

Monitor pH/C-900

Operating Instructions

Original instructions
Translation disc included



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1 Introduction

About this chapter

This chapter contains important user information, descriptions of safety notices, regulatory information, and intended use of the Monitor pH/C-900 instrument.

In this chapter

Section		See page
1.1	About this manual	6
1.2	Important user information	7

1.1 About this manual

Purpose of this manual

The *Operating Instructions* provide you with the information needed to install, operate and maintain the product in a safe way.

Typographical conventions

Software items are identified in the text by ***bold italic*** text.

Hardware items are identified in the text by **bold** text.

In electronic format, references in *italics* are clickable hyperlinks.

1.2 Important user information

Read this before operating the product



All users must read the entire *Operating Instructions* before installing, operating or maintaining the product.

Always keep the *Operating Instructions* at hand when operating the product.

Do not operate the product in any other way than described in the user documentation. If you do, you may be exposed to hazards that can lead to personal injury and you may cause damage to the equipment.

Intended use of the product

Monitor pH/C-900 is intended for research use only, and shall not be used in any clinical procedures, or for diagnostic purposes.

Prerequisites

In order to operate Monitor pH/C-900 safely, and according to the intended purpose, the following prerequisites must be met:

- You should be acquainted with the use of bioprocessing equipment and with the handling of biological materials.
- You must read and understand the *Safety* chapter of these *Operating Instructions*.
- The system must be installed according to the instructions in the *Installation* chapter.

Definitions

This user documentation contains safety notices (WARNING, CAUTION, and NOTICE) concerning the safe use of the product. See definitions below.



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.

1 Introduction

1.2 Important user information



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.



NOTICE

NOTICE indicates instructions that must be followed to avoid damage to the product or other equipment.

Notes and tips

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

Tip: *A tip contains useful information that can improve or optimize your procedures.*

2 Safety instructions

About this chapter

This chapter describes safety compliance, safety labels, general safety precautions, emergency procedures, power failure and recycling of Monitor pH/C-900.

Important



WARNING

Before installing, operating or maintaining the product, all users must read and understand the entire contents of this chapter to become aware of the hazards involved.

In this chapter

Section		See page
2.1	Safety precautions	10
2.2	Labels	13
2.3	Emergency procedures	14

2.1 Safety precautions

Introduction

The safety precautions in this section are grouped into the following categories:

- General precautions
- Personal protection
- Installing and moving the system
- System operation
- Maintenance

General precautions

Always follow these General precautions to avoid injury when using the Monitor pH/C-900 instrument.



WARNING

Do not operate the product in any other way than described in the user documentation.



WARNING

Only properly trained personnel may operate and maintain the product.



NOTICE

Any computer used with the equipment must comply with IEC 60950 or IEC 62368-1 and be installed and used according to the manufacturer's instructions.

Personal protection



WARNING

Always use appropriate Personal Protective Equipment (PPE) during operation and maintenance of this product.

**WARNING**

Hazardous substances and biological agents. When using hazardous chemical and biological agents, take all suitable protective measures, such as wearing protective clothing, glasses and gloves resistant to the substances used. Follow local and/or national regulations for safe operation and maintenance of this product.

**WARNING**

Spread of biological agents. The operator must take all necessary actions to avoid spreading hazardous biological agents. The facility must comply with the national code of practice for biosafety.

Installing and moving the instrument

**WARNING**

Protective ground. The product must always be connected to a grounded power outlet.

**WARNING**

Power cord. Only use power cords with approved plugs delivered or approved by Cytiva.

**WARNING**

Access to power switch and power cord with plug. Do not block access to the power switch and power cord. The power switch must always be easy to access. The power cord with plug must always be easy to disconnect.

**CAUTION**

Make sure that the system is placed on a stable, level bench with adequate space for ventilation.

System operation



WARNING

If liquid is spilled on the equipment, the electrical power supply must be disconnected immediately. The equipment must be completely dry on the inside and the outside before reconnecting the power supply.

Maintenance



WARNING

Electrical shock hazard. All repairs should be done by service personnel authorized by Cytiva. Do not open any covers or replace parts unless specifically stated in the user documentation.



WARNING

Disconnect power. Always disconnect power from the instrument before performing any maintenance task.



WARNING

Use only approved parts. Only spare parts and accessories that are approved or supplied by Cytiva may be used for maintaining or servicing the product.



WARNING

Corrosive substance. NaOH is corrosive and therefore dangerous to health. When using hazardous chemicals, avoid spillage and wear protective glasses and other suitable Personal Protective Equipment (PPE).



CAUTION

Hazardous chemicals or biological agents in UV flow cell. Make sure that the entire flow cell has been flushed thoroughly with bacteriostatic solution (e.g., NaOH) and distilled water, before service and maintenance.

2.2 Labels

Introduction

This section describes the system label and other safety or regulatory labels that are attached to the product.

System label

The system label is located on the back of the equipment. The system label identifies the equipment and shows electrical data, regulatory compliance, and warning symbols.

Description of symbols on the system label

The following symbols and text may be present on the system label:

Symbol/text	Meaning
Code no	Product code
Serial no	Serial number
Mfg Year	Manufacturing year (YYYY) and month (MM)
Voltage Frequency Max Power	Electrical requirements: • Supply voltage (VAC ~) • Supply voltage frequency (Hz) • Max. power consumption (VA)
	Warning! Read the user documentation before using the system. Do not open any covers or replace parts unless specifically stated in the user documentation.

2.3 Emergency procedures

Introduction

This section describes how to shut down the Monitor pH/C-900 instrument in an emergency situation.
The section also describes the result in the event of power failure.

Emergency shutdown

In an emergency situation, follow the steps below to stop the run:

Step	Action
1	Press the On/off switch located on the rear panel to the (O) position to turn off the power to the instrument.
2	If required, disconnect the mains power cord. <i>Result:</i> The run is interrupted immediately.

Restart after power failure

If the power supply to the instrument is interrupted, the instrument automatically restarts itself and displays the main operating window. All set values are retained in the instrument.

3 Instrument description

About this chapter

This chapter gives an overview of the Monitor pH/C-900 instrument, and a brief description of its function.

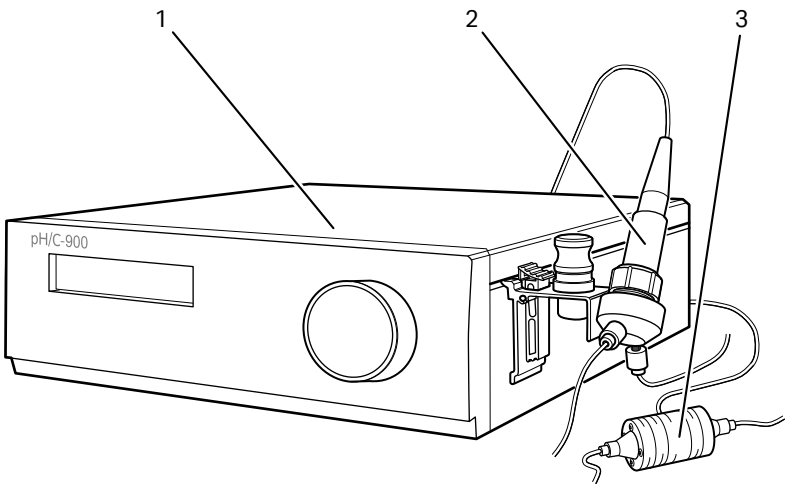
Introduction to Monitor pH/C-900

Monitor pH/C-900 is an on-line monitor for measurement of pH and conductivity. The monitor can work with standard glass pH electrodes with a built in liquid-filled reference electrode and BNC connector.

The conductivity monitor has a very large dynamic range from 1 μ S to 999.9 mS/cm and is therefore suitable for a wide range of applications.

Main unit

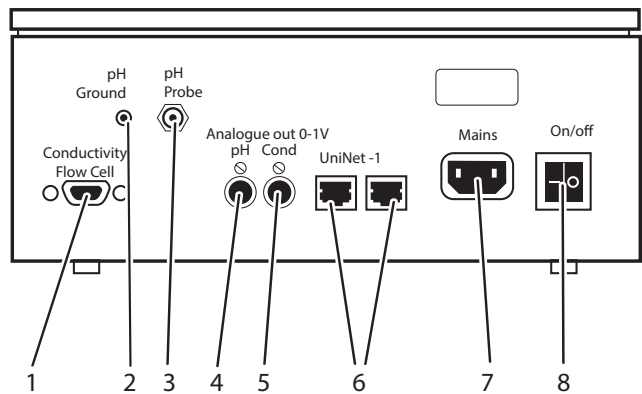
The illustration below shows the Monitor pH/C-900 instrument.



Part	Function
1	Main unit
2	pH electrode
3	Conductivity flow cell

Main unit, rear panel

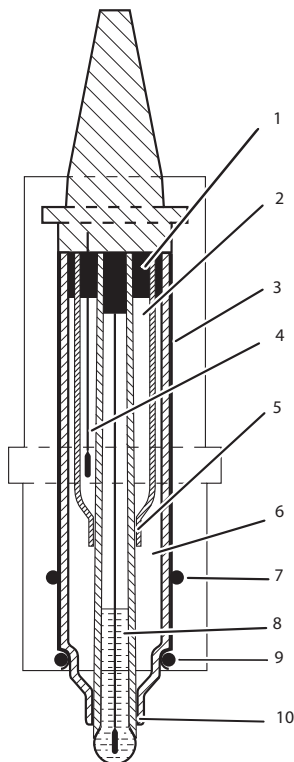
The illustration below shows the rear panel of the Monitor pH/C-900 instrument.



Part	Function
1	Conductivity Flow Cell. Connection to conductivity flow cell, 9 pole D-sub connector
2	pH Ground. pH signal ground
3	pH Probe. Connection to pH electrode, standard BNC socket
4	Analog out 0–1V pH. Separate recorder output for pH, recorder output 0–1 V
5	Analog out 0–1V Cond. Separate recorder output for conductivity, recorder output 0–1 V
6	UniNet-1. Computer network
7	Mains. Supply voltage, grounded
8	On/off. Instrument power switch

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 1M KNO₃, an annular ceramic reference junction and a low profile pH membrane. The pH electrode is delivered with a transparent cover.

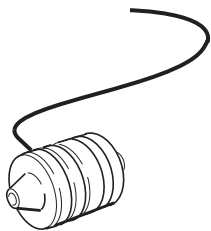


Part	Function
1	Sealing
2	Internal electrolyte bridge containing 4M KCl saturated with AgCl
3	Silicone sealing
4	Ag/AgCl reference electrode
5	Internal annular coaxial ceramic reference junction
6	External electrolyte bridge containing 1M KNO ₃
7	O-ring
8	Glass electrode containing diluted, buffered KCl

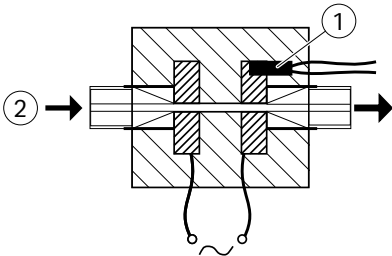
Part	Function
9	O-ring
10	External annular coaxial ceramic reference junction

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, see *Calibrating the conductivity cell*, on page 41.



One of the electrodes has a small temperature sensor (1) for measuring the temperature of the eluent (2) 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.

4 Installation

About this chapter

This chapter provides required information to enable users and service personnel to unpack, install, move and transport Monitor pH/C-900.

Safety precautions



WARNING

Before attempting to perform any of the procedures described in this chapter, you must read and understand all contents of the Safety instructions chapter.

In this chapter

Section	See page
4.1 Site requirements	20
4.2 Unpacking	22
4.3 Installing the conductivity cell	23
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4.1 Site requirements

Space requirements

Prepare a clean working area on a stable laboratory bench. The bench must comply with the specifications in the following table.

Parameter	Specification
Minimum bench area for operating Monitor pH/C-900	70 x 60 cm
Free space required around the imager	At least 40 cm free space in front of the instrument 10 cm free space on all other sides
Space for touchscreen or monitor with keyboard and mouse	60 x 60 cm
Load capacity	980 N (100 kg) or higher
Inclination of bench surface	Horizontal $\pm 2^\circ$



WARNING

Access to power cord. Do not block access to the power cord. The power cord must always be easy to disconnect.

Environmental requirements

The following general requirements must be fulfilled:

- The room must have exhaust ventilation
- The instrument should not be exposed to sources of heat, such as direct sunlight
- Dust in the atmosphere should be kept to a minimum
- The equipment must not be exposed to vibrations

The installation site must comply with the following specifications.

Parameter	Requirement
Allowed location	Indoor use only
Ambient temperature, operation	5°C to 40°C
Ambient temperature, storage	-25°C to 70°C

Parameter	Requirement
Max. relative humidity, operation	80% RH, non-condensing, up to 31°C Decreasing linearly to 50% RH at 40°C
Relative humidity, non-operating	20% to 95%, noncondensing
Altitude, operation	Up to 2000 m
Pollution degree of the intended environment	Pollution degree 2
Placement	In ÄKTA™ explorer or ÄKTApurifier

Electrical power requirements

Parameter	Specification
Supply voltage	100 to 120 V AC 220 to 240 V AC
Frequency	50/60 Hz
Max power	300 VA
Transient overvoltages	Overvoltage category II



WARNING

Protective ground. The product must always be connected to a grounded power outlet.

4.2 Unpacking

Unpack the instrument and check the items against the supplied packing list.

Check the equipment for damage before starting assembly and installation as follows.

- Check that there are no loose parts in the transport crate.
- Check that all the parts are either mounted on the system or located in the accessory kit box.

If any damage is found, document the damage, and contact your local Cytiva representative.

It is recommended that all packing materials should be retained if onward transport of the instrument is expected.

4.3 Installing the conductivity cell



NOTICE

The mains power to Monitor pH/C-900 must be switched off before connecting the instrument to any cells or external equipment.

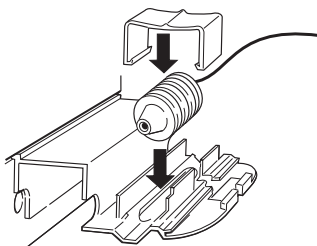
Follow the steps below to install the conductivity cell.

Step

Action

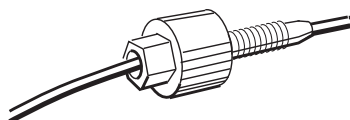
1

Place the conductivity cell in a suitable place, for example on the shelf of the Monitor UV-900 using the clip provided with the UV monitor. The cell can be placed up to 1.5 m from the monitor housing.



2

Connect the conductivity cell to the socket **Conductivity Flow Cell** on the rear panel of the instrument.



3

Connect the tubing with the Fingertight connectors. The flow cell itself does not have a recommended flow direction. In conjunction with the pH electrode, place the conductivity flow cell and select its flow direction so that the screw head end of the flow cell faces the pH flow cell.

4.4 Installing the pH electrode



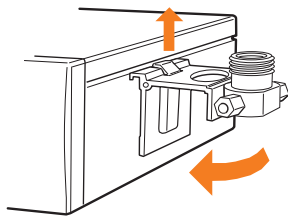
NOTICE

The mains power to Monitor pH/C-900 must be switched off before connecting the instrument to any cells or external equipment.

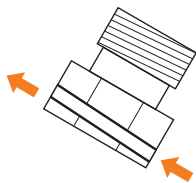
Mount the flow cell holder

Follow the steps below to mount the flow cell holder.

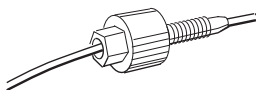
Step	Action
1	Hook the flow cell holder on the right hand side of the housing. Secure it with the slide clamp.



- 2 If the flow cell holder is not used, the flow cell must still be installed at an angle of 30° from the vertical with the outlet placed higher than the inlet to prevent air bubbles being trapped in the cell. The flow direction is marked on the flow cell.



- 3 Connect the tubing with fingertight connectors.



Insert and connect the pH electrode

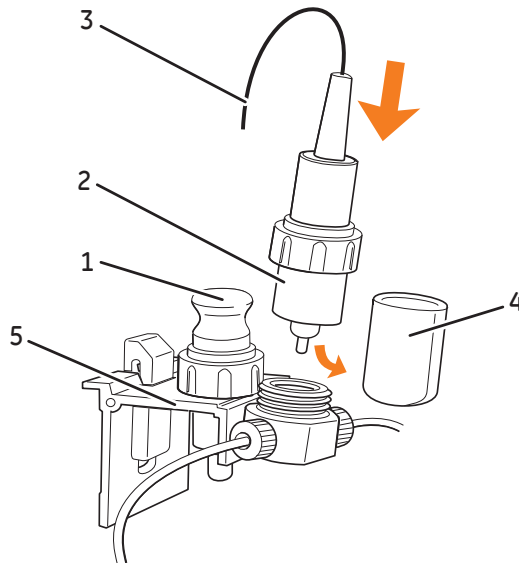


NOTICE

Never leave the pH electrode in the cell holder when the system is not used, since this might cause the glass membrane of the electrode to dry out. Remove the pH electrode from the cell holder 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.**

Follow the steps below to insert and connect the pH electrode.

Step	Action
1	Unpack the pH electrode. Make sure that it is not broken or dry.
2	Before using the electrode, remove the electrode end cover (4) and immerse the glass bulb in buffer for 30 minutes.
3	Remove the dummy electrode (1) from the flow cell and store it in the flow cell holder (5).
4	Carefully insert the electrode (2) in the flow cell. Tighten the nut by hand to secure the electrode.



4 Installation

4.4 Installing the pH electrode

Step	Action
5	Note: <i>If the electrode is not fully inserted, the system will leak and a dead volume will occur in the holder.</i>
6	Connect the pH electrode cable (3) to the socket pH probe on the rear of the module.

4.5 Connecting to chart recorder



NOTICE

The mains power to Monitor pH/C-900 must be switched off before connecting the instrument to any cells or external equipment.

The external chart recorder outputs for pH and conductivity from the monitor are 0 V to 1 V. There is also a 4 mA to 20 mA signal available at the same output connectors. Follow the steps below to connect the chart recorder.

Step	Action
1	Connect the chart recorder to the DIN-socket pH or Cond using the cable supplied: • For 0 V to 1 V use wire 1 (+) and 2 (–). Use a recorder with floating inputs (i.e., none of the inputs connected to ground). - or • For 4 mA to 20 mA use wire 5 (+) and wire 6 (–). Note: <i>The signal cable is delivered with protective covers on each wire. Do not remove the protective covers from unused connections as a short circuit may disturb the measurements.</i>
2	Set the recorder to 0 V to 1 V or 4 mA to 20 mA input, full scale.

4.6 Connecting to communication link



NOTICE

The mains power to Monitor pH/C-900 must be switched off before connecting the instrument to any cells or external equipment.

The monitor is intended for use with ÄKTAexplorer and ÄKTApurifier, and can be controlled from a PC running UNICORN™ version 2.20 or higher, using UniNet cables.

Connect two UniNet cables to the **UniNet 1** connectors. The instrument can be connected in series anywhere between the PC and a termination plug. The UniNet link connects, in series, the PC with Pump P-900, Monitor pH/C-900, Monitor UV-900 and the Frac-900. The termination plug is connected to the last instrument in the chain.

4.7 Connecting to supply voltage



WARNING

Protective ground. The product must always be connected to a grounded power outlet.

Follow the steps below to connect to the supply voltage.

Step	Action
1	Make sure the On/off switch is in the OFF-position 0 .
2	Connect the supplied mains cable between the instrument and a grounded mains socket. Any voltage 100 VAC to 240 VAC, 50 Hz to 60 Hz can be used.

The instrument contains no user replaceable fuse. See *Main unit, rear panel, on page 16*.

4.8 Preparing the instrument for use



NOTICE

Any computer used with the equipment must comply with IEC 60950 or IEC 62368-1 and be installed and used according to the manufacturer's instructions.

Before the instrument is ready to use:

- Set the conductivity cell constant, see *Entering the conductivity cell constant*, on page 43.
- Calibrate the temperature sensor, see *Calibrating the temperature sensor*, on page 46.
- Calibrate the pH electrode, see *Section 5.6 Calibrating pH and conductivity*, on page 52.

Note: *The conductivity cell constant is shown on the packaging. Retain the packaging in case the conductivity cell constant needs to be re-entered.*

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

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

Before performing these procedures you are recommended to read *Section 5.1 Starting the instrument*, on page 32, *Moving between menus*, on page 33, *Return to main menu*, on page 34, *Select value*, on page 34 and *Main menu overview*, on page 35.

5 Operation

About this chapter

This chapter gives instructions on how to operate the product in a safe way.

Safety precautions



WARNING

Before attempting to perform any of the procedures described in this chapter, you must read and understand all contents of the Safety instructions chapter.

In this chapter

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5.1 Starting the instrument

Note: *The monitor can be used immediately but the full specifications are not obtained until after a 1 hour warm-up.*

Follow the steps below to start the instrument.

Step	Action
1	Switch on the instrument at the On/off switch on the rear panel. At switch on, the instrument performs a self test and then starts calibration. After approximately 30 seconds the display shows Calibration OK. Selftest Monitor pH/C900 Calibrating Calibration OK
2	The display shows Cond Temp pH and the instrument is ready to use. All parameters are factory set to default values. If the conductivity cell is not connected the Temp and Cond fields are blank. The pH field is blank if ShowpH is set to off. Cond Temp pH 25.4% 22.9°C 11.50

5.2 Menu selection and settings

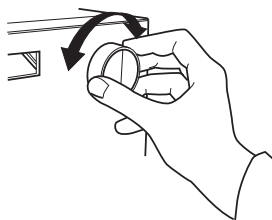
Moving between menus

A specific menu is selected by turning the front selection dial clockwise or counter-clockwise. When the required menu is visible the menu or selection is accepted by pressing the **OK** button.

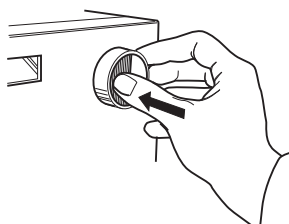
Follow the steps below to move between the menus.

Step	Action
------	--------

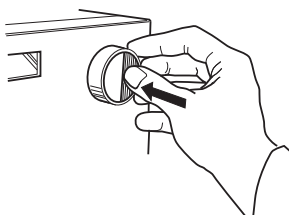
- | | |
|---|--|
| 1 | Turn dial clockwise or counterclockwise to select menus. |
|---|--|



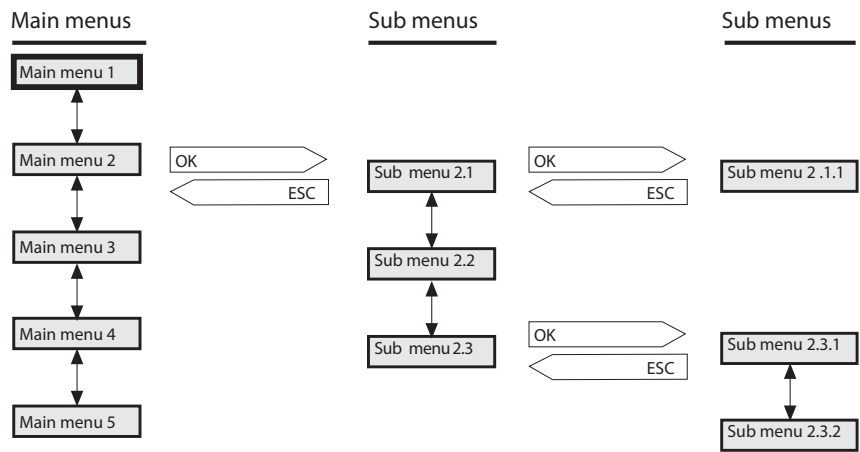
- | | |
|---|---|
| 2 | Press OK to select the sub-menu. |
|---|---|



- | | |
|---|--|
| 3 | Press ESC to return one menu level. |
|---|--|

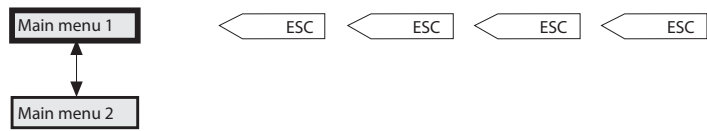


If a menu has sub levels, the sub menu is displayed by pressing the **OK** button. Pressing the **ESC** button moves back one menu level.



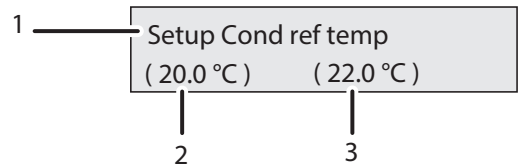
Return to main menu

Pressing **ESC** repeatedly, always returns to the **Main menu 1** which is the main operating menu.



Select value

A cursor below a text or numerical value shows what is affected by the dial. To increase the value turn the dial clockwise. To decrease the value turn the dial counterclockwise. The value can be reset by turning the dial several clicks counterclockwise. The parameter (1) being changed is shown in the top left of the display, the current value (2) is shown below the parameter and the new value to be (3) is shown in the lower right of the display.



When setting numerical values the cursor moves to the adjacent digit if the dial is turned quickly in one direction, to simplify entering large values. The cursor moves back one decimal place to the right every two seconds if the dial is not turned. The text or numerical value displayed is accepted by pressing the **OK** button. To cancel, press the **ESC** button.

Main menu overview

Display	Function
Cond Temp pH 25.4% 22.9°C 11.50	Main operation menu. The menu is accessed from all position by pressing the ESC button repeatedly.
4.000 mS/cm 22.9°C ----	Alternative display of conductivity with horizontal bar graph.
Set Cond Scale 100%	Setting conductivity full scale.
Set Cond Scale 0%	Setting conductivity zero point.
Calibrate pH	Calibration of pH monitor.
Set pH Analogue Out	Setting the recorder output for the pH measurement.
Check	Check internal operating values. See <i>Check monitor cell and electrode</i> , on page 35.
Setup	Setup conductivity, pH, temp., language, etc. See <i>Section 5.3 Setup menu</i> , on page 40.
Alarm/Timer 00:30:52	Set different timer option. See <i>Setting and using the alarm timer</i> , on page 37.

Check monitor cell and electrode

Follow the steps below to check the conductivity cell and pH electrode.

Step	Action
1	Select main menu Check , press OK .
2	Select sub menu Check Monitor cell and Electrode , press OK .
	Check Monitor Cell and Electrode
3	The text Passed will appear for 2 seconds if the cell and electrode are indicating reasonable values. If there are any problems an error message will appear.

Check Service Mode

Service information relevant to the instrument can be checked. Information may not be available in all menus.

Follow the steps below to check the service mode.

Step	Action
1	Select main menu Check , press OK .
2	Select sub menu Check Service Mode , press OK .
	Check Service Mode
3	The service telephone number is displayed, press OK .
	Telephone Service 012345678901
4	The service contract number is displayed, press OK .
	Contract Number 012345678901
5	The instrument serial number is displayed, press OK .
	Serial Number 01234567 YM 012345

Step	Action
6	The instrument name and software version are displayed, press OK . Monitor pH/C-900 V1.00
7	The date of the last service is displayed, press OK . Date of Maintenance ?
8	A test of the instrument buzzer is performed, press OK . Buzzer Test

Setting and using the alarm timer

You can set the alarm function to either a fixed alarm time or using a count-down timer. The default or previous value is shown in parentheses. Follow the steps below to set the alarm timer.

Step	Action
1	Select main menu Alarm/Timer , press OK . The display shows the current time. Alarm/Timer 12:30:52
2	Select sub menu Set Alarm , if you want to set an alarm at a fixed time. Press OK to enter the time value in the form HH.MM.SS , pressing the OK button after entering each time unit. Set Alarm 12:32:21 (0) 00.00.00

5 Operation

5.2 Menu selection and settings

Step	Action
------	--------

- | | |
|---|--|
| 3 | If you want to set a count-down timer, turn the dial to select sub menu Set Timer . Press OK to enter the countdown value in the form HH.MM.SS , pressing the OK button after entering each time unit. An alarm time and a count-down timer cannot both be set. |
|---|--|

Set Timer
(18:34:52) 00.00.00

- | | |
|---|--|
| 4 | Press ESC button to return to the Alarm/Timer menu which now shows the set alarm time or count-down time as BzzHH →MM →SS . |
|---|--|

Alarm/Timer 12:35:16
Bzz00:33:00

- | | |
|---|---|
| 5 | When the alarm time is due or the count-down timer reaches 00 →00 →00 , an alert display is shown and the instrument beeps, until the OK button is pressed. The display shows the time elapsed since the alarm, and the current time. |
|---|---|

Bzz00:00:29 13:08:45
!!

The alarm timer is based on the internal instrument clock which can be set in the **Set Clock** menu placed after the **Alarm/Timer** menu. The clock is reset when the power is turned off.

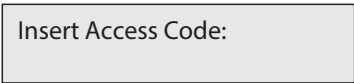
Set Clock
(12:26:53) 12: 36:53

A set alarm/timer function can be reset by pressing **OK** in the menu **Alarm/Timer off?**.

Alarm/Timer off?
OK=off

Service displays

The instrument has service displays for use by authorized service personnel. If the service display ***Insert Access Code:*** is accidentally selected, press the **ESC** button to exit to the normal operation display.



Insert Access Code:

5.3 Setup menu

Setting up conductivity temperature compensation

The conductivity in a buffer is temperature dependent. To relate conductivity to concentration and/or compare conductivity values, temperature compensation should be used. 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.

Follow the steps below to set up conductivity temperature compensation.

Step	Action
1	Select main menu Setup , press OK .
2	Select sub menu Setup Conductivity , press OK . Setup Conductivity
3	Select sub menu Setup Cond Temp Comp , press OK . Setup Cond Temp Comp (2.0%/°C) 2.0
4	Set a temperature compensation factor, press 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. Set the value to 0 for no temperature compensation.
5	Select sub menu Setup Cond Ref Temp , press OK . Select the reference temperature to which the measured conductivity values will be converted (normally 20°C or 25°C), press OK . Setup Cond Ref Temp (22.3°C) 25.0

Calibrating the conductivity cell

Normally it is not necessary to adjust the cell constant as the flow cell is precalibrated on delivery. Adjustment is only necessary when replacing the conductivity flow cell with a flow cell whose cell constant is unknown. It is also recommended that the conductivity flow cell is recalibrated after cleaning. When adjusting the cell constant from UNICORN select **SystemControl** → **System** → **Calibrate** and then select **CondCalib**.

Note: *The conductivity temperature compensation must not be used when adjusting the cell constant. Set the **Setup Cond temp comp** to 0 (see *Setting up conductivity temperature compensation*, on page 40). The temperature sensor must be calibrated before adjusting the cell constant (See *Calibrating the temperature sensor*, on page 46)*

Follow the steps below to calibrate the conductivity cell.

Step	Action
1	Prepare a calibration solution of 1.00 M NaCl, 58.44 g/L. Let the solution stand 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.
3	Stop the flow and wait 15 minutes, until the temperature is constant in the range 20°C to 30°C.
4	Read the conductivity value displayed and compare it with the theoretical value from the graph, at the temperature of the calibration solution. If the displayed value and the theoretical value correspond, no further action is required. If the values differ, proceed with actions 5–8.
5	Select main menu Setup , press OK .

Setup

6	Select sub menu Setup Conductivity , press OK .
---	---

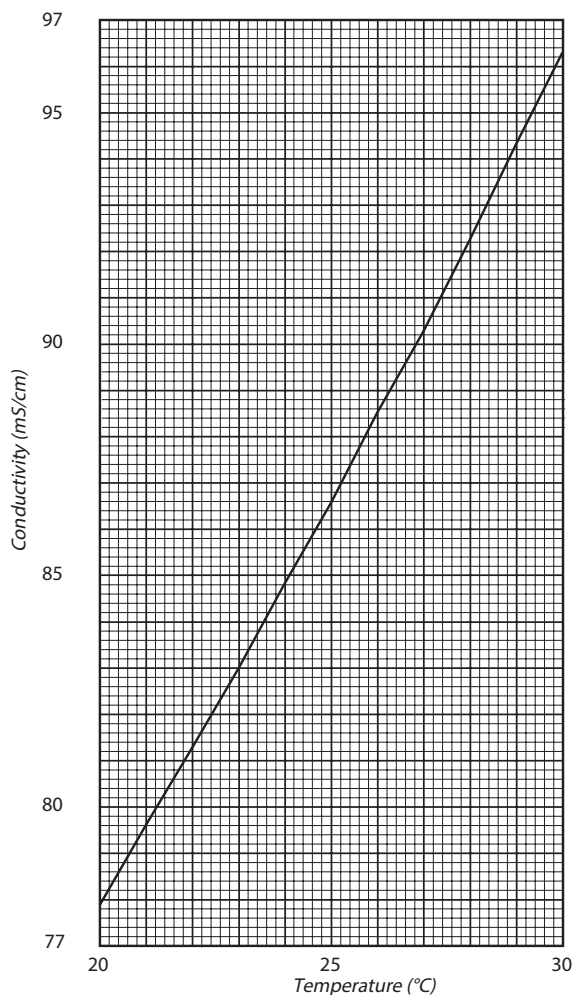
Setup Conductivity

7	Select sub menu Setup Adjust Cond , press OK .
---	--

Setup Adjust Cond
(83.53mS/cm)

Step	Action
8	A warning message will be displayed, press OK. Warning! This will change cell calib
9	Enter the theoretical conductivity value according to the graph, press OK. The new cell constant is automatically calculated and updated. Setup Adjust Cond (83.53mS/cm) 86.6<u>0</u>

The illustration below shows the conductivity of 1.00 M NaCl at 20°C to 30°C.



Entering the conductivity cell constant

After replacing the flow cell, the cell constant has to be set. (The cell constant is shown on the packaging).

Follow the steps below to enter the conductivity cell constant.

Step	Action
1	Select main menu Setup , press OK . Setup
2	Select sub menu Setup Conductivity , press OK . Setup Conductivity
3	Select sub menu Setup Adjust Cell Constant , press OK . Setup Adj Cell Const (34.4/cm)
4	A warning message will be displayed, press OK . Warning! This will change cell calib
5	Enter the cell constant, press OK . The new cell constant is updated. Setup Adj Cell Const (34.4/cm) 35. <u>5</u>

When entering the cell constant from UNICORN select **System Control** → **System** → **Calibrate** and select **Cond_Cell**.

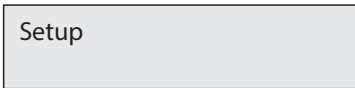
Setting up pH temperature compensation

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.

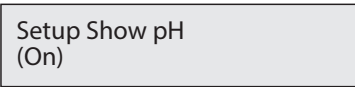
Follow the steps below to set up pH temperature compensation.

Step	Action
1	Select main menu Setup , press OK . 
2	Select menu Setup pH , press OK . 
3	Select sub menu Setup pH Temp Comp , press OK . 
4	Set the temperature compensation On or Off , press OK .

Setting up the pH display

Normally the pH is displayed in the main operating menu or its alternative (see *Section 5.4 Reading pH and conductivity values, on page 50*). If not required the pH display can be set to off.

Follow the steps below to set up the pH display.

Step	Action
1	Select main menu Setup , press OK . 
2	Select menu Setup pH , press OK . 
3	Select sub menu Setup Show pH , press OK . 

Step	Action
4	Set the pH display on or off, press OK .

Calibrating the temperature sensor

Calibration of the temperature sensor in the conductivity flow cell is only necessary if the monitor is used in high accuracy measurement or the conductivity flow cell is replaced.

Follow the steps below to calibrate the temperature sensor.

Step	Action
1	Place the flow cell together with a precision thermometer inside a box or empty beaker to ensure that they are not exposed to draft. Leave them for 15 minutes to let the temperature stabilize.
2	Read the temperature on the thermometer.
3	Select main menu Setup , press OK . Setup
4	Select sub menu Setup Temperature , press OK . Setup Temperature
5	Select sub menu Setup Adjust Temp , press OK . Setup Adjust Temp (23.5°C)
6	A warning message will be displayed, press OK . Warning! This will change temp calib
7	Enter the temperature shown on the thermometer, press OK . Setup Adjust Temp (23.5°C) 25.0

Setting up the temperature display

Display of the temperature in the conductivity flow cell, in the main operating menu, can be enabled or disabled.

Follow the steps below to set up the temperature display.

Step	Action
------	--------

- | | |
|---|---|
| 1 | Select main menu Setup , press OK . |
|---|---|

Setup

- | | |
|---|--|
| 2 | Select sub menu Setup Temperature , press OK . |
|---|--|

Setup Temperature

- | | |
|---|--|
| 3 | Select sub menu Setup Show Temp , press OK . |
|---|--|

Setup Show Temp
(On) On Off

- | | |
|---|---|
| 4 | Set the temperature display On or Off , press OK . |
|---|---|

Selecting language

The language used on the display can be changed.

Follow the steps below to select language.

Step	Action
------	--------

- | | |
|---|---|
| 1 | Select main menu Setup , press OK . |
|---|---|

Setup

- | | |
|---|---|
| 2 | Select sub menu Setup Language press OK . |
|---|---|

Setup Language
(GB) GB D F E I

Step	Action
3	Select the desired language. GB = British English D = German F = French E = Spanish I = Italian

Setting up the unit number

The unit number is the identification the Monitor pH/C-900 instrument has on the UniNet-bus. It should correspond to the number set in UNICORN for the Monitor pH/C-900 instrument. The number should be set to 0 if one Monitor pH/C-900 is used. If more than one Monitor pH/C-900 is used they must all have different numbers. Follow the steps below to set up the unit number.

Step	Action
1	Select main menu Setup , press OK . Setup
2	Select sub menu Setup Unit Number , press OK . Setup Unit Number
3	Select unit number (0–25).

Setting up the display angle

The display angle can be set to compensate for different viewing heights. Follow the steps below to set up the display angle.

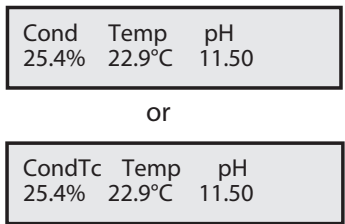
Step	Action
1	Select main menu Setup , press OK . Setup

Step	Action
2	Select sub menu Set Display Angle , press OK . Set Display Angle
3	Select viewing angle (-> Up , -> Mid or ->/ Down).

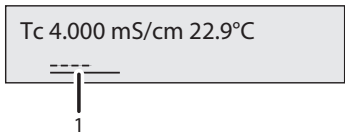
5.4 Reading pH and conductivity values

The main operating menu shows the conductivity as a percentage of full scale together with the current temperature in the flow cell, and the pH value. If the pH value is not stable or is changing, an asterisk is displayed after the value, e.g. 4.02*. The menu is reached from any other menu by pressing the **ESC** button repeatedly.

If temperature compensation is switched-on, the display will show **CondTc** instead of **Cond**, see the illustration below and *Setting up conductivity temperature compensation, on page 40*.



By turning the dial one click clockwise, an alternative display of the conductivity is shown. This display shows the actual conductivity value in mS/cm together with the percentage value and as a horizontal bar graph (1) with 10% resolution. If temperature compensation is switched on, **Tc** is shown in the display, see the illustration below.



The display of pH and temperature can be disabled, see *Setting up the pH display, on page 45* and *Setting up the temperature display, on page 47*.

5.5 Setting conductivity scale

The monitor measures conductivity over the complete working range. No range settings are required. However, to obtain a usable output signal for a recorder, or to view the conductivity as a percentage of buffer B, it is possible to set a 0 to 100% range. This can be done with reference to the buffers used or by selecting any fixed range between 0 $\mu\text{S}/\text{cm}$ and 999.9 mS/cm .

Follow the steps below to set the scale with reference to the buffers.

Step	Action
1	Start the flow with the high conductivity buffer. Select main menu Set Cond Scale 100% , press OK . Set Cond Scale 100%
2	When the conductivity level has stabilized, set the value which should correspond to 100% by pressing OK . If required, the value can be changed with the setting dial.
3	Change to the low conductivity buffer. Select main menu Set Cond Scale 0% , press OK . Set Cond Scale 0%
4	When the conductivity level has stabilized, set the value which should correspond to 0% by pressing OK . If required, the value can be changed with the setting dial.

The scale can be set without pumping buffer through the cell. Follow the same procedure, and simply set the conductivity values directly at steps 2 and 4, ignoring the measured conductivity values displayed. The difference between the value for 100% and 0% value (span) must be at least 1 mS/cm . The settings remain until they are changed. Values above 150% are shown as 150%, values below 0% as 0%.

5.6 Calibrating pH and conductivity

Introduction

A good 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. Calibration can also be performed from UNICORN. In UNICORN select **System Control** → **System** → **Calibrate**. Select the **pH monitor**. The calibration procedure can be done with the pH electrode either fitted in or removed from the flow cell.

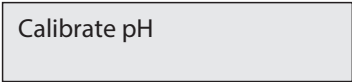
Calibrating pH with the electrode outside the flow cell

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.

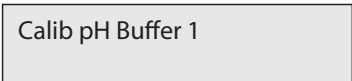
Follow the steps below to calibrate the pH electrode outside the flow cell.

Note: *The Monitor must be unlocked if connected to a UNICORN control system.*

Step	Action
1	Remove the pH electrode from the flow cell and rinse the electrode tip with distilled water and dab it carefully with a soft tissue to absorb the remaining water. Note: <i>Do NOT wipe the electrode as this may charge it and give unstable readings.</i>
2	Immerse the electrode in the first standard buffer solution (normally pH 7.0).
3	Select main menu Calibrate pH . The display shows the current low and high calibrated pH value. Press OK .



4	Select sub menu Calib pH Buffer 1 , press OK . When the pH value has stabilized, the Please wait message will disappear.
---	---



- | Step | Action |
|------|--|
| 5 | Adjust the pH value in the display using the dial, so that it corresponds to the known pH value of the 1:st buffer solution, press OK . The sub menu Calib pH Buffer 2 is shown. |

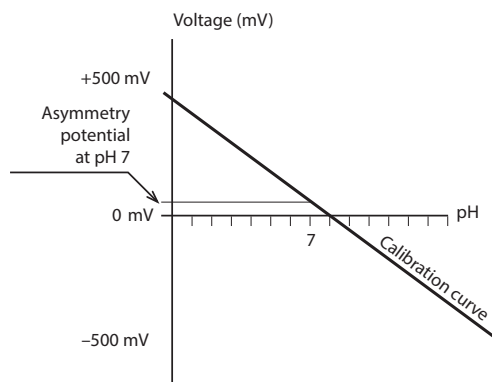
Calib pH Buffer 2

- | | |
|---|--|
| 6 | Rinse the electrode tip with distilled water and then immerse the electrode in the 2:nd standard buffer solution (e.g. pH 4.0 or pH 9.0), press OK . |
| 7 | When the pH value has stabilized, the Please wait message will disappear. |
| 8 | Adjust the pH value in the display using the dial, so that it corresponds to the known pH value of the 2:nd buffer solution, press OK . |
| 9 | The sub menu Calibrated Electrode Slope 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. Press ESC to return to the main menu. |

Calibrated Electrode

- | | |
|----|--|
| 10 | Before use, rinse the electrode using distilled water. |
|----|--|

A new electrode has a slope of, typically, 95% to 102% and an asymmetry potential within ± 30 mV. As the electrode ages the slope decreases and the asymmetry potential increases. The illustration below shows an example of a pH electrode calibration curve.



5 Operation

5.6 Calibrating pH and conductivity

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

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

Calibrating pH with the electrode in the flow cell

When calibrating with the electrode fitted in the flow cell in ÄKTApurifier, follow the above procedure. Before adjusting the pH monitor, ensure that the pH has stabilized. Leave the pump running while calibrating. Switch to the other standard buffer solution and repeat the procedure. For a description of calibration from UNICORN with the electrode fitted in the flow cell, see UNICORN User Manual.

Calibrating conductivity

The cell constant for the particular flow cell is written on the flow cell packaging. Refer to *Entering the conductivity cell constant*, on page 43 for how to enter the cell constant.

Adjustment of the cell constant is only necessary when the monitor is to be used to determine specific conductivity with high accuracy. The procedure is described in *Calibrating the conductivity cell*, on page 41. Calibration can also be performed from UNICORN.

5.7 Using an external chart recorder

The external chart recorder outputs for pH and conductivity from the monitor are 0 V to 1 V. There is also a 4 mA to 20 mA signal available at the same output connectors.

For the conductivity signal, 0% represents 0 V and 100% represents 1 V as set under main menus **Set Cond scale 0%** and **Set Cond scale 100%**.

For the pH signal, the full scale and zero level has to be set according to the steps below.

Step	Action
1	Select main menu Set pH Analogue Out , press OK . Set pH Analogue Out
2	Select sub menu Set pH Full Scale . Set the range value, press OK . The range is the full scale pH range for the chart recorder (1 V). Set pH Full Scale (pH12.00) 11.00
3	Select sub menu Set pH Zero Level , press OK .
4	Set the value, press OK . The zero level is the pH value corresponding to 0 V to the chart recorder. The difference between zero level and full scale must be at least 1 pH unit. Set pH Zero Level (pH 2.00) 4.00

5.8 Storage and shut-down



NOTICE

Never leave the pH electrode in the cell holder when the system is not used, since this might cause the glass membrane of the electrode to dry out. Remove the pH electrode from the cell holder 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.**

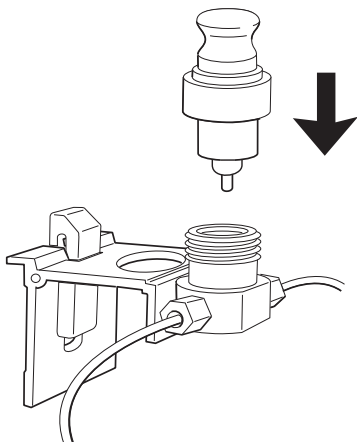
Storage of conductivity flow cell

Overnight: The conductivity cell can be left filled with a buffer.

Weekend or Long time storage: Flush the conductivity cell with water and fill with 20% ethanol.

Storage of pH electrode

The pH electrode should always be stored in a 1:1 mixture of pH 4 buffer and 1 M KNO_3 when not in use. When the pH electrode is removed from the flow cell, a dummy electrode can be inserted in the flow path, see the illustration below.



Tip: *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 in order to regenerate the electrode.*

6 Maintenance

About this chapter

This chapter provides required information to enable users and service personnel to clean and maintain the Monitor pH/C-900. The instrument contains no internal user replaceable parts.

Safety precautions



WARNING

Before attempting to perform any of the procedures described in this chapter, you must read and understand all contents of the Safety instructions chapter.

In this chapter

Section		See page
6.1	Cleaning before planned service	58
6.2	User maintenance schedule	59
6.3	Cleaning	60
6.4	Component maintenance	63

6 Maintenance

6.1 Cleaning before planned service

6.1 Cleaning before planned service

Cleaning before planned maintenance/service

To ensure the protection and safety of service personnel, all equipment and work areas must be clean and free of any hazardous contaminants before a Service Engineer starts maintenance work.

Please complete the checklist in the *On Site Service Health and Safety Declaration Form* or the *Health and Safety Declaration Form for Product Return or Servicing*, depending on whether the instrument is going to be serviced on site or returned for service, respectively.

Health and safety declaration forms

Health and safety declaration forms are available for copying or printing in the *Reference information* chapter of this manual, or on digital media supplied with the user documentation.

6.2 User maintenance schedule

Interval	Action
Every 6 month or more often if required	• Change pH electrode • Check that the power cord is whole and undamaged. It shall be replaced if any sign of damage is detected.
When required	• Clean the conductivity cell • Clean the pH electrode

6.3 Cleaning

Introduction

This section describes procedures and recommendations for cleaning Monitor pH/C-900.

Cleaning the conductivity cell



WARNING

Corrosive substance. NaOH is corrosive and therefore dangerous to health. When using hazardous chemicals, avoid spillage and wear protective glasses and other suitable Personal Protective Equipment (PPE).



CAUTION

Hazardous chemicals or biological agents in UV flow cell. Make sure that the entire flow cell has been flushed thoroughly with bacteriostatic solution (e.g., NaOH) and distilled water, before service and maintenance.

Follow the steps below to clean the conductivity cell.

Step	Action
1	Remove the pH electrode and install the dummy electrode 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.

Cleaning the pH electrode



WARNING

Hazardous substances and biological agents. When using hazardous chemical and biological agents, take all suitable protective measures, such as wearing protective clothing, glasses and gloves resistant to the substances used. Follow local and/or national regulations for safe operation and maintenance of this product.

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:

Electrode fouling	Action
Salt deposits	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 is for a 5 minute period. Rinse electrode tip in distilled water between each solution.
Oil or grease film	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 deposits	Dissolve the deposit by immersing the electrode in a 1% pepsin solution, in 0.1 M HCl, for five minutes, followed by thorough rinsing with distilled water.

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

Follow the steps below to clean the pH electrode.

Step	Action
1	Heat a 1 M KNO ₃ solution to 60°C to 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 electrode response, replace the electrode.

Cleaning the conductivity flow cell



CAUTION
Hazardous chemicals or biological agents in UV flow cell.
Make sure that the entire flow cell has been flushed thoroughly with bacteriostatic solution (e.g., NaOH) and distilled water, before service and maintenance.

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

Follow the steps below 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 a 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 less than 0.8 mm.*

Instrument housing



NOTICE

Remove liquid and dirt from the system surface using a cloth, and if necessary, a mild cleaning agent. Do not use strong detergents.

Wipe the instrument housing regularly with a damp cloth. Let the instrument dry completely before use.

6.4 Component maintenance

Introduction

This section describes procedures and recommendations for changing pH electrode and conductivity flow cells.

Changing pH electrode

See *Section 4.4 Installing the pH electrode, on page 24*.

Changing conductivity flow cells

The flow cells can be changed when required. Make sure the instrument is switched off, before disconnecting/connecting the cells to the rear of the instrument housing.

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 *Entering the conductivity cell constant, on page 43*. If the cell constant is not known, it can be determined (see *Calibrating the conductivity cell, on page 41*).

7 Troubleshooting

About this chapter

This chapter provides information required to enable users and service personnel to identify and correct problems that may occur when operating Monitor pH/C-900.

If the suggested actions in this guide do not solve the problem, or if the problem is not covered by this guide, contact your Cytiva representative for advice.

Safety precautions



WARNING

Before attempting to perform any of the procedures described in this chapter, you must read and understand all contents of the Safety instructions chapter.

In this chapter

Section		See page
7.1	Problems and corrective actions	65
7.2	Error messages	69

7.1 Problems and corrective actions

Cytiva support



NOTICE

If the suggested actions do not correct the fault, contact your local Cytiva representative.

When contacting Cytiva for support, state the program version of the instrument. The program version of the instrument is shown for 2 seconds during switch-on.

pH Measurement

Problem	Corrective action
No response to pH changes	- Check that the electrode cable is connected properly to the rear of the instrument. - The electrode glass membrane may be cracked. Replace the electrode.
Small response to pH changes	- Clean the pH electrode according to <i>Cleaning the pH electrode, on page 60</i> and recalibrate. - If the problem remains, replace the pH electrode.
Slow pH response or Calibration impossible	- Check the pH electrode tip. If it is contaminated clean the electrode following the instructions in <i>Cleaning the pH electrode, on page 60</i>. - If the membrane has dried out, the electrode may be restored by soaking it in buffer overnight. - Clogged liquid junction. Refer to <i>Cleaning the pH electrode, on page 60</i>.

7 Troubleshooting

7.1 Problems and corrective actions

Problem	Corrective action
Incorrect/unstable pH reading	• Check that the electrode cable is connected properly to the rear of the instrument. • Check that the pump and valves operates correctly. • Check that the electrode is correctly inserted in the flow cell and, if necessary, hand-tighten the nut. • If air in the flow cell is suspected, tap the flow cell carefully or tilt it to remove the air. Alternatively flush the flow cell with buffer at 8 mL/min for 30 seconds. • Check that the pH electrode is not broken. • Check that the pH electrode is calibrated. • Check the slope (see <i>Section 5.6 Calibrating pH and conductivity, on page 52</i>. If it is outside the range 80% to 105% or the asymmetry potential deviates more than 60 mV from 0 mV, clean the pH electrode. Recalibrate and if the problem persists, replace the pH electrode. • Clean the pH electrode if required, see <i>Cleaning the pH electrode, on page 60</i>. • 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. • There may be interference from other equipment. Connect the pH flow cell and the rear panel of the monitor using a standard laboratory 4 mm banana connector cable. • Check that the pH electrode has been calibrated at the correct temperature. • 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. Mount the dummy electrode instead. • Clogged liquid junction. Refer to <i>Cleaning the pH electrode, on page 60</i>.
pH values vary with varied back-pressure	Replace the pH electrode.

Conductivity measurement

Problem	Corrective action
Incorrect or unstable reading	• Check that the conductivity flow cell cable is connected properly to the rear of the instrument. • Check that the pump and valves operate correctly. • If temperature compensation is being used, check that the temperature sensor is calibrated, and that the correct temperature compensation factor is in use. • Check that the column is equilibrated. If necessary clean the column. • Check the operation of the mixer.
Baseline drift or noisy signal	• There may be air in the flow cell. Use a flow restrictor after the flow cell. • Check for leaking tubing connections. • Check the column is equilibrated. If necessary clean the column. • Check the operation of the mixer and the pump. • Clean the flow cell according to procedure in <i>Cleaning the conductivity flow cell, on page 61</i>.
Conductivity measurement with the same buffer appears to decrease over time	• Clean the flow cell according to procedure in <i>Cleaning the conductivity flow cell, on page 61</i>. • The ambient temperature may have decreased. Use a temperature compensation factor, see <i>Setting up conductivity temperature compensation, on page 40</i>
Absolute conductivity value wrong	• Turn the flow cell so the end with the screws is facing the pH flow cell. • Recalibrate the conductivity cell. • Calibration solution, 1.00 M NaCl, not correctly prepared. Prepare a new calibration solution and recalibrate the conductivity cell.
Ghost peaks appear the in gradient profile	• A charged sample has been detected (e.g. protein). • Air bubbles are passing through the flow cell. Check for loose tubing connections. If necessary use a flow restrictor after the conductivity flow cell.

7 Troubleshooting

7.1 Problems and corrective actions

Other problems

Problem	Corrective action
Error in external chart recorder	• Check the chart recorder in accordance with its manual. • Test the recorder function and input voltage which should be 1 V full scale. • Check the conductivity scaling and pH scaling, see <i>Section 5.5 Setting conductivity scale, on page 51</i> and using an external chart recorder, see <i>Section 5.7 Using an external chart recorder, on page 55</i>.
No text on the front display	• Check that the mains cable is connected and the power switch is in ON-position.

7.2 Error messages



NOTICE

If the suggested actions do not correct the fault, contact your local Cytiva representative.

Error message	Corrective action
Cell constant is out of range	- Wrong solution used during calibration. Use 1.00 M NaCl and recalibrate. - Air in the conductivity cell during calibration. Flush the flow cell with calibration solution and recalibrate. - Dirty conductivity flow cell. Clean the cell according to <i>Cleaning the conductivity flow cell, on page 61</i>. Recalibrate the cell. - Bad cell. Replace.
pH diff is too small	The difference between the zero level and full scale must be at least 1 pH unit. Recalibrate the pH electrode.
Bad pH cell or not connected	- Check that the pH electrode is connected. - Replace the pH electrode.
Temp cell is bad or not connected	- Check that the conductivity cell is connected. Recalibrate. - The calibration value differs from the predefined calibration value by more than $\pm 5^{\circ}\text{C}$. Recalibrate. If the message is still displayed, replace the conductivity cell.
Too close between buffer 1&2	The difference between the pH of the buffers used during calibration must be at least 1 pH unit.
Cal failed	Very bad slope, $<10\%$ or $>199\%$. Recalibrate. If the message is still displayed, replace the pH electrode.
Bad Slope	Slope is $<70\%$ or $>110\%$. Clean the pH electrode and recalibrate. If the message is still displayed, replace the pH electrode.
Check temp&cond condition	Check that the conductivity cell is connected.

7 Troubleshooting

7.2 Error messages

Error message	Corrective action
Diff cond 0% & 100% is too small	The difference between 0% and 100% must be at least 0.1 mS/cm. Recalibrate.
Only allowed in "stand-alone"	Unit number cannot be changed when the instrument is connected in ÄKTAexplorer or ÄKTApurifier.
ERROR 88-89, 96	Call for Service.
ERROR key(OK) ERROR key (Esc) ERROR key (OK+Esc) ERROR 100 ERROR 109-113	1. Switch off the instrument. 2. Check all connections. 3. Switch on the instrument.
ERROR 120	Call for Service.
ERROR 121	Calibration range not within limits. Recalibrate with new values.
ERROR 106-108 ERROR 118	1. Switch off the instrument. 2. Check all UniNet1 connections. 3. Switch on the instrument.
Exc x/y in ab.c Exc DIV/O in ab.c Exc instr in ab.c Exc address in ab.c	1. Switch off the instrument. 2. Check all connections. 3. Switch on the instrument.

8 Reference information

About this chapter

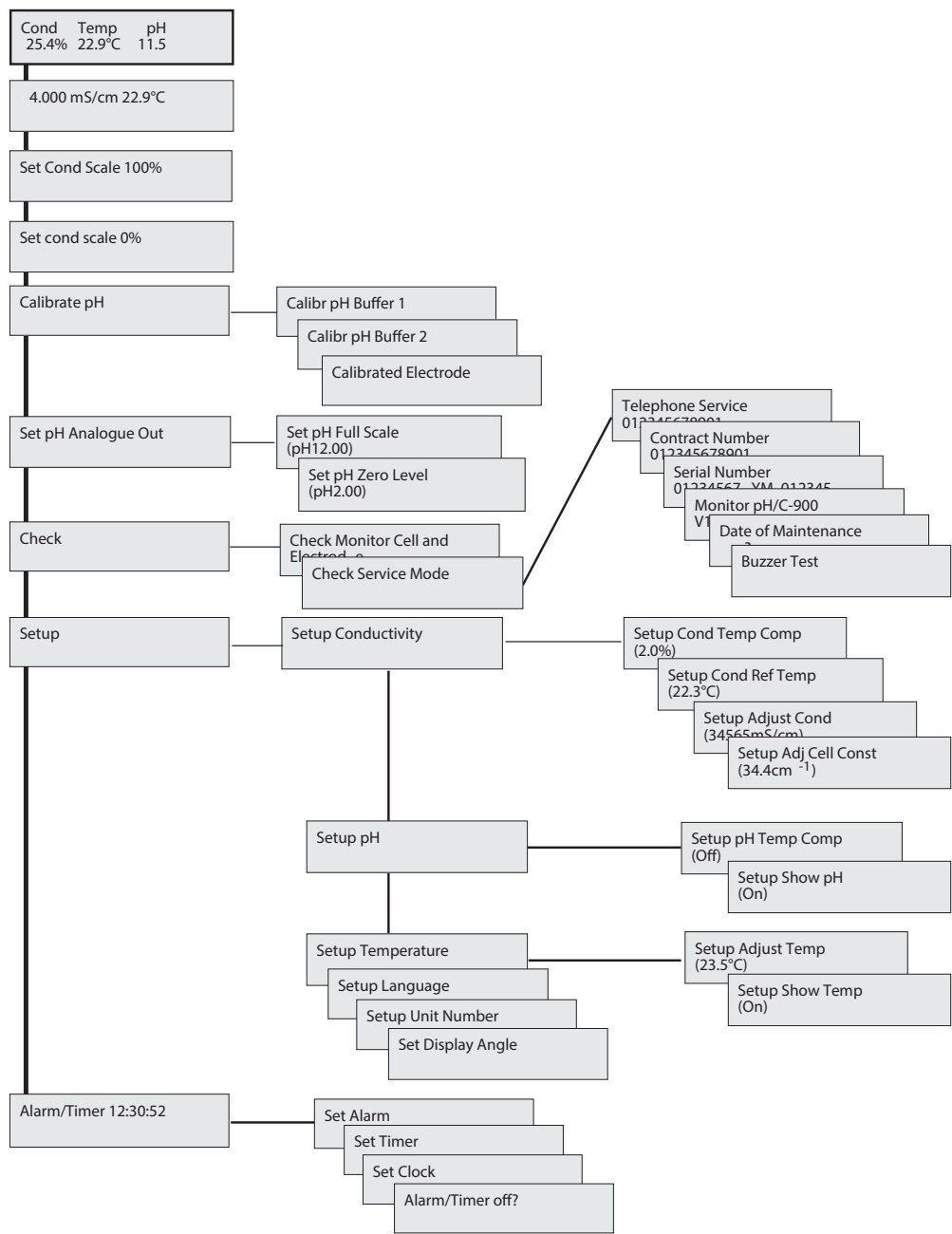
This chapter provides technical reference information and a list of spare parts and accessories for Monitor pH/C-900.

In this chapter

Section		See page
8.1	Menu overview	72
8.2	Technical specifications	73
8.3	Accessories and spare parts	76
8.4	Recycling information	78
8.5	Regulatory information	79
8.6	Health and Safety Declaration Form	88

8.1 Menu overview

The illustration below shows the full menu tree of Monitor pH/C-900.



8.2 Technical specifications

Applicability

The full specifications apply only after at least 1 hour warm-up.

Operating data, pH measurement

Parameter	Specification
pH range	0 to 14 (specially valid between 2 and 12)
Temperature compensated accuracy	± 0.1 pH within 4°C to 40°C
Non temperature compensated accuracy	± 0.2 pH within 15°C to 25°C ± 0.5 pH within 4°C to 15°C and 25°C to 40°C
Response time	Max. 10 s (0% to 95% of step)
Long term drift	Max. 0.02 pH/h (measured at pH 4.0)
Flow rate sensitivity	Max. 0.1 pH units within 0 to 10 mL/min

Operating data, conductivity measurement

Parameter	Specification
Conductivity range	1 µS/cm to 999.9 mS/cm
Deviation from theoretical conductivity	Max. ± 2% of full scale calibrated range or ± 10 µS/cm whichever is greater in the range 1 µS/cm to 300 mS/cm
Short term reproducibility	Max. ± 1% or ± 5 µS/cm
Long term reproducibility	Max. ± 3% or ± 15 µS/cm
Noise	Max. ± 0.5% of full scale calibrated range
Response time	Max. 3 s (0% to 95% of step)
Temperature sensor accuracy	± 2.0°C
Temperature sensor drift	± 0.5°C per 10 h
Flow rate sensitivity	± 1% within 0 to 100 mL/min

Parameter	Specification
Environment	4°C to 40°C 20% to 95% relative humidity 84 to 106 kPa (840 to 1060 mbar) atmospheric pressure

pH flow cell

Parameter	Specification
Maximum flow rate	100 mL/min
Maximum pressure	0.5 MPa (5 bar, 72 psi)
Back pressure	Max. 0.02 MPa (0.2 bar, 2.9 psi)
Internal volume	88 µL
Wetted materials	pH electrode and flow cell: Glass, FFKM (perfluororubber), titanium Dummy electrode: PTFE (polytetrafluoroethylene)
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 flow cell

Parameter	Specification
Max Flow rate	100 mL/min
Max Pressure	5 MPa (50 bar, 725 psi)
Back pressure	Max. 0.01 MPa (0.1 bar, 1.5 psi)
Internal volume	14 µL
Wetted materials	Titanium, CTFE
pH stability range	1 to 13, 1 to 14 (<1 days exposure)

Parameter	Specification
Chemical resistance	The wetted parts are resistant to organic solvents and salt buffers commonly used in chromatography of biomolecules, except 100% Ethylacetate, 100% Hexane, and 100% Tetrahydrofuran (THF).

Physical data

Parameter	Specification
Control	Stand alone or from a PC with UNICORN-version 2.20 or higher, through UniNet 1 connection.
Degree of protection	Housing: IP 20 Flow cells: IP 44
Power requirements	100 to 240 V~
Maximum voltage fluctuation	± 10% from the nominal voltage
Frequency	50 to 60 Hz
Power consumption	25 VA
Functions	Languages selectable; English, German, Spanish, French, Italian
pH electrode cable	1.5 m, BNC connector
Conductive cell cable	1.5 m, D-sub 9 pole connector
Inlet- and outlet tubing	UNF 10-32 2B Fingertight connector with capillary tubing 1/16" outer diameter
Analogue outputs	0 to 1 V and 4 to 20 mA full scale, overrange function (see <i>Section 4.5 Connecting to chart recorder, on page 27</i> for pin configuration)
Display	2 rows with 20 characters each
Dimensions, H × W × D	100 × 260 × 370 mm
Weight	8.5 kg
Noise	< 70 dB A

8.3 Accessories and spare parts

Item	Quantity per pack	Product code
Monitor pH/C-900 without pH electrode and flow cells (Monitor pH/C-900 without pH electrode and flow cells)	1	18110776
pH electrode, round tip (pH electrode, round tip)	1	18111126
pH electrode with flow cell and holder, round tip (pH electrode with flow cell and holder, round tip)	1	18113484
pH flow cell, incl. dummy electrode (pH flow cell, incl. dummy electrode)	1	18111292
Dummy electrode, round tip (Dummy electrode, round tip)	1	18111103
Conductivity flow cell (Conductivity flow cell)	1	18111105
Signal cable, mini-DIN, open (Signal cable, mini-DIN, open)	1	18111064
FEP tubing, i.d. 1/8", o.d. 3/16" (FEP tubing, i.d. 1/8", o.d. 3/16")	3 m	18111247
Tubing connector for 3/16" o.d. tubing (Tubing connector for 3/16" o.d. tubing)	10	18111249
Ferrule for 3/16" tubing (Ferrule for 3/16" tubing)	10	18111248
Stop plug, 5/16" (Stop plug, 5/16")	5	18111250
Stop plug, 1/16" (Stop plug, 1/16")	5	18111252
Union Luer female/1/16" male (Union Luer female/1/16" male)	2	18111251
Union 1/16" female/M6 male (Union 1/16" female/M6 male)	6	18111257
Union M6 female/1/16" male (Union M6 female/1/16" male)	8	18111258
PEEK tubing, i.d. 0.75 mm, o.d. 1/16" (PEEK tubing, i.d. 0.75 mm, o.d. 1/16")	2 m	18111253
FEP tubing, i.d. 0.75 mm, o.d. 1/16" (FEP tubing, i.d. 0.75 mm, o.d. 1/16")	2 m	18111254

Item	Quantity per pack	Product code
PEEK tubing, i.d. 1.0 mm, o.d. 1/16" (PEEK tubing, i.d. 1.0 mm, o.d. 1/16")	2 m	18111583
Fingertight connector 1/16" (Fingertight connector 1/16")	10	18111255

8.4 Recycling information

Introduction

This section contains information about the decommissioning of Monitor pH/C-900.

Decontamination

Monitor pH/C-900 shall be decontaminated before decommissioning and all local regulations shall be followed with regard to scrapping of the equipment.

Disposal of the product

When taking Monitor pH/C-900 out of service, the different materials must be separated and recycled according to national and local environmental regulations.

Recycling of hazardous substances

Monitor pH/C-900 contains hazardous substances. Detailed information is available from your Cytiva representative.

Disposal of electrical components

Waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.



8.5 Regulatory information

Introduction

This section lists the regulations and standards that apply to the Monitor pH/C-900 instrument.

In this section

Section	See page
8.5.1 Contact information	80
8.5.2 European Union and European Economic Area	81
8.5.3 Eurasian Economic Union Евразийский экономический союз	82
8.5.4 Regulations for North America	84
8.5.5 Regulatory statements	85
8.5.6 Declaration of Hazardous Substances (DoHS)	86

8.5.1 **Contact information**

Contact information for support

To find local contact information for support and sending troubleshooting reports, visit *cytiva.com/contact*.

Manufacturing information

The table below summarizes the required manufacturing information.

Requirement	Information
Name and address of manufacturer	Cytiva Sweden AB Björkgatan 30 SE 751 84 Uppsala Sweden
Telephone number of manufacturer	+ 46 771 400 600

8.5.2 European Union and European Economic Area

Introduction

This section describes regulatory information for the European Union and European Economic Area that applies to the equipment.

Conformity with EU Directives

See the EU Declaration of Conformity for the directives and regulations that apply for the CE marking.

If not included with the product, a copy of the EU Declaration of Conformity is available on request.

CE marking



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.

8.5.3 Eurasian Economic Union
Евразийский экономический союз

This section describes the information that applies to the product in the Eurasian Economic Union (the Russian Federation, the Republic of Armenia, the Republic of Belarus, the Republic of Kazakhstan, and the Kyrgyz Republic).

Introduction

This section provides information in accordance with the requirements of the Technical Regulations of the Customs Union and (or) the Eurasian Economic Union.

Введение

В данном разделе приведена информация согласно требованиям Технических регламентов Таможенного союза и (или) Евразийского экономического союза.

Manufacturer and importer information

The following table provides summary information about the manufacturer and importer, in accordance with the requirements of the Technical Regulations of the Customs Union and (or) the Eurasian Economic Union.

Requirement	Information
Name, address and telephone number of manufacturer	See <i>Manufacturing information</i>
Importer and/or company for obtaining information about importer	Cytiva RUS LLC 109004, Russian Federation Moscow Stanislavskogo str., 21, building 3, premises I, room 57 Telephone: +7 495 7877617 E-mail: <i>rucis@cytiva.com</i>

Информация о производителе и импортере

В следующей таблице приводится сводная информация о производителе и импортере, согласно требованиям Технических регламентов Таможенного союза и (или) Евразийского экономического союза.

Требование	Информация
Наименование, адрес и номер телефона производителя	См. Информацию об изготовлении
Импортёр и/или лицо для получения информации об импортёре	ООО "Цитива РУС" 109004, Российская Федерация город Москва, ул. Станиславского, д. 21, строение 3, помещение I, комната 57 Телефон: +7 495 7877617 Адрес электронной почты: rucis@cytiva.com

Description of symbol on the system label

Описание обозначения на этикетке системы



This Eurasian compliance mark indicates that the product is approved for use on the markets of the Member States of the Customs Union of the Eurasian Economic Union

Данный знак о Евразийском соответствии указывает, что изделие одобрено для использования на рынках государств-членов Таможенного союза Евразийского экономического союза

8 Reference information

8.5 Regulatory information

8.5.4 Regulations for North America

8.5.4 Regulations for North America

Introduction

This section describes the information that applies to the product in the USA and Canada.

FCC compliance

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: *The user is cautioned that any changes or modifications not expressly approved by Cytiva could void the user's authority to operate the equipment.*

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

8.5.5 Regulatory statements

Introduction

This section shows regulatory statements that apply to regional requirements.

EMC emission, CISPR 11: Group 1, Class A statement



NOTICE

This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

South Korea

Regulatory information to comply with the Korean technical regulations.



NOTICE

Class A equipment (equipment for business use).

This equipment has been evaluated for its suitability for use in a business environment.

When used in a residential environment, there is a concern of radio interference.



주의사항

A급 기기(업무용 방송통신기자재)

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기

로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

8 Reference information

8.5 Regulatory information

8.5.6 Declaration of Hazardous Substances (DoHS)

8.5.6 Declaration of Hazardous Substances (DoHS)

This section describes the information that applies to the product in China.

根据 SJ/T11364-2014 《电子电气产品有害物质限制使用标识要求》特提供如下有关污染控制方面的信息。

The following product pollution control information is provided according to SJ/T11364-2014 Marking for Restriction of Hazardous Substances caused by electrical and electronic products.

电子信息产品污染控制标志说明 Explanation of Pollution Control Label



该标志表明本产品含有超过中国标准 GB/T 26572 《电子电气产品中限用物质的限量要求》中限量的有害物质。标志中的数字为本产品的环保使用期，表明本产品在正常使用的条件下，有毒有害物质不会发生外泄或突变，用户使用本产品不会对环境造成严重污染或对其人身、财产造成严重损害的期限。单位为年。

为保证所申明的环保使用期限，应按产品手册中所规定的环境条件和方法进行正常使用，并严格遵守产品维修手册中规定的定期维修和保养要求。

产品中的消耗件和某些零部件可能有其单独的环保使用期限标志，并且其环保使用期限有可能比整个产品本身的环保使用期限短。应到期按产品维修程序更换那些消耗件和零部件，以保证所申明的整个产品的环保使用期限。

本产品在使用寿命结束时不可作为普通生活垃圾处理，应被单独收集妥善处理。

This symbol indicates the product contains hazardous materials in excess of the limits established by the Chinese standard GB/T 26572 Requirements of concentration limits for certain restricted substances in electrical and electronic products. The number in the symbol is the Environment-friendly Use Period (EFUP), which indicates the period during which the hazardous substances contained in electrical and electronic products will not leak or mutate under normal operating conditions so that the use of such electrical and electronic products will not result in any severe environmental pollution, any bodily injury or damage to any assets. The unit of the period is "Year".

In order to maintain the declared EFUP, the product shall be operated normally according to the instructions and environmental conditions as defined in the product manual, and periodic maintenance schedules specified in Product Maintenance Procedures shall be followed strictly.

Consumables or certain parts may have their own label with an EFUP value less than the product. Periodic replacement of those consumables or parts to maintain the declared EFUP shall be done in accordance with the Product Maintenance Procedures.

This product must not be disposed of as unsorted municipal waste, and must be collected separately and handled properly after decommissioning.

有害物质的名称及含量

Name and Concentration of Hazardous Substances

产品中有害物质的名称及含量

Table of Hazardous Substances' Name and Concentration

部件名称 Component name	有害物质 Hazardous substance					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
18110776	X	0	0	0	0	0

0: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

X: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

- 此表所列数据为发布时所能获得的最佳信息。

0: Indicates that this hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.

X: Indicates that this hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in GB/T 26572

- Data listed in the table represents best information available at the time of publication.

8.6 Health and Safety Declaration Form

On site service



On Site Service Health & Safety Declaration Form

Service Ticket #:	
--------------------------	--

To make the mutual protection and safety of Cytiva service personnel and our customers, all equipment and work areas must be clean and free of any hazardous contaminants before a Service Engineer starts a repair. To avoid delays in the servicing of your equipment, complete this checklist and present it to the Service Engineer upon arrival. Equipment and/or work areas not sufficiently cleaned, accessible and safe for an engineer may lead to delays in servicing the equipment and could be subject to additional charges.

Yes	No	Review the actions below and answer "Yes" or "No". Provide explanation for any "No" answers in box below.
☐	☐	Instrument has been cleaned of hazardous substances. Rinse tubing or piping, wipe down scanner surfaces, or otherwise make sure removal of any dangerous residue. Make sure the area around the instrument is clean. If radioactivity has been used, perform a wipe test or other suitable survey.
☐	☐	Adequate space and clearance is provided to allow safe access for instrument service, repair or installation. In some cases this may require customer to move equipment from normal operating location prior to Cytiva arrival.
☐	☐	Consumables, such as columns or gels, have been removed or isolated from the instrument and from any area that may impede access to the instrument.
☐	☐	All buffer / waste vessels are labeled. Excess containers have been removed from the area to provide access.
Provide explanation for any "No" answers here:		
Equipment type / Product No:		Serial No:
I hereby confirm that the equipment specified above has been cleaned to remove any hazardous substances and that the area has been made safe and accessible.		
Name:		Company or institution:
Position or job title:		Date (YYYY/MM/DD):
Signed:		

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For local office contact information, visit [cytiva.com/contact](https://www.cytiva.com/contact).
28980026 AD 04/2020

Product return or servicing



Health & Safety Declaration Form for Product Return or Servicing

Return authorization number:		and/or Service Ticket/Request:	
-------------------------------------	--	---------------------------------------	--

To make sure the mutual protection and safety of Cytiva personnel, our customers, transportation personnel and our environment, all equipment must be clean and free of any hazardous contaminants before shipping to Cytiva. To avoid delays in the processing of your equipment, complete this checklist and include it with your return.

1. Note that items will NOT be accepted for servicing or return without this form
2. Equipment which is not sufficiently cleaned prior to return to Cytiva may lead to delays in servicing the equipment and could be subject to additional charges
3. Visible contamination will be assumed hazardous and additional cleaning and decontamination charges will be applied

Yes	No	Specify if the equipment has been in contact with any of the following:	
☐	☐	Radioactivity (specify)	
☐	☐	Infectious or hazardous biological substances (specify)	
☐	☐	Other Hazardous Chemicals (specify)	
Equipment must be decontaminated prior to service / return. Provide a telephone number where Cytiva can contact you for additional information concerning the system / equipment.			
Telephone No:			
Liquid and/or gas in equipment is:		☐	Water
		☐	Ethanol
		☐	None, empty
		☐	Argon, Helium, Nitrogen
		☐	Liquid Nitrogen
		☐	Other, specify
Equipment type / Product No:		Serial No:	
I hereby confirm that the equipment specified above has been cleaned to remove any hazardous substances and that the area has been made safe and accessible.			
Name:		Company or institution:	
Position or job title:		Date (YYYY/MM/DD)	
Signed:			

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To receive a return authorization number or service number, call local technical support or customer service.

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