

# General Specifications

## Model SM29 and SC29 Industrial Electrodes For Redox (ORP) measurements

Redox

Yokogawa designed a wide range of electrodes for the most severe conditions. They meet the highest standards. The dimensions and design satisfy the requirements for mounting 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 resistant up to 135°C. It meets the requirements of IP65.

The electrode cap is made of Ryton R4. This is chemically highly resistive material (comparable 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 many 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 metal electrode (with red marking strip) is used in conjunction with a reference electrode (with yellow marking strip). The application and the potential range must be considered.

It is also possible to use a glass electrode as a reference. This requires a measuring amplifier with two high-ohmic inputs and a process liquid with constant pH-value or with a Redox-potential which is dependent on pH.



### SYSTEM CONFIGURATION

<b>Sensors</b> 	<b>Fittings</b> 	<b>Connecting Equipment</b> 	<b>Converters</b> 	<b>Receivers</b> 
<b>Cable</b> 	<b>Cleaning Systems</b>  Brush, Chemical	<b>Cable</b> 	<b>Miscellaneous</b> 	<b>Accessories</b> 

**A. METAL ELECTRODES**

- Polarisation free measurement by (patented) inert metal surface.
- Dome shaped cup
- Temperature range 0...130°C
- Steam sterilisable.
- Maximum process pressure: 1 MPa (10 bar)

The Redox (ORP) electrode can be used in combination with all reference electrodes in the program of Yokogawa.

The potential of reference electrodes is depending on their composition.

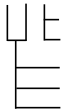
A table with the actual values for each system is given next. All values refer to 25°C

System	Fitting	Absolute value	Value against SCE
Ag/AgCl	1 m KCl	233 mV	- 8 mV
Ag/AgCl	sat. KCl	188 mV	- 45 mV
Calomel (SME)	sat. KCl	241 mV	0 mV

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

**TYPE CODING:**

SM29. . .

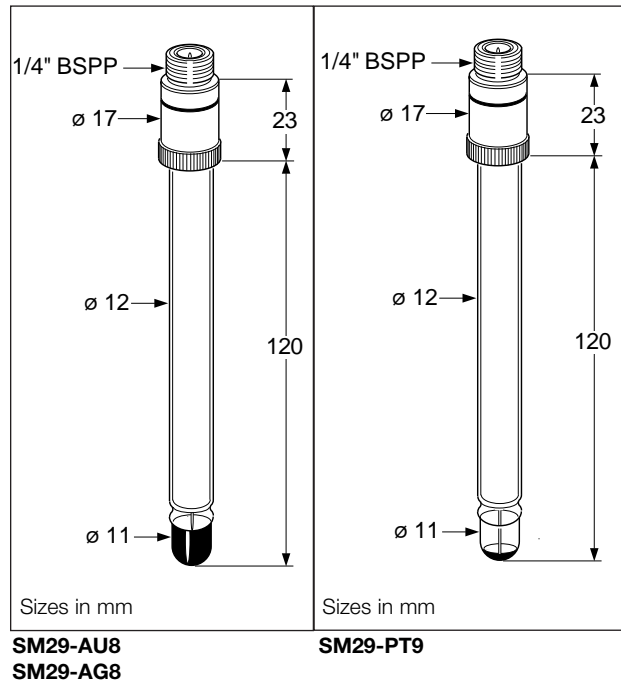


NOTE: Avoid the use of the following metals in the mentioned processes. These will decrease the lifetime of the electrodes severely.

- Platinum : Chlorine and hypochlorite
- Gold : Amalgamation and cyanide
- Silver : Ammonia and nitric acid

**SPECIFICATIONS**

TYPE	TEMP. RANGE	PROCESS PRESSURE	METAL SURFACE
SM29-AG8	0...130°C	maximum 1 MPa (10 bar)	silver
SM29-AU8	0...130°C	maximum 1 MPa (10 bar)	gold
SM29-PT9	0...130°C	maximum 1 MPa (10 bar)	solid platinum



## B. REFERENCE ELECTRODES (NON-FLOW TYPES)

### FEATURES

- Easy maintenance.
- No reference liquid wastage.
- Process pressure: max. MPa (10 bar).

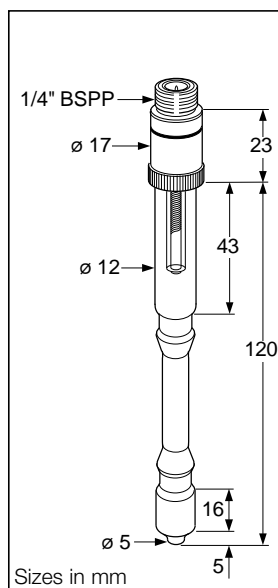
Additional features for types SR20-AC22:

- Pressure compensated.

Additional features for type SR20-AP26:

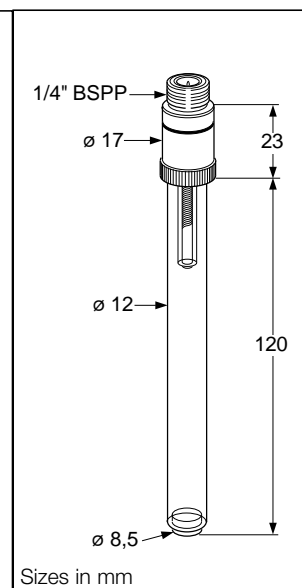
- Built-in salt bridge.

Two-phase electrode



SR20-AC22

Gel-type electrode



SR20-AP24

### TYPE CODING

SR20-....

#### Liquid outlet

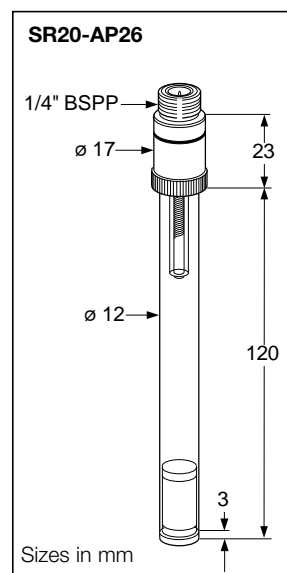
- 2 = Non-flow
- 22 = PTFE hose filled with KCl pellets
- 24 = Filled with gelled electrolyte
- 26 = Double junction filled with gelled electrolyte
- 32 = Flow (process pressure compensated)
- 5 = Flow
- 52 = Refillable at the top

#### Diaphragm

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

#### Reference system

- A = Ag/AgCl (silver-silverchloride)



Double junction gel-type

### SPECIFICATIONS

TYPE	TEMP. RANGE	REFERENCE LIQUID	REFERENCE SYSTEM	DIAPHRAGM RESISTANCE/25°C	DIAPHRAGM
SR20-AC22	0...120°C	saturated KCl-solution	Ag/AgCl (pin) silver-silverchloride	ceramic	<5kOhm
SR20-AP24	0...80°C	thickened KCl (1 m.)	Ag/AgCl (pin) silver-silverchloride	PTFE	<5kOhm
SR20-AP26	0...80°C	thickened KCl (1 m.)	Ag/AgCl (pin) silver-silverchloride	PTFE	<5kOhm

## 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. 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.

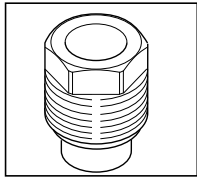
### FEATURES

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

Additional features for types SR20-AC32

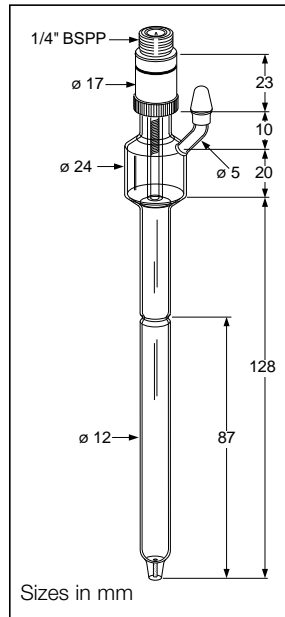
- Automatic compensation for process pressure variations.
- Constant flow of the reference liquid for minimal diffusion potential.
- Process pressure: max. 1MPa (10 bar)
- Refillable, with large KCl-reservoir.

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

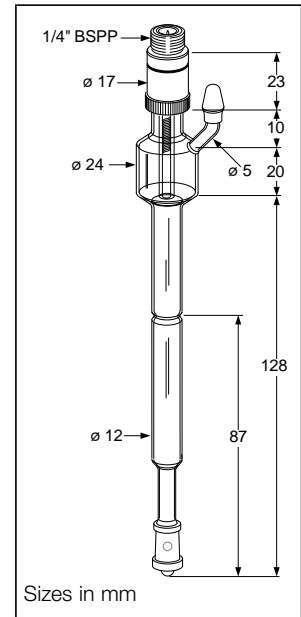


Mounting kit for types SR20-AC52 and SR20-AS52 (accessory) ordernr. 82850747

### Refillable at the top

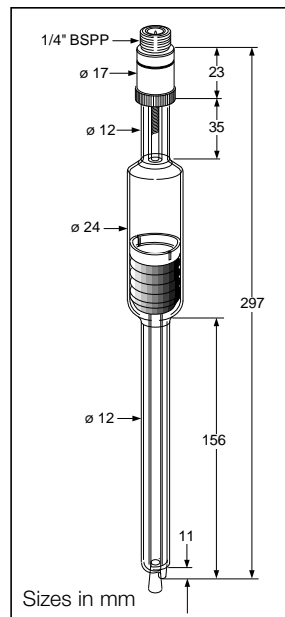


SR20-AC52

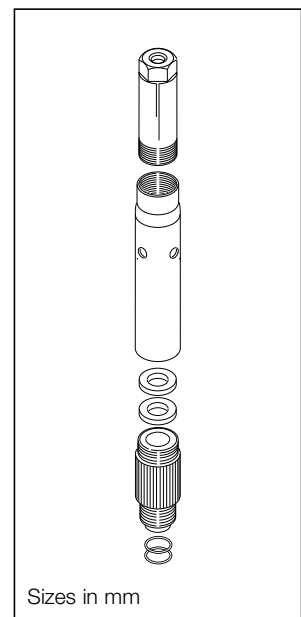


SR20-AS52

### Bellomatic



SR20-AC32



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

## SPECIFICATIONS

TYPE	TEMP. RANGE	REFERENCE LIQUID	PROCESS PRESSURE	REFERENCE SYSTEM	DIAPHRAGM	DIAPHRAGM RESISTANCE/25°C	FLOW AT 25°C
SR20-AC52	0...100°C	KCl-solution (1 m.)	Atmospheric	Ag/AgCl (pin) silver-silverchloride	ceramic	<10 kOhm max.	0,5 ml/day at 10 kPa overpressure
SR20-AS52	0...100°C	KCl-solution (1 m.)	Atmospheric	Ag/AgCl (pin) silver-silverchloride	sleeve	<10 kOhmmax	0,5 ml/day at 10 kPa overpressure
SR20-AC32	0...120°C	KCl-solution (1 m <sup>3</sup> .)	0...1MPa	Ag/AgCl (pin) silver-silverchloride	ceramic	<10 kOhm max.	max. 0.2ml/day <sup>3</sup>

<sup>3</sup>) The flow is highly dependent on temperature. When using the electrode continuously at temperatures over 70°C it is recommended to fill the electrode with a reference liquid having a higher viscosity (ordernr. 82895203 and 82895258)

## D. COMBINED ELECTRODES

The combined electrodes are for applications where installation of separate sensors is not possible.

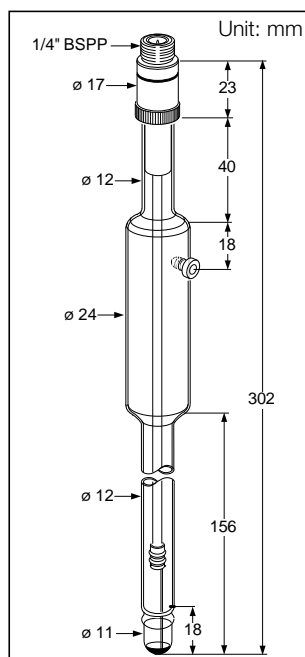
Basically, there are two types:

### 1. REDOX/REFERENCE

The combined redox/reference electrode for general applications. It has a large KCl-reservoir for long operating life. For atmospheric conditions this electrode can be mounted in a mounting kit FP20-S13. For higher process pressure KCl-ratings the reservoir should be pressurised (the pressure on the reference liquid should be over the process pressure). For this application the mounting kit FP20-S14 can be used.

### FEATURES

- Polarisation free measurement by (patented) inert metal surface.
- Steam sterilisable.
- Dome shaped surface.
- Refillable at the side.
- Temperature range: 0...130°C.
- Process pressure: max. 500 kPa (5 bar).
- Mounting kit (accessory) for fixing in a fitting.



SC29-PTC54

## SPECIFICATIONS

TYPE	TEMP. RANGE	PROCESS PRESSURE	MEMBRANE	REFERENCE LIQUID	REFERENCE SYSTEM	DIAPHRAGM	FLOW
SC29-PTC54	0...130°C	0...500 kPa	platinum	KCl-solution (1m.) thickened	Ag/AgCl silver-silver-chloride	Ceramic resistance: <10 kOhm	max 0,5 ml/day at 10 kPa overpressure

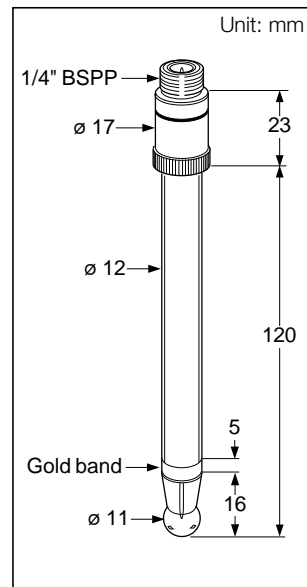
## 2. REDOX /PH

This combined electrode can be used in processes with a constant pH value or for processes where the Redox potential is dependent on pH in order to achieve pH compensated Redox potential.

A Redox-converter with a high impedance reference input is required.

### FEATURES

- Polarisation free measurement by (patented) inert metal surface.
- Process pressure: max. 1MPa (10 bar).
- Temperature range: 0...100°C.
- Bulb shaped glass membrane.
- Ring shaped gold surface.



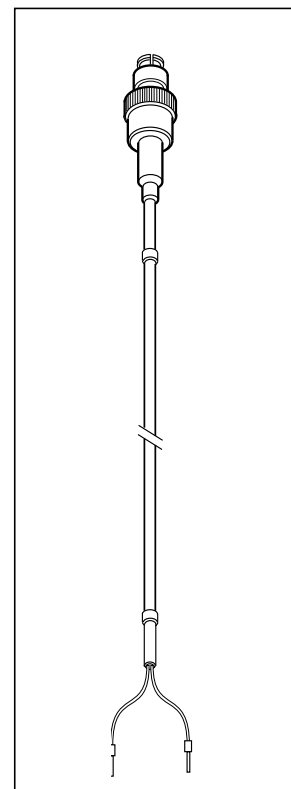
SC29-AUG28

### SPECIFICATIONS

TYPE	TEMP. RANGE	PROCESS PRESSURE	REFERENCE SYSTEM	MEMBRANES	
				GLASS	METAL
SC29-AUG28	0...100°C	0...1 MPa	Ag/AgCl (wire) silver-silverchloride 1m. KCl	universal pH- glass resistance: 50...100 MΩm/25°C Bulb (shockproof)	gold

## E. ACCESSORIES AND PARTS

TYPE	DESCRIPTION
WU20-PC01	COAX-cable for single electrode (1 m.)
WU20-PC02	COAX-cable for single electrode (2 m.)
WU20-PC05	COAX-cable for single electrode (5.5 m.)
WU20-PC10	COAX-cable for single electrode (10 m.)
WU20-PC15	COAX-cable for single electrode (15 m.)
WU20-PC20	COAX-cable for single electrode (20 m.)
WU20-PC25	COAX-cable for single electrode (25 m.)
WU20-LT01	TRIAX-cable for combined electrode (1 m.)
WU20-LT02	TRIAX-cable for combined electrode (2 m.)
WU20-LT05	TRIAX-cable for combined electrode (5.5 m.)
WU20-LT10	TRIAX-cable for combined electrode (10 m.)
WU20-LT15	TRIAX-cable for combined electrode (15 m.)
WU20-LT20	TRIAX-cable for combined electrode (20 m.)
WU20-LT25	TRIAX-cable for combined electrode (25 m.)
82895202	250 ml, 1 molal KCl-solution
82895203	250 ml, 1 molal KCl-solution with higher viscosity
82895208	250 ml, 3,3 molal KCl-solution
82895258	250 ml, 3,3 molal KCl-solution with higher viscosity
82895279	"O" ring for electrode mounting (8x)
82895011	"O" ring for mounting (top) refillable electrodes with a long glass shaft (10x)
FP20-S13	Mounting kit for BELLOMATIC reference electrode and combined electrode type SC29-PTC54
FP20-S14	Mounting kit (pressurisable) for combined electrode type SC29-PTC54
82850747	Mounting kit for (top) refillable electrodes with long glass shaft.



**WU20-PC**

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