General Specifications

Industrial Electrodes for pH
Model SM21/SR20/SC21

pH-DIN

The heart of a pH measuring loop is the electrode system. Yokogawa has designed a wide range of electrodes to ensure this heart keeps beating under the most severe conditions.

The dimensions and design meet the requirements of DIN 19263 (excluding the refillable types). A high degree of standardisation makes it possible to mount any electrode in the standard program of fittings.
Colour coded strips on electrode and cable and clear identification of sensor specifications make incorrect installation virtually impossible.

The combination electrode plug and cable socket is watertight and temperature is resistant up to 125 ºC. It meets the requirements of IP65.
The electrode cap is made of Ryton R4. This is a chemically highly resistive material (to PTFE) with strong mechanical properties. This cap is joined to the glass body by a screw thread and secured with glue to guarantee waterproof sealing.

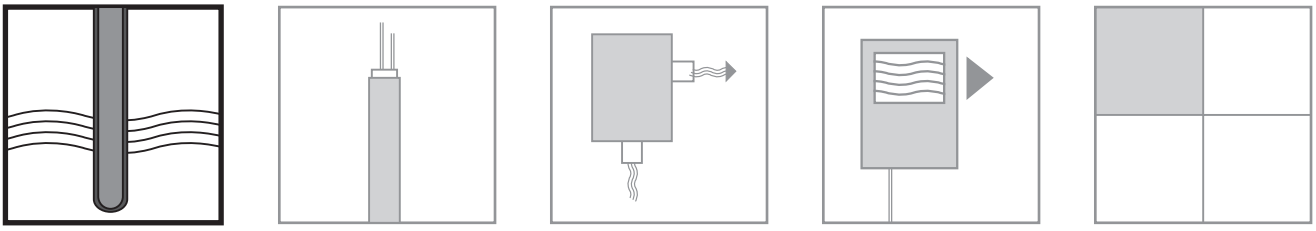
FEATURES

- Wide range of electrodes to suit all process conditions.
- Gold plated spring O connector parts, for good electrical contact under the most severe conditions.
- Coaxial plug and socket with watertight sealing that meets the requirements of IP65.
- Colour coded strips for easy identification of electrodes and cables.
- High degree of standardisation for mounting in flow- and immersion fittings.

COMPATIBILITY

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

SYSTEM CONFIGURATION



Sensors | Cables | Fittings | Transmitters | Accessories

A. GLASS ELECTRODES

FEATURES

- "All glass" construction.
- Dimensions and design meet the requirements of DIN 19263.
- Isothermal point of intersection: pH 7 (0 mV) (nominal value).
- Maximum process pressure: 1 MPa (10 bar).
- Metal foil screening.
- Bulb membrane for general purpose.
- Dome shaped membrance for "Heavy Duty" applications.

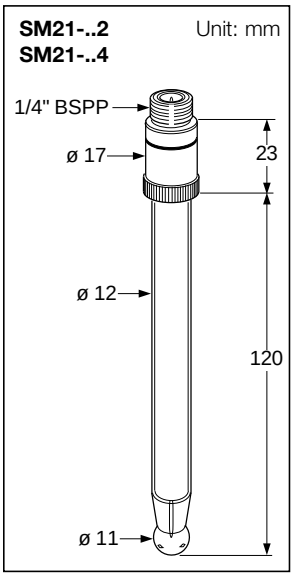
Type coding

SM21-...

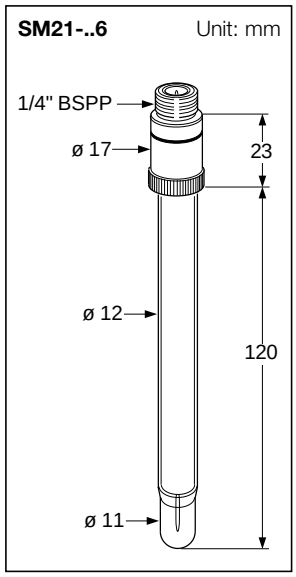
Membrane shape
- 2 = Ball
- 4 = Ball (shockproof)
- 6 = Dome (heavy duty)

Kind of membrane
- S = Low-ohmic
- G = Universal
- L = High temperature
- E = Acid resistant

Reference system
- A = Ag/AgCl (silver-silverchloride)



General



"Heavy Duty"

SPECIFICATIONS

Type	Membrane	Resistance* in MOhm/25 °C	pH range	Temperature range	Reference system	Sodium error 0,1 N[Na^+]/25 °C
SM21-AG2	Universal pH-glass bulb	25 - 50 MOhm	0 - 14	0 - 80 °C	Ag/AgCl (wire) Silver-silverchloride	< 0,17 pH at pH = 13
SM21-AG4	Universal pH-glass bulb (shockproof)	50 - 100 MOhm	0 - 14	0 - 100 °C	Ag/AgCl (pin) Silver-silverchloride	< 0,17 pH at pH = 13
SM21-AG6	Universal pH-glass bulb (heavy duty)	120 - 200 MOhm	0 - 14	0 - 100 °C	Ag/AgCl (pin) Silver-silverchloride	< 0,17 pH at pH = 13
SM21-AL2	High temperature pH-glass bulb	130 - 300 MOhm	0 - 14	10 - 80 °C	Ag/AgCl (wire) silver-silverchloride	< 0,17 pH at pH = 13
SM21-AL4	High temperature pH-glass bulb (shockproof)	300 - 450 MOhm	0 - 14	15 - 130 °C	Ag/AgCl (pin) Silver-silverchloride	< 0,17 pH at pH = 13
SM21-AL6	High temperature pH-glass bulb (heavy duty)	600 - 900 MOhm	0 - 14	25 - 130 °C	Ag/AgCl (pin) Silver-silverchloride	< 0,17 pH at pH = 13
SM21-AE2	Acid resistant pH-glass bulb	120 - 200 MOhm at 60 °C	0 - 7	60 - 130 °C	Ag/AgCl (pin) Silver-silverchloride	< 0,17 pH at pH = 7
SM21-AS4	Low ohmic pH-glass bulb (shockproof)	25 - 50 MOhm	0 - 10	0 - 80 °C	Ag/AgCl (pin) Silver-silverchloride	< 0,17 pH at pH = 10
SM21-AS6	Low ohmic pH-glass dome (heavy duty)	50 - 75 MOhm	0 - 10	0 - 80 °C	Ag/AgCl (pin) Silver-silverchloride	< 0,17 pH at pH = 10

* The resistance will decrease by 50% at any temperature of 10 °C; it will increase by 100% at any temperature decrease of 10 °C. The resistance may not exceed 1000 MOhm under measuring and calibrating conditions.

B. REFERENCE ELECTRODES (non-flow types)

A non-flow type reference electrode can be used for processes that do not contain components that poison the reference system.
The gel-type electrodes have a large area porous PTFE junction for optimal resistance against electrode pollution.
The double junction electrode is the optimal choice for processes that cannot stand contamination with KCl.
The two-phase electrode has a PTFE tube. Therefore this electrode can be applied in processes with frequent temperature and pressure fluctuations.

FEATURES

- Easy maintenance.
- No reference liquid wastage.
- Maximum process pressure: 1 MPa (10 bar).

Additional features for types SR20-AC22
- Pressure compensated.

Additional features for type SR20-AP26:
- Built-in salt bridge.

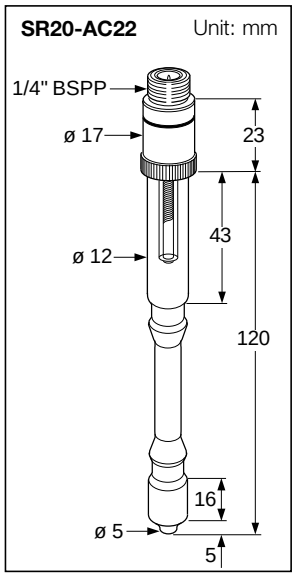
Type coding

SR20-....

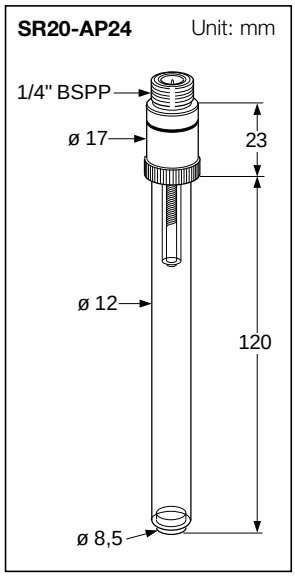
Liquid outlet
- 2 = Non-flow
  - 22 = PTFE hose filled with KCl pellets
  - 24 = Filled with gelled electrolyte
  - 26 = Double junction filled with gelled electrolyte
- 32 = Flow (process pressure compensated)
- 5 = Flow
  - 52 = Refillable at the top

Diaphragm
- C = Ceramic
- P = PTFE (porous)
- S = Sleeve

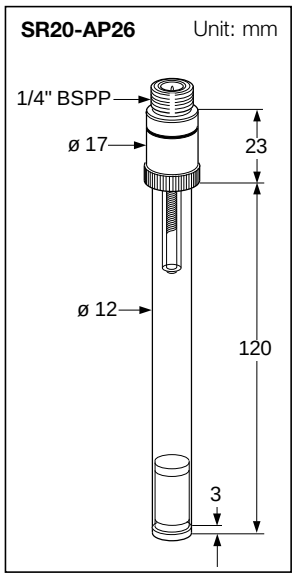
Reference system
- A = Ag/AgCl (silver-silverchloride)



Two-phase electrode



Gel-type electrode



Double junction gel-type

SPECIFICATIONS

Type	Temperature range	Reference liquid	Reference system	Diaphragm	Diaphragm resistance/25 °C
SR20-AC22	0 - 120 °C	Saturated KCl-solution (pellets)	Ag/AgCl (pin) Silver-silverchloride	Ceramic	< 5 kOhm
SR20-AP24	0 - 80 °C	Thickened KCl (1 m.)	Ag/AgCl (pin) Silver-silverchloride	PTFE	< 5 kOhm
SR20-AP26	0 - 80 °C	Thickened KCl (1 m.) Thickened KNO_3 (3 m.)	Ag/AgCl (pin) Silver-silverchloride	PTFE	< 5 kOhm

C. REFERENCE ELECTRODES (refillable)

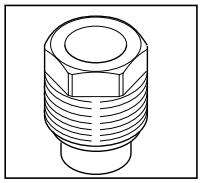
The refillable reference electrodes have a positive flow of electrolyte to prevent junction fouling or poisoning of the reference system. To prevent penetration of the process liquid into the electrode the pressure in the electrode must be higher than the process pressure. For that purpose they can be connected to a KCl-reservoir (accessory) giving extra static pressure (see also GS 12 B6W3).
The ceramic junction is suitable for most applications. In strong polluting processes a sleeve junction is preferable.
The BELLOMATIC electrode assures a constant flow of reference liquid independent of the process pressure.

FEATURES

- Liquid flow output preventing junction fouling and poisoning of the reference system.

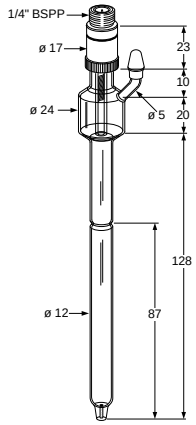
Additional features for types SR20-AC32
- Automatic compensation for process pressure variations.
- Chemical resistant Viton bellow material.
- Constant flow of the reference liquid for minimal diffusion potential.
- Refillable, with large KCl-reservoir.

NOTE:
The types SR20-AS52 can be applied in strong polluted liquids very succesfully.

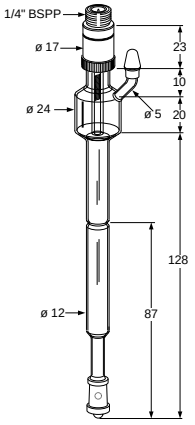


Mounting kit for types SR20-AC52 and SR20-AS52 (accessory)
Ordernr. K1500BY

SR20-AC52 Unit: mm

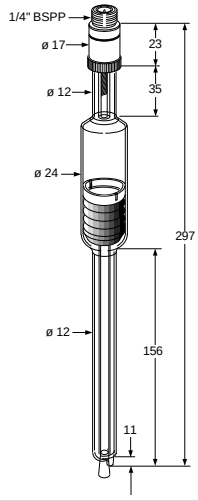


SR20-AS52 Unit: mm



Refillable at the top

SR20-AC32 Unit: mm



Mounting kit for Bellomatic electrode (accessory) type FP20-S13

Bellomatic

SPECIFICATIONS

Type	Temperature range	Pressure range	Reference liquid	Reference system	Diaphragm	Diaphragm resistance/25 °C	Flow at 25 °C
SR20-AC52	0 - 100 °C	Atmospheric	KCl-solution (1 m.)	Ag/AgCl (pin) Silver-silverchloride	Ceramic	< 10 kOhm	Max. 0,5 ml/day at 10 kPa overpressure
SR20-AS52	0 - 100 °C	Atmospheric	KCl-solution (1 m.)	Ag/AgCl (pin) Silver-silverchloride	Sleeve	< 10 kOhm	Max. 5 ml/day at 10 kPa overpressure
SR20-AC32	0 - 120 °C	0 - 1 MPa	KCl-solution (1 m.)*	Ag/AgCl (pin) Silver-silverchloride	Ceramic	< 10 kOhm	Max. 0,2 ml/day*

* The flow is highly dependent on temperature. When using the electrode continuously at temperature over 70 °C it is recommended to fill the electrode with a reference liquid having a higher viscosity (ordernrs. 82895203 and 82895258).

D. COMBINED pH/REF. ELECTRODES

The combined pH/reference electrodes are for applications where installation of separate sensors is not possible.
Basically, there are three types:
- The non-flow type for general applications. They have a large area PTFE junction and gelled electrolyte.
- G-glass for general applications.
- S-glass for fast response.

The refillable types are for applications requiring a constant flow of electrolyte to prevent penetration of process liquid in the electrode.
To compensate for process and steam pressure the steam sterilisable type can be mounted in a pressurisable holder (type FP20-S14). For atmosferic applications the BELLOMATIC mounting kit (type FP20-S13) can be used.

FEATURES

- "All glass" construction.
- Isothermal point of intersection: pH 7 (0 mV).

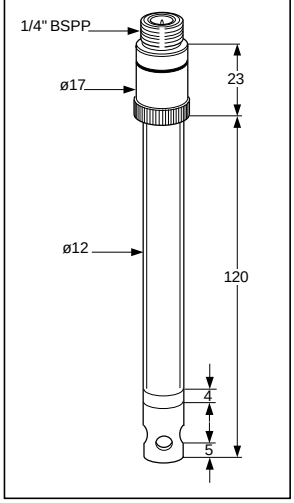
Additional features for types SC21-AGP24 and SC21-ASP24:
- Non-flow.
- Protection cage for pH membrane.
- Less maintenance by the combination of gelled electrolyte and PTFE.

Additional features for type SC21-AAC54:
- Steam sterilisable.
- Flow type with pressurisable reference part to compensate for process and/or steam pressure to guarantee a positive out-flow of KCl solution, preventing fouling or poisoning.
- Large electrolyte reservoir, containing thickened KCl reference solution for a longer stand time.

Additional features for type SC21-AAP26:
- Non-flow type, using gelled electrolyte.
- Large area PTFE junction to resist fouling to a high degree.
- Built-in salt bridge to prevent poisoning of the reference system and to prevent contamination with KCl to processes that cannot stand this.
- Reduced maintenance costs by the combination of gelled electrolyte and PTFE junctions.
- The SC21-AAP26 can be mounted directly in piping systems, vessels, tankwalls, etc. using the retractable fittings type PR20-SN..., thus further reducing maintenance costs.

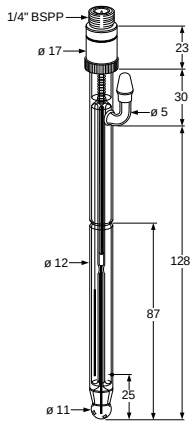
NOTE:
The FP20-S14 cannot be mounted in Yokogawa's standard immersion fittings. If this should be required or if welding sockets for mounting the FP20-S14 directly onto pipings, vessels, tanks, etc., are needed, please contact Yokogawa.

SC21-AGP24 Unit: mm
SC21-ASP24



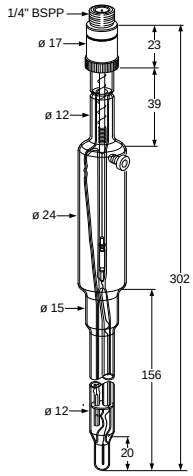
Non-flow

SC21-AGC52 Unit: mm
SC21-ASC52



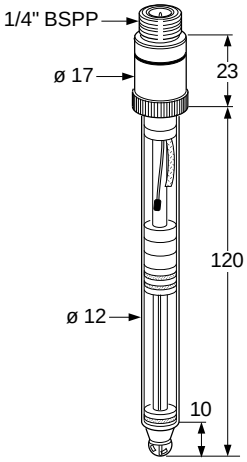
Flow

SC21-AAC54 Unit: mm

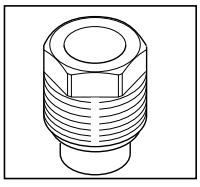


Flow

SC21-AAP26 Unit: mm



Non-flow



Mounting kit for types
SC21-AGC52 and SC21-ASC52 (accessory)
Ordernr. K1500BY

D. COMBINED pH/REF. ELECTRODES

Type coding

SC21-...

Liquid outlet
- 2 = Non-flow
  - 24 = Filled with gelled electrolyte
  - 26 = Double junction filled with gelled electrolyte
- 5 = Flow
  - 52 = Refillable at the top
  - 54 = Refillable at the side

Diaphragm
- C = Ceramic
- P = PTFE (teflon)

Membrane
- A = Chemically resistant
- S = Low ohmic
- G = Universal

Reference system
- A = Ag/AgCl (silver-silverchloride)

SPECIFICATIONS

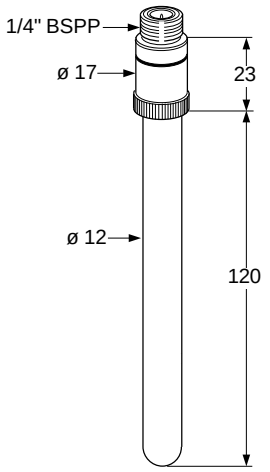
Type	Membrane	Resistance in MOhm/25 °C	pH-range	Temperature range	Pressure range	Reference liquid	Reference system	Diaphragm	Flow
SC21-AGP24	Universal pH-glass bulb	50 - 100 MOhm	0 - 14	0 - 80 °C	1 - 500 kPa	Thickened KCl (1 m.)	Ag/AgCl (wire) Silver-silverchloride	Porous PTFE	0
SC21-ASP24	Low-ohmic pH-glass bulb	25 - 50 MOhm	0 - 10	0 - 80 °C	1 - 500 kPa	Thickened KCl (1 m.)	Ag/AgCl (wire) Silver-silverchloride	Porous PTFE	0
SC21-AGC52	Universal pH-glass bulb	50 - 100 MOhm	0 - 14	0 - 100 °C	Atmospheric	KCl-solution (1 m.)	Ag/AgCl (wire) Silver-silverchloride	Ceramic	max. 0,15 ml/day at 10 kPa overpressure
SC21-ASC52	Low-ohmic pH-glass bulb	25 - 50 MOhm	0 - 10	0 - 80 °C	Atmospheric	KCl-solution (1 m.)	Ag/AgCl (wire) Silver-silverchloride	Ceramic	max. 0,15 ml/day at 10 kPa overpressure
SC21-AAC54	Chem. res. pH-glass dome	150 - 250 MOhm	0 - 12	0 - 130 °C	1 - 500 kPa	KCl-solution (3,3 m.) with increased viscosity	Ag/AgCl (wire) Silver-silverchloride	Ceramic	max. 0,5 ml/day at 10 kPa overpressure
SC21-AAP26	Chem. res. pH-glass bulb steam-sterillisable $^3/_4$ bulb	250 - 400 MOhm	2 - 12	0 - 110 °C (temporarily) 0 - 130 °C	1 - 500 kPa	Oversatured KCl, thickened saturated KNO_3 thickened	Ag/AgCl (wire) Silver-silverchloride	Porous PTFE	0

E. TEMPERATURE SENSOR

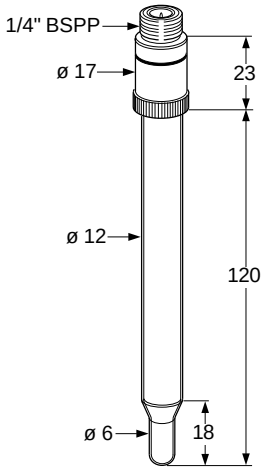
FEATURES

- Temperature sensor: resistance thermometer Pt100 or Pt1000.
- Max. process pressure: 1 MPa (10 bar).
- Max. process temperature: approx. 150 ºC.
- Short response using heat transfer compound.

SM60-Pt0100 Unit: mm



SM60-Pt1000 Unit: mm



SPECIFICATIONS

Type	Temperature sensor	Pressure range	Temp. range
SM60-PT0100	Pt100	0 - 1 MPa	-20 - 150 ºC
SM60-PT1000	Pt1000	0 - 1 MPa	-20 - 150 ºC

Pt100

ºC	Ohm
-25	90,15
-20	92,13
-15	94,10
-10	96,07
-5	98,04
0	100,00
5	101,95
10	103,90
15	105,85
20	107,80
25	109,74
30	111,68
35	113,61
40	115,54
45	117,47
50	119,40
55	121,32
60	123,24
65	125,26
70	127,08
75	129,00
80	130,91
85	132,81
90	134,70
95	136,60
100	138,50
105	140,40
110	142,29
115	144,18
120	146,07

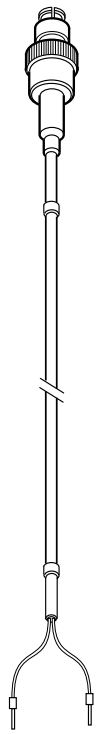
Pt1000

ºC	Ohm
-25	901,5
-20	921,3
-15	941,0
-10	960,7
-5	980,4
0	1000,0
5	1019,5
10	1039,0
15	1058,5
20	1078,0
25	1097,4
30	1116,8
35	1136,1
40	1155,4
45	1174,7
50	1194,0
55	1213,2
60	1232,4
65	1252,6
70	1270,8
75	1290,0
80	1309,1
85	1328,1
90	1347,0
95	1366,0
100	1385,0
105	1404,0
110	1422,9
115	1441,8
120	1460,7

ACCESSORIES AND OPTIONS

Type	Description
WU20-PC01	Cable for single electrode (1 m)
WU20-PC02	Cable for single electrode (2 m)
WU20-PC05	Cable for single electrode (5,5 m)
WU20-PC10	Cable for single electrode (10 m)
WU20-PC15	Cable for single electrode (15 m)
WU20-PC20	Cable for single electrode (20 m)
WU20-PC25	Cable for single electrode (25 m)
WU20-LT01	Cable for combined electrode (1 m)
WU20-LT02	Cable for combined electrode (2 m)
WU20-LT05	Cable for combined electrode (5,5 m)
WU20-LT10	Cable for combined electrode (10 m)
WU20-LT15	Cable for combined electrode (15 m)
WU20-LT20	Cable for combined electrode (20 m)
WU20-LT25	Cable for combined electrode (25 m)

WU20-PC.



SERVICE PARTS

Type	Description
82895202	250 ml, 1 molal KCl-solution
82895203	250 ml, 1 molal KCl-solution with higher viscosity
82895279	O-ring for electrode mounting (6x)
82895011	O-ring (10 x 4) for mounting of electrodes with a long glass shaft (5x)
6C231	Buffer powder pH = 1,68 (at 25 ºC)
6C232	Buffer powder pH = 4,01 (at 25 ºC)
6C236	Buffer powder pH = 9,18 (at 25 ºC)
6C237	Buffer powder pH = 6,87 (at 25 ºC)
FP20-S13	Mounting kit for BELLOMATIC reference electrode and combined electrode type SC21-AAC54
FP20-S14	Mounting kit (pressurisable) for combined electrode type SC21-AAC54
K1500BY	Mounting kit for refillable electrodes with long glass shaft

Note: 82895011 and K1500BY will have to be ordered together.

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