

- On-line measurement of pH and conductivity – two monitors combined in one unit
- Accurate readings of elution conditions – measures conductivity and pH with temperature compensation
- Accurate and reliable day-to-day performance – automatic self-diagnosis
- Easy-to-use – controlled by UNICORN™ control system or by a single dial
- Suitable for a wide range of applications – from reversed phase with very low conductivity eluents to high salt separations at flow rates up to 100 ml/min

Introduction

Monitor pH/C-900 is a combined monitor for accurate, on-line monitoring of pH and conductivity in a wide range of liquid chromatography applications. Its accurate response coupled with high precision over a wide measuring range makes it ideal for use in all chromatography techniques, from reversed phase with very low conductivity eluents to hydrophobic chromatography in high salt solutions. Monitor pH/C-900 is simple to use, either as part of ÄKTA™ design or as a stand-alone detector.

The pH/C-900 consists of a control unit, a flow cell for conductivity, a flow cell with a holder for the pH electrode and the pH electrode (Fig. 1).



Fig. 1. Monitor pH/C-900 is a combined monitor for accurate, on-line monitoring of pH and conductivity conditions with high precision over a wide dynamic range.

On-line measurement of pH and conductivity

Information from on-line monitoring of pH and conductivity is an ideal complement to a UV monitor in liquid chromatography. When monitoring true elution conditions and optimizing gradients, such data provide a reliable check of the sample, the buffer conditions, and the equipment used, etc. Furthermore, pH and conductivity data are extremely useful when monitoring the run-to-run reproducibility, especially when developing and optimizing purification schemes. Figure 2 shows typical applications of the pH/C-900 monitor.

Sample: A synthetic peptide corresponding to residue 89–101 of myelin basic protein
Sample load: 30 µg/ml gel
Column: Sephasil™ C8 4 × 250 mm (3.14 ml)
Eluent A: 0.065% TFA in distilled water
Eluent B: 0.05% TFA in acetonitrile
Gradient: 10–50% B in 10 column volumes
Flow rate: 0.5 ml/min (4 cm/min)
System: ÄKTAexplorer

Sample: Tritylated phosphorothioate 25-mer oligonucleotide in 25% ammonia
Sample load: 200 ODU (corresponding to 7.4 mg oligonucleotide)
Column: RESOURCE™ Q 1 ml, 3 cm bed height
Eluent A: 10 mM NaOH
Eluent B: 0.4% TFA in distilled water
Eluent C: 10 mM NaOH, 2 M NaCl
Flow rate: 1.6 ml/min (300 cm/h)
System: ÄKTAexplorer

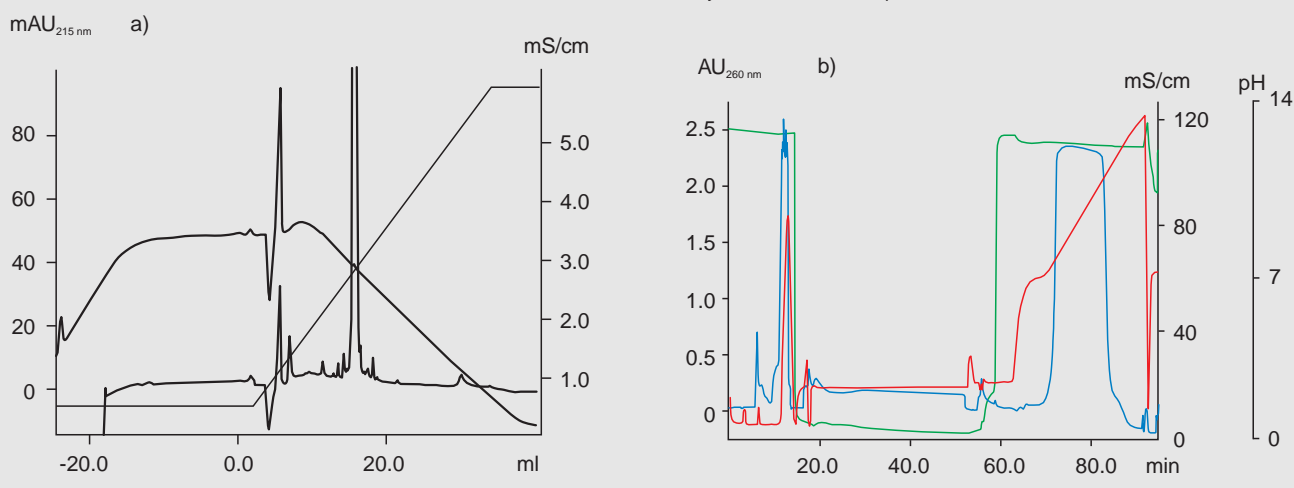


Fig. 2. Information from on-line monitoring of pH and conductivity is especially useful when developing and optimizing purification schemes. Fig 2a illustrates how the conductivity monitor can be utilized to follow the gradient formation in reversed phase chromatography. Here, the conductivity signal has also been used to follow the equilibration to ensure that the column has been completely equilibrated before the sample is applied. Figure 2b shows an application where pH is an important parameter to record when documenting that the separation has run according to its programmed method.

Accurate readings of elution conditions

The response times of both flow cells give almost instantaneous signals on the display and the recorded chromatogram, providing easy to interpret gradient and elution patterns.

Low cell volumes in both cells (24 µl conductivity flow cell and 88 µl pH flow cell) contribute to accurate readings, as does the very high linearity of the conductivity unit. Figure 3 illustrates the measured conductivity, using Monitor pH/C-900, compared to the theoretical conductivity.

As variations in temperature influence conductivity readings, the conductivity flow cell is fitted with a temperature sensor that measures the temperature of the eluent. A temperature compensation factor can be programmed to report the conductivity relative to a set reference temperature. The same temperature sensor is also used for temperature compensation of pH readings.

Accurate and reliable day-to-day performance

At each start-up, the pH/C-900 automatically performs a self-diagnostic test. This ensures top performance throughout day-to-day operation.

Easy-to-use

Monitor pH/C-900 is an integral component of ÄKTAexplorer. When operated in ÄKTAdesign, all functions, such as temperature compensation, alarms etc., are under direct control of UNICORN, the control system of ÄKTAdesign. Signals from the monitor can be shown in real time on the display on the PC.

Monitor pH/C-900 can also be used as a stand-alone monitor or in user-designed systems. When used as a stand-alone unit, all menus and settings are entered with one dial on the front panel (see Fig. 4).

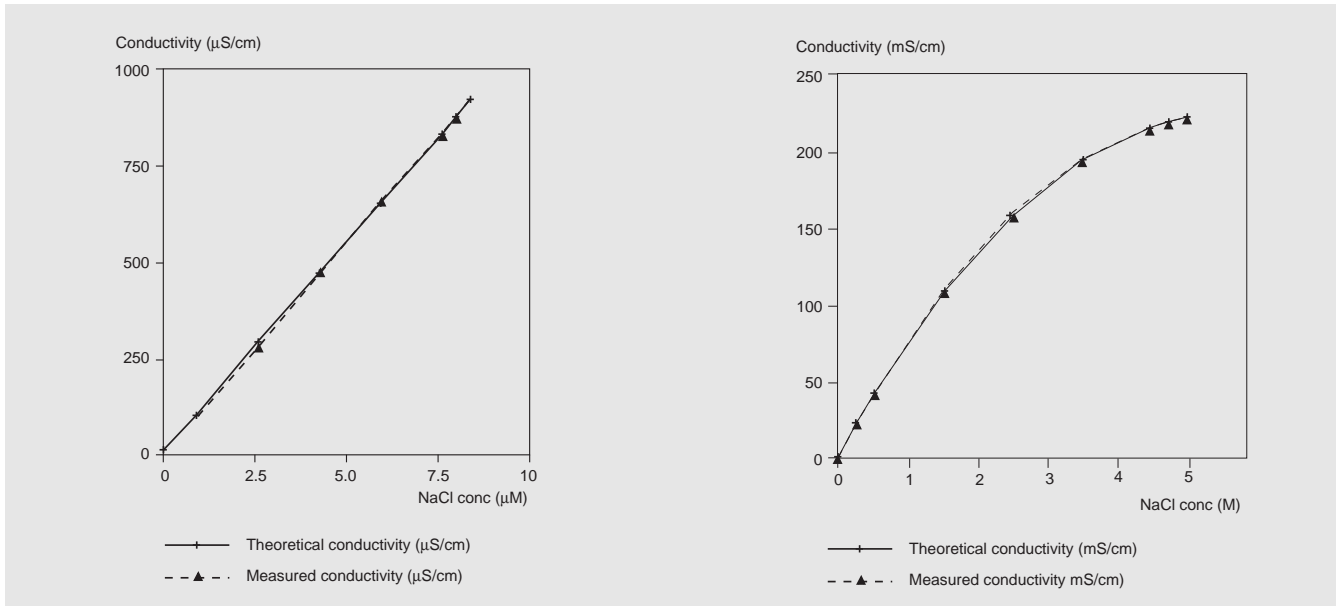


Fig. 3. This figure illustrates accurate readings with high linearity at two quite different concentration ranges of sodium chloride. Conductivity measured with Monitor pH/C-900 is compared with the theoretical conductivity.

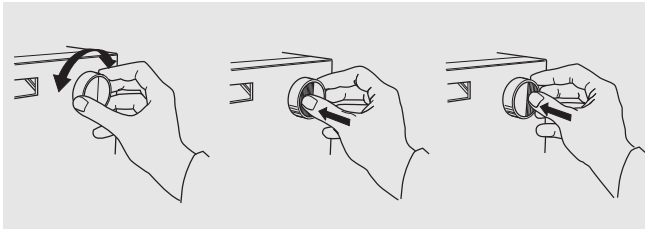


Fig. 4. The pH/C-900 is simple to use. A single dial controls selection and acceptance of values when used as a stand-alone unit.

The normal display shows conductivity as a percentage of full scale, the current temperature in the flow cell, and the pH. Other displays can be programmed according to user needs. For example, the display can show only the actual conductivity in $\mu\text{S}/\text{cm}$ or mS/cm with the percentage value as a horizontal bar graph.

Suitable for a wide range of applications

The pH/C-900 is a versatile monitor both in terms of its broad measuring range for conductivity and pH as well as its flow rate range.

The dynamic conductivity ranges from $1 \mu\text{S}$ to $999.9 \text{ mS}/\text{cm}$ in one range, which eliminates range settings. Flow rates up to $100 \text{ ml}/\text{min}$ can be used without changing flow cells. These capabilities make the pH/C-900 easy to use from analytical to preparative scale with a wide range of elution buffers.

Technical specifications

Operating data

Conductivity unit

Conductivity range	1 $\mu\text{S/cm}$ –999.9 mS/cm
Accuracy	$\pm 2\%$ of full scale calibration range or $\pm 10 \mu\text{S/cm}$ whichever is greater in the range 1 $\mu\text{S/cm}$ –300 mS/cm
Reproducibility	$\pm 3\%$ maximum or $\pm 15 \mu\text{S/cm}$ whichever is greater in the range 1 $\mu\text{S/cm}$ –300 mS/cm
Noise	$\pm 0.5\%$ of full scale calibrated range

Flow cell

cell constant:	50 $\text{cm}^{-1} \pm 20$
max. flow rate:	100 ml/min
max. pressure:	5 MPa (725 psi)
cell volume:	24 μl
temperature range:	+4 to +40 °C (liquid)
wetted parts:	CTFE (chlorotrifluoroethylene) and titanium

pH unit

pH range 0–14 (specifications valid between 2–12)

Accuracy ± 0.1 pH unit, temperature compensated

Stability max 0.1 pH units deviation/10 h

Flow cell

max. flow rate:	100 ml/min
max. pressure:	0.5 MPa (72 psi)
cell volume:	40 μl
temperature range:	+4 to +40 °C (liquid)
wetted parts	
pH electrode:	Glass, PE and EPDM
Flow cell:	PEEK
dummy electrode:	PTFE (polytetrafluoroethylene)

Environment

Ambient

temperature +4 to +40 °C

Relative humidity 20–95%

Atmospheric

pressure 84–106 kPa

Physical data

Control

stand-alone use:	dial
in ÄKTAdesign:	UNICORN and/or dial

Display 2 lines with 20 characters in each

Power requirement 100–120/220–240 V AC, 50–60 Hz

Power consumption 25 VA

Analog output 0–1 V, 4–20 mA

Net weight 4 kg

Dimensions

W × D × H 260 × 370 × 100 mm

Ordering information

Designation	Quantity	Code No.
Monitor pH/C-900 (Conductivity cell, pH Flow Cell and pH electrode should be ordered separately)	1	18-1107-76
Conductivity cell	1	18-1111-05
pH electrode complete, flat tip (incl. electrode, dummy, flow cell and holder)	1	18-1124-70
pH electrode, flat tip	1	18-1124-71
Signal cable 6 pin miniDIN-open	1.5 m	18-1110-64
ÄKTAexplorer		18-1112-41

Related product literature

Product	Code No.
Monitor UV-900	Data File 18-1111-17
Pump P-901	Data File 18-1111-18
UNICORN control system	Data File 18-1111-20
ÄKTAexplorer	Data File 18-1111-21
ÄKTAexplorer ancillary equipment	Data File 18-1111-22

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