Monitor UPC-900

Operating Instructions

Original instructions

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Table of Contents

1 Introduction

Purpose of the Operating Instructions

The *Operating Instructions* provides you with the instructions needed to handle Monitor UPC-900 in a safe way.

1.1 Prerequisites

In order to operate Monitor UPC-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.

In this chapter

This chapter contains the following sections:

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

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

Safety notices

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.

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.*

Typographical conventions

Software items are identified in the text by ***bold italic*** text. A colon separates menu levels, thus ***File:Open*** refers to the ***Open*** command in the ***File*** menu.

Hardware items are identified in the text by **bold** text (for example, **Power**).

1.3 Regulatory information

In this section

This section describes the directives and standards that are fulfilled by Monitor UPC-900.

Manufacturing information

The table below summarizes the required manufacturing information. For further information, see the EU Declaration of Conformity (DoC) document.

Requirement	Content
Name and address of manufacturer	GE Healthcare Bio-Sciences AB, Björkgatan 30, SE 751 84 Uppsala, Sweden

Conformity with EU Directives

This product complies with the European directives listed in the table, by fulfilling the corresponding harmonized standards.

Directive	Title
2004/108/EC	Electromagnetic Compatibility (EMC) Directive
2006/95/EC	Low Voltage Directive (LVD)

CE marking

CE

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

- used as a stand-alone unit, or
- connected to other products recommended or described in the user documentation, and
- used in the same state as it was delivered from GE, except for alterations described in the user documentation.

International standards

This product fulfills the requirements of the following standards:

Standard	Description	Notes
EN/IEC 61010-1, UL 61010-1, CAN/CSA-C22.2 No. 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use	EN standard is harmonized with EU directive 2006/95/EC
EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements	EN standard is harmonized with EU directive 2004/108/EC

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 GE 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.

Regulatory compliance of connected equipment

Any equipment connected to Monitor UPC-900 should meet the safety requirements of EN/IEC 61010-1, or relevant harmonized standards. Within EU, connected equipment must be CE marked.

Environmental conformity

This product conforms to the following environmental requirements.

Requirement	Title
2011/65/EU	Restriction of Hazardous Substances (RoHS) Directive
2012/19/EU	Waste Electrical and Electronic Equipment (WEEE) Directive
ACPEIP	Administration on the Control of Pollution Caused by Electronic Information Products, China Restriction of Hazardous Substances (RoHS)
Regulation (EC) No 1907/2006	Registration, Evaluation, Authorization and restriction of CHemicals (REACH)

1.4 User documentation

In addition to these *Operating Instructions*, the documentation package supplied with Monitor UPC-900 also includes product documentation binders containing detailed specifications and traceability documents.

The most important documents in the document package with regard to technical aspects of Monitor UPC-900 are listed below.

System-specific documentation

User documentation	Content
Monitor UPC-900 Operating Instructions	Detailed system description. Comprehensive user instructions, method creation, operation, advanced maintenance and troubleshooting.
EU Declaration of Conformity for UPC-900	Document whereby the manufacturer ensures that the product satisfies and is in conformity with the essential requirements of the applicable directives.

2 Safety instructions

About this chapter

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

Important

WARNING

Before installing, operating or maintaining Monitor UPC-900, all users must read and understand the entire contents of this chapter to become aware of the hazards involved.

Failure to do this may cause human injury or death, or damage to the equipment.

In this chapter

This chapter contains the following sections:

2.1 Safety precautions

Introduction

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

- *General precautions, on page 12*.
- *Personal protection, on page 12*
- *Installing and moving the instrument, on page 13*.
- *System operation, on page 14*.
- *Maintenance, on page 14*.

General precautions

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

WARNING

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

WARNING

Only properly trained personnel may perform operation and user maintenance of the product.

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 glasses and gloves resistant to the substances used. Follow local and/or national regulations for safe operation and maintenance of Monitor UPC-900.

WARNING

Spread of biological agents. The operator has to 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 GE.

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.

CAUTION

pH electrode. Handle the pH electrode with care. The glass tip may break and cause injury.

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.

WARNING

When lamp power is on, the lamp socket carries dangerous voltage. Do not connect/disconnect the lamp with the monitor switched on.

Maintenance

WARNING

Electrical shock hazard. All repairs should be done by service personnel authorized by GE. 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

When lamp power is on, the lamp socket carries dangerous voltage. Do not connect/disconnect the lamp with the monitor switched on.

WARNING

Use only GE parts. Only spare parts and accessories that are approved or supplied by GE 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).

WARNING

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

WARNING

High intensity UV light. This product uses high intensity ultra-violet light. Do not disconnect the optical fibers while the lamp is on.

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.

CAUTION

If the mercury lamp is broken, make sure that all mercury is removed and disposed of according to national and local environmental regulations.

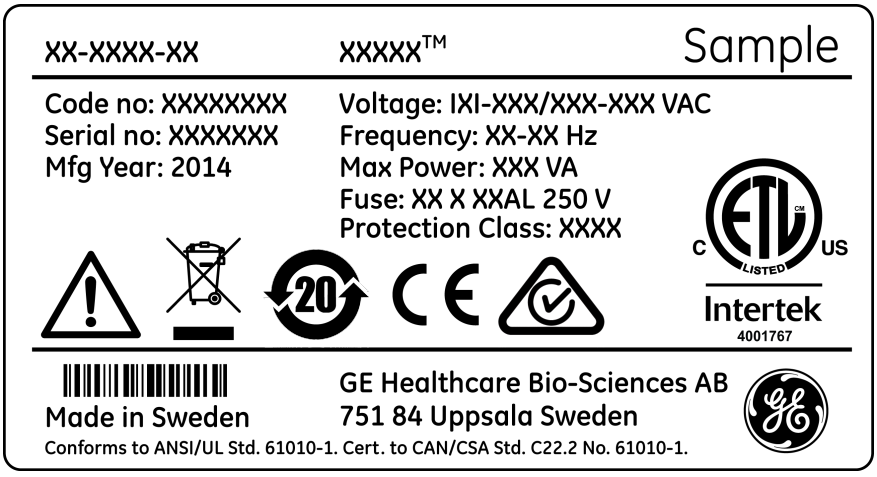
2.2 Labels

Introduction

This section describes the system label on Monitor UPC-900 and its meaning.

System label

The illustration below shows the system label.



Note: *The specific data shown on the system label below is only an example. Actual data is specific for each individual system and may vary from system to system.*

The system label information is explained in the table below.

Label text	Description
Code no:	GE Code number.
Serial no:	GE Serial number.
Mfg Year:	Manufacturing year.
Voltage:	Voltage.
Frequency:	Supply voltage frequency.
Max power:	Max power.
Fuse:	Fuse.
	**Warning!** Read the user documentation before using the system. Do not open any covers or replace parts unless specifically stated in the user documentation.
	This symbol indicates that waste 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.
	This symbol indicates that the product contains hazardous materials in excess of the limits established by the Chinese standard SJ/T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronics.
	The system complies with applicable European directives.
	The system complies with the requirements for electromagnetic compliance (EMC) in Australia and New Zealand.
	This symbol indicates that UPC-900 has been certified by a Nationally Recognized Testing Laboratory (NRTL). NRTL means an organization, which is recognized by the US Occupational Safety and Health Administration (OSHA) as meeting the legal requirements of Title 29 of the Code of Federal Regulations (29 CFR), Part 1910.7.

2.3 Emergency procedures

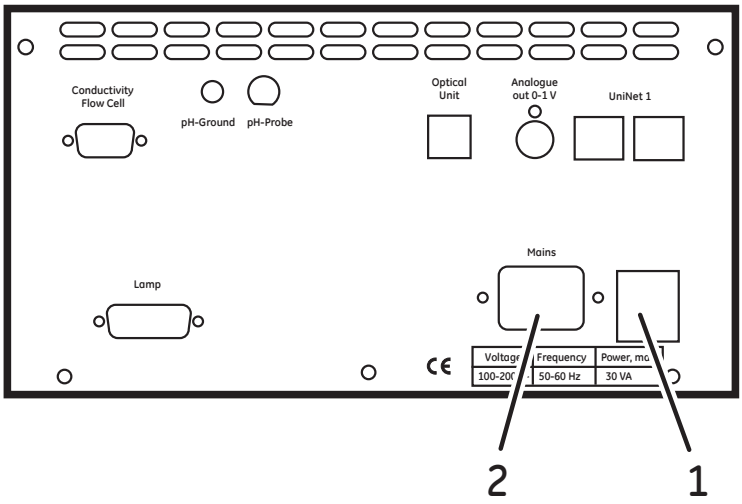
Introduction

This section describes how to perform an emergency shutdown of Monitor UPC-900. It also describes the result in the event of power failure.

Emergency shutdown

In an emergency situation, do as follows to stop the run:

Switch off power to the instrument by pressing the **Power switch** (1) on the rear panel to the **0** position. If required, disconnect the mains power cord (2). The run is interrupted immediately.



Power failure

In the event of power failure the run is interrupted immediately.

Restart after power failure

If the power supply to the instrument is interrupted, it automatically restarts when power is restored and displays the main operating menu. All set values are retained in the module and the lamp is switched on.

2.4 Recycling information

Introduction

This section contains information about the decommissioning of Monitor UPC-900.

Decontamination

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

Disposal, general instructions

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

Recycling of hazardous substances

Monitor UPC-900 contains hazardous substances. Detailed information is available from your GE representative.

Disposal of electrical components

Waste 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.

2.5 Declaration of Hazardous Substances (DoHS)

根据SJ/T11364-2006《电子信息产品污染控制标识要求》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/T11364-2006 Marking for Control of Pollution caused by Electronic Information 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SJ/T11363-2006《电子信息产品中有毒有害物质的限量要求》中限量的有毒有害物质。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 SJ/T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products. The number in the symbol is the Environment-friendly Use Period (EFUP), which indicates the period during which the toxic or hazardous substances or elements contained in electronic information products will not leak or mutate under normal operating conditions so that the use of such electronic information 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.

有毒有害物质或元素的名称及含量
Name and Concentration of Hazardous Substances

产品中有毒有害物质或元素的名称及含量
Table of Hazardous Substances' Name and Concentration

部件名称 Component name	有毒有害物质或元素 Hazardous substance					
	铅 Pb	汞 Hg	镉 Cd	六价铬 Cr6+	多溴联苯 PBB	多溴二苯醚 PBDE
18-1129-74	X	0	0	0	0	0
18-1128-95	X	0	0	0	0	0

0: 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006标准规定的限量要 求以下

X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006标准规定的限量要求

- 此表所列数据为发布时所能获得的最佳信息

0: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.

X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.

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

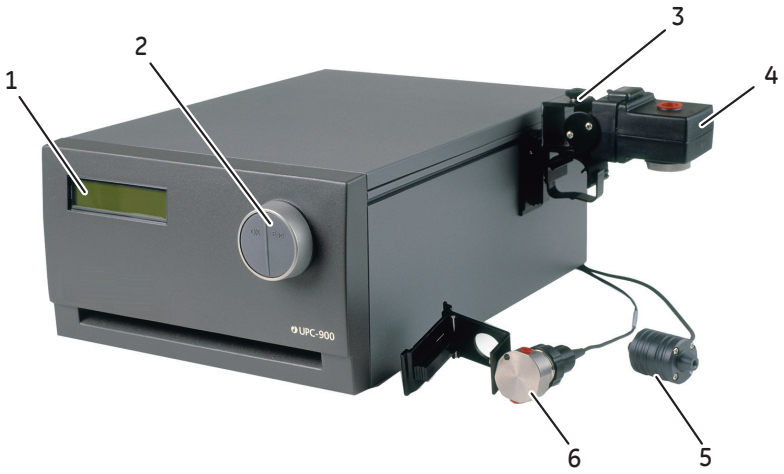
3 System description

Module

Monitor UPC-900 is an on-line monitor for measurement of UV-absorption, pH (optional in ÄKTA™ systems) and conductivity. The monitor can work with standard glass pH electrodes with a built in liquid-filled reference electrode and a BNC connector.

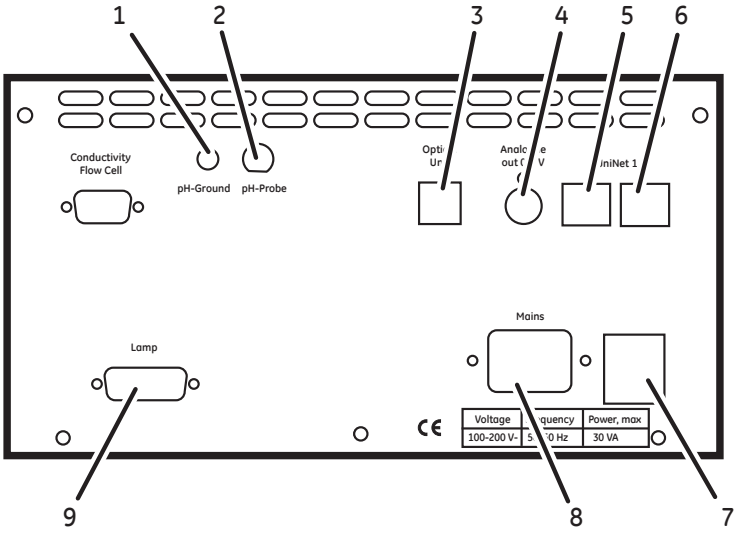
3.1 Illustrations

Monitor UPC-900 front and right side



Part	Function
1	Display
2	Dial
3	Holder
4	Optical unit
5	Conductivity flow cell
6	pH electrode

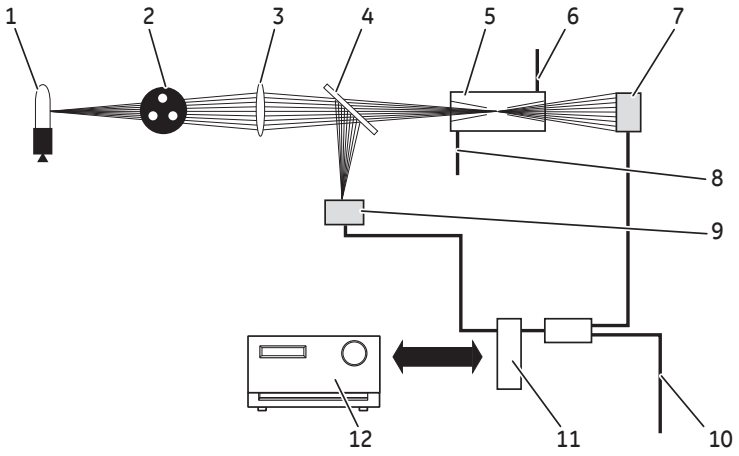
Rear side



Part	Connector/Switch	Function
1	**Conductivity flow cell**	Connection to conductivity flow cell, 9 pole D-sub connector
2	**pH-Ground**	Reference ground for pH measurement
3	**pH-Probe**	Connection to pH electrode, standard BNC socket
4	**Optical unit**	UV signal from optical unit
5	**Analogue out 0 1 V**	Chart recorder outputs, 3 channels 0 to1.0 V
6	**UniNet 1**	Computer network
7	**Power switch**	Mains supply on/off switch
8	**Mains**	Supply voltage, grounded
9	**Lamp**	UV lamp connection

3.2 Optical unit

Illustration



Part	Function
1	Optical unit
2	Filter
3	Lens
4	Beam splitter
5	UV flow cell
6	Inlet
7	Photodetector
8	Outlet
9	Photodetector
10	Analog outputs
11	Microprocessor
12	Monitor UPC-900 front panel

UV lamps

The UV optical unit houses the lamp (Zn or Hg), the wavelength filter and the UV flow cell. The light beam is directed through a double conical or straight flow-through cuvette (6 ml or 2 ml illuminated volume) to a photodetector. The photodetector current is fed to the signal processing circuitry in the instrument.

The reference signal and the measuring signal originate from the same light beam, thus assuring a stable baseline by eliminating the effects of variations in lamp intensity.

The Hg lamp emits light only at certain wavelengths. It does not emit light at 280 nm, for this wavelength the light is converted at a fluorescent surface before it passes the filter. On the lamp housing there is a dedicated exit for 280 nm light, which means that the lamp position needs to be changed when working with this wavelength.

For 214 nm wavelength a Zn lamp is used. This lamp is larger than the Hg lamp and is therefore mounted in a larger lamp housing.

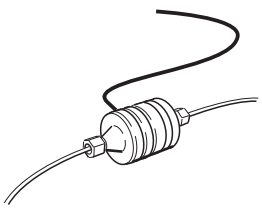
The lamp connectors are keyed to inform the monitor software of which lamp type is connected.

3.3 Conductivity flow cell

Description

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.

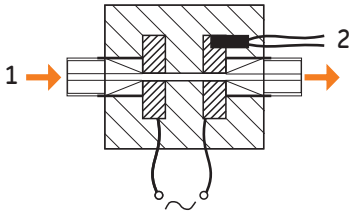
The conductivity is automatically calculated by multiplying the measured conductance by the flow cell's cell constant. The cell constant is precalibrated on delivery but can be measured with a separate calibration procedure. This procedure is described in *Setup adjust conductivity, on page 74*.



Conductivity measurement

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

Conductivity measurement has a dynamic range from 1 µS to 999.9 mS/cm.

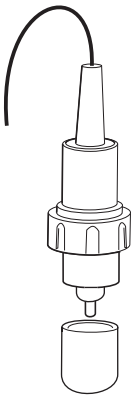


3.4 pH electrode

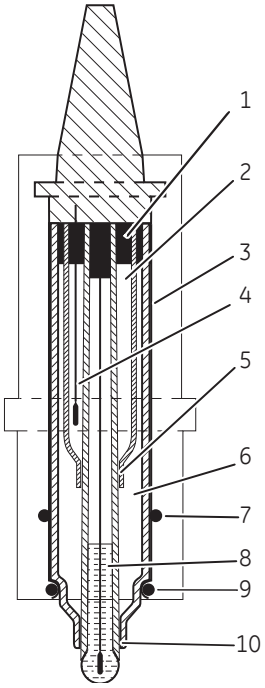
Description

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 4 M KCl saturated with Ag/AgCl, an outer electrolyte bridge of 1 M KNO3, 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 any other pH electrode.



Illustration



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
9	O-ring
10	External annular coaxial ceramic reference junction

4 Installation

About this chapter

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

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

This chapter contains the following sections:

4.1 Site requirements

Precautions

CAUTION

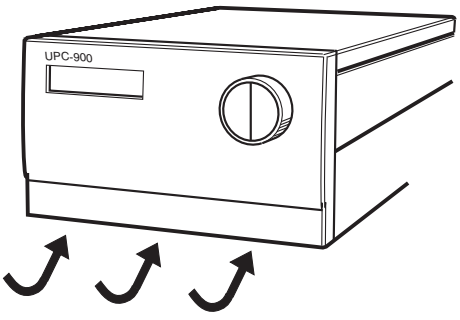
Make sure that the system is placed on a stable, level bench with adequate space for ventilation.

Placement

Parameter	Requirement
Operation site	Indoor use
Altitude	Maximum 2000 m
Electrical power	100/240 V AC ±10%, 50/60 Hz
Transient overvoltages	Overvoltage category II
Ambient temperature	4°C to 40°C
Placement	Stable laboratory bench or in ÄKTA system rack
Pollution degree	2

The instrument should be located in a place of low temperature variations, away from heat sources, draughts and direct sunlight.

To ensure correct ventilation a free space of 0.1 m is required behind and in front of the instrument. Do not use any soft material under the instrument, to ensure that the ventilation inlet in the front is not blocked.



4.2 Unpacking

Inspect the instrument

Unpack the instrument and check the items against the supplied packing list. Inspect the items for obvious damage that may have occurred during transportation.

Note: *It is important that the filters, flow cells and lamps are not handled during unpacking. For protection of these items, they should remain in their packing materials until required for use.*

We recommend that all packing materials be retained if onward transport of the module is expected.

Note: *pH measurement is optional in ÄKTA systems.*

4.3 Install the optical unit

Install the holder

Hook the holder (1) into the slot on the right hand side of the module. Secure it by pushing the slide clamp up (2).

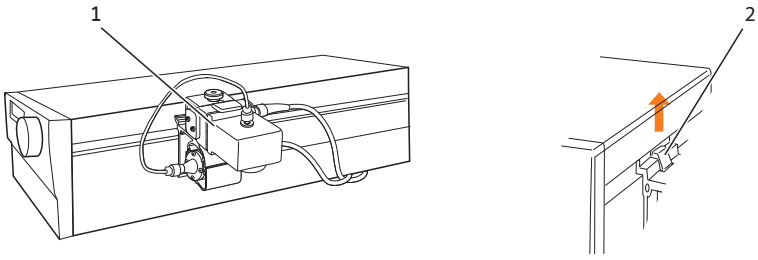
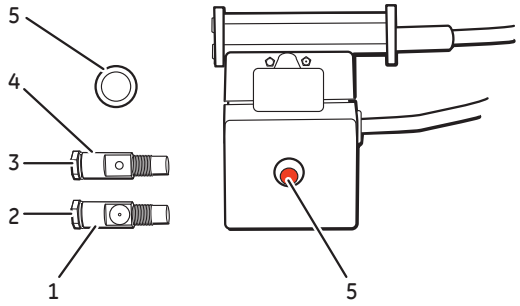


Illustration of the UV flow cell

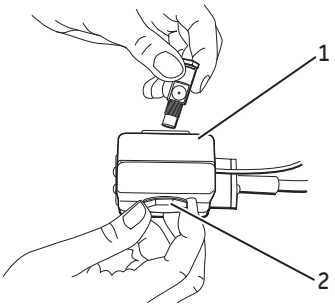


Part	Function
1	Flow cell 5 mm
2	O-ring
3	Flow cell 2 mm
4	O-ring
5	Protective plug for flow cell (red)

Install the UV flow cell

There is one analytical (5 mm) and one preparative (2 mm) flow cell available (stand-alone units only include the preparative flow cell). Both cells are installed in the same way, as described below.

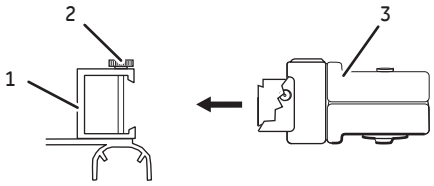
Step	Action
1	Remove the red protective plugs from the detector housing (1) and the flow cell.
2	Insert the flow cell into the detector housing from above. ***Note:*** *The flow cell can only be placed in one correct position.*



3	Secure the flow cell by turning the locking nut (2) until the stop position. ***Note:*** *If the locking nut is not tightened sufficiently, the monitor will function poorly (e.g. drifting base-line).*
4	Place the protective cover around the flow cell to protect the electronics inside the optical unit from liquid spillage. ***Note:*** *Avoid spillage for prolonged monitor lifetime.*
5	To remove the flow cell, reverse the procedure. ***Note:*** *Make sure that the Hg lamp position and the filter is selected according to the wave length to be used. This is described in Change lamp assembly, on page 92.*

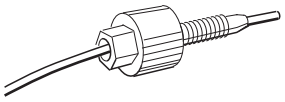
Connect the optical unit to the instrument

Step	Action
1	Place the optical unit (3) in the holder (1), or in a suitable location as close to the column as possible. The optical unit can be placed up to 1.5 m from the instrument housing.



2	Secure it by tightening the screw (2) in the holder.
3	Connect the lamp cable to the socket **Lamp** on the rear panel of the instrument.
4	Connect the signal cable to the socket **Optical unit** on the rear panel of the instrument.

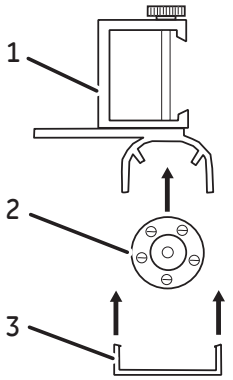
Connect to the column

Step	Action
1	Fix the optical unit directly under the column if possible. ***Note:*** *Always position the optical unit with the filter wheel cover facing upwards.*
2	• *5 mm flow cell*: Connect the column outlet tubing directly onto the top of the optical unit for the 5 mm flow cell using a fingertight connector. • *2 mm flow cell*: Connect the column outlet tubing onto the bottom of the optical unit for the 2 mm flow cell using a fingertight connector. ***Note:*** *The inlet port of the 5 mm UV cell is above the optical unit. The inlet port of the 2 mm UV cell is below the optical unit.*
3	Screw to fingertightness.
4	Connect the optical unit outlet tubing onto the opposite hole in the flow cell. Use fingertight connectors. If no outlet tubing exists, cut a piece of PEEK tubing (i.d. 0.5 mm, o.d. 1/16"). The length should be 170 mm when using the 5 mm flow cell, and 230 mm when using the 2 mm flow cell. 
5	Connect the other end of the tubing to the conductivity flow cell or to another appropriate unit.

4.4 Install the conductivity flow cell

The conductivity flow cell

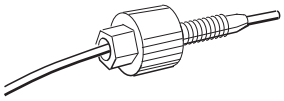
Step	Action
1	Place the conductivity flow cell (2) in its cell holder (1), or in a suitable location, as close to the optical unit/column as possible. The cell can be placed up to 1.5 m from the monitor housing. Secure the cell with the clamp (3).



Note:

When the conductivity flow cell is used 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.

2	Connect the conductivity flow cell to the socket conductivity flow cell on the rear panel of the module.
3	Connect the tubing with fingertight connectors.



4.5 Install the pH electrode

Precautions

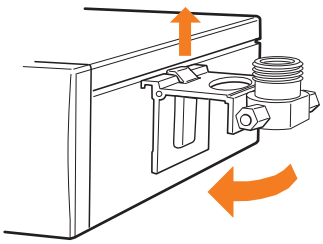
CAUTION

pH electrode. Handle the pH electrode with care. The glass tip may break and cause injury.

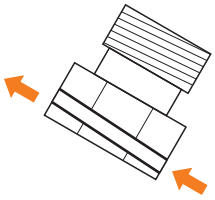
Mount the flow cell holder

Note: *The pH electrode is optional in ÄKTA systems.*

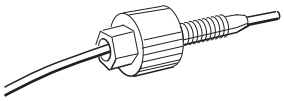
Step	Action
1	Hook the flow cell holder on the right hand side of the housing. Secure it with the slide clamp.



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.



Step	Action
3	Connect the tubing with fingertight connectors.

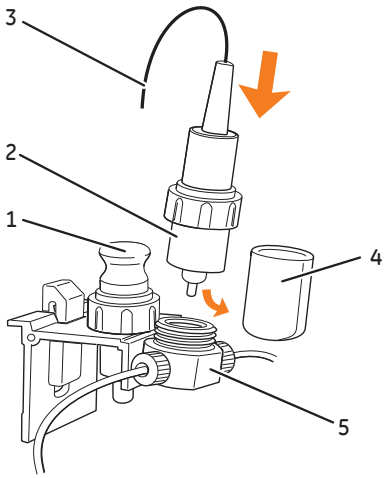


Insert the pH electrode

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 2 M KNO_3. **Do NOT store in water only.**

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.



Note:

If the flow cell is full of liquid, it is not possible to insert the electrode. If so, loosen the inlet connection while inserting the electrode to allow the liquid to run out from the flow cell. Remember to re-tighten the connector.

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

4.6 Communication and power supply

Precautions

WARNING

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

Connect electrical signal cables

NOTICE

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

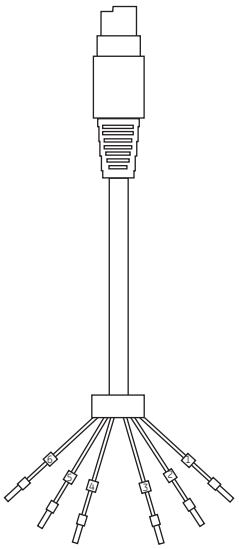
The sockets for electrical signals are located on the rear panel. The monitor and the flow cells are separate units. All flow cells are connected to the rear of Monitor UPC-900, see illustration in *Rear side, on page 25*.

Connect to chart recorder (if used)

The external chart recorder outputs for UV, pH and conductivity from the monitor are 0 to 1 V.

Step	Action
1	Connect the chart recorder to the **Analog out 0-1 V** socket (mini-DIN) using the cable supplied. Pin designations for the signals are as follows:

Pin no.	Signal	Range	Value (full scale)
1	UV	0 to 1 V	0.001 to 5 au
2	signal ground	0 V	-
3	conductivity	0 to 1 V	0.1 mS/cm to 999.9 mS/cm
4	signal ground	0 V	-
5	pH	0 to 1 V	0 to 14
6	signal ground	0 V	-



Note:

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.

2	Set the recorder to 0 to 1 V input, full scale.

Connect to a communication link

NOTICE

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

The monitor can be controlled from the front dial and display or controlled from a PC running UNICORN™ version 3.0 or higher via UniNet 1 cables.

Connect two UniNet 1 cables to the UniNet 1 connectors. The module can be connected in series anywhere between the PC and a termination plug. The UniNet 1 link can connect, in series, the PC with Pump P-920, Monitor UPC-900 and the Frac-920. The termination plug is connected to the last module in the chain.

Connect to supply voltage

WARNING

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

Step	Action
1	Make sure the **Power switch** is in the OFF-position (**0**).
2	Connect the supplied mains cable between the module and a grounded mains socket. Any voltage from 100 to 240 VAC, 50 to 60 Hz can be used.

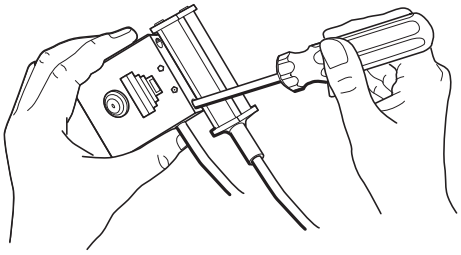
Note: *The module contains no user-replaceable fuse.*

4.7 Optical filters (optional)

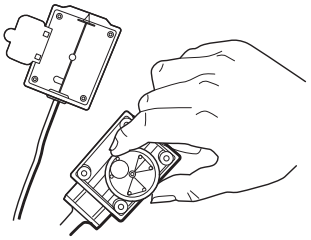
Install optical filters

The Hg optics with 254 and 280 nm filters and the Zn optics with the 214 nm filter are delivered with filters installed. If other filters are to be used, install them as follows:

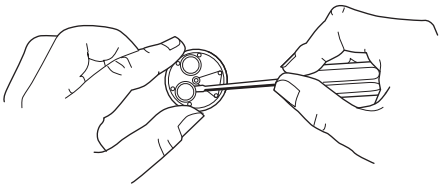
Step	Action
1	If the Zn lamp is attached, remove the lamp housing as described in *Change lamp assembly, on page 92*.
2	Remove the four screws in the filter housing. Separate the filter housing from the detector housing.

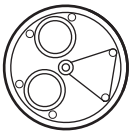
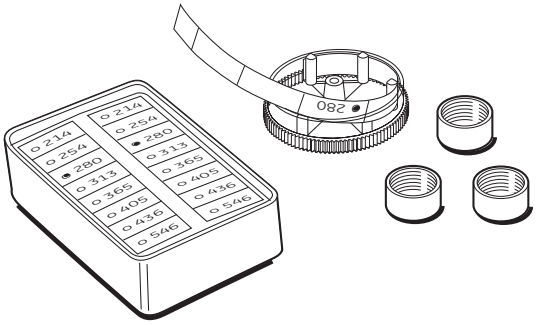


3	Carefully remove the filter wheel from the filter housing.



4	If necessary, remove the filter(s) from the filter wheel by pressing it (them) out, for example with a small screwdriver.



Step	Action
	Note: *Filters are sensitive optical components. Never touch the optical surfaces or expose them to temperatures above 60°C. Clean them with dry lens cleaning tissue and store them, when not in use, in the box in which they were supplied. Heavy contamination may be removed by using a lens tissue dipped in ethanol.*
5	Insert the filter(s) of choice into the filter wheel (maximum 3 filters) with the correct orientation (the mirror side facing upwards) and position over one of the three triangular apertures. The filters snap in by pressing them quite firmly. Do not touch the filter surface.
	
6	Remove the circular plastic band showing the wavelength(s).
7	Remove labels from the band if necessary. Place the correct labels on the band with the label designation facing outwards. Make sure that the label position corresponds to the filter position, i.e., the label should be placed opposite the filter.
	
8	Reassemble the circular plastic band with the filter wheel peg fitting into the band notch.
9	Check that all filters are clean. Insert the filter wheel back into the filter housing. ***Note:*** *The filter wheel can be placed only in correct position.*

Step	Action
10	Reassemble the filter housing with the detector housing by fastening the four screws.

5 Operation

About this chapter

This chapter provides the information required to operate Monitor UPC-900 in a safe way.

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.

WARNING

When lamp power is on, the lamp socket carries dangerous voltage. Do not connect/disconnect the lamp with the monitor switched on.

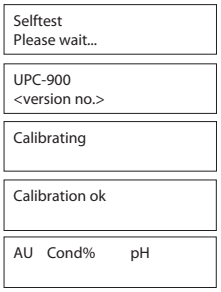
In this chapter

This chapter contains the following sections:

5.1 Preparations before start

Switch on the monitor

- Switch on the monitor using the **Power switch** on the rear panel. At switch-on, the module performs a selftest. Several beeps are heard during this process.
- If an error is detected, an error message is shown.
- Name and software version number is shown for 2 seconds.
- All parameters are set to factory default values.



The selftest takes approx. 1 minute. When start-up is completed with no errors, the display shows the main menu 1.

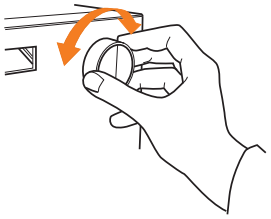
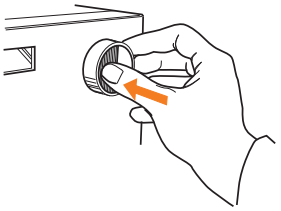
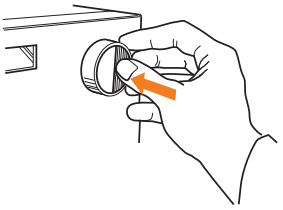
The monitor can be used immediately but the full specifications are not obtained until after 1 hour of lamp warm–up.

Prepare the module for use

Step	Action
1	Calibrate the pH electrode, see *Section 5.6 Calibrate the pH electrode, on page 60*.
2	Set the conductivity cell constant, see *Setup adjust conductivity, on page 74*. (Only required when the flow cell has been replaced.)
3	Calibrate the temperature sensor, see *Setup adjust temperature, on page 71*. (Only required if the monitor is to be used for high accuracy measurements, or if the flow cell has been replaced.) ***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:*** *The measured temperature is the temperature in the conductivity flow cell, which can differ from the ambient temperature in ÄKTA systems.* ***Note:*** *When running chromatography using organic solvents, we recommend that the pH electrode is removed and the dummy electrode inserted in its place as organic solvents will cause pH electrode degeneration.*

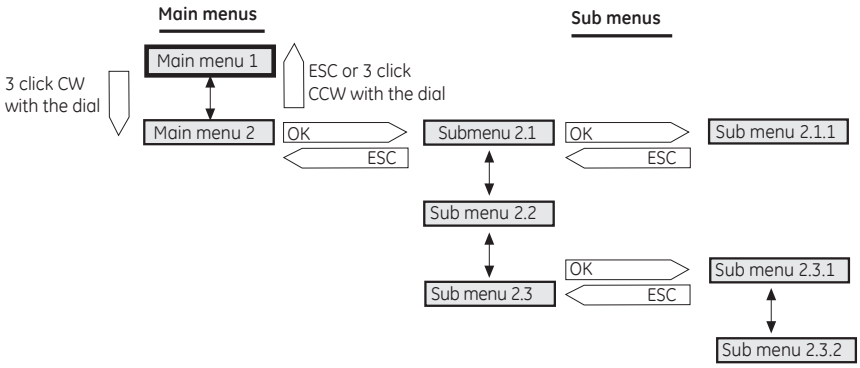
5.2 Using the menu on the instrument

The dial

Function	Action
Menu selection A specific menu is selected by turning the front selection dial clockwise or counterclockwise. When the required menu is visible, the menu or selection is accepted by pressing the **OK** button.	
OK button Go down to a sub menu or accept setting.	
ESC button Return one menu level.	

Sub menus

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



Return to main menu

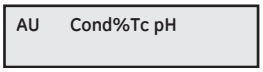
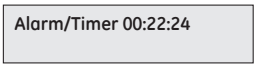
Pressing **ESC** repeatedly always returns to the main menu 1, which is the main operating menu.

Select value

A cursor below a text or numerical value shows what is affected by the dial. To increase a numerical value, turn the dial clockwise. To decrease the value, turn the dial counter-clockwise.

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

Main menu overview

Menu	Function	Display
Main menu 1	This menu is accessed from all positions by pressing **ESC**.	
Lamp control	This menu is accessed by turning the dial one step counterclockwise from main menu 1. It is used to manually switch the lamp on/off.	
Autozero	Used to zero the UV signal from the monitor.	
Eventmark	Used to set eventmarks on the UV curve.	
Main menu 2	Used to display pH, temperature (in the conductivity flow cell) and conductivity in mS/cm as well as in percentage of full range.	
Parameter menus	Used to set measurement parameters for Cond, pH and UV.	
Check menus.	Checking internal operating values. See *Section 5.9 Monitor check, on page 66*	
Setup menus	Setting up language, unit number, etc. See *Section 5.10 Monitor setup, on page 70*	
Alarm/Timer menus	Setting different timer options. See *Section 5.11 Alarm timer, on page 82*.	

5.3 Common menu functions

Control the UV lamp

Step	Action	Display
1	The ***Lamp*** menu is accessed by turning the dial one step counterclockwise from main menu 1, and then pressing **OK**. We recommend the lamp be switched off to conserve lamp operating time when no measurement is being made. A warm-up time of 60 minutes is required to achieve full specifications. However, in most cases, a warm-up time of 15 minutes is sufficient.	Lamp (on)
2	Switch the lamp on/off by moving the cursor with the dial, and then pressing **OK**.	Lamp (on) on off

Read the UV absorbance value

The main menu 1 shows the absorbance value with four digits for the chosen wavelength. This menu is reached from any other menu by pressing **ESC**.

If the lamp is off, ***Lamp Off*** is displayed instead.

AU Cond%Tc pH

Autozeroing UV

The autozero function in the UV part of the module sets the detected absorbance to zero when **OK** is pressed. Using autozero is recommended at the start before the sample is injected.

Step	Action	Display
1	From main menu 1, turn the dial one step clockwise to select ***Autozero UV***, then press **OK**. The normal absorbance value display is then shown.	Autozero UV
2	In UNICORN, Autozero is set with the instruction ***AutoZeroUV*** in ***System Control:Manual:Alarm&Mon***.	

Create eventmarks

Eventmarks can be set and displayed as spikes on the UV curve, for example, when the sample is injected. The spikes are 10% of the full scale AU setting.

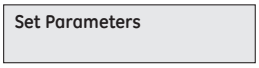
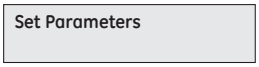
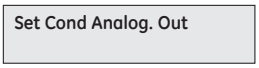
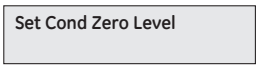
Step	Action	Display
1	From main menu 1, turn the dial two steps clockwise to select ***Eventmark***, then press **OK**. A spike on the UV curve is created.	Eventmark

5.4 Analog outputs settings

Set the conductivity analog output

This settings menu is used to set measurement parameters (zero and full range values) for Cond, pH and UV on the analog output channels. The analog output channels can be connected to a chart recorder, for example.

Note: *The user interface of the monitor must be unlocked if connected to a UNICORN control system.*

Step	Action	Display
1	From the main menu 1, turn the dial four steps clockwise to enter the menu ***Set Parameters***. Click **OK**, select the quantity to set by moving the cursor with the dial, then click **OK** again.	 
2	Current analog settings are displayed (zero and full scale values).	
3	Press **OK** to access the settings menu. Press **OK**.	
4	Set the desired zero value. The range is 0.000 to 999.9 mS/cm. Press **OK** to acknowledge.	
5	Turn the dial clockwise to access the settings menu. Press **OK**.	
6	Set the desired full scale value. The range is 0.000 to 99.9 mS/cm. Press **OK** to acknowledge. Press **ESC** two twice to return to menu **Set Parameters**.	

Set the pH analog output

After having selected ***Set Parameters pH*** and pressed **OK**, turn the dial one step clockwise to skip the ***Calibrate pH*** menu. Then press **OK**.

Note: *The pH values for zero level and full scale must differ by at least 1 pH unit.*

Note: *The zero level and full scale values can be calibrated in any order.*

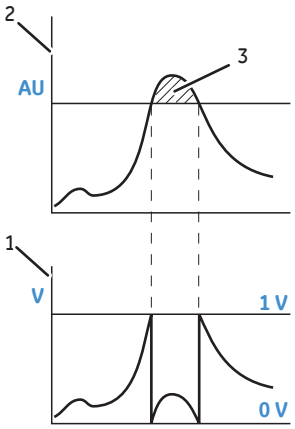
Step	Action	Display
1	Current analog settings are displayed (zero and full scale values).	Set ph Analog. Out
2	Press **OK** to access the full scale settings menu. Press **OK**.	Set ph Full Scale
3	Set the desired full scale value. The range is pH -0.50 to 14.30. Press **OK** to acknowledge.	Set ph Full Scale
4	Turn the dial clockwise one step to access the zero level settings menu. Press **OK**.	Set ph Zero Level
5	Set the desired zero level value. The range is pH -0.50 to 14.30. Press **OK** to acknowledge. Press **ESC** twice to return to menu ***Set Parameters***.	Set ph Zero Level

Set the UV analog output

Step	Action	Display
1	Current analog settings are displayed (zero and full range values). Allowed full range values are 0.0001, 0.0002, 0.0005, 0.001, 0.002, 0.005, 0.01, 0–02, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0 and 5.0. Zero level is set as a percentage of full scale.	Set UV Analog. Out
2	Press **OK** to access the settings menu. The current setting is displayed. Press **OK**.	Set UV Range
3	Set the desired full range value. Press **OK** to acknowledge.	Set UV Range
4	Turn the dial clockwise to access the settings menu. The current setting is displayed. Press **OK**.	Set UV Zero Level
5	Set the desired zero level value. Press **OK** to acknowledge. Press **ESC** twice to return to menu ***Set Parameters***.	Set UV Zero Level

Automatic over-range function

The module has an automatic over-range function. If the monitor signal reaches the full range value during a peak, the signal will drop instantly to 0 V and give an accurate display of the peak starting from this position.



Part	Function
1	Signal to recorder (V)
2	Measured absorbance level (AU)
3	Over-range

5.5 Calibrate conductivity

Cell constant

The cell constant for the particular flow cell is written on the flow cell packaging. Refer to *Setup adjust conductivity, on page 74*.

Adjustment of the cell constant is only necessary when the monitor is to be used to determine conductivity with high accuracy. The procedure is described in *Setup adjust conductivity, on page 74*. Calibration can also be performed from UNICORN.

Select ***System Control:System:Calibrate***.

5.6 Calibrate the pH electrode

Once a day

A good laboratory routine is to calibrate the module once a day, when the electrode is replaced and if the ambient temperature changes.

The pH electrode 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.

Calibrate 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.

The steps below describe the procedure used with the electrode removed from the flow cell.

Note: *The user interface of the monitor must be unlocked if connected to UNICORN.*

Step	Action	Display
1	Remove the pH electrode from the flow cell and immerse the electrode in the first standard buffer solution (normally pH 7.0).	Set Parameters
2	From main menu 1, turn the dial four steps clockwise to enter menu ***Set Parameters***. Press **OK**.	Set Parameters
3	Select **Set parameters** and press **OK**.	Calibrate pH (7.00–12.00)

Step	Action	Display
4	Select menu ***Calibrate pH***. Current calibration values are displayed buffer 1–buffer 2. Buffer 1=fixed lower calibrated pH value. Range=0.00–14.00 Buffer 2=fixed higher calibrated pH value. Range=0.00–14.00 ***Note:*** *The pH values for buffer 1 and 2 must differ by at least 1 pH unit*.	Calibr pH Buffer 1
5	Press **OK** to access the settings menu. The order of calibration, buffer 1 or buffer 2, is optional. Press **OK** to start with buffer 1, or turn the dial to start with buffer 2. In this example, we start with buffer 1.	Calibr pH Buffer 1
6	This text disappears when the reading is stable and the following text is then shown.	Calibr pH Buffer 1
7	Adjust the pH value in the display using the dial so that it corresponds to the known pH value of the first buffer solution and press **OK**.	Calibr pH Buffer 2
8	Turn the dial clockwise to access the buffer 2 calibrating menu. Rinse the electrode tip with distilled water and then immerse the electrode in the second buffer solution (e.g., pH 4.0 or 9.0) and press **OK**.	Calibr pH Buffer 2
9	This text disappears when the reading is stable and the following text is then shown.	Calibr pH Buffer 2
10	Adjust the pH value in the display using the dial so that it corresponds to the known pH value of the second buffer solution and press **OK**.	
11	When the two point calibration is performed successfully, the following text is shown for one second.	Calibration OK

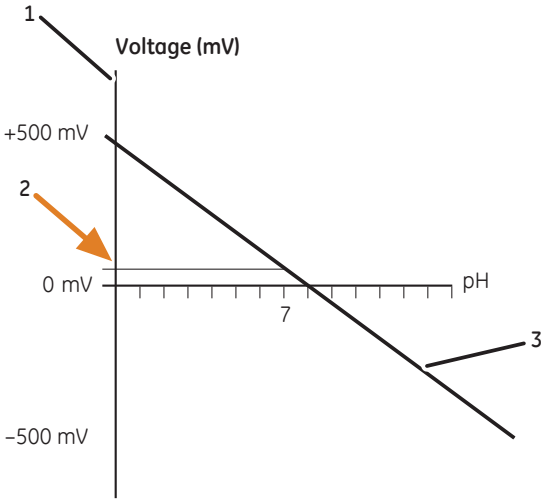
Step	Action	Display
12	From the ***Calibrate pH Buffer 2*** menu, turn the dial one step clockwise to access sub menu ***Calibrated Electrode Slope.*** This menu shows the slope of the calibration curve, where 100% corresponds to 59.16 mV per pH step at 25°C. The asymmetry potential at pH 7 is shown as a mV value. Press **ESC** to return to the ***Set Parameters*** menu.	
13	Before use, rinse the electrode using distilled water.	

Calibrated electrode slope

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

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 diminished.



Part	Function
1	Voltage (mV)
2	Assymmetry
3	Calibration curve

Calibrate with the electrode in the flow cell

When calibrating with the electrode fitted in the flow cell in a ÄKTA system, follow the above procedure but let at least 30 to 35 ml (with 2 ml mixer) of standard buffer solution be pumped through the system to stabilize pH.

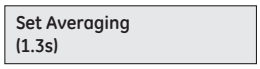
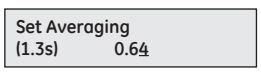
Leave the pump running while calibrating. Switch to the second standard buffer solution and repeat the procedure. For a description of calibration from UNICORN with the electrode fitted in the flow cell, see UNICORN user documentation.

5.7 Filter noise in the UV signal

Filter noise in the UV-signal

To filter the noise in the UV-signal, a moving average filter is used. The averaging time is the time interval used for calculating the moving average of the absorbance signal. A long averaging time will smooth out noise efficiently, but it will also distort the peaks. Peaks narrower than the minimum peak width value according to the table below may be distorted. Because of this, the averaging time should be as short as possible. On delivery, the averaging time is set to 1.3 s.

Moving average filter

Step	Action	Display
1	From main menu 1, turn the dial six steps clockwise and press **OK** twice.	
2	Select ***Setup UV*** and press **OK**.	
3	The menu ***Set Averaging*** is displayed, showing the current set averaging time. Press **OK**.	
4	Set the desired value and press **OK**. Values allowed are 0.02, 0.04, 0.08, 0.16, 0.32, 0.64, 1.3, 2.6, 5 and 10 s.	

In UNICORN, the averaging time is set with the instruction ***AveragingTime*** in ***System Control:Manual:Alarm&Mon***.

Averaging time (s)	Corresponding time constant (s) (approximately)	Min. peak width at half height (s)
10.0	5.00	50.0
5.10	2.00	32.0
2.60	1.00	16.0
1.30	0.50	8.0
0.64	0.20	3.2
0.32	0.10	1.6
0.16	0.05	0.8
0.08	0.03	0.5
0.04	0.01	0.2
0.02	0.01	0.1

5.8 Read pH, temperature and conductivity

Menu 1 and dial

Step	Action	Display
1	The main operating menu 1 shows UV absorption, conductivity in percentage of full range and pH. If the pH value is not stable or is changing, an asterisk is displayed, i.e., pH*. This menu is reached from any other menu by pressing **ESC**. If temperature compensation is switched on, the display will show ***Cond%Tc*** instead of ***Cond%,*** see *Setup conductivity temperature compensation, on page 72*.	AU Cond% T_C pH* 0.00002 015.0 4.02
2	By turning the dial three steps clockwise, main operating menu 2 is shown instead. This display shows pH, temperature (in the conductivity flow cell) and the actual conductivity in mS/cm together with the percentage value. If temperature compensation is switched on, Tc is shown in the display. The display of pH, temperature and conductivity can be disabled, see *Setup show temperature, on page 72*.	pH 12.50 22.4 735.8 mS/cm T_C 78.8%

5.9 Monitor check

Check autozero level

The module internal absorbance value for autozero can be checked to test the consistency of buffers.

Step	Action	Display
1	Select main menu ***Check*** and press **OK**.	Check Autozero AZ 0.00006 AU
2	Select sub menu ***Check Autozero***. The autozero absorbance value for the used wavelength is shown.	

Check lamp run time

The lamp run time can be checked to determine the need for lamp replacement. Run times for both Hg and Zn lamps are monitored.

Step	Action	Display
1	Select main menu ***Check*** and press **OK**.	
2	Select sub menu ***Check Lamp Run Time*** and press **OK**.	Check Lamp Run Time Hg 2300h Zn 340h

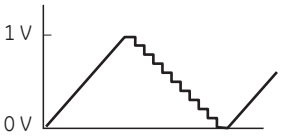
Check lamp intensity

The lamp intensity can be checked to determine the status of the lamp used.

Step	Action	Display
1	Select main menu ***Check*** and press **OK**.	Check Lamp Intensity
2	Select sub menu ***Check Lamp Intensity***.	

Check recorder

The function of a connected chart recorder can be tested.

Step	Action	Display
1	Select main menu ***Check*** and press **OK**.	Check Recorder
2	Select sub menu ***Check Recorder*** and press **OK**.	
3	Start the test by selecting on and press **OK**. The test will ramp the signal on each channel up to 1 V and then decrease the signal in 10% steps back to 0 V. The test is run continuously. Compare the diagram of the chart recorder with the figure. 	Check Recorder Please wait!
4	Stop the test by pressing **OK** or **ESC**.	

Check service mode

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

Step	Action	Display
1	Select main menu ***Check*** and press **OK**.	
2	Select sub menu ***Check Service Mode*** and 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 module serial number is displayed, press **OK**.	Serial Number: 01234567 YM 012345
6	The module name and software version are displayed, press **OK**.	UPC-900 V1.00
7	The date of the last service is displayed, press **OK**.	Date of Maintenance: ?
8	A test of the module's buzzer is performed, press **OK**.	Buzzer Test

5.10 Monitor setup

Selecting setup sub menus

There are setup sub menus for temperature, conductivity, pH and UV absorbance.

Step	Action	Display
1	Select main menu ***Setup*** and press **OK**.	
2	Select sub menus ***Temp***, ***Cond***, ***pH*** or ***UV*** with the dial and press **OK**.	Setup Temp Cond pH UV

Setup adjust temperature

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

Step	Action	Display
1	Place the flow cell together with a precision thermometer inside a box or empty beaker to make sure that they are not exposed to draught. Leave them for 15 minutes to let the temperature stabilize.	
2	Read the temperature on the thermometer.	
3	Select sub menu ***Setup Temp*** and press **OK**.	Setup Temp Cond pH UV
4	Select sub menu ***Setup Adjust Temp*** and press **OK**. The current temperature is shown.	Setup Adjust Temp (22.3°C)
5	A warning message is shown until confirmed by pressing **OK**.	Warning! This will change temp calib
6	The current adjustment value is displayed as default. Enter the temperature shown on the thermometer and press **OK**.	Setup Adjust Temp (22.3°C) 22.3

Setup show temperature

The display of the temperature in the conductivity flow cell, shown in the main operating menu 2, can be enabled or disabled.

Step	Action	Display
1	Select sub menu ***Setup Temp*** and press **OK**.	Setup Temp_ Cond pH UV
2	Select sub menu ***Setup Show Temp*** and press **OK**. The current status for showing temperature is displayed. If on is shown, current temperature is displayed in main menu 1 and 2. If off is shown, no temperature is displayed in the main menus.	Setup Show Temp (on)
3	Change the setting if desired and press **OK**.	Setup Show Temp (on) on off_

Setup conductivity temperature compensation

Step	Action	Display
1	Select sub menu ***Setup Cond*** and press **OK**.	Setup Temp Cond_ pH UV
2	Select sub menu ***Setup Cond Temp Comp*** and press **OK**. The current temperature compensation factor is shown. 0.0% means that the compensation is off (default setting). The range is 0.0 to 9.9%.	Setup Cond Temp Comp (0.0%)
3	The current compensation factor is displayed as default. Adjust the compensation factor setting as necessary and press **OK**.	Setup Cond Temp Comp (0.0%) 0.0_

Setup conductivity reference temperature

Step	Action	Display
1	Select sub menu ***Setup Cond*** and press **OK**.	Setup Temp Cond_ pH UV
2	Select sub menu ***Setup Cond Ref Temp*** and press **OK**. The current reference temperature value is shown. 25.0°C is the default setting. The range is 0.00 to 99.9°C.	Setup Cond Ref Temp (25.0°C)
3	The current reference temperature value is displayed as default. Adjust the reference temperature value setting as necessary and press **OK**.	Setup Cond Ref Temp (25.0%) 25.0_

Setup adjust conductivity

Normally it is not necessary to adjust the cell constant as the flow cell is pre-calibrated on delivery. Adjustment is only necessary when replacing the conductivity flow cell with a flow cell whose cell constant is unknown.

We recommend that the conductivity flow cell is recalibrated after cleaning. When adjusting the cell constant from UNICORN, select ***System Control:System:Calibrate*** and then select ***CondCalib***.

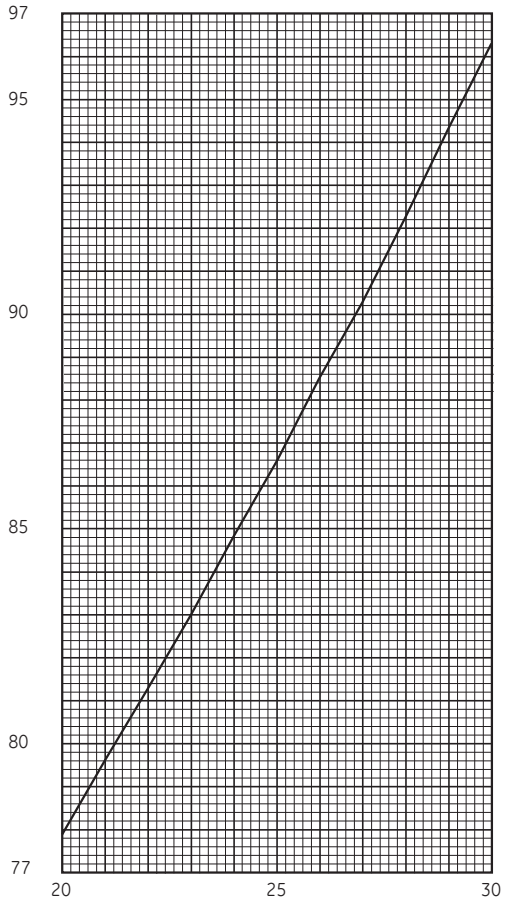
Note: *The conductivity temperature compensation must not be used when adjusting the cell constant. Set the* ***Setup Cond Temp Comp*** *to 0 (see Setup conductivity temperature compensation, on page 72). The temperature sensor must be calibrated before adjusting the cell constant (see Setup adjust temperature, on page 71).*

Step	Action	Display
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 to 30°C.	
4	Read the conductivity value displayed and compare it with the theoretical value from the graph below 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 sub menu ***Setup Cond*** and press **OK**.	Setup Temp Cond_ pH UV
6	Select sub menu ***Setup Adjust Cond*** and press **OK**. The current conductivity value is shown.	Setup Adjust Cond (1.000mS/cm)
7	A warning message is shown until confirmed by pressing **OK**.	Warning! This will change cell calib

Step	Action	Display
8	The current value is displayed as default. Enter the theoretical conductivity value according to the graph and press **OK**. The new cell constant is automatically calculated. The range is 1.000 to 999.9 mS/cm.	Setup Adjust Cond (83.53mS/cm) 86.6

Conductivity graph

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



Setup adjust cell constant

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

Step	Action	Display
1	Select sub menu ***Setup Cond*** and press **OK**.	Setup Temp Cond_ pH UV
2	Select sub menu ***Setup Adjust Cell Const*** and press **OK**. The current cell constant is shown.	Setup Adj Cell Const (83.56cm $^{-1}$)
3	A warning message is shown until confirmed by pressing **OK**.	Warning! This will change cell calib
4	The current cell constant value is displayed as default. Enter the new cell constant as read from the packaging and press OK. The range is 0.1–300.0 cm^{-1}. When entering the cell constant from UNICORN, select ***System Control:System:Calibrate*** and select ***Cond_Cell***.	Setup Adj Cell Const (83.56 $^{-1}$) 86.6_

Setup show conductivity

Step	Action	Display
1	Select sub menu ***Setup Cond*** and press **OK**.	Setup Temp Cond_ pH UV
2	Select sub menu ***Setup Show Cond*** and press **OK**. The current status for showing conductivity is displayed. If ***on*** is shown, current conductivity is displayed in main menus 1 and 2. If ***off*** is shown, no conductivity is displayed in the main menus.	Setup Show Cond (on)
3	Change the setting if desired and press **OK**.	Setup Show Cond (on) on off_

Setup pH temperature compensation

The relationship between pH and the output signal from the pH electrode is temperature dependent. For accurate measurements during temperature changes, the pH measurement can be temperature compensated. In normal applications, when the temperatures of the buffers and calibration buffers are identical, temperature compensation is not necessary.

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.

Step	Action	Display
1	Select sub menu ***Setup pH*** and press **OK**.	Setup Temp Cond pH UV
2	Select sub menu ***Setup pH Temp Comp*** and press **OK**. The current status for showing pH is displayed. If ***on*** is shown, ***Tc*** is displayed in main menus 1 and 2. If ***off*** is shown (default), ***Tc*** is not displayed in the main menus.	Setup pH Temp Comp (off)
3	Change the setting if desired and press **OK**.	Setup pH Temp Comp (off) on off

Setup show pH

Normally the pH is displayed in the main operating menus, see *Section 5.8 Read pH, temperature and conductivity, on page 66*.

Reading pH, temperature and conductivity values). If not required, the pH display can be set to off.

Step	Action	Display
1	Select sub menu ***Setup pH*** and press **OK**.	Setup Temp Cond pH UV
2	Select sub menu ***Setup Show pH*** and press **OK**. The current status for showing pH is displayed. If ***on*** is shown, current pH is displayed in main menus 1 and 2. If ***off*** is shown, no pH is displayed in the main menus.	Setup Show pH (on)
3	Change the setting if desired and press **OK**.	Setup Show pH (on) on off

Setup UV averaging filter constant

Step	Action	Display
1	Select main menu ***Setup UV*** and press **OK**.	Setup Temp Cond pH UV
2	Select sub menu ***Set Averaging*** and press **OK**. The current filter constant is shown. Valid values are 0.02, 0.04, 0.08, 0.16, 0.32, 0.64, 1.3, 2.6, 5 and 10 seconds.	**Set Averaging** **(1.3s)**
3	Change the setting if desired and press **OK**.	**Set Averaging** **(1.3s) 0.64**

Setup lamp run time

When the UV lamp is replaced, the ***Lamp Run Time*** counter should be reset.

Step	Action	Display
1	Select sub menu ***Setup UV*** and press **OK**.	Setup Temp Cond pH UV
2	Select sub menu ***Setup Lamp Run Time*** and press **OK**.	Setup Lamp Run Time Hg (2000h)
3	Set the ***Lamp Run Time*** counter to zero with the dial. Press **OK** to acknowledge.	Setup Lamp Run Time Hg (2000h) 000

Setup show UV

Normally UV absorbance is displayed in main menu 1. If not required, the UV absorbance display can be set to off.

Step	Action	Display
1	Select sub menu ***Setup UV*** and press **OK**.	Setup Temp Cond pH UV
2	Select sub menu ***Setup Show UV*** and press **OK**. The current status for showing UV is displayed. If ***on*** is shown, the current UV value is displayed in main menu 1. If ***off*** is shown, no UV value is displayed in main menu 1.	Setup Show UV (on)
3	Change the setting if desired and press **OK**.	Setup Show UV (on) on off

Setup language

The language used on the display can be changed.

Step	Action	Display
1	Select main menu ***Setup*** and press **OK**.	
2	Select sub menu ***Setup Language*** and press **OK**.	
3	Select the desired language. GB = English D = German F = French E = Spanish I = Italian	Setup Language (GB) GB D E F I

Setup unit number

The unit number is the identification the Monitor UPC-900 has on the UniNet-bus. It should correspond to the number set in UNICORN for the Monitor UPC-900. The number should be set to 0 if one Monitor UPC-900 is used.

If more than one Monitor UPC-900 is used, they must all have different numbers.

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

Setup display angle

Sets the display angle to compensate for different viewing heights.

Step	Action	Display
1	Select main menu ***Setup*** and press **OK**.	
2	Select sub menu ***Set Display Angle*** and press **OK**.	Set Display Angle
3	Select viewing angle (->\ Up, ->| Mid or ->/ Down).	

5.11 Alarm timer

Setting and using the alarm timer

You can set the alarm function to either a fixed alarm time or use a countdown timer. You cannot set both an alarm time and the count-down timer.

The default or current value is shown in parentheses.

Step	Action	Display
1	Select main menu ***Alarm/Timer***. The display shows current time.	Alarm/Timer 12:30:52
2	Press **OK.** Turn the dial one step clockwise to select sub menu ***Set Alarm*** if you want to set an alarm at a fixed time. Press **OK** to enter the time in the form HH.MM.SS and press **OK** again after entering each time unit.	Set Alarm 12:32:21 (0) 00.00.00
3	If you want to set a count-down time, turn the dial one step further to select sub menu ***Set Timer***. Press **OK** to enter the count-down value in the form HH.MM.SS and press **OK** again after entering each time unit.	Set Timer (18:34:52) 00.00.00
4	Press **ESC** 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 Buzzer 00:33:00
5	When the alarm time is due or the count-down timer reaches 00:00:00, an alert display is shown and the module beeps for 30 s, or until **OK** is pressed. The display shows the time elapsed since the alarm and the current time. A second alert display is shown until **OK** is pressed. The alarm timer is based on the internal module clock, which can be set in the ***Set Clock*** menu located after the ***Set Timer*** menu. The clock will be reset when power is turned off. A set alarm/timer function can be reset by pressing ***OK*** in the menu ***Alarm/ Timer off?***	00:00:29 13:08:45 !! Alarm time !! !! Alarm time !! Set Clock (12:26:53) 12:36:53 Alarm/Timer off? Buzzer 18:34:52 Insert Access Code:

5.12 Service displays

Insert access code

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

6 Maintenance

About this chapter

This chapter provides required information to enable users and service personnel to clean, maintain, calibrate and store the Monitor UPC-900.

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.

WARNING

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

WARNING

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

WARNING

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

In this chapter

This chapter contains the following sections:

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.

Copy the form you need from *Section 8.4 Health and Safety Declaration Form, on page 118* or print it from the PDF file available on the User Documentation CD.

6.2 User maintenance schedule

Periodic maintenance

Interval	Action
Every 3 months	Check the monitor

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

6.3 Cleaning

6.3.1 The monitor housing

Clean the monitor housing

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

6.3.2 Clean UV flow cell

Precautions

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).

WARNING

Hazardous substances and biological agents. When using hazardous chemical and biological agents, take all suitable protective measures, such as wearing protective glasses and gloves resistant to the substances used. Follow local and/or national regulations for safe operation and maintenance of Monitor UPC-900.

Clean the UV flow cell in place

Pump a cleaning or sanitising agent through the flow cell. The standard recommendation is to pump 1 M NaOH for 30 minutes and then wash out with buffer.

Clean the UV flow cell off-line

NOTICE

Keep UV flow cell clean. Do not allow solutions containing dissolved salts, proteins or other solid solutes to dry out in the flow cell. Do not allow particles to enter the flow cell, as damage to the flow cell may occur.

A clean flow cell is essential for ensuring the correct operation of the UV-monitor.

Step	Action
1	Connect a syringe to the inlet of the flow cell and squirt distilled water through the cell in small amounts. Then fill the syringe with a 10% surface active detergent solution like Decon™ 90, Deconex™ 11, RBS™ 25 or equivalent, and continue to squirt five more times.
2	After five squirts, leave the detergent solution in the flow cell for at least 20 minutes.
3	Pump the remaining detergent solution through the flow cell.
4	Rinse the syringe and then flush the flow cell with distilled water (10 ml).

6.3.3 Conductivity flow cell

Precautions

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).

WARNING

Hazardous substances and biological agents. When using hazardous chemical and biological agents, take all suitable protective measures, such as wearing protective glasses and gloves resistant to the substances used. Follow local and/or national regulations for safe operation and maintenance of Monitor UPC-900.

Clean the conductivity flow cell inplace

Step	Action
1	Remove the pH electrode and install the dummy electrode in the pH flow cell.
2	Pump a cleaning or sanitising agent through the flow cell. The standard recommendation is to pump 1 M NaOH for 30 minutes and then wash out with buffer.

Cleaning the conductivity flow cell off-line

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 a pump or a syringe.
2	Leave it for 15 minutes.
3	Rinse thoroughly with 50 ml distilled water. ***Note:*** *If the flow cell is totally blocked, the blockage can be removed using a needle or a wire with a diameter less than 0.8 mm.*

6.3.4 Clean the pH electrode

Precautions

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).

WARNING

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

Clean the pH electrode

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

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 the electrode tip in distilled water.

Oil or grease films

Wash the electrode tip in a liquid detergent and water. If the film is known to be soluble in a particular organic solvent, wash with this solvent. Rinse the 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.

Step	Action
1	Heat a 1 M KNO_3 solution to 60 to 80°C.

Step	Action
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 re-testing.
4	If these steps fail to improve the electrode response, replace the electrode.

6.4 Optical unit

Check lamp intensity

Step	Action	Display
1	Select menu ***Check*** and press **OK**.	
2	Select menu ***Check Lamp Intensity***. If: R <300 mV for 254 nm R <150 mV for 280 nm R <150 mV for 214 nm, replace the lamp according to *Change lamp assembly, on page 92*, or contact GE for lamp replacement.	Check Lamp Intensity 0.00002 015.0 4.02

Check lamp run time

Step	Action	Display
1	Select menu ***Check*** and press **OK**.	
2	Select menu ***Check Lamp Run Time***. • The lifetime of a Hg lamp at 254 nm, in room temperature is typically 7000 hours (in cold room, typically 2000h). • The lifetime of a Hg lamp at 280 nm, in room temperature is typically 3500 hours. • The lifetime of a Zn lamp is typically 2000 hours in room temperature.	**Check Lamp Run Time** **Hg 2300 h Zn 340 h**
3	When necessary replace the lamp according to *Change lamp assembly, on page 92*, or contact GE for lamp replacement.	

Autozero

The module internal absorbance value for autozero can be checked to test the consistency of buffers.

Step	Action	Display
1	Select menu ***Check*** and press **OK**.	
2	Select menu ***Check Autozero***. The autozero absorbance value for the wavelength used is shown.	Check Autozero AZ 0.00006 AU

Change lamp assembly

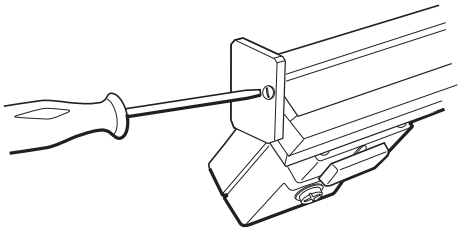
WARNING

High intensity UV light. This product uses high intensity ultra-violet light. Do not disconnect the optical fibers while the lamp is on.

CAUTION

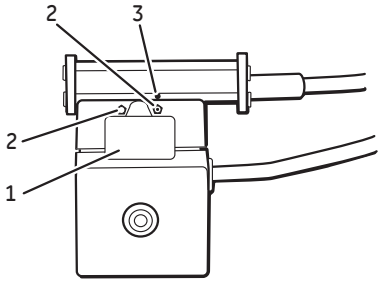
If the mercury lamp is broken, make sure that all mercury is removed and disposed of according to national and local environmental regulations.

Step	Action
1	Use a Philips screwdriver to detach the end plate by removing one and loosening the other of the two holding screws on the lamp housing to be removed.



2	Slide the lamp housing off the filter housing.
3	Detach the end plate, as in step 1 above, from the lamp housing to be fitted to the optical unit.
4	Slide the lamp housing onto the filter housing. The lamp and signal cables should be on the same side. As you slide the lamp housing into position, depress the two pressure pads on the filter housing in sequence to facilitate the installation.
5	Refit the lamp housing end plate.
6	Slide the lamp housing firmly into place. There will be a faint click when the housing is positioned correctly. The Hg lamp housing can take up two positions, one for 280 nm and one for all other wavelengths. ***Note:*** *The Zn lamp housing has only one position.*

Step	Action
7	Set the wavelength to be used by selecting lamp position (indicated by a dot (3) on the lamp housing) in combination with the appropriate filter, i.e., the dot on the lamp housing should be adjacent to the symbol on the filter housing (2) corresponding to the symbol on the filter wheel (1) for the filter to be used. A click will indicate that the filter is in position.



If...	Then...
Setting up for 280 nm	Align the lamp housing to 
Setting up for other wavelengths.	Align the lamp housing to 

Note:

The wavelength and the flow cell type should also be entered in the ***Questions*** *menu in UNICORN.*

Filter change

The Hg optics with 254 and 280 nm filters and the Zn optics with the 214 nm filter are delivered with filters installed. If other filters are to be used, install the new filters as described in *Install optical filters, on page 45*.

6.5 Conductivity flow cell

Change the conductivity flow cell

The conductivity flow cell can be changed when required. Make sure the monitor is switched off before disconnecting/connecting the cell from the rear of the monitor housing.

If the cell is replaced with a new flow cell, the monitor must be calibrated with the new cell constant value written on the flow cell package, see *Setup adjust conductivity, on page 74*.

6.6 pH electrode

Change the pH electrode

See *Section 4.5 Install the pH electrode, on page 39*

6.7 Storage

UV flow cell

NOTICE

Keep UV flow cell clean. Do not allow solutions containing dissolved salts, proteins or other solid solutes to dry out in the flow cell. Do not allow particles to enter the flow cell, as damage to the flow cell may occur.

Overnight

The flow cell can be left filled with buffer.

Weekend and long term storage

Flush the flow cell with distilled water and then fill it with 20% ethanol.

The flow cell can also be stored dry by flushing as above with distilled water and then blowing a compressed inert gas such as nitrogen (N_2) through the cell. Replace the red protective caps. Never use compressed air as this may contain droplets of oil.

Conductivity flow cell

Overnight

The conductivity cell can be left filled with a buffer.

Weekend or long term storage

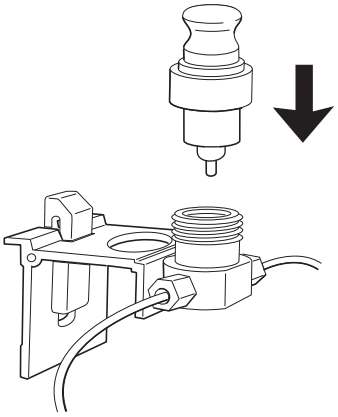
Flush the conductivity cell with water and fill with 20% ethanol.

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 2 M KNO_3. **Do NOT store in water only.**

The pH electrode should always be stored in a 1:1 mixture of pH 4 buffer and 2 M KNO_3 when not in use. When the pH electrode is removed from the flow cell, the dummy electrode (supplied) can be inserted in the flow path.



Electrode regeneration

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 2 M KNO_3 overnight.

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 UPC-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 GE representative for advice.

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.

WARNING

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

7.1 Fault actions

UV measurement

Component	Problem	Corrective action
UV measurement	No text on the front display	Check that the mains cable is connected and the **power switch** is in **ON**-position (**I**).
	Noisy UV-signaldrift or instability	• Select menu ***Check Autozero*** to check the autozero absorbance value. If AZ is between 1.5 and 2, there may be air bubbles in the flow cell, or the wrong buffer system in use. • Wrong filter for the lamp used. Check that the lamp is in proper position and that the correct filter is used. • The buffer may be impure. Check if the signal is still noisy with water. • There may be air in the flow cell. Check that the flow restrictor gives a back-pressure of 0.2 MPa. • If there is a lot of air in the water, degas the buffer before use. • Check the connections of the optical unit. • Clean the UV-cell, see *Section 6.3.2 Clean UV flow cell, on page 86* • Locking nut in optical unit not properly tightened. Turn the locking nut to the stop position.
	Ghost peaks	• Check that there is no air in the eluents. Degas if necessary. • Clean the system in accordance with the ÄKTA system manual. • Clean the column in accordance with the column instructions. • Check that the mixer is functioning correctly and that the correct chamber volume is being used.

Component	Problem	Corrective action
UV measurement	Low sensitivity	• Aging lamp. Check the lamp and replace if necessary • Wrong lamp position. Check that the lamp position and the wavelength used (filter position) fit together. • Dirty on-line filter. Clean or replace the filter.
	Error in external chart recorder	• Check the chart recorder in accordance with its manual. • Test the recorder function by selecting recorder test according to *Check recorder, on page 68*.

pH measurement

Component	Problem	Corrective action
pH measurement	No response to pH changes	• Check that the electrode cable is connected properly to the rear of the module. • The electrode glass membrane may be cracked. If so, replace the electrode.
	Small response to pH changes	• Clean the pH electrode according to *Section 6.3.4 Clean the pH electrode, on page 89* and recalibrate. • If the problem remains, replace the pH electrode.
	Slow pH response or calibration impossible	• Check the electrode glass membrane. If it is contaminated, clean the electrode following the instructions in *Section 6.3.4 Clean the pH electrode, on page 89*. • If the membrane has dried out, the electrode may be restored by soaking it in buffer overnight. • Clogged liquid junction. Refer to *Section 6.3.4 Clean the pH electrode, on page 89*.
	pH values vary with varied back-pressure	Replace the pH electrode.

Component	Problem	Corrective action
pH measurement	Incorrect/unstable pH reading	• Check that the electrode cable is connected properly to the rear of the module. • Check that the pump 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 20 ml/min for 1/2 min. Use a flow restrictor after the pH electrode. • Check that the pH electrode is not broken. • Check that the pH electrode is calibrated. • Check the slope (see *Section 5.6 Calibrate the pH electrode, on page 60*). If it is outside the range 80 to 105% or if the asymmetry potential deviates more than ±60 mV from 0 mV, clean the pH electrode. Recalibrate. If the problem persists, replace the pH electrode. • Clean the pH electrode if required, see *Section 6.3.4 Clean the pH electrode, on page 89*. • Compare the response of the pH electrode with that of another pH electrode. If the response differs greatly, the electrode may require cleaning or replacement. • There may be interference from static fields. 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. We recommend that the pH electrode is not used in applications using organic solvents. Mount the dummy electrode instead. • Clogged liquid junction. Refer to *Section 6.3.4 Clean the pH electrode, on page 89*.

Conductivity measurement

Component	Problem	Corrective action
Conductivity measurement	Incorrect or unstable reading	• Check that the conductivity flow cell cable is connected properly to the reading rear of the module. • Check that the pump operates 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 and check that the flow restrictor gives a back-pressure of 0.2 MPa. • Check for leaking tubing connections. • Check that the column is equilibrated. If necessary, clean the column. • Check the operation of the mixer and the pump. • Clean the flow cell according to the procedure in *Section 6.3.2 Clean UV flow cell, on page 86*.
	Conductivity measurement with the same buffer appears over time	• Clean the flow cell according to the procedure in *Section 6.3.2 Clean UV flow cell, on page 86*. • The ambient temperature may have changed. Use a temperature compensation factor, see *Setup conductivity temperature compensation, on page 72*.

Component	Problem	Corrective action
Conductivity measurement	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 in the 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.

Other problems

Component	Problem	Corrective action
Other problems	Error in external pH or Cond. 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 *Set the conductivity analog output, on page 56* and *Check recorder, on page 68*
	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

Warnings 34 to 77

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

Message	Action
34 Start up failed Retry/Call service 35 WARNING wrong averaging time set	1 Perform a new start-up. The preceding message may tell more about the cause. 2 If not, call service.
50 Electrical error Call for service	Wrong value for averaging time set. See *Section 5.7 Filter noise in the UV signal, on page 64* on how to set the averaging time relative to peak width.
57 Electrical error Call for service 75 Electrical error Call for service	Call for Service.
70 Lamp disconnected If not call service	Connect the lamp, or call for service.
71 WARNING low light intensity	1 Check connection between optical unit and monitor. 2 Check that lamp and filter position correspond. 3 Change lamp. If warning persists, call for service.

Message	Action
72 Change lamp or call for service 76 Change lamp or call for service	1 If used in cold room, additional warm up might be needed. 2 If problem remains, change the lamp. 3 If problem remains, call for service.
73 WARNING Too much straylight leaks in	1 Check that filter wheel cover is closed. 2 Check that non-transparent tubings are used at UV flow cell inlet and outlet. 3 Check that optical unit is not exposed to direct sunlight. 4 If problem remains, call service
77 WARNING Autozero Out of range	1 Auto is not allowed from a level above 2 AU. 2 Check buffers. 3 Clean UV cell.

Warnings 83 to 97

Message	Action
83 WARNING temp_cal will be changed 84 WARNING cond_cal will be changed	1 Press **OK** to accept the change. 2 Press **ESC** to skip the change.
85 WARNING condscale (0-100%)<0.1mS	1 The difference between 0 and 100% must be at least 0.1 mS/cm. 2 Increase the span between zero and full scale setting. See *Section 5.4 Analog outputs settings, on page 56*.
86 WARNING cond_cell bad/not connected	1 Check that the conductivity cell is connected. 2 Recalibrate temperature. 3 If problem remains, replace the conductivity cell.
87 WARNING pH-probe bad/not connected	1 Check the pH electrode connection. 2 Clean the pH electrode. 3 If problem remains, change the pH electrode.
88 Electrical error Call for service	1 Factory calibration for pH is lost. The monitor can still be used but may not meet specifications for pH measurement. 2 Call for service.
89 Electrical error Call for service	1 Factory calibration for conductivity is lost. The monitor can still be used but may not meet specifications for conductivity measurement. 2 Call for service.

Message	Action
90 ATTENTION set<=0mV first 91 WARNING bad pH ad value	Only visible to service personnel.
92 WARNING electrode slope <70 or >110% 93 pH_cal failed check electrode	1 Electrode slope is out of range. Check buffers and recalibrate. 2 Clean the pH electrode and recalibrate. 3 If the message remains, replace the pH electrode.
94 WARNING<1pH unit between cal_buff 1&2	The difference between the pH of the buffers used during calibration must be at least 1 pH unit.
95 Temp cal failed check cond cell	1 Check that the conductivity cell is connected. Re-calibrate. 2 The measured temperature value differs from the reference value by more than ±5°C, or actual temperature is lower than –8°C. Recalibrate. 3 If the message remains, replace the conductivity cell.
97 WARNING pH scale (0-100%)<1pH unit	The difference between the zero level and full scale must be at least 1 pH unit. Increase the span between zero and full scale settings. See *Section 5.4 Analog outputs settings, on page 56*.

Warnings 98 to 118

Message	Action
98 Cal failed. Cell constant not 0.1-300	1 Conductivity cell constant is out of range. 2 Wrong solution used during calibration. Use 1.00 M NaCl and recalibrate. 3 Air in conductivity cell during calibration. Flush the flow cell with calibration solution and recalibrate. 4 Dirty conductivity cell. Clean the flow cell and recalibrate. 5 If the problem remains, change the conductivity cell.
ERROR key (OK) ERROR key (Esc) ERROR key (OK+Esc)	1 The key was pressed during self-test, or is faulty. 2 Switch off the module. 3 Switch on the module.
ERROR number 100 ERROR number 109-113 ERROR number 120-121	1 Switch off the module. 2 Check all connections. 3 Switch on the module.

Message	Action
ERROR number 106-108 ERROR number 118	1 Switch off the module. 2 Check all UniNet 1 and UniNet 2 connections. 3 Switch on the module.
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 module. 2 Check all connections. 3 Switch on the module.

8 Reference information

About this chapter

This chapter provides reference information that may become useful when installing, operating, maintaining and troubleshooting Monitor UPC-900.

In this chapter

This chapter contains the following sections:

8.1 Specifications

Operating data

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

UV measurement

Property	Value
Absorbance range	0.01 to 5 AU (full scale)
Autozero range	–0.2 to 2.0 AU
Baseline adjust	Adjustable 0% to 100% of full scale
Wavelengths Hg lamp, fixed by changing filter Zn lamp	 254 nm and 280 nm 313 nm, 365 nm, 405 nm, 436 nm and 546 nm 214 nm
Linearity, 5 mm cell	<3% up to 2 AU at 254 nm <5% up to 1 AU at 280 nm
Static noise short term long term	 40×10–6 AU at 254 nm (typically 6×10–6 AU at 254 nm) 40×10–6 AU at 254 nm
Static drift	±100×10–6 AU/h at 254 nm
Flow sensitivity	2×10–4 AU min/ml

UV flow cells

Property	UV flow cell, 2 mm	UV flow cell, 5 mm
Flow rate	0 to 100 ml/min	0 to 20 ml/min
Max. pressure	4 MPa (40 bar, 580 psi)	4 MPa (40 bar, 580 psi)
Backpressure	Max. 0.05 MPa at 100 ml/min	Max. 0.02 MPa at 20 ml/min
Liquid temperature range	4°C to 60°C	4°C to 60°C
Optical pathlength	2 mm	5 mm
Cell volume	2 µl (30 µl detector volume)	6 µl (10 µl detector volume)

Conductivity measurement

Property	Value
Conductivity range	1 µS/cm to 999.9 mS/cm
Reproducibility short term long term	 Max. ±1% or ±5 µS/cm whichever is greater Max. ±3% or ±15 µS/cm whichever is greater
Noise	Max. ±0.5% of full scale calibrated range
Response time	<3 s (0 to 95% of step)
Temperature sensor accuracy drift	 ±2.0°C ±0.5°C per 10 h
Flow rate sensitivity	±1% within 0 to 100 ml/min

Conductivity flow cell

Property	Value
Flow rate	0 to 100 ml/min
Maximum pressure	5 MPa (50 bar, 725 psi)
Generated backpressure	Max. 0.01 MPa at 100 ml/min

pH measurement

Property	Value
pH range	0 to 14 (spec. valid between 2 and 12)
Accuracy temperature compensated not temperature compensated	 ±0.1 pH within 4°C to 40°C ±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	<10 s (0% to 95% of step)
Long term stability	Maximum deviation 0.02 pH/h (measured at pH 4.0)
Flow rate sensitivity	Maximum deviation 0.1 pH units

pH flow cell

Property	Value
Flow rate	0.1 to 100 ml/min
Maximum pressure	0.5 MPa (5 bar, 72 psi)
Generated backpressure	Maximum 0.02 MPa (0.2 bar, 2.9 psi) at 100 ml/min

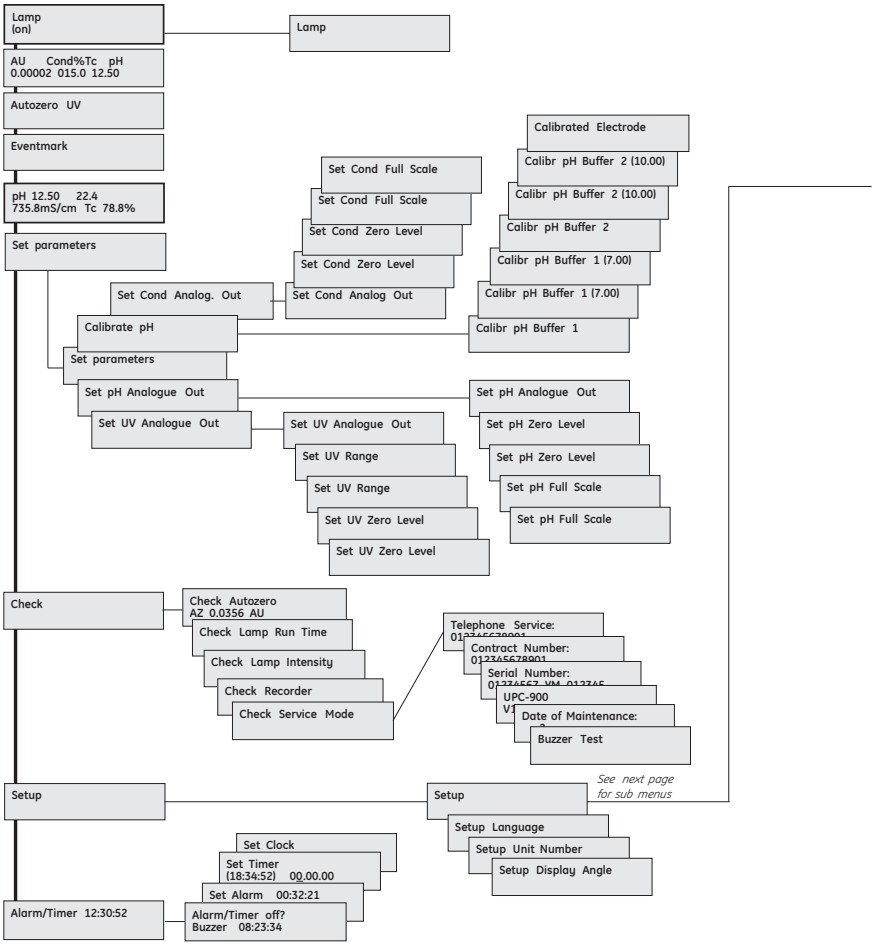
Physical data

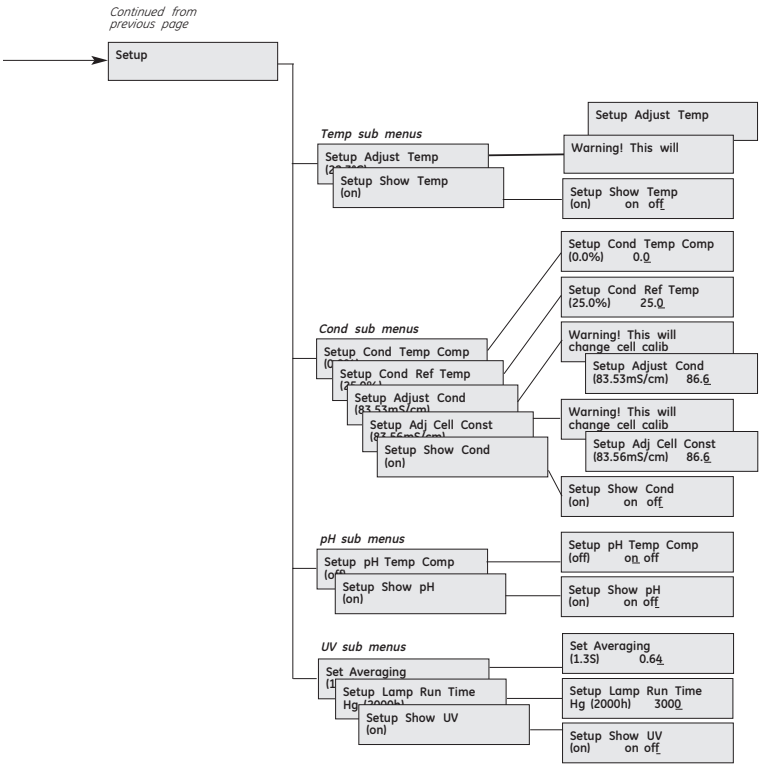
Property	Value
Control	Stand-alone or from a PC with UNICORN version 3.0 or higher, via UniNet 1 connection.
Degree of protection housing	IP 20, IP 21 flow cells IP 44
Power requirements	100/240 V AC ±10%, 50/60 Hz
Power consumption	45 VA
Functions	Languages available; English, German, Spanish, French, Italian
UV lamp cable length	1.5 m, AMP 5+2 pole connector
Optical unit, cable length	1.5 m, RJ-45 connector
pH electrode cable length	1.5 m, BNC connector
Conductivity cell cable length	1.5 m, D-sub 9 pole connector
Tubing connections	Fingertight connector, 1/16"
Analog outputs	0 to 1 V full scale
Display	2 rows with 20 characters each
Dimensions, H × W × D	100 × 260 × 370 mm
Weight	8.5 kg
Noise emission	< 80 dB A
Wetted materials UV flow cells conductivity flow cell pH electrode flow cell dummy electrode	 Quartz, ETFE (ethylene tetrafluoroethylene), titanium Titanium, CTFE (chlorotrifluoroethylene) Glass, FFKM (perfluororubber) Titanium PTFE (polytetrafluoroethylene)
pH stability range	1 to13 (1 to14, <1 day exposure)

Property	Value
Typical lamp lifetime	
Hg, 254 nm, room temperature	7000 hours
Hg, 254 nm, cold room	2000 hours
Hg, 280 nm, room temperature	3500 hours
Zn, 214 nm, room temperature	2000 hours
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).

8.2 Menu overview

Illustration




Continued from previous page
Setup
Temp sub menus
Setup Adjust Temp
Setup Show Temp (on)
Setup Adjust Temp
Warning! This will
Setup Show Temp (on) on off
Cond sub menus
Setup Cond Temp Comp
Setup Cond Ref Temp
Setup Adjust Cond
Setup Adj Cell Const
Setup Show Cond (on)
Setup Cond Temp Comp (0.0%) 0.0
Setup Cond Ref Temp (25.0%) 25.0
Warning! This will change cell calib
Setup Adjust Cond (83.53mS/cm) 86.6
Warning! This will change cell calib
Setup Adj Cell Const (83.56mS/cm) 86.6
Setup Show Cond (on) on off
pH sub menus
Setup pH Temp Comp
Setup Show pH (on)
Setup pH Temp Comp (off) on off
Setup Show pH (on) on off
UV sub menus
Set Averaging
Setup Lamp Run Time
Setup Show UV (on)
Set Averaging (1.3S) 0.64
Setup Lamp Run Time Hg (2000h) 3000
Setup Show UV (on) on off

8.3 Ordering information

Accessories and spare parts

Item	Quantity	AC [1]	Code No
Hg optics with 254 and 280 nm filters	1	A	28-4042-23
Zn optics with 214 nm filter	1	A	28-4042-24
Hg lamp and housing complete	1	C	28-4042-25
Zn lamp and housing complete	1	C	28-4042-26
UV flow cell 5 mm	1	C	18-1128-24
UV flow cell 2 mm	1	C	18-1128-25
Filter 214 nm	1	C	18-0622-01
Filter 254 nm	1	C	18-0620-01
Filter 280 nm	1	C	18-0621-01
Filter 313 nm	1	C	18-0623-01
Filter 365 nm	1	C	18-0624-01
Filter 405 nm	1	C	18-0625-01
Filter 436 nm	1	C	18-0626-01
Filter 546 nm	1	C	18-0627-01
Filter wheel cpl.	1	A	18-0647-01
Conductivity flow cell complete	1	A	18-1111-05
pH electrode, round tip	1	C	18-1111-26
pH flow cell, round tip, including dummy electrode	1	A	18-1112-92
Dummy electrode, round tip	1	A	18-1111-03
pH electrode complete, round tip, incl. pH electrode, flow cell and holder	1	C	18-1134-84
Flow cell holder UPC-900	1	A	18-3055-87

Item	Quantity	AC[1]	Code No
Clamp, Conductivity flow cell	1	A	18-1111-14
PEEK (polyether ether ketone) tubing, i.d. 0.50 mm, o.d. 1/16" (G)	2 m	A	18-1113-68
PEEK tubing, i.d. 0.75 mm, o.d. 1/16"	2 m	A	18-1112-53
Union 1/16" female/M6 male, PEEK 	6	A	18-1112-57
Fingertight connector 1/16", for PEEK tubing o.d. 1/16" 	10	A	18-1112-55
Union M6 female/1/16" male, PEEK 	8	A	18-1112-58
Union, 1/16" male/1/16" male, for 1/16" o.d. tubing, PEEK 	10	A	18-1120-92
Tubing cutter	1	A	18-1112-46
U-wrench, M6	1	A	19-7481-01
U-wrench, 1/4"	1	A	18-1112-45
Signal cable, 6 pin mini-DIN-open	1	A	18-1110-64
Chart Recorder REC 111, 1 channel	1	A	18-1132-32
Chart Recorder REC 112, 2 channel	1	A	18-1132-33

1 A = accessories
C = consumables

8.4 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 GE 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, please 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	Please 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. Please rinse tubing or piping, wipe down scanner surfaces, or otherwise ensure removal of any dangerous residue. Ensure the area around the instrument is clean. If radioactivity has been used, please 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 GE 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:			

DOC1149542/28-9800-26 AC 05/2014

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

1. Please 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 GE 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	Please specify if the equipment has been in contact with any of the following:	
		Radioactivity (please specify)	
		Infectious or hazardous biological substances (please specify)	
		Other Hazardous Chemicals (please specify)	

Equipment must be decontaminated prior to service / return. Please provide a telephone number where GE 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, please 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:			

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

DOC1149544/28-9800-27 AC 05/2014

Index

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P

R

S

T

U

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