pH/C-902

Instruction

Important user information

All users must read the entire instructions to fully understand the safe use of pH/C-902.

Safety notices

WARNING
WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. It is important not to proceed until all stated conditions are met and clearly understood.

CAUTION
CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. It is important not to proceed until all stated conditions are met and clearly understood.

Note: *A note is used to indicate information that is important for trouble-free and optimal use of the product.*

Declaration of conformity

This product meets the requirements of applicable CE-directives when installed and used in an ÄKTAprocess™ system. A copy of the corresponding Declaration of Conformity for the ÄKTAprocess system is available on request.

CE

The CE marking and the corresponding EU Declaration of Conformity is valid for the instrument when it is:

- used according to the *Operating Instructions* or user manuals, and
- used in the same state as it was delivered, except for alterations described in the *Operating Instructions* or user manuals.

Introduction

The pH/C-902 Monitor is a high precision on-line monitor for measurement of pH and conductivity in high performance liquid chromatography applications.

The monitor is suitable for pH and conductivity measurements in pharmaceutical applications where monitoring of running conditions is critical.

The pH/C-902 Monitor is a combined monitor with two independent measuring channels for both pH and conductivity.

The pH/C-902 features:

- Two separate pH measuring channels
- Two separate conductivity measuring channels
- Fast response
- High accuracy and reproducibility
- Flow cells with small dead volume
- Flow cells that can be connected close together, minimizing band broadening and time delays between detectors.
- Control via UNICORN™ software only.

Safety

- The instrument is designed for indoor use only
- Do not use the instrument in a dusty environment or close to spraying water
- Only use the instrument in accordance with local safety regulations

WARNING
The instrument must not be opened by the user.

WARNING
Always disconnect the power supply before attempting to replace any item on the instrument during maintenance.

WARNING
The instrument power supply must be connected to a grounded mains socket.

WARNING
When using hazardous chemicals, always use protective glasses and other suitable personal protection equipment.

Installation

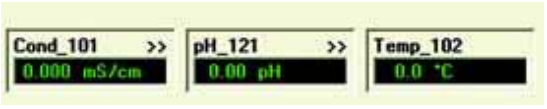
The instrument is delivered pre-installed in ÄKTAprocess system with all electrical connections prepared inside the electronics cabinet. The conductivity cells and the pH electrode flow cell holder are also mounted in proper positions.

WARNING
The electronics cabinet of the ÄKTAprocess system must only be opened by personnel authorized by Cytiva.

Operation

When the system is powered, the instrument is simultaneously switched on. The monitor can be used immediately, but the full specifications are not reached until after a warm-up period of 15 minutes.

The pH/C-902 Monitor has no user interface for the operator. It is controlled entirely via UNICORN control software (version 5.0 or later). The pH and conductivity values, as well as the temperature, are displayed in the **System Control** module of the UNICORN control software.



Note: *The measured temperature is the temperature in the conductivity flow cell, which can differ from the ambient temperature.*

Preparing the instrument

The following settings and calibrations may be necessary to perform as described below:

- Set up conductivity temperature compensation
- Calibrate the conductivity cells
- Prepare and insert the pH electrode
- Calibrate the pH electrode
- Set up pH temperature compensation

Setting up the conductivity temperature compensation

The conductivity in a buffer is temperature dependent. Temperature compensation should be used when relating conductivity to concentration and/or comparing conductivity values. The compensation consists of a compensation factor together with a reference temperature. All conductivity values will then automatically be converted to the set reference temperature.

In the UNICORN System Control module:

Step	Action
1	Select **System:Settings**. *Result:* The **Instructions** dialog box opens.
2	Select **Monitors** and click **Cond_CIR101** or **Cond_CIR102**.
3	Enter a temperature compensation value between 0 and 9.99% in the **CompFactor** box.
4	Click **OK**.

The factor is expressed in percentage increase of conductivity per °C increase in temperature. If the temperature compensation factor is unknown, a general approximate value of 2% can be set for many common salt buffers.

Check the **OFF**-box in the **Instructions** dialog box for no temperature compensation.

Calibrating the conductivity cell

Normally it is not necessary to adjust the cell constant as the flow cell is pre-calibrated on delivery. The conductivity flow cell constant is shown on the packaging and can be entered when the cell is changed. Adjustment is only necessary when replacing the conductivity cell with a flow cell whose constant is unknown. However, it is also recommended that the flow cell is recalibrated after cleaning.

The cell constant is adjusted in the UNICORN System Control module.

Setting the constant for a new conductivity cell

The following instruction is applicable for a conductivity cell where the constant value is known:

Step	Action
1	Read the constant value from the packaging.
2	Selec **System:Calibrate.** *Result:* The **Calibration** dialog box opens.
3	In the **Monitor** box, select **CIT101_Cel** or **CIT102_Cel**.
4	Type the constant value in the **Reference Value 1** box.
5	Click the **Read Value 1** button. *Result:* The measured value is displayed in the **Measured value** box.
6	Click the **Close** button to exit the dialog box.

Calibrating the conductivity cell

Note: *The conductivity temperature compensation must not be activated when the cell constant is adjusted. Set the compensation to **OFF** in the **Instructions** dialog box.*

Step	Action
1	Prepare a calibration solution of 1.00 M NaCl, 58.44 g/l. Let the solution rest until it is at room temperature. This is important for exact measurements.
2	Fill the flow cell completely with the calibration solution by pumping at least 15 ml through the cell with a syringe.

Step	Action
3	Stop the flow and wait 15 minutes until the temperature is constant in the range of 20-30°C.
4	Read the displayed conductivity value and compare it to the theoretical value at the temperature of the calibration solution from the graph below.

No further actions are necessary if the displayed value and the theoretical value correspond. If not, proceed with the following steps:

5	Select **System:Calibrate**. *Result:* The **Calibration** dialog box opens.
6	In the **Monitor** box, select **CIT101_Cal** or **CIT102_Cal**.
7	Type the theoretical conductivity value according to the graph below in the **Reference Value 1** box.
8	Click the **Read Value 1** button. *Result:* The measured value is displayed in the **Measured value** box. The new constant value is updated and displayed in the **Cell constant** box.
9	Click the **Close** button to exit the dialog box.

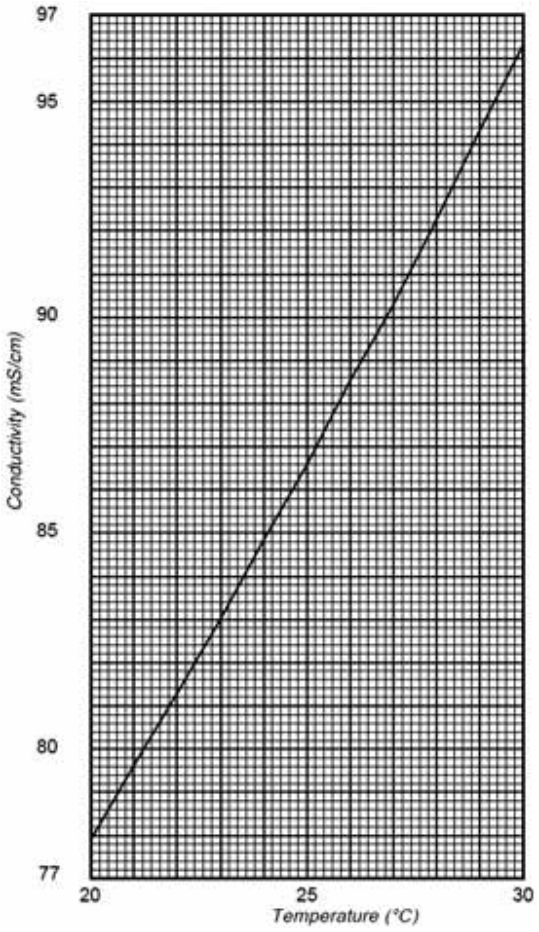


Fig 1. Conductivity of 1.00 M NaCl at 20-30°C

Preparing and inserting the pH electrode

The tip of the pH electrode consists of a thin glass membrane. protect it from breakage, contamination and drying out or the electrode will be destroyed. Always store the electrode with the end cover filled with a 1:1 mixture of pH 4 buffer and 1 MKO_3. Do **not** store in water only.

When it is not in use, e.g. during system CIP, service or storage of the system, the pH electrode is replaced by a pH plug and the pH electrode is placed in a holder that is attached to the frame adjacent to the pH monitor

The instruction below describes how to insert the pH electrode:

Step	Action
1	Unscrew the plastic fastening nut from the pH cell and remove the pH plug.
2	Remove the pH electrode from its holder and take off the protective cap. rinse the electrode with pure water. ***Note:*** *The pH plug may be placed in the pH electrode holder while the electrode is in use*
3	Remove the fastening nut from the pH plug, insert the electrode into the electrode adaptor and slide the nut over the adaptor.
4	Carefully insert the electrode in the flow cell. Tighten the nut by hand to secure the electrode.
5	Connect the monitor cable to the electrode.
6	Connect the grounding wire to the pH cell.

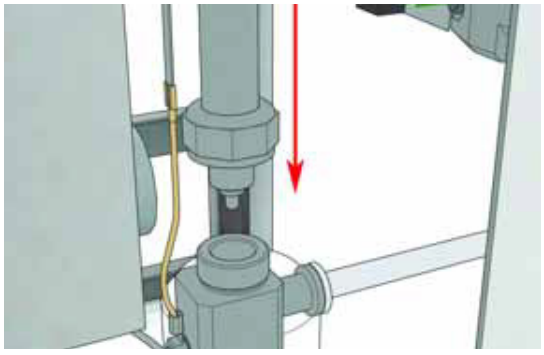


Fig 2. Inserting pH electrode into the flow cell

Note: *if the electrode is not fully inserted, the system will leak and a dead volume will occur in the holder.*

CAUTION
Handle the pH electrode with care

Note: *When running chromatography using organic solvents it is recommended that the pH electrode is removed and the dummy electrode is inserted in its place, as organic solvents will cause pH electrode degeneration.*

Calibrating the pH electrode

A proper laboratory routine is to calibrate the instrument once a day, when the electrode is replaced and if the ambient temperature is changed. The pH monitor is calibrated using standard buffer solutions in a two point calibration. The two buffer solutions can have any pH value as long as the difference between them is at least 1 pH unit.

The calibration can be performed with the pH electrode either fitted in or removed from the flow cell.

Calibrating with the electrode outside the flow cell

When calibrating the electrode out of the flow cell and changing from one buffer to another, rinse the electrode tip with distilled water and dab it carefully with a soft tissue to absorb the remaining water. Do **NOT** wipe the electrode as this may charge it and give unstable readings.

Step	Action
1	Remove the pH electrode from the flow cell and immerse the electrode in the first standard buffer solution (normally pH 7.0).
2	Select **System:Calibrate** in the UNICORN System Control module. *Result:* The **Calibration** dialog box opens.
3	In the **Monitor** box, select **pH_AIT121**.
4	Enter the first reference pH value in the **Reference value 1** box.
5	Click the **Read Value 1** button. *Result:* The measured value is displayed in the **Measured value** box.
6	Rinse the electrode tip with distilled water and then immerse the electrode in the second standard buffer solution (e.g. pH 4.0 or 9.0).
7	Enter the second reference pH value in the **Reference value 2** box.
8	Click the **Read Value 2** button. *Result:* The measured value is displayed in the **Measured value** box.

The **Calibrated electrode slope** box shows the slope of the calibration curve where 100% corresponds to 59.16 mV per pH step at 25°C. The **Asymmetry potential at pH 7** is shown as a mV value.

9	Before use, rinse the electrode using distilled water.

Calibrating with the electrode in the flow cell

Follow the same procedure as above. Ensure that the pH value has stabilized before reading. Leave the pump running while calibrating. Switch to the second standard buffer solution and repeat the procedure.

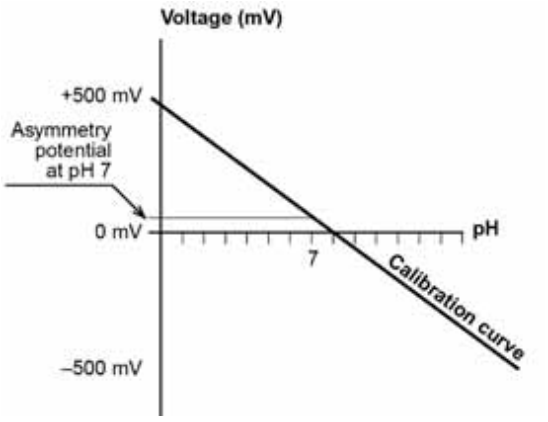


Fig 3. Relationship between pH and the monitor output signal in mV

A new electrode typically has a slope of 95 – 102% and an asymmetry potential within ±30 mV. As the electrode ages the slope decreases and the asymmetry potential increases.

As a rule, an electrode should be replaced when it has an asymmetry potential outside of ±60 mV and a slope lower than 80%, and no improvement can be achieved by cleaning.

An electrode is still usable at lower slopes and higher asymmetry potentials but the response will be slower and the accuracy diminished.

Setting up pH temperature compensation

The relationship between pH and the output signal from the pH electrode is temperature dependent. For more accurate measurements during temperature changes, the pH measurement can be temperature compensated. In normal applications, if the temperature of the buffers and calibration buffers are identical, temperature compensation does not need to be on.

When using temperature compensation it is important that the temperature of the pH electrode is the same as that of the conductivity flow cell since that is where the temperature is measured.

The temperature compensation is activated in the UNICORN System Control module:

Step	Action
1	Select **System:Settings**. *Result*: The **Instructions** dialog box opens.
2	Select **Monitors**.
3	Select **pH_AIA121_TC**.
4	Click the **ON** radio button.
5	Click **OK** to close the dialog box.

Storage

CAUTION
Never leave the pH electrode in the flow cell for any period of time when the system is not used since this may cause the glass membrane of the electrode to dry out.

Storage of the pH electrode

Step	Action
1	Always dismount the pH electrode from the flow cell and fit the end cover filled with a 1:1 mixture of pH 4 buffer and 1 M KNO_3. Do **NOT** store in water only.
2	Replace the pH electrode with the pH plug in the flow cell.

Regeneration of the pH electrode

If the electrode has dried out, immerse the lower end of the electrode in buffer with a 1:1 mixture of pH 4 buffer and 1 M KNO_3 overnight.

Storage of the conductivity flow cells

- **Overnight:** The conductivity cell can be left filled with a buffer.
- **Weekend or long-term storage:** Flush the conductivity cell with water and fill the cell with 20% ethanol.

Restart after power failure

If the power supply to the instrument is interrupted, the instrument automatically restarts itself when the power is resumed. All set values are retained in the instrument.

Maintenance

WARNING
Disconnect the power supply before attempting to replace any item on the instrument during maintenance.
Only personnel authorized by Cytiva may service the instrument.

CAUTION
Only spare parts approved or supplied by Cytiva may be used for maintaining and servicing the instrument.

Periodic maintenance

Interval	Action
Every 6 months or more often if required	Change pH electrode
When required	Clean the conductivity cell
	Clean the pH electrode

See procedures below

Cleaning the flow cell

Step	Action
1	Remove the pH electrode and replace it with the pH plug in the pH flow cell.
2	Pump a cleaning or sanitizing agent through the flow cells.

The standard recommendation is to pump 1 M NaOH for 30 minutes and then wash out with buffer.

WARNING
NaOH is corrosive and therefore dangerous to health. When using hazardous chemicals avoid spillage and wear protective glasses and other suitable personal protection equipment.

Cleaning the pH electrode

Note: *The pH electrode has a limited life length and should be replaced every six months or when the response time is slow.*

Use one of the following procedures to clean the electrode to improve the response:

Deposit	Procedure
Salt	Dissolve the deposit by immersing the electrode first in 0.1 M HCl, then in 0.1 M NaOH, and again in 0.1 M HCl. Each immersion should last for 5 minutes. Rinse the electrode tip in distilled water between each solution.
Oil or **Grease Films**	Wash electrode tip in a liquid detergent and water. If film is known to be soluble in a particular organic solvent, wash with this solvent. Rinse electrode tip in distilled water.
Protein	Dissolve the deposit by immersing the electrode in a 1% pepsin solution, in 0.1 M HCl, for 5 minutes, followed by a thorough rinsing with distilled water.

If these procedure fail to rejuvenate the electrode, the problem is most likely a clogged liquid junction.

Step	Action
1	Heat a 1 M KNO_3 solution to 60 – 80°C.
2	Place the electrode tip in the heated KNO_3 solution.
3	Allow the electrode to cool while immersed in the KNO_3 solution before retesting.

If these steps fail to improve the response of the electrode, it should be replaced.

Changing the pH electrode

See Section *Preparing and inserting the pH electrode,* .

Cleaning the conductivity flow cell

If the conductivity measurements are not comparable to previous results, the electrodes in the flow cell may be contaminated and require cleaning. To clean the flow cell:

Step	Action
1	Pump 15 ml of 1 M NaOH at 1 ml/min through the flow cell either by using the pump or a syringe.
2	Leave it for 15 minutes.
3	Rinse thoroughly with 50 ml de-ionized water.

Note: *If the flow cell is totally blocked, the blockage can be broken using a thin needle or a piece of string with a diameter of less than 0.8 mm.*

Changing conductivity flow cells

The flow cells can be changed when required. Make sure that the system is disconnected from the mains power and de-pressurized before disconnecting/ connecting the flow cells.

If the cell is replaced with a new flow cell, the monitor must be calibrated with the new cell constant value which is written on the flow cell package. See Section *Calibrating the conductivity cell,* .

Troubleshooting

General

When contacting Cytiva for support, access the UNICORN Maintenance Manager in the **System Control** module to display the instrument information, e.g. version number, for reference.

Step	Action
1	Select **System:Maintenance**.
2	Select the **Info** tab.
3	Click the **pH/Cond** icon.
4	Click **General**.

WARNING
The electronics cabinet may only be opened by Cytiva authorized personnel.

Faults and actions

If the suggested actions do not correct the fault, call Cytiva.

pH measurement

Fault	Action
No response to pH changes	1. Check that the electrode cable is connected properly to the electrode. 2. The electrode glass membrane may be cracked. Replace the electrode.
Small response to pH changes	1. Clean the pH electrode. 2. If the problem remains, replace the pH electrode.
Slow pH response or Calibration impossible	1. Check the pH electrode tip. If it is contaminated, clean the electrode. 2. If the membrane has dried out, the electrode may be restored by soaking it in buffer overnight. 3. Clean the liquid junction.
Incorrect / unstable pH reading	1. Check that the electrode cable is connected properly to the electrode. 2. Check that the pump(s) and valves operates correctly. 3. Check that the electrode is correctly inserted in the flow cell and, if necessary, hand-tighten the nut. 4. If air in the flow cell is suspected, tap the flow cell or tilt it to remove the air. Alternatively flush the flow cell with buffer at 8 ml/min for 1/2 min. 5. Check that the pH electrode is not broken. 6. Check that the pH electrode is calibrated. 7. Check the slope. If it is outside the range 80 – 105% or the asymmetry potential deviates more than 60 mV from 0mV, clean the pH electrode. Recalibrate and if the problem persists, replace the pH electrode. 8. Clean the pH electrode if required. 9. Compare the response of the pH electrode with that of another pH electrode. If the response differ greatly, the electrode may require cleaning or replacement. 10. Check that the pH electrode has been calibrated at the correct temperature. 11. In organic solvents such as ethanol, methanol and acetonitrile, stable pH measurements are not possible since dehydration of the membrane will occur. It is recommended that the pH electrode is not used in applications using organic solvents. Replace the electrode with the pH plug. 12. Clean the liquid junction.
pH values vary with varying back-pressure	Replace the pH electrode.

Conductivity measurement

Fault	Action
Incorrect or unstable reading	1. Check that the conductivity flow cell cable is connected properly. 2. Check that the pump(s) and valves operate correctly. 3. If temperature compensation is being used, check that the correct temperature compensation factor is in use. 4. Check that the column is equilibrated. If necessary, clean the column.
Baseline drift or noisy signal	1. There may be air in the flow cell. Use a flow restrictor after the flow cell. 2. Check for leaking tubing connections. 3. Check that the column is equilibrated. If necessary, clean the column. 4. Check the operation of the pump(s). 5. Clean the flow cell.

Fault	Action
Conductivity measurement with the same buffer appears to decrease over time	1. Clean the flow cell. 2. The ambient temperature may have decreased. Use a temperature compensation factor. (See Section *Setting up the conductivity temperature compensation,*)
Absolute conductivity value wrong	1. Recalibrate the conductivity cell. 2. The calibration solution, 1.00 M NaCl was not correctly prepared. Prepare a new calibration solution and recalibrate the conductivity cell.
Ghost peaks appear in the gradient profile	1. A charged sample has been detected (e.g. protein) 2. Air bubbles are passing through the flow cell. Check for loose tubing connections. If necessary use a flow restrictor after the conductivity flow cell.

Error messages

If the suggested actions do not correct the fault, call Cytiva.

pH monitor

Error	Help text message
pH not offset calibrated	Must be factory calibrated, contact service engineer.
Error in temp sensor	If conductivity cell (where temperature sensor is located) is not connected, connect cell and restart system. If error message reappears or conductivity cell is already connected, contact service engineer.
Warning: Bad slope	Slope is < 70% or >100%. Clean the pH electrode. If message reappears, replace the pH electrode.
pH calibration failed	Very bad slope, <10% or >199%. Check pH cell connection. Recalibrate. If error message reappears, replace the pH electrode.
pH too close betw buff 1&2	The difference between pH of the buffers used during calibration must be at least 1 pH unit.
pH-value is out of range	pH must be in the range 0-14.
Bad or not conn pH electr.	Defect pH electrode or pH electrode not connected.
Error factory calibration pH	Factory calibration of negative offset must be repeated, contact service engineer

Conductivity monitor

Error	Help text message
Cell const out of range	1. Wrong solution used during calibration. Recalibrate. 2. Air in conductivity cell during calibration. Flush the flow cell with calibration solution and recalibrate. 3. Dirty conductivity cell. Clean the cell. Recalibrate. 4. Bad cell. Replace.
Error cond hardware	Restart system. If error message reappears, call service engineer.
Incorrect filter size	Enter correct filter size.

Temperature monitor

Error	Help text message
Error in temp sensor	Temperature sensor in conductivity cell X is broken or conductivity cell is not connected. If conductivity cell is not connected, connect cell and restart system. If error message reappears or conductivity cell is already connected, contact service engineer.
Error temp comp	Set correct temperature compensation (0-9.95%) or if conductivity cell is not connected, connect cell and restart system. If error message reappears or conductivity cell is already connected, contact service engineer.
Error in temp sensor	If conductivity cell (where temperature sensor is located) is not connected, connect cell and restart system. If error message reappears or conductivity cell is already connected, contact service engineer.
Ref temp out of range	Enter correct reference temperature (0-99.9°C).

Reference information

pH electrode

The pH electrode is of the sealed combination double junction type. It contains a sealed Ag/AgCl reference which cannot be refilled, an internal electrolyte bridge of 4M KCl saturated with Ag/AgCl, an outer electrolyte bridge of 1 M KNO_3, an annular ceramic reference junction and a low profile pH membrane. The pH electrode is delivered with a transparent cover.

The flow cell should not be used with another pH electrode.

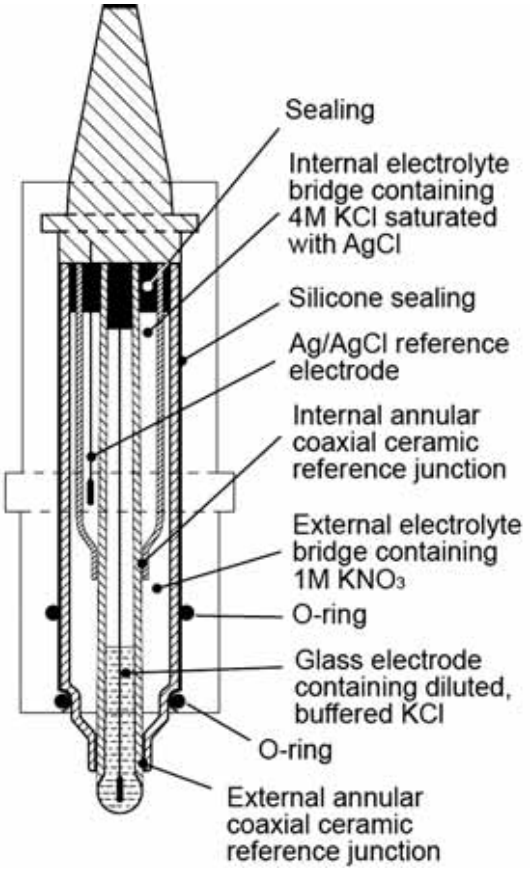


Fig 4. pH electrode cross-section

Conductivity cell

The flow cell has two cylindrical titanium electrodes positioned in the flow path of the cell. An alternating voltage is applied between the electrodes and the resulting current is measured and used to calculate the conductivity of the eluent. The monitor controls the AC frequency and increases it with increasing conductivity between 50 Hz and 50 kHz giving maximum linearity and true conductivity values.

The conductivity is automatically calculated by multiplying the measured conductance by the flow cell's cell constant. The cell constant is pre-calibrated on delivery but can be measured with a separate calibration procedure. This procedure is described in Section *Calibrating the conductivity cell,* .

One of the electrodes has a small temperature sensor for measuring the temperature of the eluent in the flow cell. Temperature variations influence the conductivity and in some applications, when highly precise conductivity values are required, it is possible to program a temperature compensation factor that recalculates the conductivity to a set reference temperature.

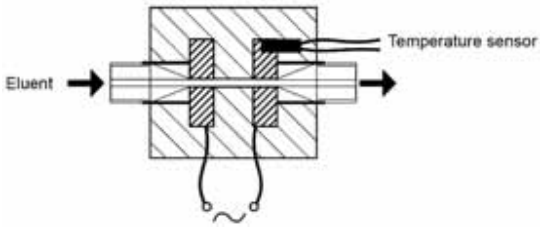


Fig 5. Conductivity cell – principle

Technical specifications

Operating data

General	
Operating temperature for monitor	4 – 40°C
Operating surrounding temperature for cells	2 – 30°C
Surrounding humidity	20 – 95% rH

pH measurement	
pH range	0 to 14 (spec. valid between 2 and 12)
Accuracy	
temperature compensated[1]	±0.1 pH within +4 to +40°C
not temperature compensated[1]	±0.2 pH within +15 to +25°C ±0.5 pH within +4 to +40°C
Response time	Max 150 s (0-95% of step)
Long term drift	Max 0.1 pH units/8 h (constant conditions)
Flow rate sensitivity	Max 0.2 pH units within 50l/h - 200 l/h 20°C

[1] Calibrated for 20°C

Conductivity measurement	
Conductivity range	1 µS/cm - 999.9 mS/cm
Deviation from true conductivity value	Max ± 4 % or ±10 µS/cm, whichever is greater, in the range 1 µS/cm – 300 mS/cm Max ± 2 % or ±10 µS/cm, whichever is greater, in the range 0,1 µS/cm – 100 mS/cm (at room temperature)
Reproducibility	
short term	Max ±1 % or ±5 µS/cm
long term	Max ±3 % or ±15 µS/cm
Noise	±0.5% of full scale calibrated range
Response time	Max. 120 s (0 – 95% of step)
Temperature sensor	
Accuracy	±2.0°C
Drift	±1%/10 h
Flow rate sensitivity	±1% within 50 l/h – 200 l/h 20°C

Flow cell data

pH cell	
Cell sizes:	
6 mm	For use in: 6mm Polypropylene systems 3/8" Stainless steel systems
10 mm	For use in: 10mm Polypropylene systems 1/2" Stainless steel systems
22 mm	For use in: 1" systems (PP and SS)

pH cell	
Flow range	4 – 180 l/h (6 mm cell)
	13 – 600 l/h (10 mm cell)
	45 – 1800 l/h (22 mm cell)
Max pressure	10 bar (6 and 10 mm cell)
	6 bar (22 mm cell)
	3 bar up to +60°C (all cells)
	1 bar up to +80°C (all cells)
Back pressure	Max 0.1 bar at 600 l/h (6 and 10 mm cell)
	Max 0.1 bar at 1800 l/h (22 mm cell)
Wetted materials	PEEK and Polypropylene (polypropylene systems)
	PEEK and EN 1.4435 (stainless steel systems)
	Sealing: EPDM, FEP encapsulated silicone
Chemical resistance	The wetted parts are resistant to organic solvents and salt buffers commonly used in chromatography of biomolecules, except 100% Ethyl acetate, 100% Hexane and 100% Tetrahydrofuran (THF)

Conductivity cell	
Cell sizes:	
8 mm	For use in:
	6 and 10 mm Polypropylene systems
	3/8" and 1/2" Stainless steel systems
12 mm	For use in:
	1" Polypropylene systems
	1" Stainless steel systems
Flow range	4 – 600 l/h (8 mm cell)
	45 – 1800 l/h (12 mm cell)
Max pressure	10 bar (8 mm cell)
	6 bar (12 mm cell)
	3 bar up to +60°C (all cells)
	1 bar up to +80°C (all cells)
Back pressure	Max 0.1 bar at 600 l/h (8 mm cell)

Conductivity cell	
	Max 0.2 bar at 1800 l/h (12 mm cell)
Wetted materials	PEEK, Polypropylene and Titanium
	Sealing: EPDM, FEP encapsulated silicone
Chemical resistance	The wetted parts are resistant to organic solvents and salt buffers commonly used in chromatography of biomolecules, except 100% Ethyl acetate, 100% Hexane and 100% Tetrahydrofuran (THF)

Accessories and spare parts

Item	Quant	Code no.
Transmitter pH/C-902	1	28-4019-33
pH electrode CPS11-1BA2ESA	1	44-5514-99
pH Cable CPK9 TOP68 L=5	1	44-5514-85
O-ring kit pH PFR91	1	44-3004-70
pH flowcell PEEK/PFR91 Process connection: 3/4" Tri-Clamp (TC25), ID 9.4mm	1	28-4022-28
Conductivity sensor 8mm EPDM	1	28-4021-98
Conductivity sensor 8mm FEP	1	28-4021-99
O-ring kit CM-C EPDM	1	28-4022-00
2pcs O-ring 25.07x2.62 EPDM		
6pcs O-ring 10.78x2.62 EPDM		
1pc O-ring 58x3.0 EPDM		
1pc Assembly rod		
O-ring kit CM-C FEP	1	28-4022-01
2pcs O-ring 25.07x2.62 EPDM		
6pcs O-ring 10.77x2.62 FEP		
1pc O-ring 58x3.0 EPDM		
1pc Assembly rod		

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