

## 1. GENERAL

- Isothermal point of intersection: pH 7 (nominal value at 0 mV).
- Maximum pressure: 1000 kPa (10 bar).
- Metal foil screening.

### SM21-AG2

- pH, temperature range: 0 to 14 pH, 0 to 80 °C.
- Glass Resistance (25°C): 25 to 50 MΩ.
- Ag/AgCl wire reference system.

### SM21(D)-AG4

- pH, temperature range: 0 to 14 pH, 0 to 100 °C.
- Glass Resistance (25°C): 50 to 100 MΩ.
- High quality Ag/AgCl pin reference system.

### SM21(D)-AG6

- pH, temperature range: 0 to 14 pH, 0 to 100 °C.
- Glass Resistance (25°C): 120 to 200 MΩ.
- High quality Ag/AgCl pin reference system

### SM21(D)-AL4

- pH, temperature range: 0 to 14 pH, 15 to 130 °C.
- Glass Resistance (25°C): 300 to 450 MΩ.
- High quality Ag/AgCl pin reference system.

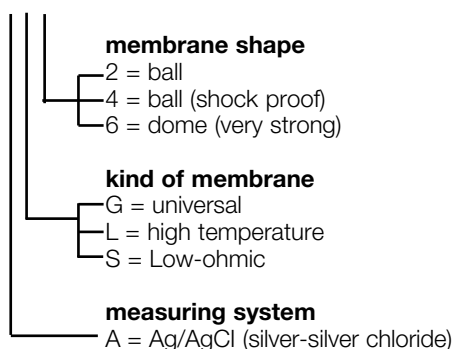
### SM21(D)-AL6

- pH, temperature range: 0 to 14 pH, 25 to 130 °C.
- Glass Resistance (25°C): 600 to 900 MΩ.
- High quality Ag/AgCl pin reference system.

## 1.2. TYPE NUMBER

The type number of the electrode is arranged as follows:

SM21-. . .



## 1.3. SPECIFICATIONS

The information about range, specifications, etc. is clearly shown on the type plate attached to the electrode cap.

The electrical resistance of the membrane is given at 25°C (each temperature increase of 10°C halves the resistance of the membrane).

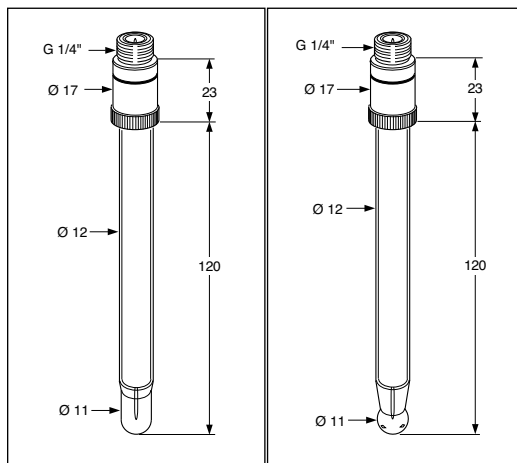


Fig. 1. SM21-A.6

Fig. 2. SM21-A.2, SM21-A.4

## 2. INSTALLATION

### 2.1. SOAKING

For accurate pH measurement a gel layer must be formed on the glass membrane surface. For this reason the pH sensitive part of the electrode should be soaked for 24 hours before the electrode is used.

When an electrode has been stored dry and you need to use it immediately (there is no time for soaking), you may do so, but as a result initial regular re-calibration will be required until the gel layer is formed.

The electrode when despatched has a protective cover cap filled with 0,04% HCl solution around the membrane which ensures you can use the electrode immediately.

### 2.2. MOUNTING

The electrode must be fitted with an electrode cable (type WU20(D)-PC..) marked with a red strip.

The mounting of an electrode in a fitting should be carried out as shown in the figure 4 and 5.

The electrode fits any Yokogawa cable fitted with the standard nut of which the dimensions are shown in figure 3. The nut can be ordered under part number K1500DW.

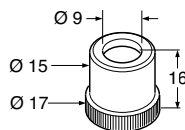


Fig. 3. K1500DW (set of 12 cable nuts).

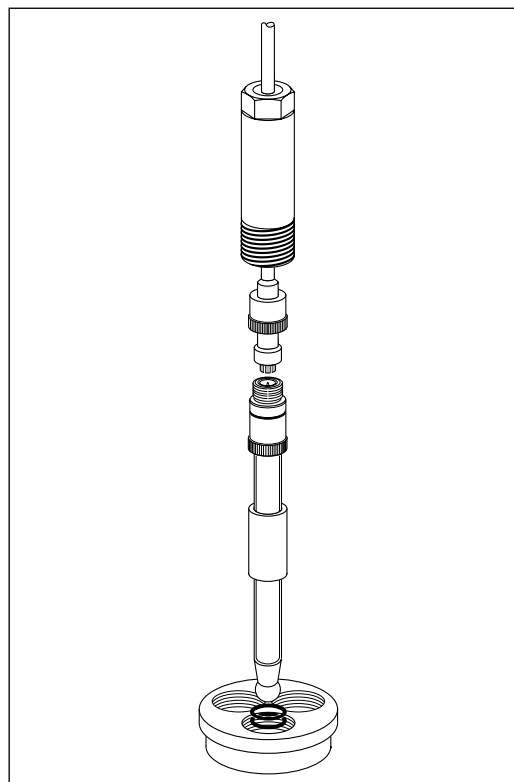


Fig. 4. Standard mounting with mounting set FP20-R12(M), FP20-S12(M)

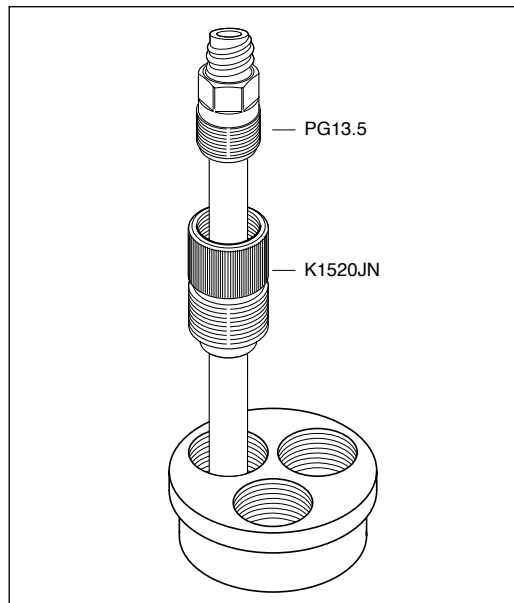


Fig. 5. Mounting PG13,5 in Yokogawa fitting using the adapter K1520JN (PVC-C) or K1500DV (PVDF)

## 2.3. COMPATABILITY

Generally, the glass electrode is used in conjunction with a reference electrode (with yellow marking strip) and a temperature sensor (green marking strip).

**NOTE:** The reference system of both glass and reference electrodes must be similar

## 3. USE AND MAINTENANCE

### 3.1. CALIBRATION AND BUFFERING

To calibrate a pH sensor, two buffer solutions with known pH values are required. It is recommended that one buffer solution have a value near to pH 7.00 (ITP). Depending on the process value to be measured, the second buffer solution should be either acidic (below 7.00) or alkaline (above 7.00) area. Normally, the IEC buffers (4.01, 6.87 and 9.18) are used. The following is a very general 2-point calibration procedure.

1. Clean the sensor (deposits may be removed using a 5% (approximate) solution of HCL).
2. Rinse sensor thoroughly with clean (demi) water.
3. Immerse the sensor in the first buffer (6.87 pH is recommended).
4. Refer to appropriate Instrument Instruction Manual for Calibration procedures (Auto; Manual; Sample, etc.)
5. Rinse sensor thoroughly with clean (demi) water.
6. Immerse the sensor in the second buffer (4.01 or 9.18 recommended).
7. Repeat Step 4.

During calibration the temperature compensation should be active. The instrument automatically compensates for the sensitivity change of the pH sensor at different temperatures. After calibration is complete replace or re-install the sensor into the process.

### WARNING:

During buffering the liquid earth and the temperature compensator must be connected. The temperature of the buffer solution must be within the limits of the technical specification as indicated on the type plate,

### 3.2. CLEANING

When the sensitivity of the electrode has noticeably decreased, the electrode must be cleaned with a suitable detergent.

- Depositions of hydroxydes, lime, iron hydroxyde can be removed by immersing the electrode in a diluted solution of hydrochloric acid and then cleaning with water.
- Depositions of oil and fat can be removed by means of hot water in conjunction with domestic washing solution.  
When the result is unsatisfactory a domestic abrasive may be used.
- Albuminous depositions can be removed by means of a solvent containing: 8,5 ml concentrated hydrochloride acid, 10 gr pepsin and 1 l demi water.

**NOTE:** When polar solvents are used for special cleaning purposes, it is necessary to soak the electrode for some time after cleaning as the polar solvent influences the gel layer.

When an a-polar solvent is used (benzin, ether, toluene) follow up treatment with a polar solvent (methanol, acetone) and soaking is necessary.

### 3.3. DEGRADED ELECTRODES

During measurement the glass membrane of the electrodes is affected. This has one or more of the following effects:

- Decrease on the speed of response.
- Increase of the electrical resistance.
- Decrease of the sensitivity.
- Zero point shift.

The effect of aging of the electrodes makes it necessary to carry out re-calibration of the electrode system regularly.

The frequency depends on the composition of the sample to be measured and the temperature. e.g.: If the life-time of an electrode is 100% at the room temperature, it will be 20% at 80°C and only 5% at 120°C.

It is possible to re-activate an aged electrode by immersing it for 10 seconds in a P.V.C. beaker containing a solution of vinegar (1 mol) and potassium fluoride (1 mol). Ratio 1:1.  
After this the electrode must be cleaned carefully.

### WARNING:

As a result of the strong etching properties of the acid, the handling should be done carefully in consult with a security officer.

### 3.4. ISOLATION

Since the electrical resistance of the glass electrode is extremely high it is necessary to guarantee a high insulation between measuring electrode and screening. This requires a dry and clean connector before fitting and in addition, the connection to the electrode must be made by means of the correct electrode cable.  
When a connection box is used this must also be dry and clean.

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**YOKOGAWA** ◆

# User Manual

## Directions for use pH Electrodes

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