subject to change without notice for the performance improvement.

Standard Type Electrodes,  
Their Characteristics  
and Examples of Use

	L型	LH型	C型	S型
	For liquid		For high stability of interface control etc.	For conductive attachment
	<b>P-10L</b>	<b>P-10LH</b>	<b>P-10C</b>	<b>P-10S</b>
		<p>In case the measuring temperature is high</p>		

Working range	Liquid	Liquid and electrode applied by the temperature	Liquid slurry with adhesion property and short electrode	Liquid and slurry with adhesion property
Example of use	Water, kerosene, cresol, aluminum sulfate and aluminum chloride	Warm water, hot water, other chemicals of high temperature, etc.	Oil and water interface detection, sludge, sewage, brine, hedoro (sludge), soy, ketchup, sulfuric acid, waste oil, etc.	Linemilk, caustic soda sludge, sulfuric acid, mayonnaise, ketchup, brine, waste oil, etc.
Wetted part Temperature	max 90°C	max 150°C	max 150°C	max 60°C
Ambient head temperature	max 55°C	max 55°C	—	max 55°C
Pressure	5kg/cm <sup>2</sup>	5kg/cm <sup>2</sup>	10kg/cm <sup>2</sup>	5kg/cm <sup>2</sup>
Remarks	The cable resistance temperature at use of high-frequency coaxial cable RG-63U is max.55°C. When the head temperature exceeds 55°C the cables cable is substituted by 141AU, etc.	The symbol H or R stands for a radiator to lower till the head, and H is employed at the higher temperature than the R.	—	—

※PT 3/4 OR PTI B

G型	P型	N型	R型	PP型									
Long electrode	with dead zone	without dead zone		For high pressure resistance									
<b>G</b>	<b>P-15P</b>	<b>P-10N P-20N</b>	<b>P-20R</b>	<b>PP</b>									
													
<table border="1"> <thead> <tr> <th>Description</th> <th>D φ</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td>G-1A</td> <td>6</td> <td>P U C</td> </tr> <tr> <td>G-2A</td> <td>3</td> <td>Teflon</td> </tr> </tbody> </table>	Description	D φ	Material	G-1A	6	P U C	G-2A	3	Teflon				
Description	D φ	Material											
G-1A	6	P U C											
G-2A	3	Teflon											
 <p>Chemicals, alkalis etc.</p>  <p>Long electrode That of intense adhesion, sewage and brine.</p>	 <p>Upper - and lower limit control for feedstuff, fertilizer, etc.</p>  <p>What the temperature rises like lime, etc. or that of high temperature</p>  <p>Kinds of dust</p>	 <p>High - sensitivity pellets, powder, sugar, etc.</p>	 <p>Liquid level detection</p>  <p>Upper - and lower limit detection control of fluid</p>	 <p>High pressure type</p>  <p>Accumulator, etc. at high temperature and under high pressure</p>									
Liquid with adhesion property, slurry and long electrode	Powder and particular matters		Liquid with little adhesion property	Pressure resistance type									
Living drainage, various industrial liquid wastes, water oil, etc.	Collecting dust, plastics, carbon black, wheat, cement, millet jelly, sugar, feedstuff, fertilizer, etc.		Turbine oil and pure water	For accumulator, water, oil, bulk materials, particular matters, etc.									
Max. 50°C(G-1A) Max.150°C(G-2A)	Max. 90°C (For high temperature available, max.1,000°C)		Max. 90°C	Max. 90°C (For high temperature available, max. 1000°C)									
max50°C	max55°C		55°C	max55°C									
5kg/cm <sup>2</sup>	10kg/cm <sup>2</sup>		5 kg/m <sup>2</sup>	By the specified pressure resistances 50kg/cm <sup>2</sup> 100kg/cm <sup>2</sup> 150kg/cm <sup>2</sup> 200kg/cm <sup>2</sup> 250kg/cm <sup>2</sup> 300kg/cm <sup>2</sup>									
—	—		—	—									

※Contact us, as other electrodes for special purpose may be manufactured.

# LIC-S45

The requirements demand to the level switch destined to bulk materials, particular matters and granular matters are the prudent measures to clear various bad conditions like mechanical strength, adhesion coarse particulates and water drops, direct rays of the sun in summer, low temperature in winter, etc. supposing that it is equipped to a large storage tank. The level switch, model LIC-S45 is a level switch for exclusive use of ores designed on the basis of numerous experimental results conducted with cooperation given of a variety of factories by investigating minutely actual situations of ore plants and data on properties of bulk materials, particular matters and granular matters.



① Transmitter body (Model LIC-S45)



CAPACITANCE LEVEL CONTROLLER	
MODEL	LIC-S45
VOLTAGE	AC100/110V/200/220V
SER. NO.	198 - E
FELLOW KOGYO CO., LTD.	

### ■ CONFIGURATION

The level switch, model LIC-S45 is constituted by ① a transmitter body, ② electrodes and ③ an exclusive lead cable. Fig.1 shows the most basic application of level switch, model LIC-S45 that the electrode, model KP-08 is installed to the upper limit and the electrode, model KP-10 to the lower limit.



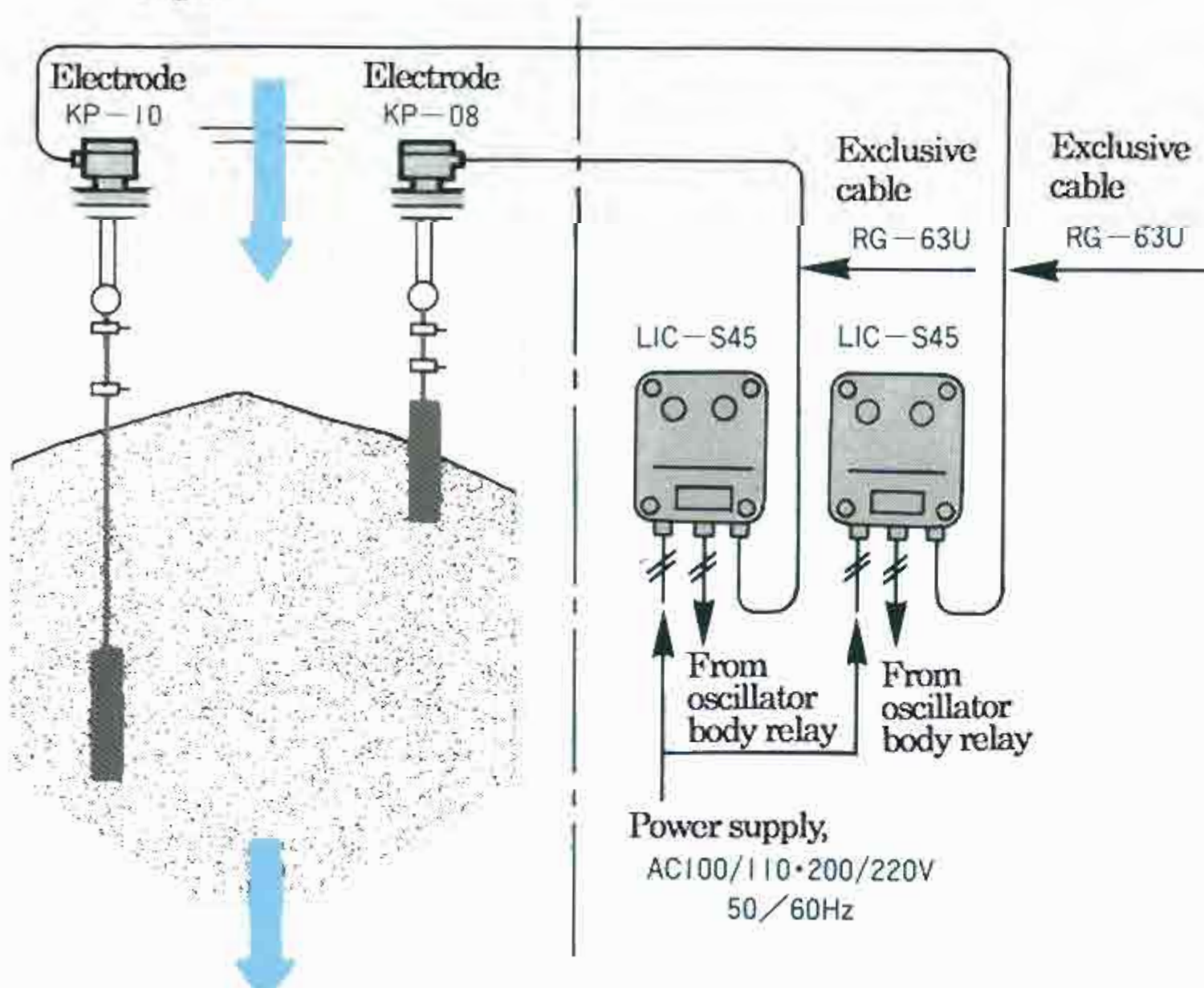
③ Exclusive lead cable (High – frequency coaxial cable : RG-63U)

■ CHARACTERISTICS

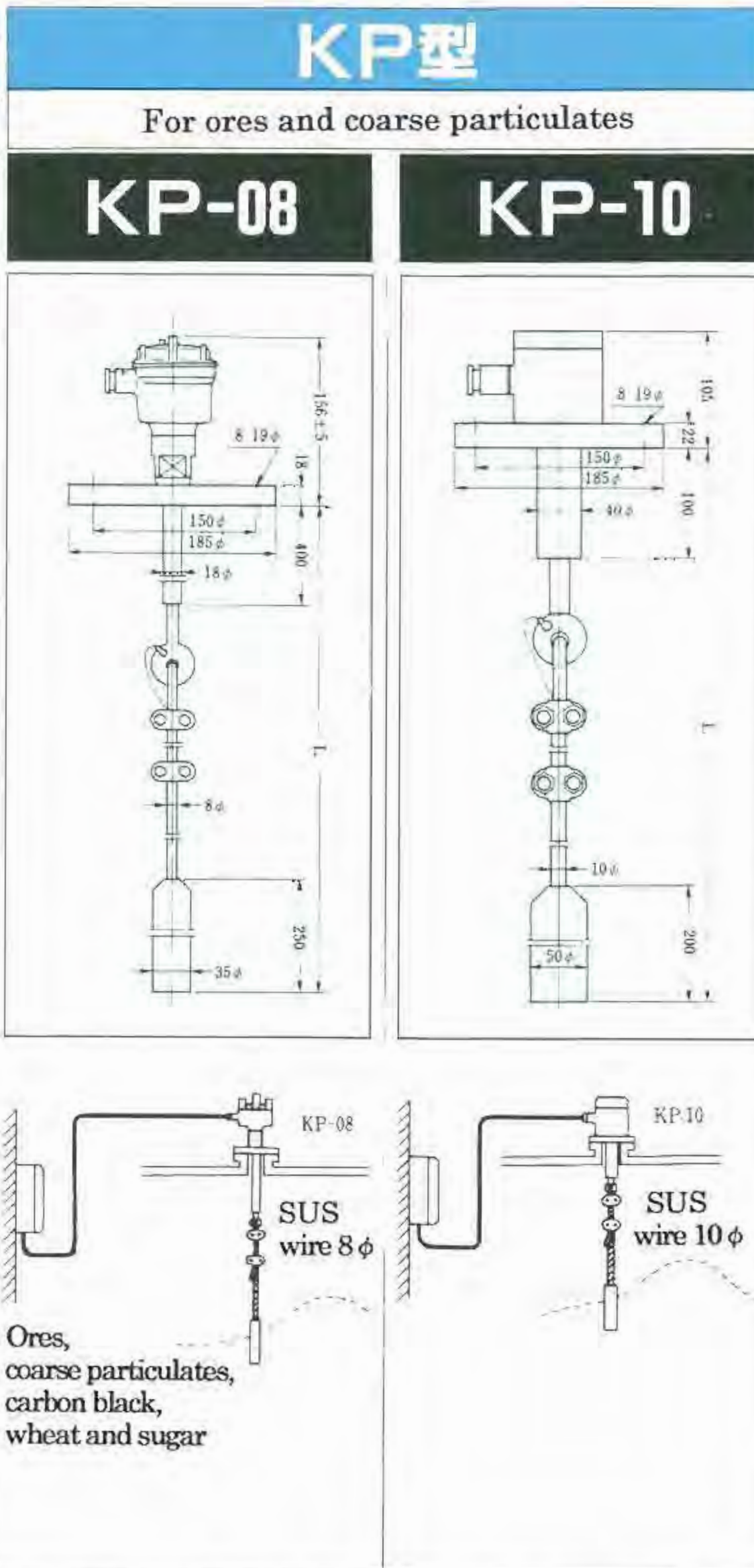
- ① It has a sufficient degree of allowance for a variety of stresses like tensile load, vibrations, impact, etc.
- ② It does not malfunction even if irregular state changes of ores like inflow of rain water, drying for a long period of time, etc. occur in the same storage tank.
- ③ It suppresses influences by the adhesion of coarse particulates, water drops, etc. to the main section of electrode, and maintains the stable operation for a long period of time. (Patent pending)
- ④ To prevent the electronic circuit from the static electricity, the electrostatic filter is incorporated. It is not influenced by ores electrified (coarse particulates), etc.
- ⑤ It can be used with a sense of relief for coarse particulates and granular matters to the coke oven, rotary kiln, hopper related to the electric furnace, etc.
- ⑥ Since electrodes are separated from the body, the installation of electrodes can be made in a place to where normally persons cannot make access, and the work like adjustment, inspection, maintenance, etc. is extremely simple.
- ⑦ For the instantaneous operation prevention because of the drop of measuring object and electrode swinging at idling, the delay circuit is incorporated. It can make the delay till 0.5 to 2 seconds.
- ⑧ The length of electrode can be freely changed in the site.



Fig.1



Ore Type Electrodes,  
Their Characteristics  
and Examples of Use



Working range	Bulk materials, particular matters and granular matters	
Wire gage	8 φ	10 φ
Wire material	SUS304	SUS304
Tensile load	1 ton	3 ton
Head material	A 0	FC
Dimensions	Vinyl chloride (Teflon)	Delrin (Teflon)
Insulating material	400 mm	100 mm
Flange	Corresponding to the	Corresponding to the
L	JIS 10K 3B	JIS 10K 3B
	1.5m and 3m	5m and 10m
Wetted part temperature	Max. 70°C (200°C)	Max. 100°C (200°C)
		For high pressure
Ambient head temperature	Max. 55°C	
Painting color	7.5BG6/1.5	

- ※In parentheses stands for the specifications of model H.  
 ※Besides this, as required the following specifications may be changed.
- (1)Changes of wire gage, length, material, etc.
  - (2)Strengthening of tensile resistance load
  - (3)Change of insulating section material or length
  - (4)Increase of temperature resistance property
  - (5)Change of flange standard
  - (6)Change of tip heavy bob shape
  - (7)Bar electrode, flat electrode, etc.

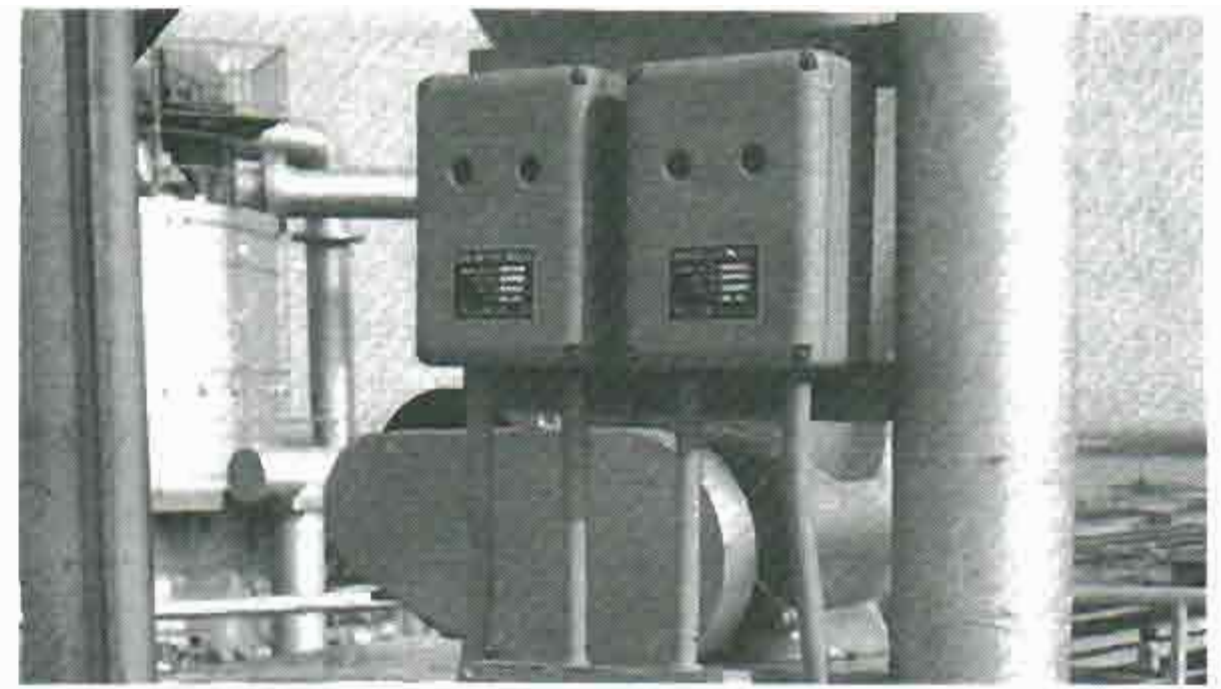
Application

Measured material	Temperature	Grain size	Water content
Chrome ore	Normal temperature	Less than 70 mm	10 ~ 50%
Manganese ore	Normal temperature	50 ~ 70 mm	10 ~ 20%
Iron ore	Normal temperature	Less than 50 mm	5 ~ 15%
Phosphate rock	Normal temperature	Powder	None
Ore dust	80°C	Powder	30%
Silica	Normal temperature	Less than 100 mm	5 ~ 15%
Ferrosilicon	90°C	Powder	None
Limestone	150°C	Less than 300 mm	2%
Soda ash	Normal temperature	Less than 20 mm	None
Cement	100°C	Powder	None
Cokes	Normal temperature ~ 800°C	Less than 300 mm	None
Powder lignite	90°C	Powder	10%
Coal	Normal temperature	Less than 50 mm	20%
Charcoal	Normal temperature	50 φ × 300 l	
Wheat	Normal temperature	Grain	5 ~ 15%
Bauxite	Normal temperature		
Copper core	Normal temperature	250 φ ~	20 ~ 30%
Iron sand	150°C	Powder	None
Aluminum debris	Normal temperature	Monothilic	None
Crushed stone	80°C	200 φ ~	None
Sand	80°C		None
Zinc ore	Normal temperature	50 ~ 110 φ	10 ~ 15%
Lead core	Normal temperature	150 φ ~	Unknown
Darai powder	Normal temperature	Monothilic	None
Glass ball	800°C	20 φ	None
Crude sugar	Normal temperature	Granulated	Unknown
Wood chip	Normal temperature	Angle of 2~3 cm	40%
Plastic powder	Normal temperature ~ 100°C	Angle of 2 mm	None
Plastic powder	Normal temperature	Powder	None
Corn	Normal temperature		15 ~ 20%
Serpentine	Normal temperature	Monothilic	10 ~ 12%
Scale	Normal temperature	Powder	Monothilic
Burning dolomite		Powder	A little
Metasilicon	Normal temperature ~ 600°C	Monothilic	None
Silicon		Monothilic	Monothilic
Iron oxide series collecting dust		Particulate	Less than 2%
Coke series collecting dust	700 ~ 800°C	Particulate	None
Coal series collecting dust		Particulate	
Alloy iron dust	Normal temperature	Particulate	
Alumina			
Pellet	Normal temperature ~ 800°C	≒ 20 φ	None
Ballast	Normal temperature		
Carbon	Normal temperature	Particulate	
Nickel ore	1000°C	Monothilic	None
Iron powder	750°C		None
Sintering ore	400°C	Monothilic	
Massive nickel	800°C		None

## ■ MOUNTING

### ● Transmitter body, model LIC-S45

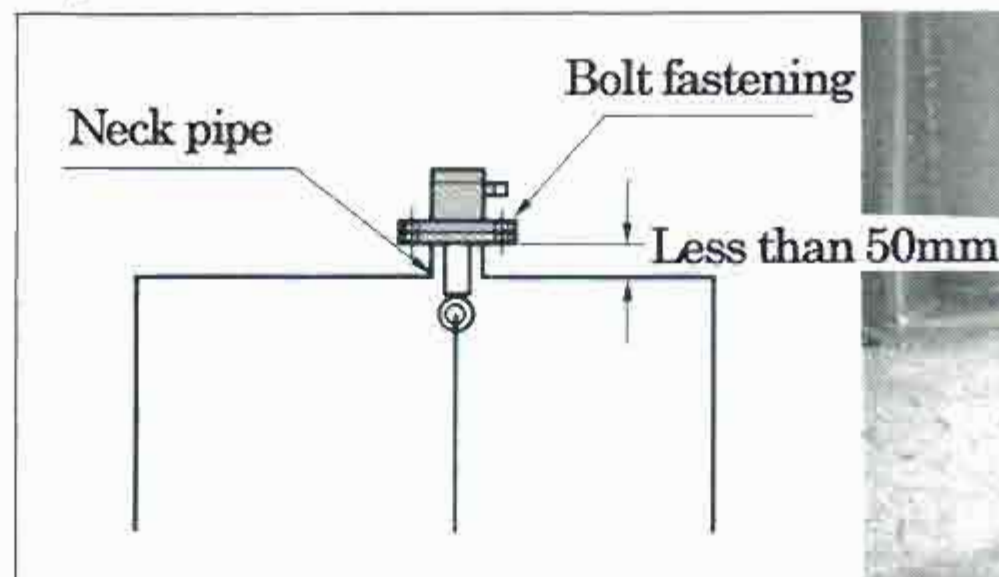
The construction of transmitter section is of outdoor sealed construction, and mount a cover in case it is installed in a place exposed to the rain or a place exposed to the direct rays of the sun.



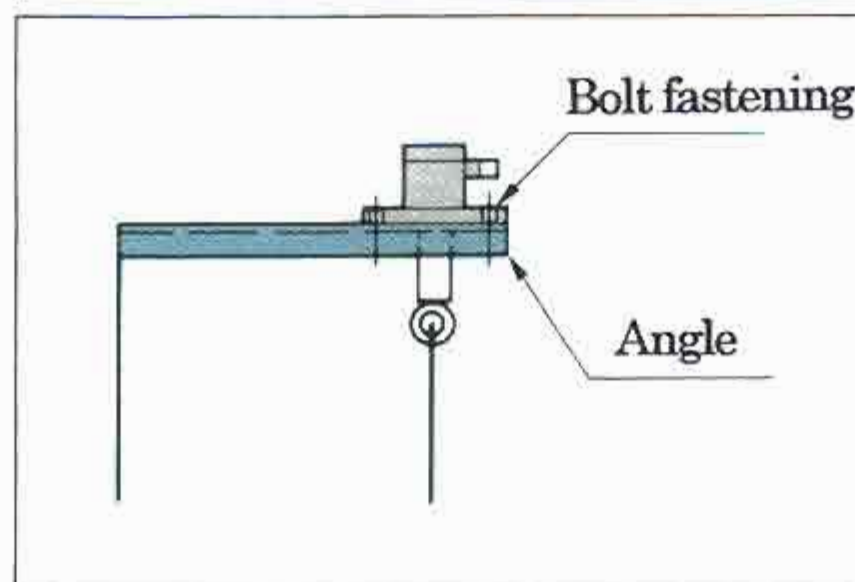
### ● Electrode

- Keep away the distance between electrodes by more than 500mm to minimum.
- Install it by keeping away the electrode mounting position as far as possible from the drop spot of conveyor chute.
- Make the distance between the electrode and the transmitter to approximately 10m. (5m and 10m are standard.)

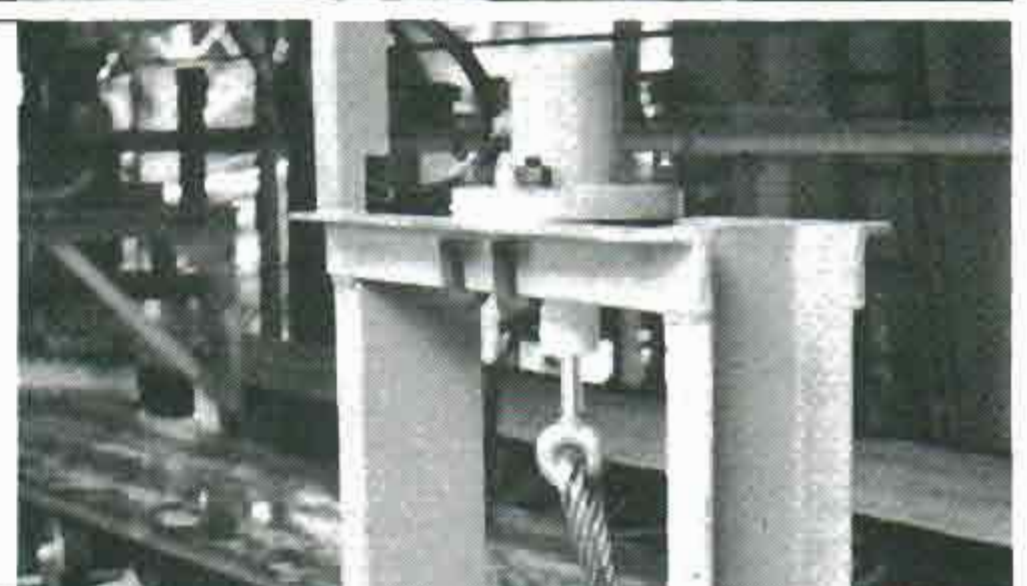
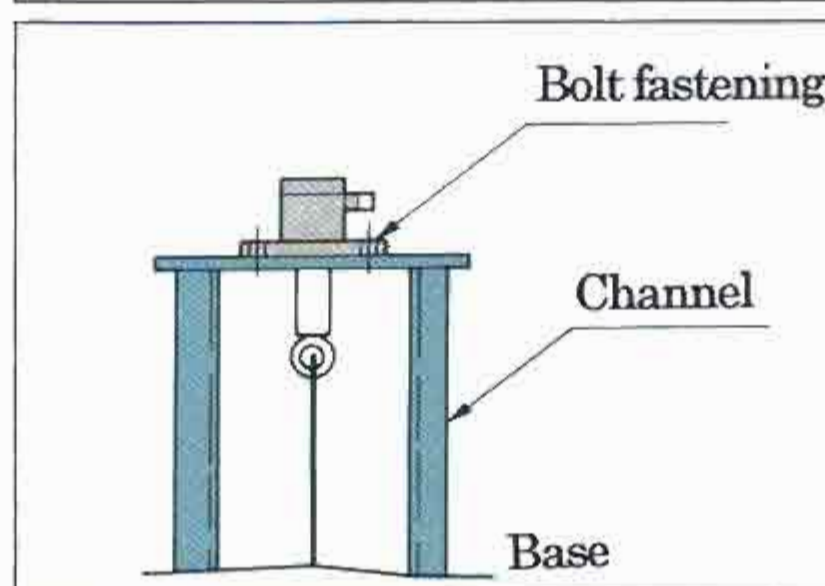
#### a. In case of sealed tank



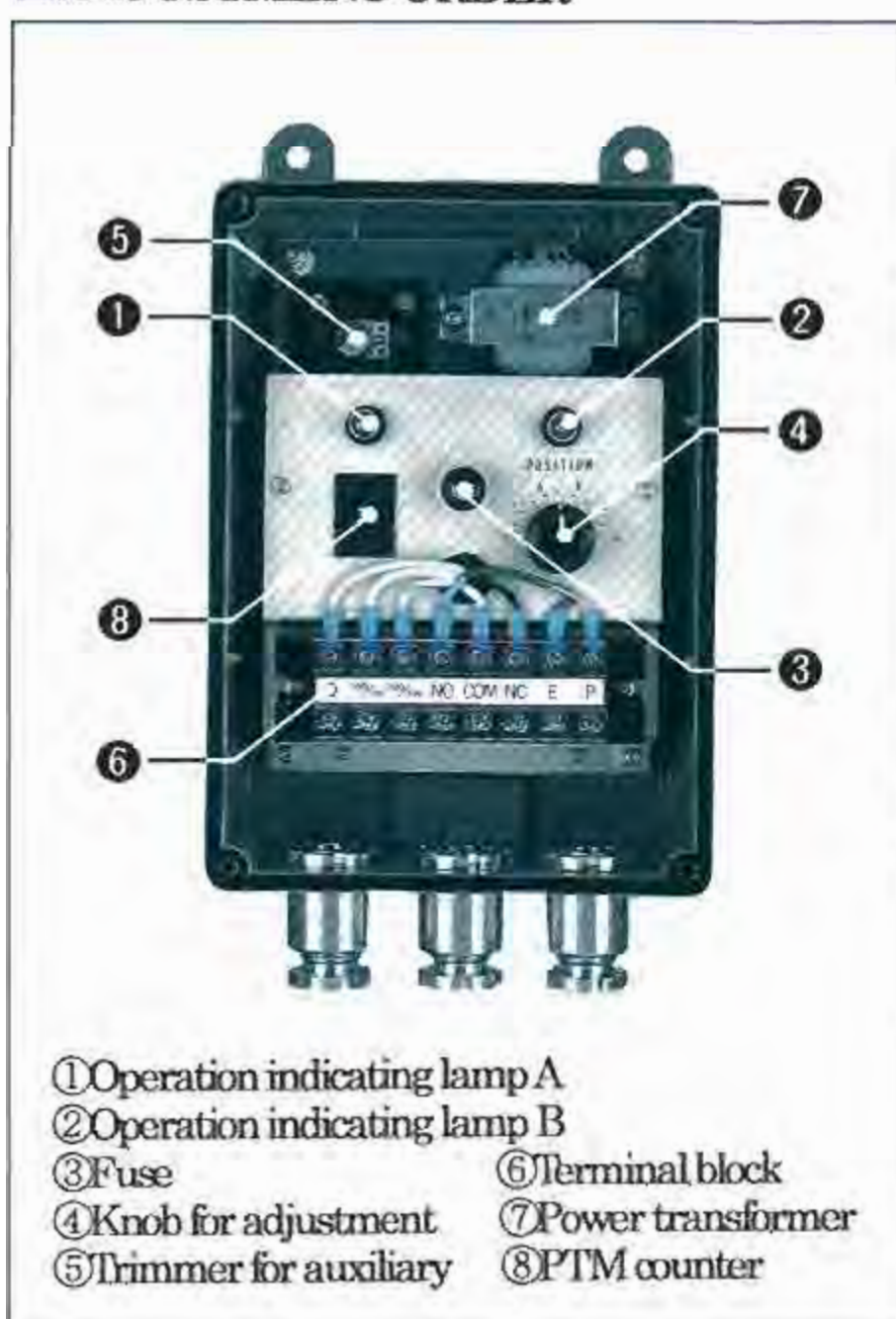
#### b. In case of open tank



#### c. An example in case it is impossible to mount it directly to the hopper



## ■ ADJUSTMENT ORDER



A. Empty the tank, and so on, and fully separate the measured material from the electrode.

B. It is safer to keep the connections of NO, COM, NC, etc. related to the external circuit left till the completion of adjustment.

C. Set the value of PTM counter (hereinafter called PTM) to "0".

D. Set the scale of knob for adjustment (hereinafter called knob) to "0".

E. After ending the above-mentioned operation, feed the power supply.

At this time confirm that the relay operation indicating lamp B

In case the relay operation indicating lamp B

(hereinafter called lamp B) comes on.

In case the relay operation indicating lamp A (herein after called A)

Comes on, since there is an abnormality (defective connection) in the

electrode section, make the revision.

F. Come to raise the numerals of PTM to 0 → 1 → 2, and stop it where the

lamp is switched to B → A.

G. Then, turn the adjusting knob silently clockwise, and confirm the point

where the lamp is switched to A → B. This is called the base point.

When there is no base point even though the knob is turned till the scale

trimmer), and find again the base point.

If the base point is found at the right side from the scale 5, there is no

hindrance in the adjustment, and since it is convenient in terms of the

maintenance to make the total number of switches used left as the same

base point, it is recommended to turn the above-mentioned little by little

and make the scale 8 as the base point.

H. When the base point is determined, lower the knob in the direction of "0"

by approximately 2 to 5 scales. With the above, the adjustment is completed.

Raise and lower the measured material 2 to 3 times after adjustment, and

Confirm the operation.

