

# General Specifications

SC24  
4 in 1 differential pH sensor

The SC24 differential pH sensor is unique to the industry. Offering the possibility of maintenance free operation without any reference problems. In the SC24 differential pH sensor, the reference cell is made of glass, with no porous junction. No electrolyte is in contact with the process.

The differential measuring principle combines the normal potential generated by the pH glass with the potential from a Sodium pNa glass. In applications where Sodium-, Potassium- or Calcium-salt is present the glass will generate a stable reference voltage. This means the measurement can be done without a conventional reference electrode, eliminating problems caused by aging and pollution of the liquid junction.

Because the sensor integrates four functions in one – pH sensing, reference cell, temperature compensation and liquid earth (ORP), the user only has to deal with one sensor and one cable. The unit is designed for 12 mm PG13.5 mounting, and so is compatible with most industrial holders.



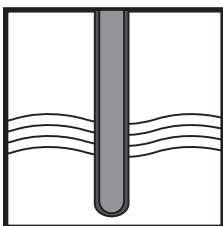
## Features

- Sterilizable pH sensor
- No reference electrode or junction
- Low maintenance
- No diffusion = high stability

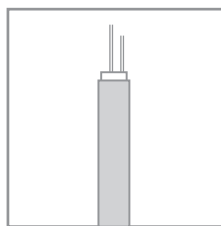
## Applications

- Process where KCL is forbidden
- Process with rapid temperature / pressure changes
- Chlorine manufacturing (electrolysis of Brine)
- Bio- ethanol fermentation processes
- Pulp and Paper

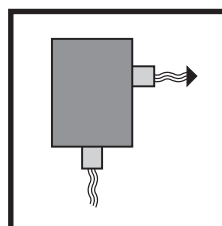
## System Configuration



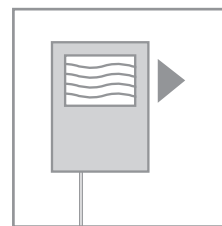
Sensors



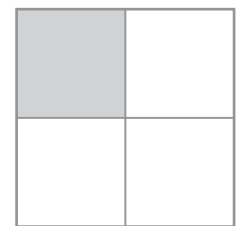
Cables



Fittings



Transmitters



Accessories

## General

The SC24 is not a standard pH sensor, it is differential pH sensor. This means that the reference is not a (liquid) junction but a glass sensor which does not respond to pH changes (within the applicable range of the sensor). This means the sensor is truly maintenance free and the output voltage of the sensor depends only on the salt concentration of the process.

The sensor responds to pH changes rather than analyzes the accurate pH value. In that sense it is best to describe the sensor as **pH control sensor** rather than **pH measuring sensor**.

A pH sensor measures the voltage that the pH membrane measures as function of the pH value of the process sample. This voltage is then compared with the mV output of a reference cell that is independent on the pH value of the sensor

In most pH control applications the salt concentration is rather constant, so the output of the SC24 differential sensor is only dependent on the pH of the process.

A rule of thumb is that a change in salt concentration of +/- 25% has an effect of less than 0.1pH on the pH reading.

## Calibration

For buffer calibration it is necessary to use pH buffers that have the same ionic strength. The pH standards that are preprogrammed in the pH analyzers do not fulfill this requirement. That is why the "AUTOCAL" mode in the analyzer will not be used for calibration of the SC24 differential pH sensor. The sensor will be calibrated using the "MANUAL" method and uses special buffer solutions:

K1520BG pH 2.00 ionic strength 1 mol NaCl 500 ml

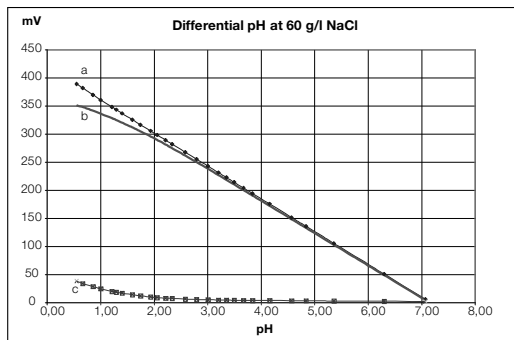
K1520BH pH 4.00 ionic strength 1 mol NaCl 500 ml

K1520BJ pH 7.00 ionic strength 1 mol NaCl 500 ml

K1520BK pH 9.00 ionic strength 1 mol NaCl 500 ml

If these buffer solutions are not available, then it is possible to use standard buffers (4.01; 6.86; 9.18) to check functionality of the sensors. However if they are used for calibration of Asymmetry and Slope they will result in wrong SLOPE calculations.

In that case it is better to use default settings for ASY (0 mV) and SLOPE (100%) and use the buffers only to verify the proper functioning of the sensor.



## How to read this graph?

In this example the pH is measured in a 1 mol/l Brine solution (NaCl). This means that the pNa is  $-10\log 1 = 0$ . Line a shows the mV output of the reference glass. It shows a very stable mV output in the whole range of 2-14 pH. Under 2 pH the SC24 sensor shows some loss of sensitivity due to the acid error. The acid error is negligible if the pH is at least 2 units higher than the negative logarithm of the salt concentration. Brine is a difficult solution to measure pH, because the brine ions tend to cause high junction potentials in traditional reference elements.

GS 12B6J7-02E-E

## Functional specifications

### Measuring elements

- pH glass electrode
- Silver/Silver Chloride reference
- Solid Platinum electrode
- Pt1000 temperature sensor.

### Construction materials / wetted materials:

Earth Pin	: Platinum
Sensor	: Glass

### Functional specifications

Glass impedance	
pH-glass dome	: 600 to 900 MΩ
pNa-glass dome	: 600 to 900 MΩ
Isothermal point	: pH 7, pNa 0
Reference system	: pNa, salt sensitive reference glass
Temperature element	: Pt1000 to IEC 751
Asymmetry potential	: $0 \pm 15$ mV
Slope	: > 93 % (of theoretical value)

**Note:** The temperature sensor included in the SC24 is intended to provide indication and cell compensation. The construction has not been tested to the pressure vessel standards required for plant temperature control.

### Dynamic specifications

Response time pH step (7 to 4)	: < 15 sec for 90%
Response time temp element (25°C)	: < 90 sec for 90%
Stabilization time (0.02 pH unit/10 s)	: < 2 minutes

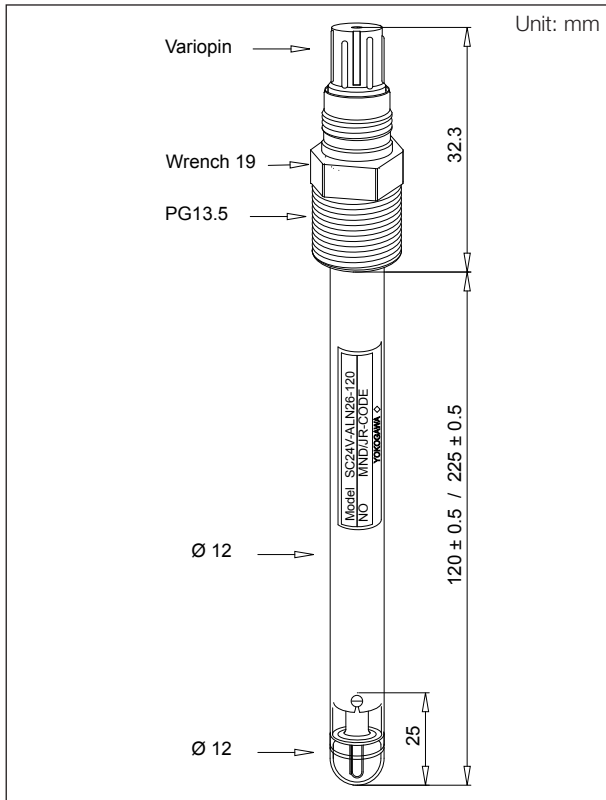
### Operating range

pH	: 2 to 14
Temperature	: -10 to 120 °C (14 to 248 °F)
Pressure	: 0 to 10 bar (0 to 145 PSIG)
Conductivity	: > 50 μS/cm
Storage temperature	: -10 to 50 °C (14 to 122 °F)

**Note:** Specifications should not be considered in isolation. For example the pH range can be 2-12pH, where the measurement is at elevated temperatures. For advice about specific applications please contact your local sales office.

## Model & Suffix Codes

Model Code	Suffix Code	Option Code	Description
SC24V			Combined 12mm four-in-one salt sensitive reference pH sensor with Variopin connector
Sensor type	-ALN26		Ag/AgCl reference system, pH half cell L-glass, reference cell salt sensitive glass, non-flow, heavy duty
Sensor length		-120 -225	120 mm 225 mm



**Figure 1 SC24V sensor dimensions**

### Holders

The SC24 differential pH sensor is standard 12 mm OD pH sensor with PG13.5 process connection and VP8 connector, so it can be used in most industrial installations that provide PG13.5 process connection.

The sensor is available in lengths of 120 mm and 225 mm to accommodate most direct insertion holders on the market including Yokogawa PR10 and EXATRAC.

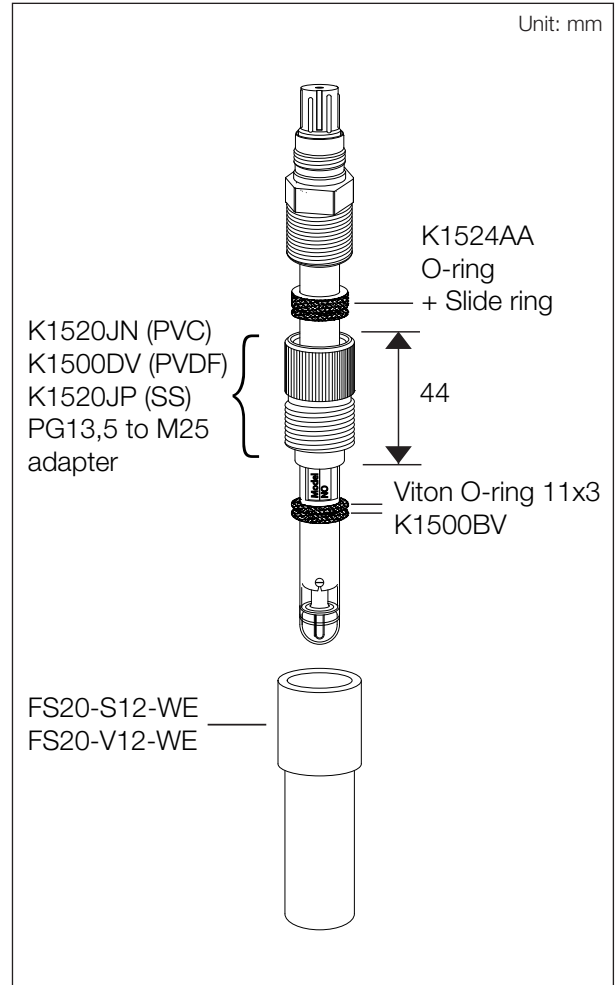
The 120 mm version also fits in the Yokogawa pH Compact holder family: PF20, PD20 and PS20

The SC24 differential pH sensor is also compatible with the huge installed base of FF20, FS20 or FD20 pH holders using the (temporarily) supplied adapter K1520JN (PVC), but also available in PVDF (K1500DV) and SS (K1520JP), see figure 2.

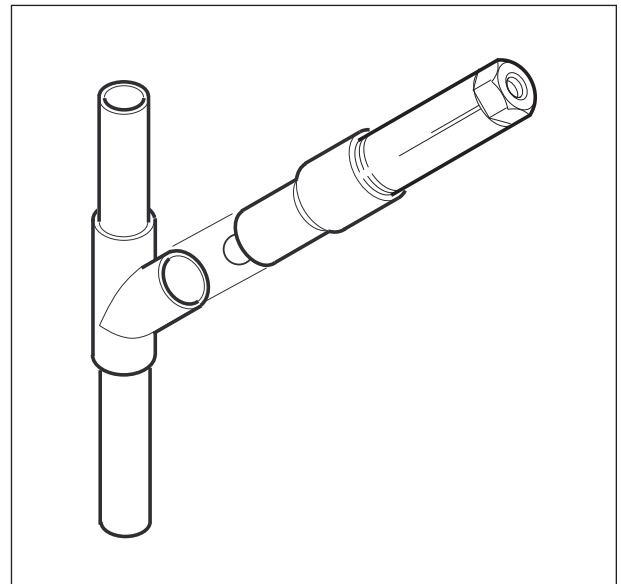
When the sensor is used in the YOKOGAWA PH8 holder family HA405-120-S3, HA405-120-PP or HA405-120-PV; then respectively the adapter K9148NA, K9148NB or K9148NC must be specified as well.

When the sensor is used in the YOKOGAWA FF40/FD40 or FS40 Conductivity holders, then adapter K1523JA must be specified, see figure 4.

Also a very small conductivity flowfitting is available (K1598AC), together with the PG13,5 adapter (K1523JB) a very compact solution, see figure 5.



**Figure 2 SC24 in a FS20 holder**



**Figure 3 Application examples subassemblies SS/PVC**

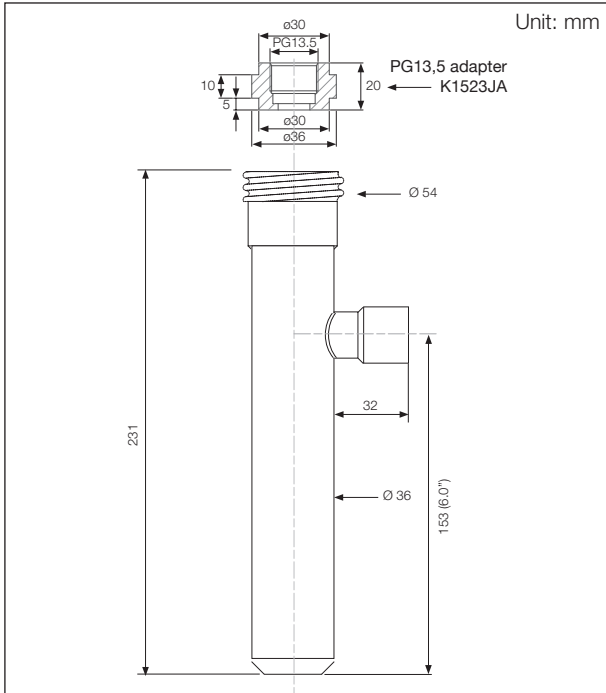


Figure 4 Flowfitting FF40

When the sensor is used in the YOKGAWA FF40/FD40 or FS40 Conductivity holders, then adapter K1523JA must be specified

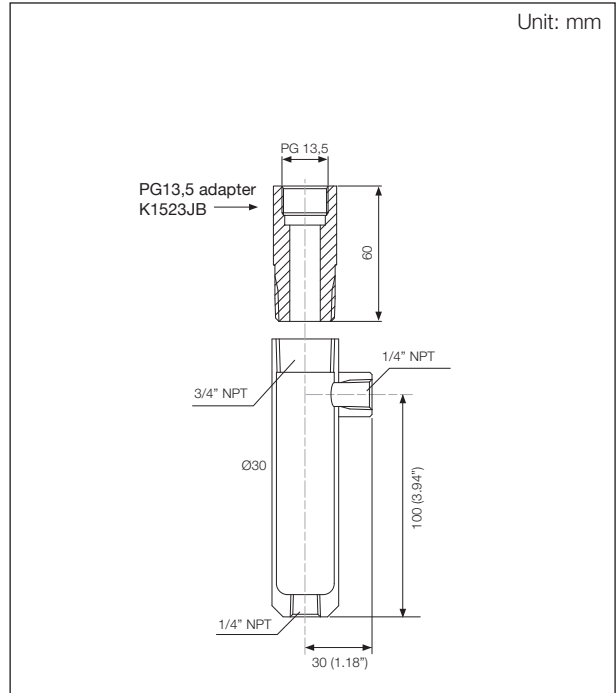


Figure 5 Flowfitting SC4A

Also a very small conductivity flowfitting is available (K1598AC), together with the PG13,5 adapter (K1523JB) a very compact solution.

## Spare parts for SC24

### Buffer solutions

Prod. No.	Description
K1520BG	Buffer Solution PH 2 + PNA 0
K1520BH	Buffer Solution PH 4 + PNA 0
K1520BJ	Buffer Solution PH 7 + PNA 0
K1520BK	Buffer Solution PH 9 + PNA 0
K1520BF	Buffer Solution PH 4/7/9 + PNA 0

### Connection equipment

Prod. No.	Description
WU10-V-D-02	Cable Variopin dual coax 2 m
WU10-V-D-05	Cable Variopin dual coax 5 m
WU10-V-D-10	Cable Variopin dual coax 10 m
WU10-V-D-15	Cable Variopin dual coax 15 m
WU10-V-D-20	Cable Variopin dual coax 20 m
BA10	Junction box for pH extension cables
WF10-XXX-F	pH signal cable with terminated ends. Specify length in whole meters (e.g. XXX = 020)

### Sealings

Prod. No.	Description
K1500BV	O-Rings EPDM 11X3 (6 PCS.)
K1500BZ	O-Rings VITON 11X3 (6 PCS.)
K1500GR	O-Rings SILICON 11X3 (8PCS)
K1524AA	O-ring + Slide ring Set

### Adapters

Prod. No.	Description
K1523JA	Adapter for mounting Pg13,5-sensors in F*40
K1520JN	Adapter M25x1.5 - PG13.5 PVC
K1520JP	Adapter M25x1.5 - PG13.5 RVS
K1500DV	Adapter M25x1.5 - PG13.5 PVDF
K1523JB	Adapter PG13.5 to 3/4"NPT
K1598AC	Flow fitting (3.1), for SC4A (In combination with K1523JB)
K9148NA	Adapter for mounting Pg13,5-sensors in HA405-120-S3
K9148NB	Adapter for mounting Pg13,5-sensors in HA405-120-PP
K9148NC	Adapter for mounting Pg13,5-sensors in HA405-120-PV

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