

General Specifications

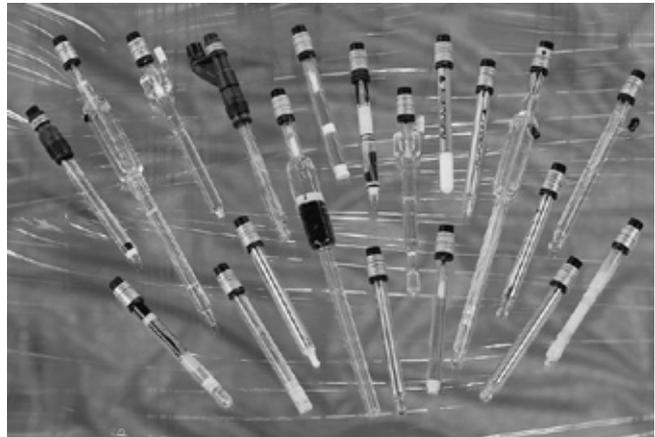
Model SM21/ SR20/ SC21/ SM29/SC29/ SM60
Industrial Electrodes for pH/Redox

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.

The combination electrode plug and cable socket is watertight and temperature is resistant up to 125°C. It meets the requirements of IP65.

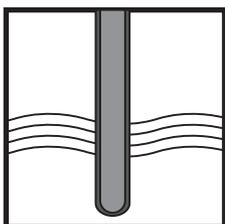
Colour coded strips on electrode and cable and clear identification of sensor specifications make incorrect installation virtually impossible.



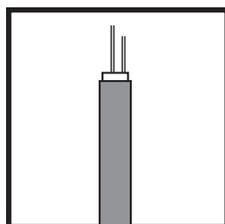
Features

- Wide range of electrodes to suit almost all process conditions.
- The connector parts are gold plated to ensure a good electrical contact under the most severe conditions.
- A 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 various flow-, insertion- and immersion fittings.

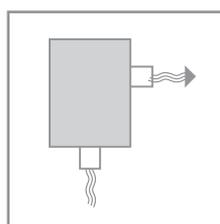
System configuration



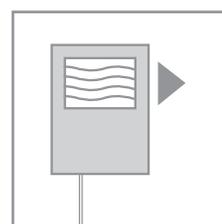
Sensors



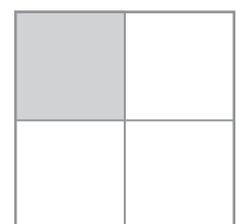
Cables



Fittings



Transmitters



Accessories

General

The principle of pH measurement is quite simple. All one needs is a glass electrode constructed of pH sensitive glass and a reference (potential) that remains stable under all conditions. This directly shows the weak point in the measuring loop. As the reference needs an 'open' circuit to the process, a stable reference potential is sometimes hard to keep. Most reference electrodes have a porous diaphragm to realize this open connection to the process. Several materials are being used like ceramic, Zirconia, PTFE and wood. The porous diaphragm can get clogged or high diffusion potentials may build up. Poisoning of the reference is another cause for unstable reference potentials. A reference electrode can be poisoned by the penetration of the process liquid or by diffusion of components of the process medium through the diaphragm. The stable reference potential which is formed by a Ag/AgCl reference system in a KCl solution is shifted if either gets effected. E.g. silver chloride + sulfide will form the insoluble silver sulfide. These particles give deposits, which can block the diaphragm from inside the reference electrode. Likewise the chloride concentration can be altered and therefore the reference potential is altered. The latter can be corrected by re-calibration. Poisoning of the AgCl reference system is irreversible and the reference electrode needs to be replaced.

Maintenance

For accurate pH measurement, regular (even frequent) maintenance is required. This knowledge is decisive for the

selection of fittings and electrodes of the pH measuring loop. One needs to keep in mind that the electrode(s) must remain accessible and exchangeable. Once the right fitting has been selected, the process of selecting the right electrode(s) must take place.

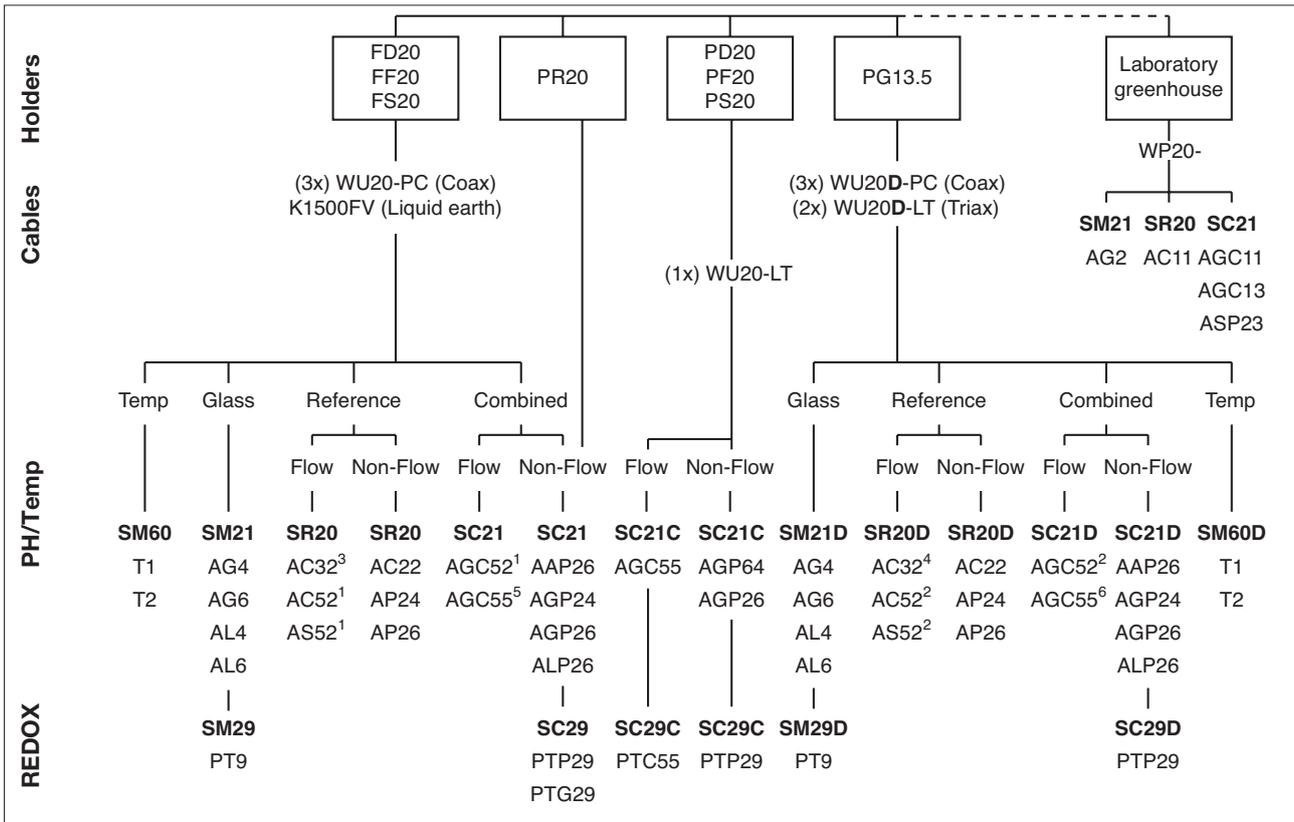
Glass electrode

The SM21-AG4 will suit the great majority of the pH applications as this electrode is constructed in such a way that its sensitivity and strength are optimized. When sensitivity is required more than strength than the SM21-AG2 should be selected. For tough industrial applications (including auto-cleaning) the dome shaped electrode is the best selection. 'L'-glass should be selected when the electrode is used at higher temperatures (>70°C) and/or in applications that need a glass type that is resistant to chemical attack.

Reference electrode

Reference electrodes come in flowing- and non-flowing types. Flowing types such as the SR20-AC52, AC32 with a ceramic diaphragm are used in processes that have low ionic strength such as (ultra) pure water. The SR20-AS52 is a flowing type electrode with a sleeve junction. Due to the high electrolyte flow rate, the sensor is suitable for UPW application as well as in highly polluting applications. The electrolyte flow towards the process tends to keep the junction clean from clogging and poisoning. For all other applications the SR20-AP24 is preferred. When the process cannot withstand KCl, the SR20-AP26 should be used.

Electrode Selection Diagram



Note	Electrode	Mounting	Reservoir	Electrolyte	Thickened electrolyte
1	SR20-AC52 / SC21-AGC52	K1500BY	K1500FU	K1520VA	K1520VN
2	SR20D-AC52 / SC21D-AGC52	included	K1500FU	K1520VA	K1520VN
3	SR20-AC32	FP20-S13	-	K1520VA	K1520VN
4	SR20D-AC32	FP20-S13D	-	K1520VA	K1520VN
5	SC21C-AGC55	included	K1520YA	K1520VA	K1520VN

Yokogawa has her own specific cap (Y-CAP). The process connection for this cap is M25 and can be mounted in all the fittings that are available in our program

Secondly we have the D-CAP, which has a PG13,5 process connection and is often used in the German market. The sensors with D-CAP fit into all our fittings when using the adapter K1500DV (PVDF) or adapter K1520JN (PVC). The SR20D-AC32 needs a mounting kit, when mounted into our fittings. One is specifically for the Y-cap FS20-S13 another for the D-CAP (FP20-S13D). The SR20-AS52 and AC52 also need a mounting kit to fit into a pH fitting regardless if it is a D- or Y-CAP (K1500BY). With the FD20, FF20, FS20 fittings this mounting kit can be ordered as an option (option /R)

The third available connector is the C-CAP. These sensors are suitable for mounting in our Compact fitting program (PD20, PF20 and PS20).

Single pH Glass Electrodes

The AG4 will suit the majority of pH measurement with separate electrodes. For heavy industrial applications (including automatic cleaning) the AG6 is a better selection due to its strength.

"L"-type glass is selected when process conditions deteriorate. The thickness of the glass is specified by the suffix code.

2: 01. - 0.2 mm, 4: 0.3 - 0.4 mm, 6: > 1 mm

Features

- "All glass" construction.
- Dimensions and design meet the requirements of DIN 19263.
- Isothermal point of intersection: pH 7 (nominal value at 0 mV).
- Maximum pressure: 1000 kPa (10 bar).
- Metal foil screening.
- Bulb membrane for general purpose.
- Dome shaped membrane for "Heavy Duty" applications.

Additional characteristics for type SM21-AG2

- Use in light applications or laboratory environment where its sensitivity is more important than its strength.
- General (G) purpose glass membrane for a fast response.
- pH, temperature range: 0 to 14 pH, 0 to 80°C.
- Glass resistance (25°C): 25 to 50 M Ω .
- Ag/AgCl wire reference system.

Additional characteristics for type SM21(D)-AG4

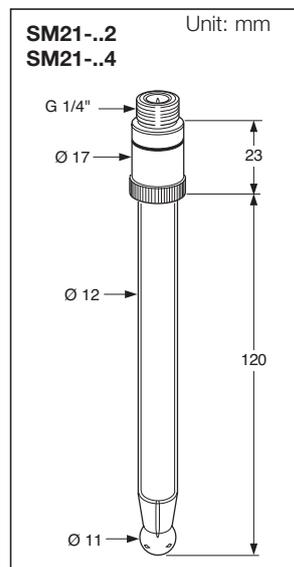
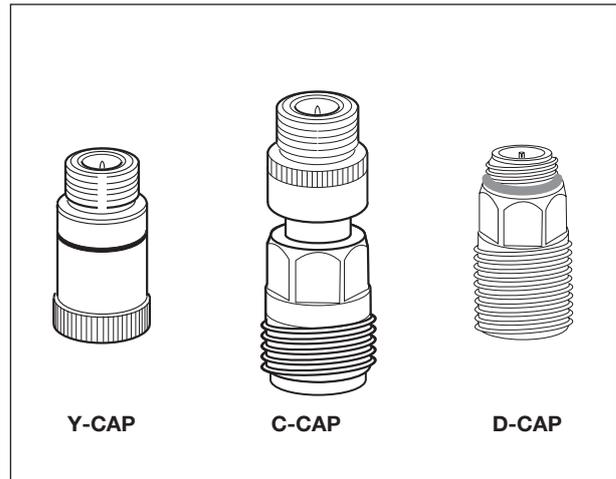
- Universal pH electrode suitable for the majority of pH applications.
- Shock proof general (G) purpose glass membrane
- pH, temperature range: 0 to 14 pH, 0 to 100°C.
- Glass resistance (25°C): 50 to 100 M Ω .
- High quality Ag/AgCl pin reference system.

Additional characteristics for type SM21(D)-AG6

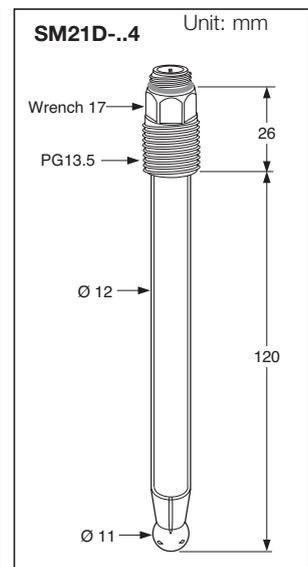
- Large area, dome shape membrane construction guarantees great strength, retaining the necessary sensitivity.
- For use in slurries and highly polluting fluids.
- Suitable for autocleaning applications.
- pH, temperature range: 0 to 14 pH, 0 to 100°C.
- Glass resistance (25°C): 120 to 200 M Ω .
- High quality Ag/AgCl pin reference system

Additional characteristics for type SM21(D)-AL4

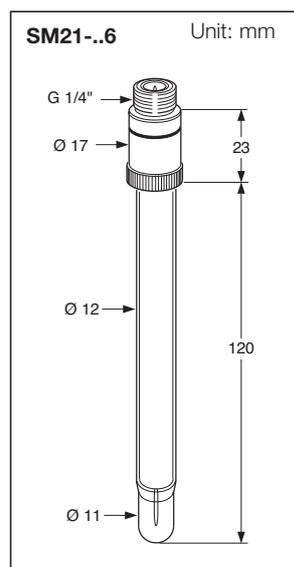
- L-Glass is chemical resistant and very suitable for high temperature applications (continuously > 70°C).
- Shock proof general (G) purpose glass membrane
- pH, temperature range: 0 to 14 pH, 15 to 130°C.
- Glass resistance (25°C): 300 to 450 M Ω .
- High quality Ag/AgCl pin reference system.



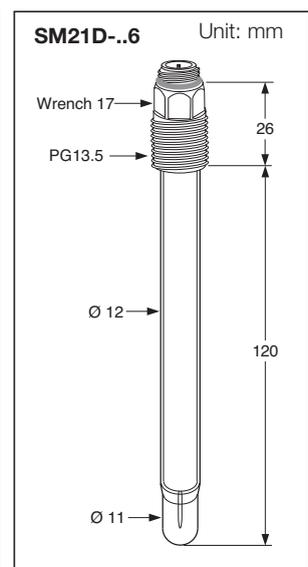
General (ball)



General (ball)



"Heavy Duty" (Dome)



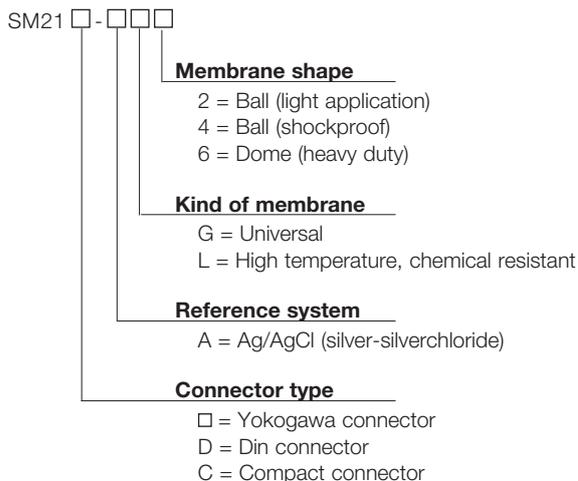
"Heavy Duty" (Dome)

Additional characteristics for type SM21(D)-AL6

- Dome shape membrane in combination with L-glass ensures mechanical strength and chemical resistance. Recommended in higher temperature applications (continuously > 70°C).
- Suitable in hot caustic applications.
- Suitable in processes with traces of HF.
- 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.

Note: The resistance may not exceed 1000 MΩ under measuring and calibrating conditions (according DIN the resistance of the glass may not exceed 1GΩ). As a general rule, the glass-resistance will increase by 100% with every temperature decrease of 10°C (likewise, the glass impedance will decrease by 50% with every temperature increase of 10°C).

Type coding



Specifications Single pH Glass Electrodes

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

Single Reference Electrodes (non-flow)

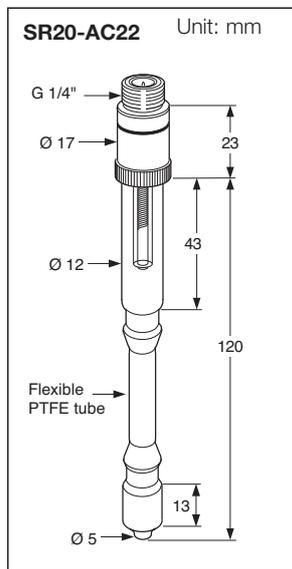
A non-flow type reference electrode can be used for processes that don't contain components that poison the reference system. The gel-type electrodes have a large area of porous PTFE junction for optimal resistance against electrode pollution. The SR20-AP26 electrode is the optimal choice for processes that cannot stand contamination with KCl. The SR20-AC22 electrode has a flexible PTFE tube. Therefore this electrode can be applied in processes with frequent temperature- and pressure fluctuations.

Features

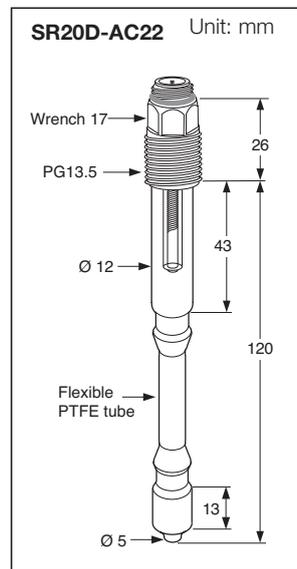
- Easy maintenance.
- No reference liquid wastage.
- Maximum process pressure: 1000 kPa (10 bar).
- High quality Ag/AgCl reference system (pin) which can stand high temperatures

Additional characteristics of types SR20(D)-AC22

- Temperature / pressure variation compensation.
- To be used in non-polluting fluids.
- Saturated KCl-solution (pellets).
- For low ionic applications and high temperatures.
- Temperature range: 0 to 120°C.
- Diaphragm resistance (25°C) <5kΩ.



Two-phase electrode



Two-phase electrode

Additional characteristics of type SR20(D)-AP24

- General purpose PTFE diaphragm electrode.
- Large PTFE diaphragm.
- Thickened KCl-solution (3.3 m.).
- Temperature range: 0 to 80°C.
- Diaphragm resistance (25°C) <5k Ω .

Additional characteristics of type SR20(D)-AP26

- When KCl is prohibited in the application.
- Double junction, thickened KNO₃ in buffer compartment.
- Large PTFE diaphragm against pollution.
- Thickened KCl-solution (3.3 m.).
- Temperature range: 0 to 80°C.
- Diaphragm resistance (25°C) <5k Ω .

Type coding

SR20 □ - □ □ □

Liquid outlet**Non-flow**

- 22 = PTFE hose filled with KCl pellets
- 24 = Filled with thickened electrolyte
- 26 = Double junction filled with gelled Gel-type electrodeelectrolyte

Flow

- 11 = Refillable laboratory reference electrode
- 32 = Process pressure compensated
- 52 = Refillable at the top

Diaphragm

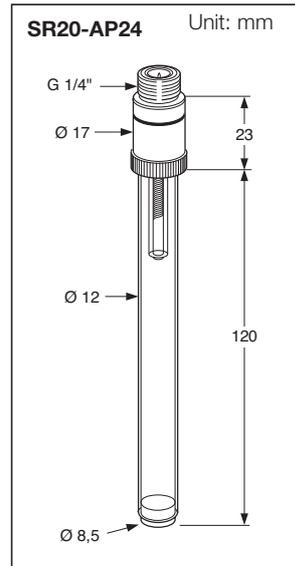
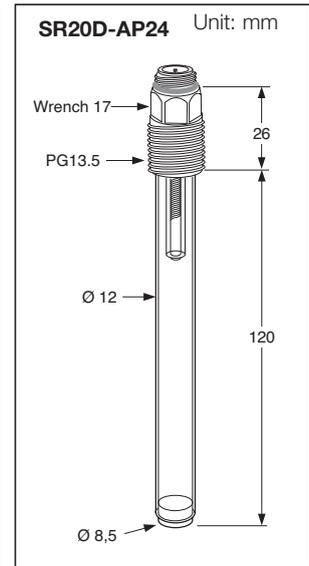
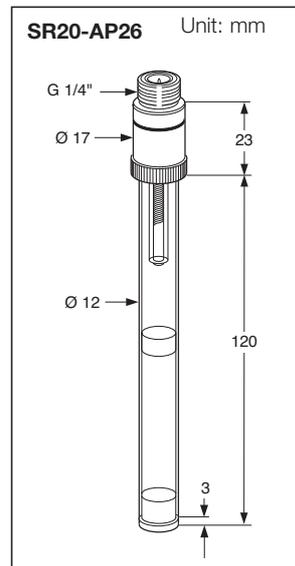
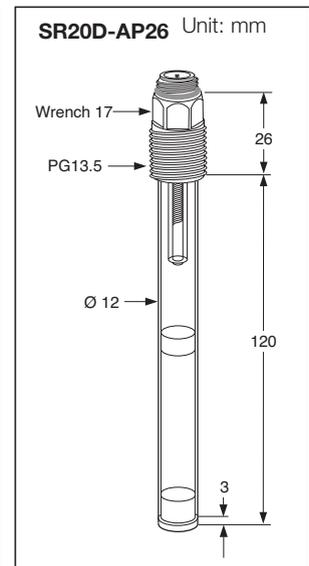
- C = Ceramic
- P = PTFE (porous)
- S = Sleeve

Reference system

- A = Ag/AgCl (silver-silverchloride)

Connector type

- = Yokogawa connector
- D = Din connector
- C = Compact connector

**Gel-type electrode****Gel-type electrode****Double junction gel-type****Double junction gel-type****Specifications Single Reference Electrodes (non-flow)**

Type	Temperature range (°C)	Reference liquid	Reference system	Diaphragm	Diaphragm resistance/25°C
SR20(D)-AC22	0 - 120	Saturated KCl-solution (pellets)	Ag/AgCl (pin) Silver-silverchloride	Ceramic	< 5 kOhm
SR20(D)-AP24*	0 - 80	Thickened KCl (3.3 m.)	Ag/AgCl (pin) Silver-silverchloride	PTFE	< 5 kOhm
SR20(D)-AP26*	0 - 80	Thickened KCl (3.3 m.) Thickened KNO ₃ (3.3 m.)	Ag/AgCl (pin) Silver-silverchloride	PTFE	< 5 kOhm

* In application where high process temperature occur together with very low (<2) or very high (>12) PH levels the lifetime is shortened.

Single Reference Electrodes (flow)

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 the electrode should be connected to a KCl-reservoir (K1500FU) giving extra static pressure. The ceramic junction is suitable for most applications. In strong polluting processes a sleeve junction is preferable.

Features

- Liquid flow output preventing diaphragm fouling and poisoning the reference system.
- High quality Ag/AgCl reference system (pin) which can stand high temperatures and temperature fluctuations.
- Standard 3.3 m. KCl electrolyte, at temp. above 70°C thickened electrolyte is advised.

Additional characteristics of type SR20-AC11

- Long life laboratory reference electrode.
- Fast response time by design.
- Less suitable for polluted fluids.
- Temperature range: 0 to 100°C.
- Atmospheric pressure.

Additional characteristics of type SR20(D)-AC32

- Automatic compensation for process pressure variations.
- Chemical resistant Viton Bellow material.
- Constant flow of reference liquid, independent of the process pressure variations for minimal diffusion potential.
- Suitable for pure water applications and for polluting fluids.
- Refillable, large KCl reservoir.
- Maximum process pressure 1000 kPa (10 bar).
- Temperature range: 0 to 120°C.
- Diaphragm resistance (25°C) < 10 kΩ.

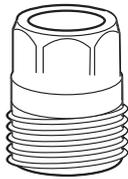
Note:

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, ordernr. K1520VN (3.3 m. KCl).

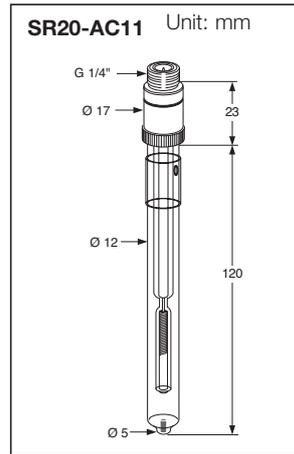
Additional characteristics of type SR20(D)-AC52

- For non-polluting, low ionic fluids.
- Maximum process pressure 100 kPa (atmospheric).
- Temperature range: 0 to 100°C.
- Diaphragm resistance (25°C) < 10 kΩ.
- Flow rate at 25°C: 0.5 ml/day.

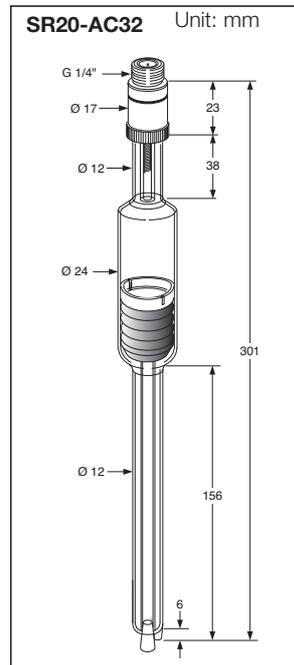
***) Note** Mounting kit for types SC21-AGC52, SC21-ASC52, SR20-AC52 and SR20-AS52 (accessory). Part number K1500BY.



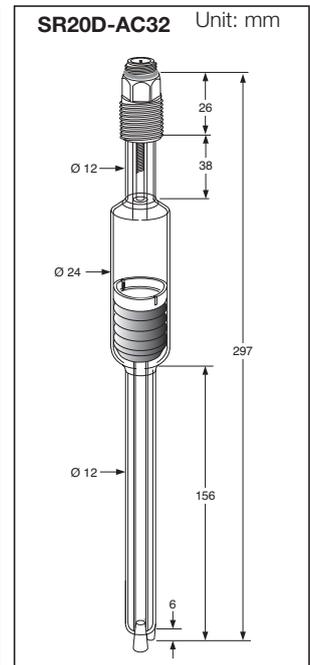
K1500BY →



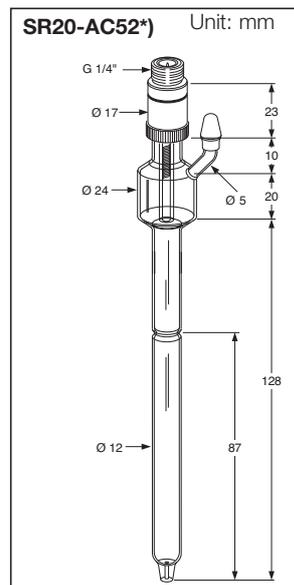
Refillable at the side



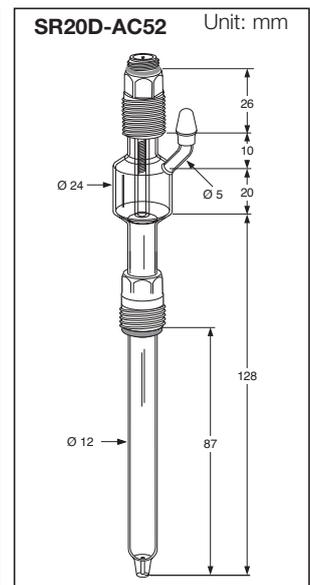
Bellomatic



Bellomatic



Refillable at the top



Refillable at the top

Additional characteristics of type SR20(D)-AS52

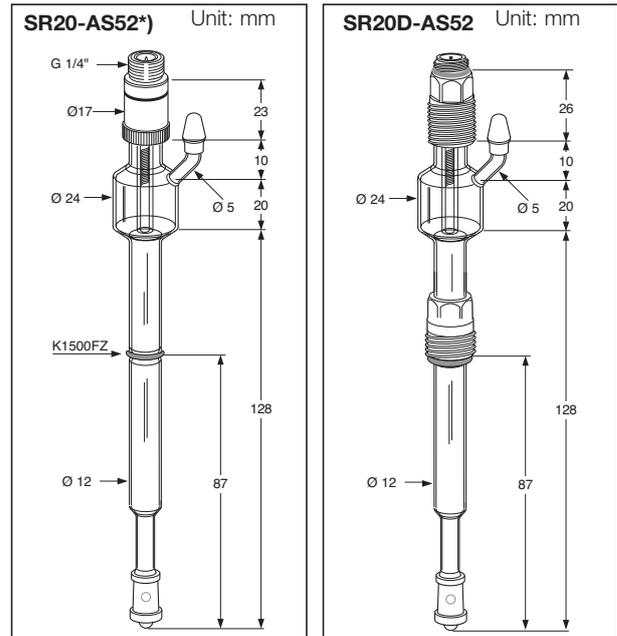
- Sleeve junction is suitable for pure water applications and very strong polluted liquids.
- Maximum process pressure 100 kPa (atmospheric).
- Temperature range: 0 to 100°C
- Diaphragm resistance (25°C) < 10 kΩ.
- Flow Rate at 25°C: 5.0 ml/day at 10 kPa overpressure.

Spare Parts SR20

Part no.	Description
K1500BZ	O-rings Viton 11x3 (6Pcs)
K1500FZ	O-rings 10x4 5pcs SR20-AC52
K1500GE	O-ring sets (5x). SR20(D)-.C32/52

Spare Parts SR20D

Part no.	Description
K1500GG	Thickened electrolyte 1M KCl (250 ml)
K1520VA	Electrolyte 3.3 m. KCl (250 ml)
K1520VN	Thickened electrolyte 3.3 m. KCl (250 ml)



Specifications Single Reference Electrodes (flow)

Type	Temp. range (°C)	Pressure range	Reference liquid	Reference system	Diaphragm	Diaphragm resistance/25°C	Flow at 25°C
SR20(D)-AC52	0 - 100	Atmospheric	KCl-solution (3.3 m.)	Ag/AgCl (pin) Silver-silverchloride	Ceramic	< 10 kOhm	Max. 0.5 ml/day at 10 kPa overpressure
SR20(D)-AS52	0 - 100	Atmospheric	KCl-solution (3.3 m.)	Ag/AgCl (pin) Silver-silverchloride	Sleeve	< 10 kOhm	Max. 5 ml/day at 10 kPa overpressure
SR20(D)-AC32	0 - 120	0 - 1 MPa	KCl-solution (3.3 m.)*	Ag/AgCl (pin) Silver-silverchloride	Ceramic	< 10 kOhm	Max. 0.2 ml/day*
SR20-AC11	0 - 100	Atm.	KCl-solution (3.3 m.)*	Ag/AgCl (pin) Silver-silverchloride	Ceramic	< 10 kOhm	Max. 0.2 ml/day*

Mounting Kit, type FP20-S13(D)

This mounting kit is used whenever a refillable electrode with a large KCl reservoir is to be fitted in a flow or immersion fitting.

Specifications

Materials

Electrode mounting set	: Ryton R4
Body	: stainless steel (AISI 316)
Screw piece	: stainless steel (AISI 316)
O-rings	: silicone
Rings	: silicone
Weight	: approx. 120 g

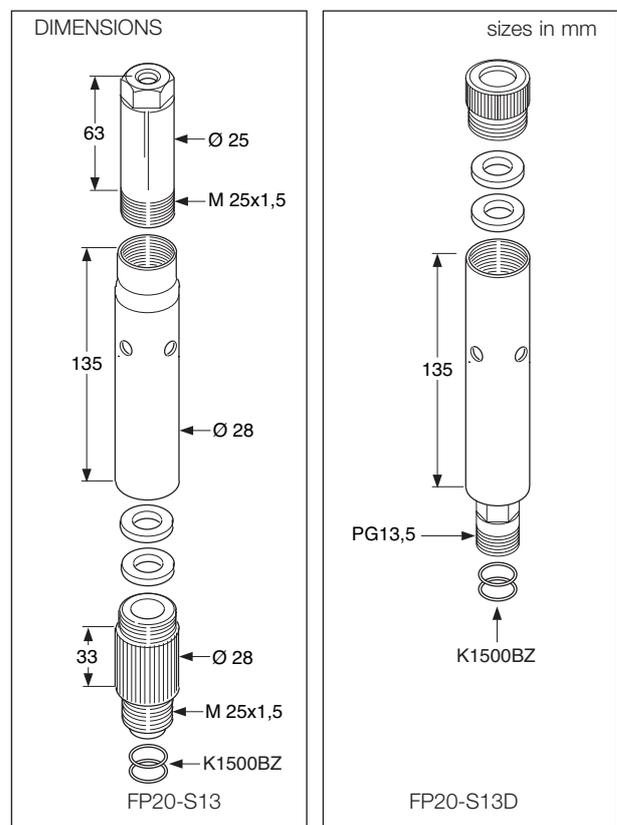
Electrodes to be used

Type nr.	Description
FP20-S13	Mounting kit for SR20-AC32
FP20-S13D	Mounting kit for SR20D-AC32
K1500HC	Rubber ring (10x)
K1500GE	O-rings (5x) for "BELLOMATIC" electrode

Ordering Instructions

Type nr.	Description
SR20-AC32	Reference electrode "BELLOMATIC"
SR20D-AC32	Reference electrode "BELLOMATIC", PG13,5

*) Note: on page 6



Electrolyte Reservoirs for F..20 fittings

The purpose of the electrolyte reservoir is dual. By mounting the electrolyte reservoir at a certain distance above the electrode, the pressure on the reference liquid in an electrode and hence, the liquid outlet of the electrode can be increased. The amount of electrolyte is increased, so less refilling is required. The reservoir can be connected to the electrode by a silicone tube.

For fixing on top of an immersion fitting a screw thread $\frac{1}{2}$ " BSPP at the lower end of the reservoir is available.

Specifications

Material	: PVC, PVC (transparent)
Temperature	: max. 70°C
Tube connection	: Ø 10
Screw thread	: 1/2" BSPP

Ordering Instructions

Type no.	Description
K1500FU	Electrolyte reservoir (SR20-A.52 / SC21-A.C52) (includes 2.5 mtr. silicon tubing)
K1500GA	5 mtr silicon tubing (7x4mm od,id)
K1500GF	Electrolyte 1M KCl (250 ml)
K1500GG	Thickened electrolyte 1M KCl (250 ml)
K1520FJ	1/4 inch Nylon tubing (5 mtr)
K1520FK	1/4 inch Nylon tubing (10 mtr)
K1520JN	Mounting adapter PG13.5 - M25 (PVC-C)
K1500DV	Mounting adapter PG13.5 - M25 (PVDF)
K1520VA	Electrolyte 3.3 m. KCl (250 ml)
K1520VN	Thickened electrolyte 3.3 m. KCl (250 ml)

Salt Bridge - SB20

This reference electrode/salt bridge combination allows the measurement of pH or redox in those cases when:

- Excessive contamination of the reference diaphragm or poisoning of the reference system is expected. The flow of the reference liquid through the diaphragm is increased by pressuring the container. The distance to the reference system is increased. Consequently, the contamination rate will decrease.
- The process can not stand the contamination with KCl. The salt bridge can be filled with several electrolytes.
- Measurement have to be performed at processes up to 1000 kPa (10 bar) and temperatures up to 100°C. As the reference electrode is mounted in the container and therefore in more favourable conditions, the lifetime will be extended reasonably. The container with reference liquid can be pressurised.

FLOW TUBE (A)

Material	: glass
Flow diaphragm	: ceramic, PTFE or sleeve
Connector	: Ryton R4

TUBING (B)

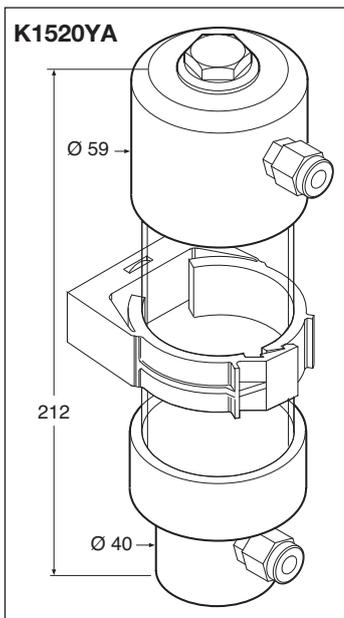
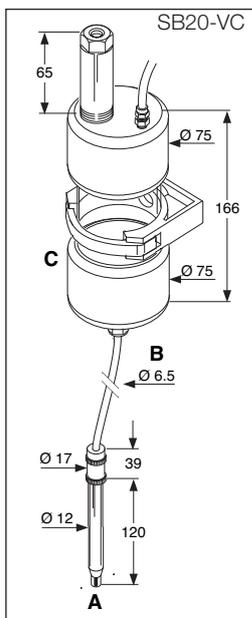
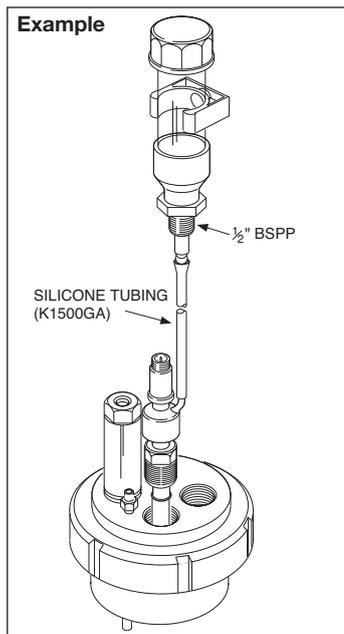
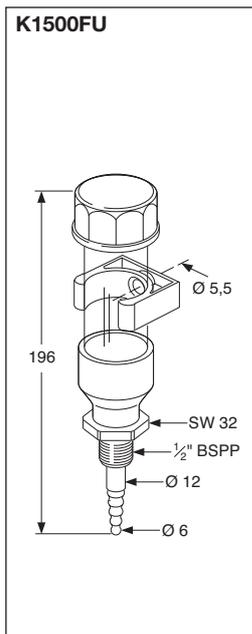
Material	: nylon
Diameter	: 1/4" o.d.
Length	: 2 mtr.

CONTAINER (C)

Container	: PVC, PVC (transparent)
Electrode mounting set	: Ryton R4
"O" ring	: silicone
Connection	: nylon
Weight	: approx. 300 g.
Mounting	: wall mounting (support with hole for screw M5)

Temperature/pressure ratio : max. 200 kPa (2 bar) at 100°C

The normal standard reference electrodes can be mounted in the container. This reference electrodes can be ordered separately. For standard applications the SR20-AP24 is most suitable.



Spare Parts SB20

Part no.	Description
K1500BW	Flow tube for SB20-VC
K1500DW	Set of 12 cable nuts for WU20
K1500DX	5 m tubing for SB20
K1500EE	Flow tube for SB20-VP
K1500EF	Flow tube for SB20-VS
K1500GR	O-rings silicon 11x3 8pcs
K1500HD	O-rings silicon 11x3 50pcs

Ordering Instruction

SB20-VC	Ceramic Junction
SB20-VP	Porous PTFE Junction
SB20-VS	Glass Sleeve Junction

Combined pH Electrodes (non-flow)

The non-flow type has a polymer gel electrolyte and a PTFE junction resulting in low maintenance. The electrodes with the dome membrane are particularly suited for applications where mechanical strength and chemical stability are important, where deposits are heavy and frequent cleaning is required. All double junction

electrodes provide a longtime stability and a prolonged lifetime.

As a general rule:

In application where high process temperature occur together with very low (<2) or very high (>12) pH levels the lifetime is shortened.

Additional characteristics of type SC21(D)-ASP23

- Noryl body (30% glass filled).
- Suitable for low temperatures.
- pH, temperature range: 0 to 10 pH, 0 to 80°C.
- Maximum process pressure 500 kPa.
- Glass Resistance (25°C): 40 to 100 MΩ.
- Diaphragm resistance (25°C) < 5 kΩ.
- Ag/AgCl wire reference system.
- Less maintenance by the combination of gelled electrolyte and porous PTFE.
- KCl electrolyte (3.3 m.)

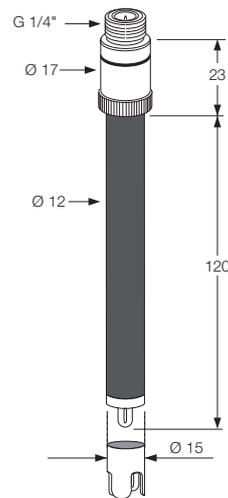
Additional characteristics of types SC21(D)-AGP24

- pH, temperature range: 0 to 14, 0 to 80°C.
- Maximum process pressure 500 kPa.
- Glass Resistance (25°C): 50 to 100MΩ.
- Ag/AgCl wire reference system.
- pH bulb with cage protection (no breakage when placed in a beaker).
- Less maintenance due to the gelled electrolyte and porous PTFE.
- Thickened electrolyte (3.3 m.).

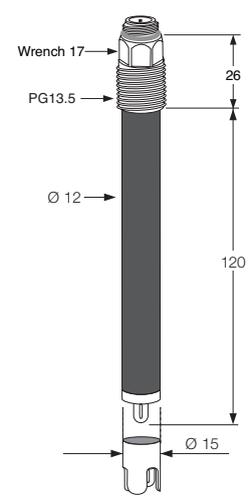
Additional characteristics of type SC21(D)-AAP26

- pH, temperature range: 0 to 14 pH, 0 to 110°C.
- Maximum process pressure 500 kPa.
- Glass Resistance (25°C): 250 to 400 MΩ.
- Diaphragm resistance (25°C) < 5 kΩ.
- High quality Ag/AgCl reference system (pin) which can stand high temperatures and temperature fluctuations.
- Built-in salt bridge to prevent poisoning of the reference system.
- A large area PTFE junction to resist fouling to a high degree.
- Chemical resistant, steam-sterilisable pH-glass.

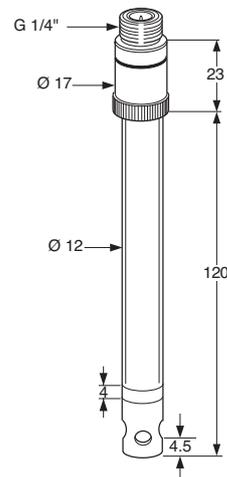
SC21-ASP23 Unit: mm



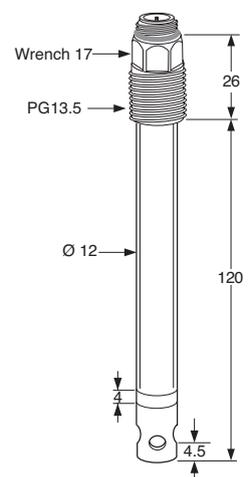
SC21D-ASP23 Unit: mm



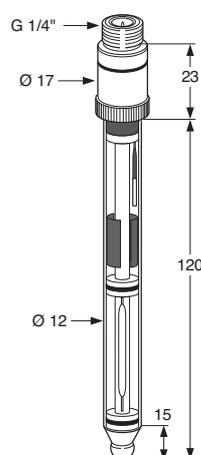
SC21-AGP24 Unit: mm



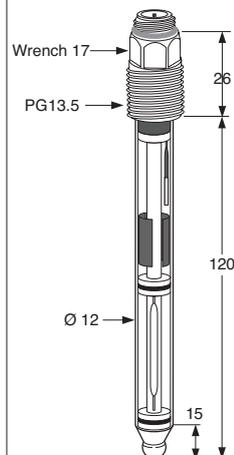
SC21D-AGP24 Unit: mm



SC21-AAP26 Unit: mm



SC21D-AAP26 Unit: mm



Additional characteristics of type SC21(D)-ALP26

- pH, temperature range: 0 to 14 pH, 10 to 120°C.
- Maximum process pressure 500 kPa.
- Glass Resistance (25°C): 500 to 900 MΩ.
- Diaphragm resistance (25°C) < 5 kΩ.
- High quality Ag/AgCl reference system (pin) which can stand high temperatures and temperature fluctuations.
- Double junction (thickened saturated KCl-solution). Built-in salt bridge prevents poisoning of the reference system.
- Heavy duty glass membrane for prolonged operation in corrosive, abrasive and fouling environments (withstanding traces of HF).
- Large area PTFE junction to resist fouling.
- Chemical resistant, steam-sterilisable pH-glass.

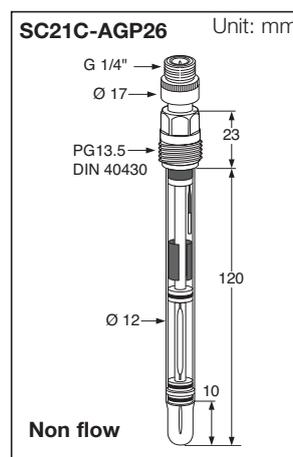
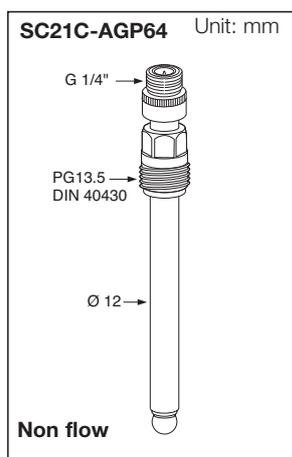
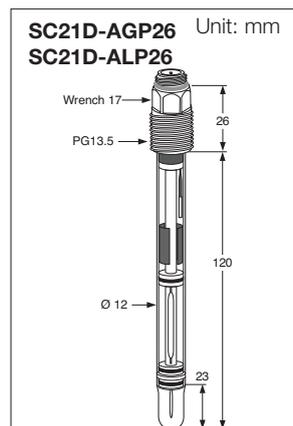
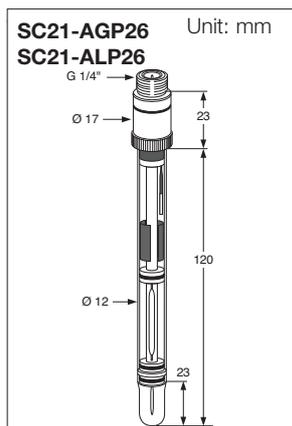
Additional characteristics of type SC21(D)-AGP26

- pH, temperature range: 0 to 14 pH, -10 to 100°C.
- Maximum process pressure 500 kPa.
- Glass Resistance (25°C): 120 to 200 MΩ.
- Diaphragm resistance (25°C) < 5 kΩ.
- High quality Ag/AgCl reference system (pin) which can stand high temperatures and temperature fluctuations.
- Double junction (thickened saturated KCl-solution). The built-in salt bridge prevents poisoning of the reference system.
- Heavy duty glass membrane for prolonged operation in corrosive, abrasive and fouling environments (withstanding traces of HF).
- A large area PTFE junction to resist fouling.

Additional Features

Additional characteristics of types SC21C-AGP64

- pH, temperature range: 0 to 14, 0 to 80°C
- Maximum process pressure 500 kPa
- Glass Resistance (25°C): 50 to 100 MΩ
- Ag/AgCl wire reference system
- Less maintenance by the combination of gelled electrolyte and porous PTFE.
- 3.3 m KCl electrolyte



Type coding

SC21□ - □□□□

Liquid outlet

- 2 = Non-flow
- 23 = Noryl housing and gelled electrolyte
- 24 = Filled with gelled electrolyte
- 26 = Double junction filled with gelled el.

Diaphragm

- C = Ceramic
- P = PTFE (teflon)

Membrane

- S = Low ohmic
- G = Universal
- L = high temperature

Reference system

- A = Ag/AgCl (silver-silverchloride)

Connector type

- = Yokogawa connector
- D = Din connector
- C = Compact connector

Specifications Combined pH Electrodes (non-flow)

Type	Membrane	Resistance in MΩ/25°C	pH-range	Temp. range (°C)	Pressure range kPa	Reference liquid	Reference system	Diaphragm	Flow
SC21(D)-AGP24	Universal pH-glass bulb	50 - 100	0 - 14	0 - 80	1-500	3.3 m. KCl Thickened	Ag/AgCl (wire) Silver-silverchloride	Porous PTFE	0
SC21(D)-ASP23	Low ohmic pH-glass bulb	40 - 100	0 - 10	0 - 80	1-500	3.3 m. KCl Thickened	Ag/AgCl (wire) Silver-silverchloride	Porous PTFE	0
SC21(D)-AAP26	Chem. res. pH-glass bulb steam-sterilisable 3/4 bulb	250 - 400	0 - 14	0 - 110	1-500	Oversaturated KCl thickened	Ag/AgCl (wire) Silver-silverchloride	Porous PTFE	0
SC21(D)-ALP26	Universal pH-glass bulb	500 - 900	0 - 14	10 - 120	1-500	Oversaturated KCl thickened	Ag/AgCl (wire) Silver-silverchloride	Porous PTFE	0
SC21(D)-AGP26	Chem. res. pH-glass dome	120 - 200	0 - 14	-10 - 100	1-500	Oversaturated KCl thickened	Ag/AgCl (wire) Silver-silverchloride	Porous PTFE	0
SC21(C)-AGP64	Universal pH-glass bulb	50 - 100	0 - 14	0 - 80	1-500	3.3 m. KCl Thickened	Ag/AgCl (wire) Silver-silverchloride	Porous PTFE	0

Combined pH Electrodes (Flow)

These flowing electrolyte sensors use a ceramic reference junction, with the electrolyte (3.3 molal KCl) and are suitable for light (laboratory included) applications. The SC21-AGC52, ASC52 can be connected to an electrolyte reservoir to give it the static overpressure (gravity) to suit the application. The flow of electrolyte through the junction, while small, remains the safest way to prevent clogging and to protect the internal reference against poisoning and diffusion. The SC21-AGC13 with its narrow shaft is particularly usefull for test tube measurements

Additional characteristics of type SC21-AGC11

- Refillable combined laboratory electrode.
- pH, temperature range: 0 to 14 pH, 0 to 80°C.
- Atmospheric pressure.
- Glass Resistance (25°C): 50 to 100 MΩ.
- Ag/AgCl wire reference system.

Additional characteristics of type SC21-AGC13

- Narrow shaft for test tube measurements.
- pH, temperature range: 0 to 14 pH, 0 to 80°C.
- Atmospheric pressure.
- Glass Resistance (25°C): 50 to 160 MΩ.
- Ag/AgCl wire reference system.

Additional characteristics of type SC21(D)-AGC52

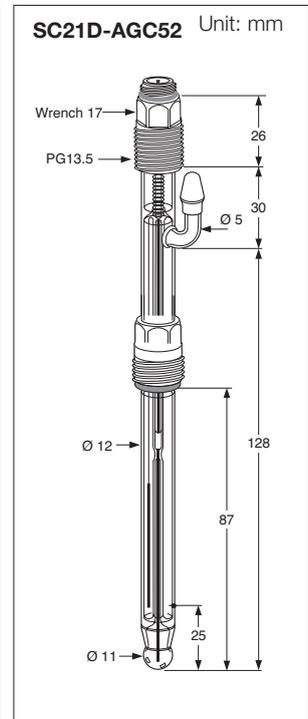
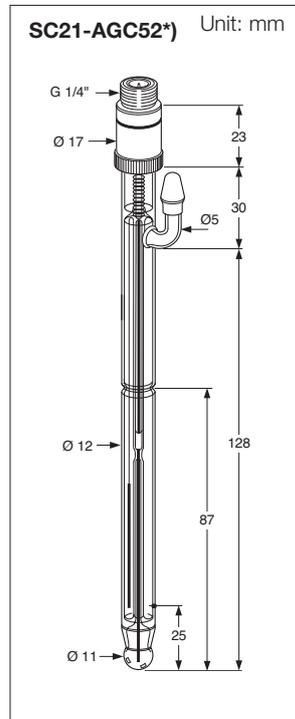
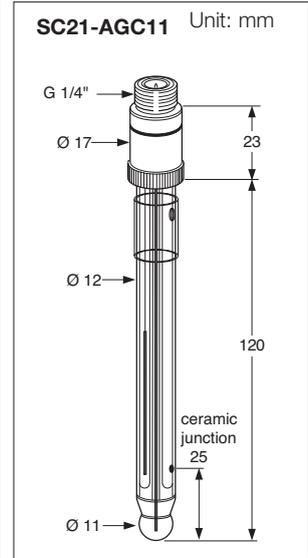
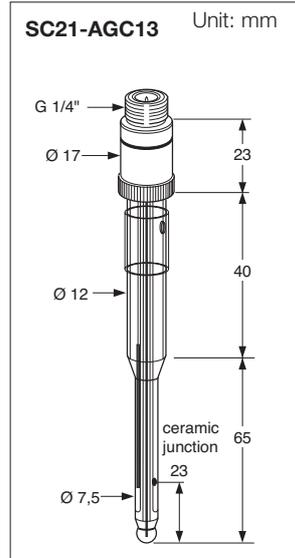
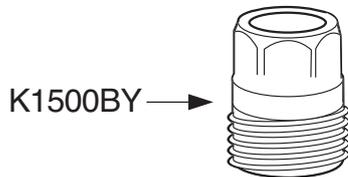
- Combined pH electrode for light applications.
- pH, temperature range: 0 to 14 pH, 0 to 80°C.
- Atmospheric pressure (static overpressure).
- Glass Resistance (25°C): 50 to 100 MΩ.
- Ag/AgCl wire reference system.
- Flow Rate at 25°C: 0.15 ml/day at 10kPa overpressure (electrolyte reservoir at a height of 1 mtr).

Note for the SC21(D)-AGC52:

- For mounting the electrode in one of the Yokogawa fittings, mounting kit K1500BY is required.
- The electrolyte flow reservoir can be ordered under number K1500FU.

Note: For more severe industrial applications we recommend the SC21C-AGC55 electrode (see page 12).

***) Note:** Mounting kit for types SC21 -AGC52, SC21 -ASC52, SR20-AC52 and SR20-AS52 (accessory). Part number K1500BY.



Spare Parts SC21

Part no.	Description
K1500BZ	O-rings Viton 11x3 (6Pcs)
K1500GF	1 Molal KCl sol. 250 ml
K1520JN	Adapter M25x1.5 - PG13.5
K1520VA	3.3 molal KCl solution

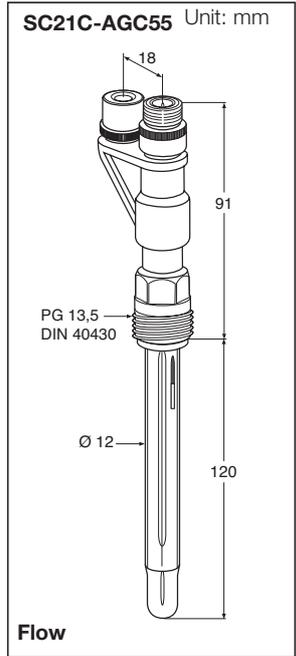
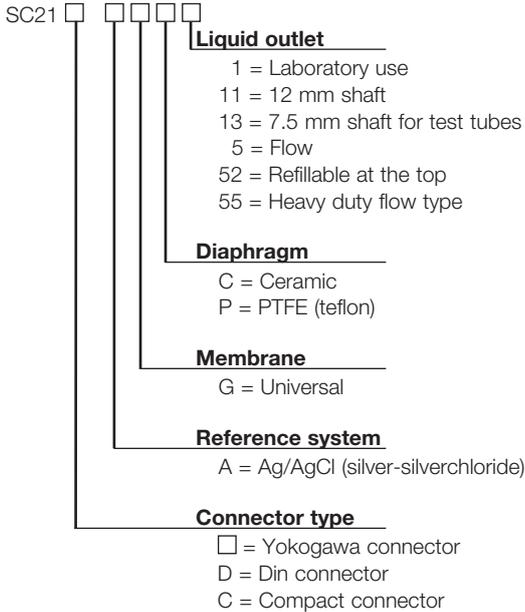
Specifications Combined pH Electrodes (Flow)

Type	Membrane	Resistance in MOhm/25°C	pH-range	Temperature range (°C)	Pressure liquid	Reference system	Reference	Diaphragm	Flow
SC21-AGC11	Universal pH-glass bulb	50 - 100	0 - 14	0 - 80	atm.	3.3 m. KCl	Ag/AgCl pin	Ceramic	0
SC21-AGC13	Universal pH-glass bulb	50 - 160	0 - 14	0 - 80	atm.	3.3 m. KCl	Ag/AgCl pin	Ceramic	0
SC21(D)-AGC52	Universal pH-glass bulb	50 - 100	0 - 14	0 - 80	atm.	3.3 m. KCl	Ag/AgCl wire	Ceramic	0
SC21(C)-AGC55	Universal pH-glass dome (heavy duty)	120 - 200	0 - 14	0 - 100	1-500kPa (only with pressure reservoir)	3.3 m.. KCl	Ag/AgCl pin	Ceramic	max. 3 ml per day at 10kPa overpressure

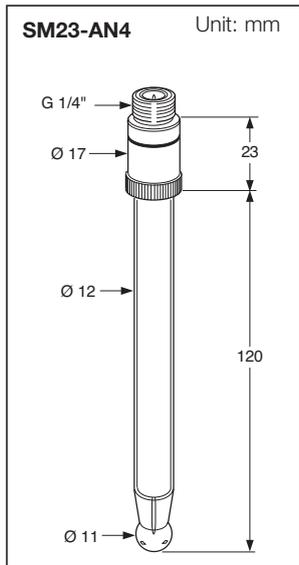
Additional features for types SC21C-AGC55

- pH, temperature range: 0 to 14, 0 to 100°C
- Maximum process pressure 500 kPa
- For tough application where pollution of the reference system is to be expected
- Low ionic application where the positive flow of electrolyte provides the conductivity needed to measure pH
- Heavy duty pH sensitive glass.
- Flowing reference system for pollution resistance, and highly stable reference potential.
- PG13.5 standard DIN electrode connection.
- Adapter to ensure compatibility with full fitting program.
- Use in combination with the pressurisable electrolyte reservoir to obtain a positive flow towards the process (K1500YA)

Type coding

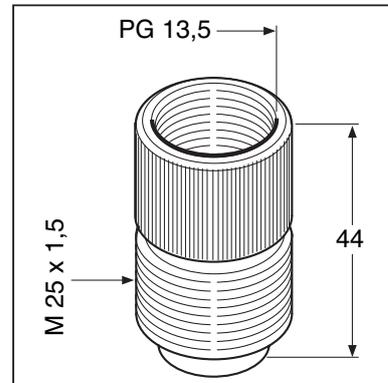


For compatibility with the Yokogawa "Compact" range of electrode holders, the SC21C-AGC55 combined sensor, has a PG13.5 DIN connector. This also makes the sensor suitable for mounting in a wide range of industry standard equipment. The SC21C-AGC55 is supplied with a PG13.5 to M25 adapter (K1520JN) that makes the sensor compatible with the full Yokogawa fitting program. For temperatures higher than 85°C we recommend to use the PVDF version.



General (ball)

Model	Suffix Code	Description
SM23		Ion selective sensor
	-AN4	Sodium sensitive (pNa)



K1520JN (PVC-C), K1500DV (PVDF)

Redox Electrodes

Redox measurements are a potentiometrical measurement of the oxidizing/reducing power of a liquid. To be able to measure this equilibrium of reversible redox reactions the electrodes used should be inert. Noble electrodes such as Platinum (Pt) and Gold (Au) are widely used for this purpose and seem to approximate the behaviour of an ideal inert electrode. Platinum is used most widely, has excellent chemical resistance but suffers slightly from chemisorption of Oxygen, which slows down its response. Gold has good properties in strongly oxidizing solutions not containing Chloride or Bromide. Gold is not resistant to Cyanide. Silver is used only for Silver analysis and as reference sensor without junction. Silver has limited chemical resistance.

- Temperature 0 to 130°C
- Maximum process pressure 1000 kPa

The potential of reference electrodes is depending on their composition. A table with the actual values for each system is given next. All values refer to 25°C.

The reference system is also indicated on the textplate of the electrode.

System	Fill solution	Value against Standard Hydrogen Electrode
Ag/AgCl	3.3 m. KCl	203 mV
Ag/AgCl	sat. KCl	196 mV

Combined Redox Electrodes

For redox measurement Yokogawa offers non-flow general purpose electrodes and a heavy duty flow electrode. All electrodes are equipped with a solid platinum cup to provide long lifetime, even in processes that harm the platinum electrodes such as hypochloride.

Redox/Reference

Additional features for type SC29C-PTP29

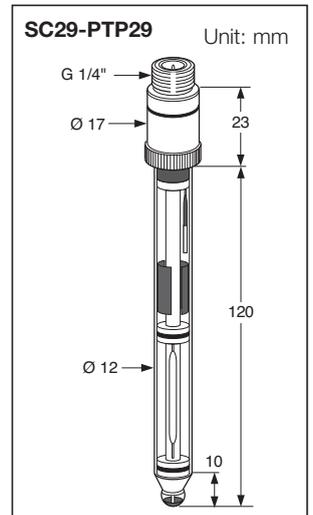
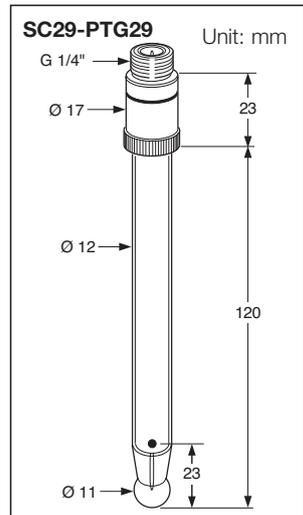
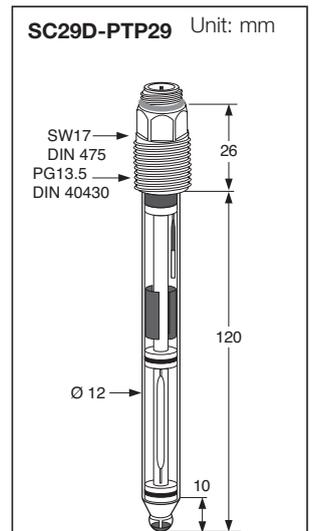
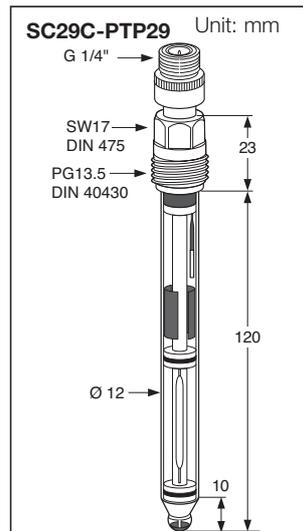
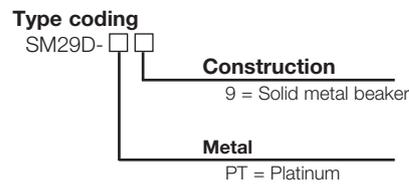
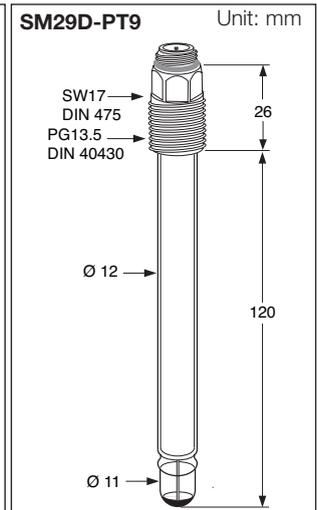
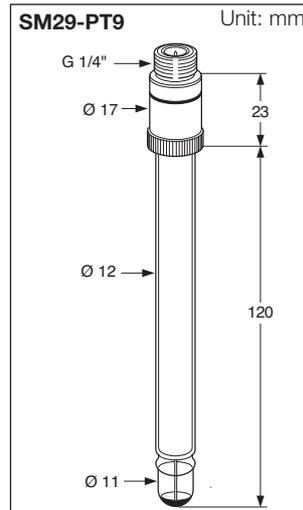
- General purpose redox measurements
- Temperature range: -10 to 100°C
- Maximum process pressure 500 kPa
- Diaphragm resistance (25°C) < 5 kΩ
- High quality Ag/AgCl reference system (pin) which can stand high temperatures and temperature fluctuations
- Double junction, thickened saturated KCl-solution, thickened saturated KCl. Built-in salt bridge prevents poisoning of the reference.
- Heavy duty platinum cup for long operation in corrosive, abrasive and fouling environments.
- Large area PTFE junction to resist fouling.

Redox/pH

This combined electrode can be used in processes with a constant pH value or for processes where the Redox potential is dependent on the pH in order to achieve a pH compensated Redox potential. In such a case a pH/Redox converter with a high input is required. All pH/Redox converters of Yokogawa have such an input.

Additional Characteristics of type SC29-PTG29

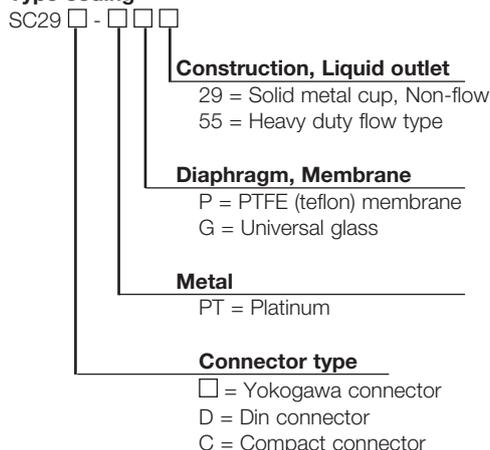
- Temperature range: 0 to 100°C.
- Maximum process pressure 1000 kPa
- Bulb shaped glass membrane.
- Ag/AgCl wire reference system
- Glass Resistance (25°C): 50 to 100 MΩ
- Solid platinum cup



Additional features for types SC29C-PTC55

- Heavy duty pH sensitive glass.
- Flowing reference system for pollution resistance, and highly stable reference potential.
- PG13.5 standard DIN electrode connection.
- Adapter to ensure compatibility with full fitting program.
- Temperature range: -10 to 100°C.
- Maximum process pressure 500 kPa.
- High quality Ag/AgCl reference system (pin) which can stand high temperatures and temperature fluctuations.

Type coding



Specifications Temperature Sensor

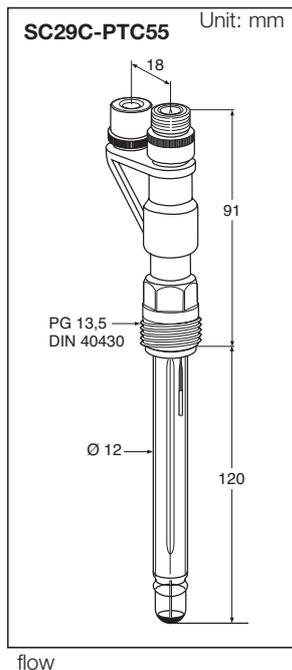
Type	Temperature sensor	Pressure range	Temperature range
SM60-Pt100	Pt100	0 - 1 MPa	-20 - 150°C
SM60-Pt1000	Pt1000	0 - 1 MPa	-20 - 150°C

Pt100

°C	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

°C	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



Specifications Redox Electrodes

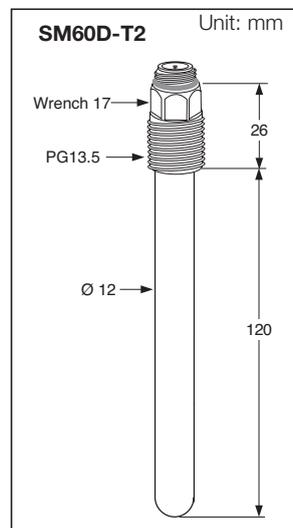
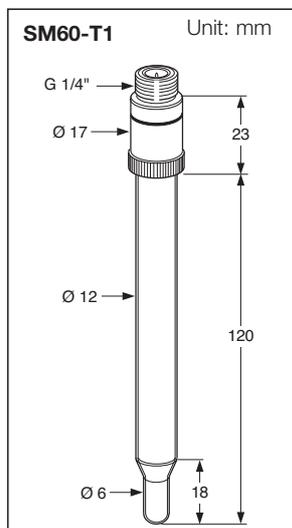
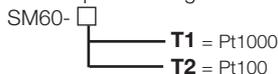
Type	Temperature range	Process pressure	Metal surface
SM29-PT9	0 - 130°C	max. 1000 kPa	Platinum
SC29C(D)-PTP29	-10 - 100°C	max. 500 kPa	Platinum
SC29-PTG29	0 - 100°C	max. 1000 kPa	Platinum
SC29C-PTC55	-10 - 100°C	max. 500 kPa	Platinum

Temperature Sensor

For accurate pH measurement temperature compensation is required. Either a Pt100 or a Pt 1000 temperature electrode can be selected.

Features

- Temperature sensor: resistance thermometer Pt100 or Pt1000.
- Max. process pressure: 1000 kPa.
- Max. process temperature: approx. 150°C.
- Short response using heat transfer compound.



Cables for Industrial Applications, type WU20(D)

When you need optimal pH or Redox measuring results, the complete measuring loop not only requires highly qualified sensors and transmitters but also the special purpose sensor cables.

The program of Yokogawa includes a range of high quality, low-noise cables for accurate transmission of low voltage signals even in areas where interference is present. They have a shield with an internal anti-noise sheath and can be connected to all pH and ORP (Redox) electrodes fitted with an O-connector.

At the electrode end the cables are provided with a socket having spring gilded contacts for secure connection to the sensor.

The combination electrode plug and cable socket is watertight and temperature resistant up to 125°C. It meets the requirements of IP 65.

Features

- Internal anti-noise sheath for accurate measurement.
- Gold plated spring O-connectors parts, for good electrical contact under the most severe conditions.
- Coaxial plug and socket with watertight sealing that meets the requirements of IP 65.
- Cables for industrial applications and for laboratory use are available.

Coax Cables

These cables are for connecting to **single or combined** sensors fitted with an O-plug. For use at higher temperature specifications (up to 110°C continuously or 125°C for short times) and the most severe conditions.

Triax Cables

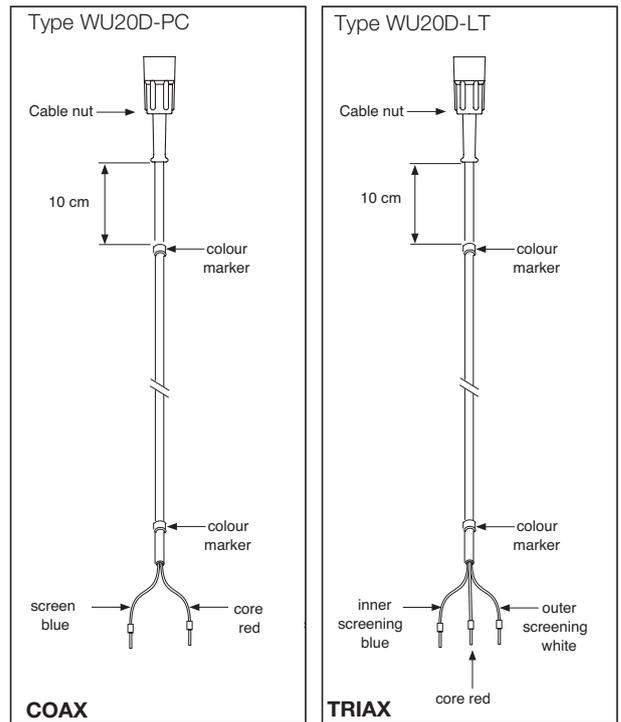
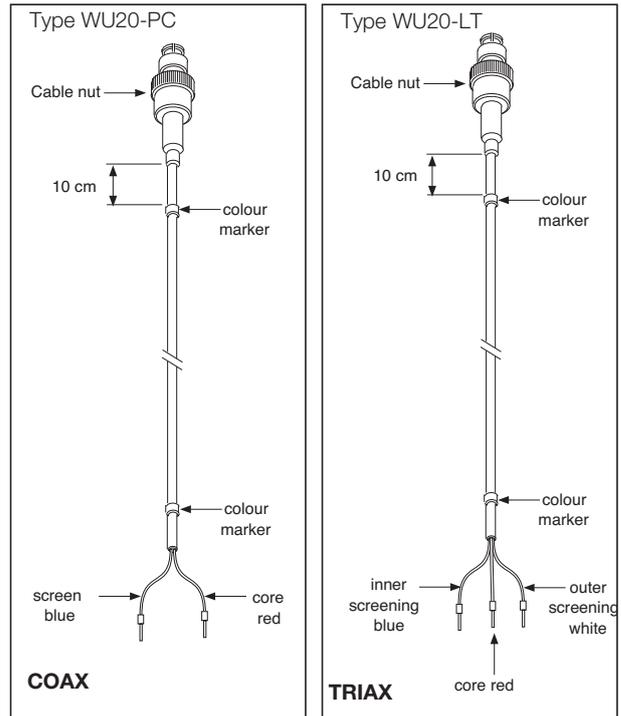
These cables are for connecting to **combined** sensors fitted with an O-plug or to **single** sensors with an O-plug for use in areas where electrical interference is present. They have both inner, and outer shielding. In areas where electrical interference is likely we recommend to use the Triax electrode cable type WU20(D)-LT. marked with a blue strip.

Notes:

1. For industrial applications the cables can be colour coded with the following marks:
 - Measuring electrode : red
 - Reference electrode : yellow
 - Temperature electrode : green
 - Combined electrode : blue
 Adhesive markers are provided for this purpose and should be fitted to both ends of the cables.
2. To secure optimal conditions, the cables may not be damaged or shortened. For protection of the cables there are special hoses available of 5 or 10 mtr. (K1500CJ, K1500CK respectively)
3. Suitable for use in intrinsically safe areas.

Specifications

- Bending radius** : min. 50 mm
- Max. temperature**
- type WU20(D)-PC : 110°C (continuously)
125°C (for short times)
 - type WU20(D)-LT : 70°C (continuously)
- Wire connections** : 2 mm contact pins



Model	Suffix code	Description
WU20(D)		Electrode cable
Type	-PC	COAX
	-LT	TRIAX
Length in m	01	1 mtr
	02	2 mtr
	05	5 1/2 mtr
	10	10 mtr
	15	15 mtr
	20	20 mtr
	25	25 mtr

Cables for use in laboratories

For adaption to the various pH instruments being used in laboratories, Yokogawa introduces the extra flexible COAX-cables for connecting all sensors types fitted with an O-plug to these instruments.

Dependent on the application the cables are for use with an instrument fitted with either a plug to DIN 19262 (type D), a 4 mm plug (type G) or a plug B, C, K or L (see fig.).

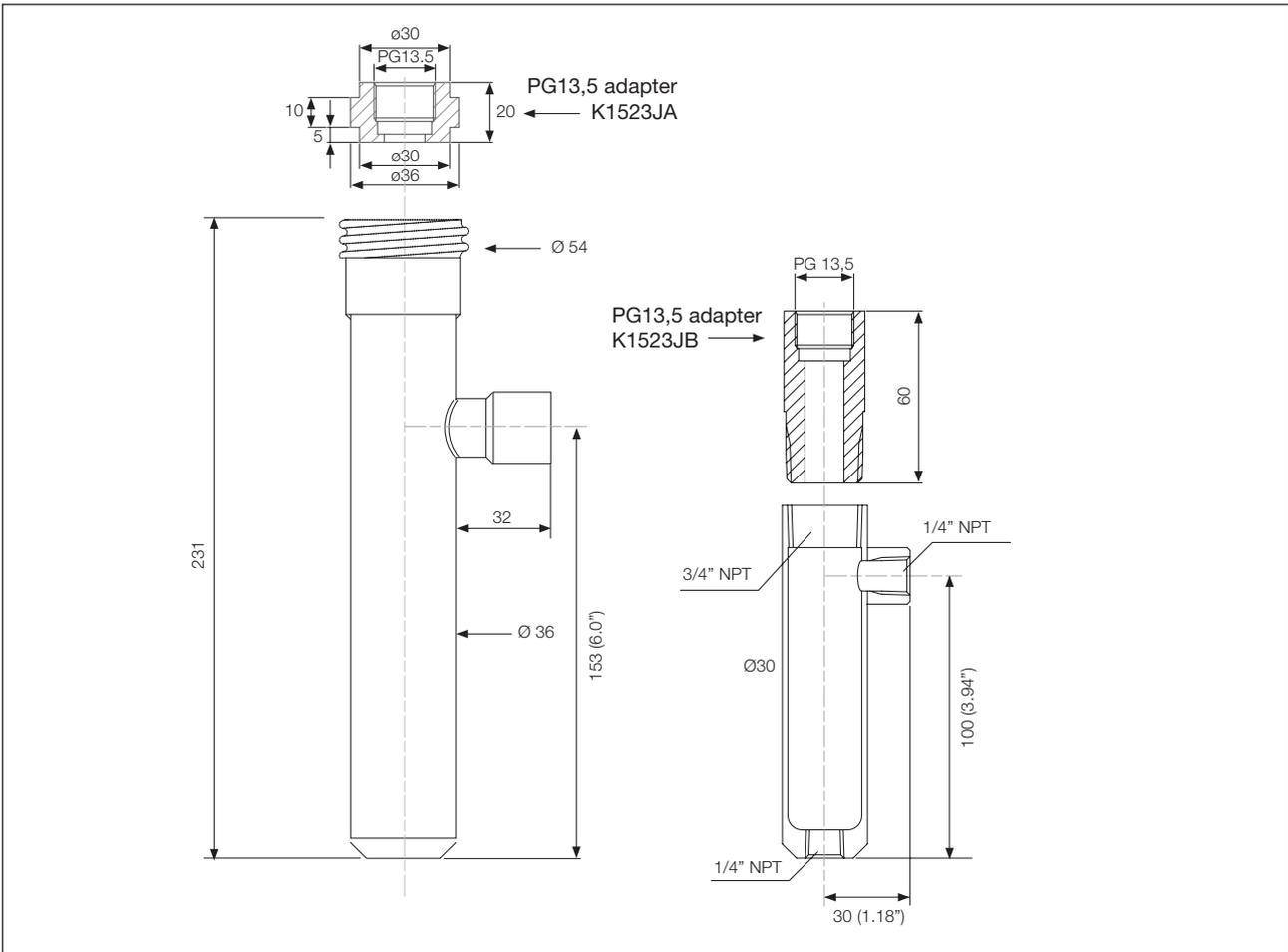
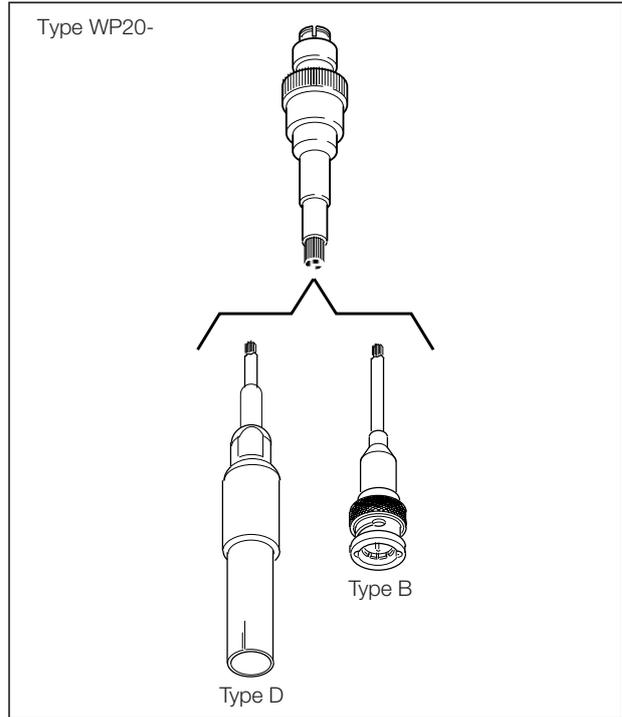
Specifications

Cable length : 1 m
 Max. temperature : 70°C

Ordering instructions

Type WP20-D : for use with single or combined electrode
 connector: plug to DIN 19262
 Type WP20-B : for use with a single or combined electrode
 connector: BNC

When ordering, specify Model and Basic codes.



Flow fitting FF40 with K1523JA: Adapter to fit sensors with a PG13,5 process connection in FF40/FS40 and FD40 fittings. Material: Polypropylene

Flow fitting option /FF K1598AC (incl. 3.1 B certificate) with Adapter K1523JB to fit sensors with PG13,5 process connection

Junction box, type BA10

Between measuring plant and control room, especially when the distance between these places is greater than the length of the standard appropriate electrode cables, the connecting equipment can be an expedient method for connecting sensor cables to a measuring instrument. The equipment includes:

1. A junction box.
2. Special purpose connecting cable WF10.

Note:

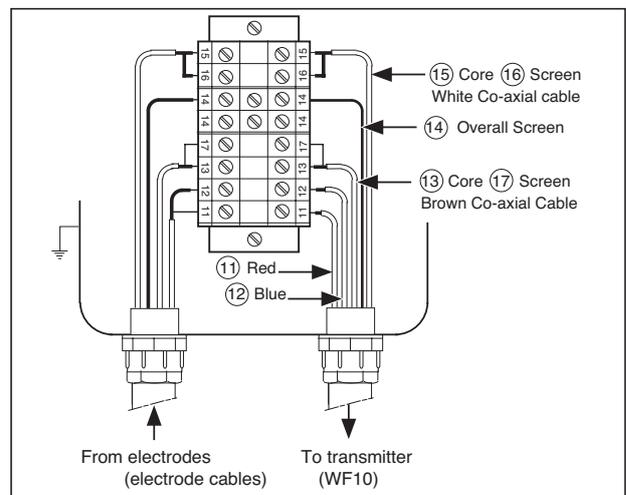
The special purpose cable, type WF10 should be used to interconnect the junction box and the measuring instrument. To have optimum measuring results the length of this cable may be max. 100 mtr.

Specifications

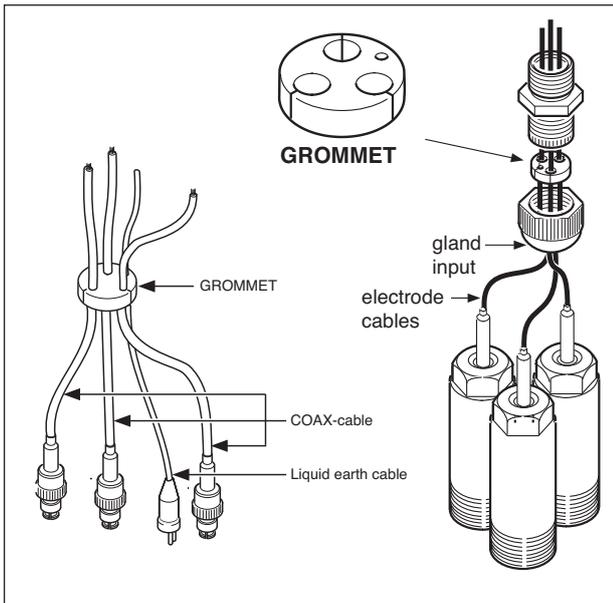
Material	: Cast aluminium case with chemically resistant lacquer
Rain-,dust protection	: Meets IP65
Terminals	: Wires up to 6 mm ²
Cable entries	: 2 holes for 1/2" NPT connection
Terminal block	: 8 terminals
Weight	: Ca. 2 kg.

Ordering Instructions

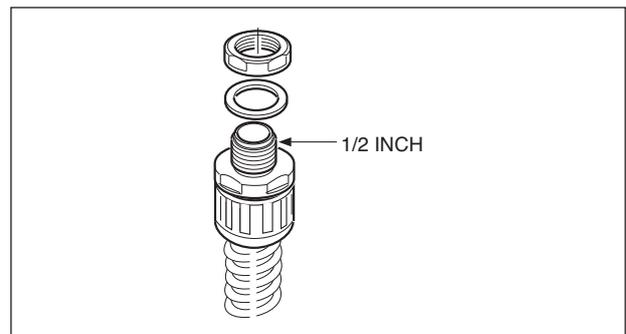
As delivered, the box includes the junction box with 2 cable glands 1/2" NPT and a grommet to ensure a watertight cable input (3 electrode cables and the liquid earth cable).



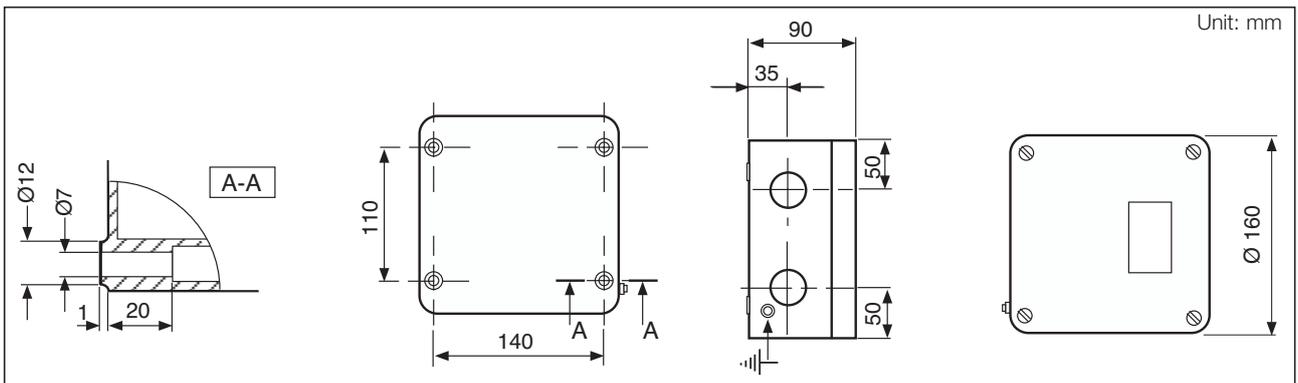
Connection diagram



Grommet (K1500BX)



Hose connection of K1500CK, K1500CJ



Dimensions/Fixing

Extention cable, type WF10

This cable satisfies the high requirements of insulating resistance and shielding. It suits the application of signal transmission representing low voltage and high impedance level. The cable is used to interconnect a junction box (BA10) and the measuring instrument.

Note: Long cable lengths add resistance and capacitance to the measuring loop. These values are specified below. The maximum values for cable length, cable capacity that are specified in the instruction manual of the analyzer may not be exceeded. The resistance may introduce a measuring error, especially when using a 100 Ohm RTD. Normally the analyzer can be calibrated for this error.

Specifications

Max. temperature : 110°C
 Material : Thermoplastic rubber (T.P.R.)
 Bending radius
 - Permanent : > 83 mm
 - Frequently : > 125 mm
 Diameter : 8.5 mm
 Colour : Black

Cable A/B

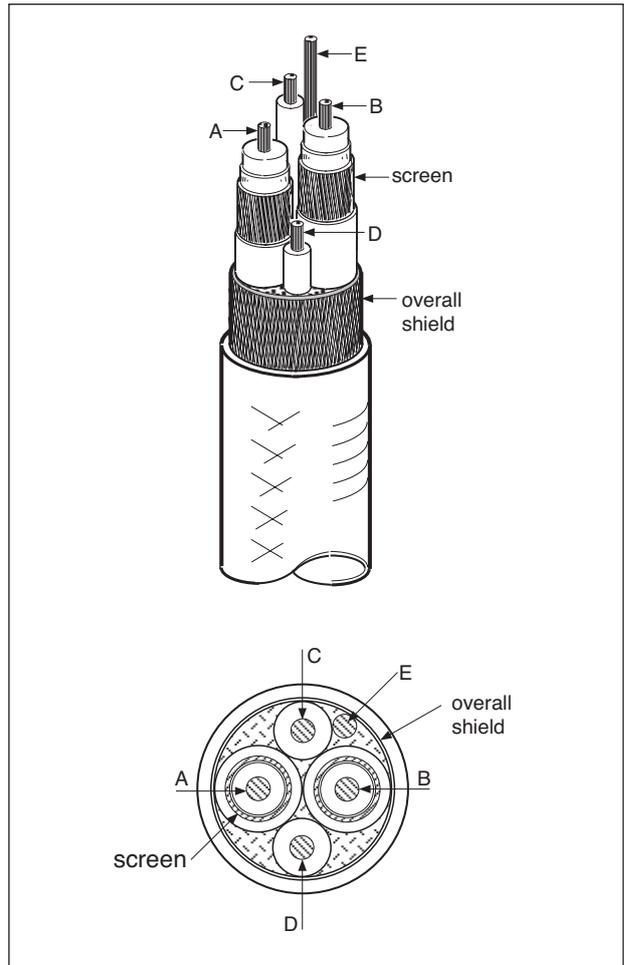
Capacitance between core and screen : max. 120 pF/m
 Insulation between core and screen : min. 15 x 10¹⁴ Ohm./km
 Resistance : ca. 80 Ohm/km
 Dielectric : T.P. Rubber
 Jacket A : Brown
 Jacket B : White

Cable C/D

Resistance : ca. 35 Ohm/km
 Jacket C : Thermoplastic rubber (Red)
 Jacket D : Thermoplastic rubber (Blue)

Cable E : Overall shield

Model	Suffix code	Description
WF10		Connecting cable
Cable length	- □ □ □	length in mtr. between 1 and 200
	-F	Finished
	-N	Not Finished



WF10

Spareparts and accessories

Part nr.	Description
K1500CJ	Protection hose with two 1/2" NPT glands (5 mtr.)
K1500CK	Protection hose with two 1/2" NPT glands (10 mtr.)
K1500BX	Grommet for watertight cable input in 1/2" NPT
K1500DN	/PH03 protection hose (3 mtr.)
K1500DP	/PH05 protection hose (5 mtr.)
K1500DQ	/PH10 protection hose (10 mtr.)
K1500DR	/PH15 protection hose (15 mtr.)
K1500DS	/PH20 protection hose (20 mtr.)

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