ÄKTA™ pure

Operating Instructions

Original instructions

Table of Contents

1 Introduction 4

1.1 About this manual 5
1.2 Important user information 6
1.3 Regulatory information 8
1.3.1 EU Directives 9
1.3.2 Eurasian Customs Union 10
1.3.3 Regulations for USA and Canada 11
1.3.4 Other regulations and standards 12
1.4 Associated documentation 14

2 Safety instructions 17

2.1 Safety precautions 18
2.2 Labels 28
2.3 Emergency procedures 31
2.4 Recycling information 35
2.5 Declaration of Hazardous Substances (DoHS) 36

3 System description 38

3.1 ÄKTA pure instrument overview 39
3.2 UNICORN software 50
3.2.1 UNICORN software overview 51
3.2.2 The System Control module 53

4 Installation 55

4.1 Site preparation 56
4.1.1 Delivery and storage 57
4.1.2 Room requirements 59
4.1.3 Site environment 62
4.1.4 Power requirements 64
4.1.5 Computer requirements 65
4.1.6 Required materials 67
4.2 Hardware installation 68
4.2.1 Unpack the instrument 70
4.2.2 Install the computer equipment 76
4.2.3 Connect system units 77
4.2.4 Install waste tubing 80
4.2.5 Prepare the pump rinsing system 83
4.2.6 Start the instrument and the computer 86
4.3 Software installation 87
4.4 Start UNICORN and connect to system 88
4.5 Prime inlets and purge pump heads 91
4.6 Performance test 99
4.7 Activate Power-save 100

5 Prepare the system for a run 101
5.1 Before you prepare the system 103
5.2 Prepare the flow path 104
5.3 Prime inlets and purge pump heads 108
5.4 Connect a column 109
5.5 Pressure alarms 114
5.6 Prepare for a run at cold room temperature 117

6 Run a method 118
6.1 Before you start 119
6.2 Applying the sample 122
6.3 Start a method run 125
6.4 Monitor the run 127
6.5 After run procedures 128

7 Maintenance 132

8 Reference information 135
8.1 System specifications 136
8.2 Chemical resistance guide 139
8.2.1 General information about biocompatibility and chemical resistance 140
8.2.2 Chemical resistance specifications 142
8.3 Ordering information 146
8.4 Health and Safety Declaration Form 155

Index 157

1 Introduction

About this chapter

This chapter contains important user information, descriptions of safety notices, regulatory information, intended use of the ÄKTA pure system, and lists of associated documentation.

In this chapter

This chapter contains the following sections:

Section	See page
1.1 About this manual	5
1.2 Important user information	6
1.3 Regulatory information	8
1.4 Associated documentation	14

1.1 About this manual

Purpose of this manual

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

Scope of this manual

The *Operating Instructions* cover ÄKTA pure 25 and ÄKTA pure 150 instruments, using previously created methods in UNICORN software 6.3.2 and later.

Typographical conventions

Software items are identified in the text by ***bold italic*** text. A colon separates items in a group, for example ***Flowpath:Injection valve*** refers to the ***Injection valve*** item in the ***Flowpath*** group.

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

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

ÄKTA pure is intended for the purification of bio-molecules, in particular proteins, for research purposes. It is intended to be used by trained laboratory staff members in research laboratories at departments within academia and industry.

ÄKTA pure shall not be used in any clinical procedures, or for diagnostic purposes.

Prerequisites

In order to follow this manual and use the system in the manner it is intended, it is important that:

- You have a general understanding of how the computer and Microsoft® Windows® work.
- You understand the concepts of liquid chromatography.
- You have read and understood the Safety instructions chapter in this manual.
- A user account has been created according to the *UNICORN™ Administration and Technical Manual*.

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.*

1.3 Regulatory information

Introduction

This section lists the regulations and standards that apply to the ÄKTA pure instrument.

Manufacturing information

The table below summarizes the required manufacturing information.

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

In this section

Section	See page
1.3.1 EU Directives	9
1.3.2 Eurasian Customs Union	10
1.3.3 Regulations for USA and Canada	11
1.3.4 Other regulations and standards	12

1.3.1 EU Directives

Conformity with EU Directives

This product fulfills the European Directives listed below. See the EU Declaration of Conformity for the directives and regulations that apply for the CE marking.

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

Directive	Title
2006/42/EC	Machinery Directive (MD)
2014/30/EU	Electromagnetic Compatibility (EMC) Directive
2014/35/EU	Low Voltage Directive (LVD)
2011/65/EU	Restriction of Hazardous Substances (RoHS) Directive
2014/53/EU	Radio Equipment Directive (RED)

CE marking

CE

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

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

1.3.2 Eurasian Customs Union

Introduction

This section contains additional regulatory information to comply with the Eurasian Customs Union technical regulations.

Manufacturer and importer information

The table below summarizes the manufacturer and importer information required by the Eurasian Customs Union.

Requirement	Information
Name and address of manufacturer	See *Manufacturing information*
Telephone number of manufacturer	Telephone: + 46 771 400 600
Importer and/or company for obtaining information about importer	GE Healthcare LLC GE Healthcare Life Sciences Presnenskaya nab., 10C, 12th floor RU-123 317 Moscow, Russian Federation Telephone 1: + 7 495 411 9714 Fax nr: + 7 495 739 6932 Email: LSrus@ge.com

1.3.3 Regulations for USA and Canada

NRTL certification

This symbol indicates that ÄKTA pure 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.

This product Conforms to UL 61010-1, and is Certified to CAN/CSA-C22.2 No. 61010-1.

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.

CAN ICES/NMB compliance

This product complies with the Canadian standard ICES-001/NMB-001 concerning electromagnetic compatibility.

1.3.4 Other regulations and standards

Introduction

This section describes the standards that apply to the ÄKTA pure system.

Environmental conformity

This product conforms to the following environmental requirements.

Standards, machinery and electrical equipment

Standard requirements fulfilled by this product are summarized in the table below.

Standard	Description
EN ISO 12100	Safety of machinery. General principles for design. Risk assessment and risk reduction.
EN 61010-1, IEC 61010-1, UL 61010-1, CAN/CSA-C22.2 No. 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.
EN 61326-1	Electrical Equipment for Measurement, Control, and Laboratory Use-EMC requirements-Part 1: General requirements (Emission according to CISPR 11, Group 1, class A)
ICES-001/NMB-001	Industrial, Scientific and Medical (ISM) Radio Frequency Generators (Canada)
EN 300 330-2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Part 2: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive
EN 301 489-3	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz

NOTICE

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

1.4 Associated documentation

Introduction

This section describes the user documentation that is delivered with ÄKTA pure.

User documentation

The user documentation listed in the table below is available in printed or PDF format. The complete documentation is also available on the User Documentation CD.

Document	Main contents
ÄKTA pure Unpacking Instruction (29020657)	Instructions for unpacking the instrument, and how to lift the instrument onto a bench.
ÄKTA pure Operating Instructions (29022997)	Instructions needed to install, operate and maintain the system in a safe way.
ÄKTA pure User Manual (29119969)	Instructions for handling the system, including Fraction collectors. Descriptions of components. Information about how to run and maintain the system.
ÄKTA pure 25 Product Documentation (29020658) OR *ÄKTA pure 150 Product Documentation* (29050426) [1]	System specification and declaration of material conformity.

1 The instrument is delivered with the relevant document.

UNICORN user documentation

The user documentation listed in the following table is available from the ***Help*** menu in UNICORN or from the ***UNICORN Online Help and Documentation*** software accessed by pressing the **F1** key in any UNICORN module.

Documentation	Main contents
UNICORN Help	Descriptions of UNICORN dialog boxes (available from the ***Help*** menu).

Documentation	Main contents
Getting started with Evaluation ***Note:*** *Available in UNICORN 7.0 and later.*	• Video clips showing common workflows in the Evaluation module. • Overview of features of the Evaluation module.
UNICORN Method Manual[1]	• Overview and detailed descriptions of the method creation features in UNICORN. • Workflow descriptions for common operations.
Administration and Technical Manual[1]	• Overview and detailed description of network set-up and complete software installation. • Administration of UNICORN and the UNICORN database.
UNICORN Evaluation Manual[1]	• Overview and detailed descriptions of the Evaluation Classic module in UNICORN. • Description of the evaluation algorithms used in UNICORN.
UNICORN System Control Manual[1]	• Overview and detailed description of the system control features in UNICORN. • Includes general operation, system settings and instructions on how to perform a run.

1 Current UNICORN version is added to the title of the manual.

Data files, application notes and user documentation on the web

To order or download data files, application notes or user documentation, see the instruction below.

Step	Action
1	Go to www.gelifesciences.com/pure.
2	Click ***Product support***.
3	Click ***Related Documents***.
4	Select to download the chosen literature.

Additional literature

For practical tips on chromatography, refer to *ÄKTA Laboratory-scale: Chromatography Systems Instrument Management Handbook* (product code 29010831).

2 Safety instructions

About this chapter

This chapter describes safety precautions, labels and symbols that are attached to the equipment. In addition, the chapter describes emergency and recovery procedures, and provides recycling information.

In this chapter

This chapter contains the following sections:

Section	See page
2.1 Safety precautions	18
2.2 Labels	28
2.3 Emergency procedures	31
2.4 Recycling information	35
2.5 Declaration of Hazardous Substances (DoHS)	36

2.1 Safety precautions

Introduction

ÄKTA pure is powered by mains voltage and handles materials that may be hazardous. Before installing, operating or maintaining the system, you must be aware of the hazards described in this manual.

Follow the instructions provided to avoid personal injuries or damage to the product, or to other personnel and equipment in the area.

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

- General precautions
- Personal protection
- Flammable liquids and explosive environment
- Installing and moving the system
- System operation
- Maintenance

General precautions

WARNING

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

WARNING

Only properly trained personnel may operate and maintain the product.

WARNING

Before connecting a column, read the instructions for use of the column. To avoid exposing the column to excessive pressure, make sure that the pressure limit is set to the specified maximum pressure for the column.

WARNING

Do not use any accessories not supplied or recommended by GE.

WARNING

Do not use ÄKTA pure if it is not working properly, or if it has suffered any damage, for example:

- damage to the power cord or its plug
- damage caused by dropping the equipment
- damage caused by splashing liquid onto it

NOTICE

Avoid condensation. If ÄKTA pure is kept in a cold room, cold cabinet or similar, keep it switched on in order to avoid condensation.

Personal protection

WARNING

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

WARNING

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

WARNING

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

WARNING

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

WARNING

High pressure. The product operates under high pressure. Wear protective glasses and other required Personal Protective Equipment (PPE) at all times.

Flammable liquids and explosive environment

WARNING

Fire Hazard. Before starting the system, make sure that there is no leakage.

WARNING

Explosion hazard. To avoid building up an explosive atmosphere when using flammable liquids, make sure that the room ventilation meets the local requirements.

WARNING

Take extra care when moving tubing or bottles with flammable liquids to avoid spillage.

CAUTION

Reversed Phase Chromatography (RPC) runs with 100% acetonitrile in ÄKTA pure. Always replace the PEEK tubing between the used system pump and the pump pressure monitor with orange PEEK tubing, i.d. 0.5 mm, before running RPC with 100% acetonitrile. The tubing to be replaced is green for 25 ml/min systems and beige for 150 ml/min systems. Set the System pressure alarm to 10 MPa for 25 ml/min systems.

Installing and moving the instrument

WARNING

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

WARNING

Supply voltage. Before connecting the power cord, make sure that the supply voltage at the wall outlet corresponds to the marking on the instrument.

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.

WARNING

Heavy object. At least two people are required to lift the instrument. All lifting and moving must be performed in accordance with local regulations.

NOTICE

Vents on the ÄKTA pure instrument. To ensure adequate ventilation, keep papers and other objects away from the vents of the instrument.

NOTICE

Disconnect power. To prevent equipment damage, always disconnect the power from the product before an instrument module is removed or installed, or a cable is connected or disconnected.

NOTICE

Misuse of UniNet-9 connectors. The **UniNet-9** connectors at the rear panel should not be mistaken for Firewire connectors. Do not connect any external equipment to the **UniNet-9** connectors other than instrument modules designed for ÄKTA pure. See *ÄKTA pure User Manual*. Do not disconnect or move the **UniNet-9** bus cable.

NOTICE

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

System operation

WARNING

Electrical shock hazard after spillage. If there is a risk that large volumes of spilled liquid may penetrate the casing of the instrument, immediately switch off the instrument, disconnect the power cord, and contact an authorized service engineer.

CAUTION

Fasten bottles and cassettes. Always fasten bottles and cassettes to the rails at the front and side panel. Use appropriate holders for bottles. Shattered glass from falling bottles may cause injury. Spilled liquid may cause fire hazard and personal injury.

CAUTION

Hazardous chemicals during run. When using hazardous chemicals, run ***System CIP*** and ***Column CIP*** to flush the entire system tubing with distilled water, before service and maintenance.

CAUTION

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

CAUTION

Max. weight on Buffer tray. Do not place containers with a volume of more than 5 liters each on the Buffer tray. The total allowed weight on the Buffer tray is 20 kg.

CAUTION

Disconnect power. Always switch off power to ÄKTA pure before cleaning any of its components, unless stated otherwise in the user documentation.

CAUTION

Avoid spillage and overflow. Make sure that the system is prepared according to the settings in the method to be run. For example make sure that the waste tubing is inserted in an appropriate waste container and secured in place.

CAUTION

Avoid spillage and overflow. Make sure that the waste tubing is inserted in an appropriate waste container and secured in place.

CAUTION

Risk of explosion. Do not use Mixer chamber 15 ml in the low flow system. The maximum pressure for Mixer chamber 15 ml is 5 MPa.

CAUTION

Fasten the waste tubing. During operation at high pressure the ÄKTA pure instrument may release bursts of liquid in the waste tubing. Securely fasten all waste tubing to the ÄKTA pure instrument and to the waste vessel.

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.

NOTICE

Avoid condensation. If ÄKTA pure is kept in a cold room, cold cabinet or similar, keep it switched on in order to avoid condensation.

NOTICE

Avoid overheating. If ÄKTA pure is kept in a cold cabinet and the cold cabinet is switched off, make sure to switch off ÄKTA pure and keep the cold cabinet open to avoid overheating.

NOTICE

Place the computer in room temperature. If the ÄKTA pure instrument is placed in a cold room, use a cold room compatible computer or place the computer outside the cold room and use the Ethernet cable delivered with the instrument to connect to the computer.

NOTICE

UV and conductivity flow cells on the high pressure side. When placing UV and/or conductivity flow cells on the high pressure side of the column, the UV flow cell has a maximum pressure limit of 2 MPa (20 bar) and the conductivity flow cell has a maximum pressure limit of 5 MPa (50 bar).

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 replacing any component on the instrument, unless stated otherwise in the user documentation.

CAUTION

Hazardous chemicals and biological agents. Before maintenance, service and decommissioning, wash the ÄKTA pure instrument with a neutral solution to make sure that any hazardous solvents and biological agents have been flushed out from the system.

CAUTION

The system uses high intensity ultra-violet light that is harmful to the eyes. Before changing or cleaning the UV cell optical fiber, make sure that the UV lamp is disconnected or that the power is disconnected.

CAUTION

Always use appropriate personal protective equipment when decommissioning the equipment.

WARNING

Corrosive chemicals during maintenance. If the system or column is cleaned with a strong base or acid, flush with water afterwards and wash with a weak neutral buffer solution in the last step or phase.

CAUTION

Cleaning the ÄKTA pure instrument before decommissioning.

- Wipe the ÄKTA pure instrument and any modules with a damp tissue using a cleaning agent so that no hazardous solvents or biological agents remain on the surface.
- Perform a system CIP using a neutral solution. Make sure that any hazardous solvents or biological agents are flushed out from the system.

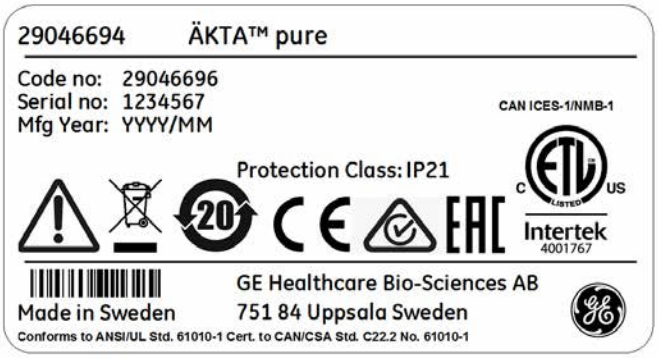
2.2 Labels

Introduction

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

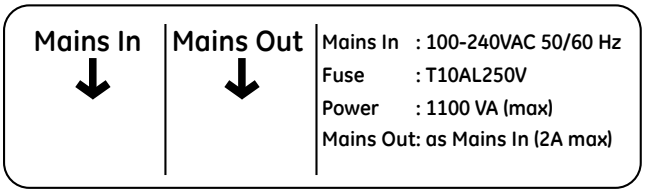
ÄKTA pure instrument label

The serial number of the ÄKTA pure instrument is printed on the instrument labels, located on the back of the instrument and below the pump tray on the front of the instrument.



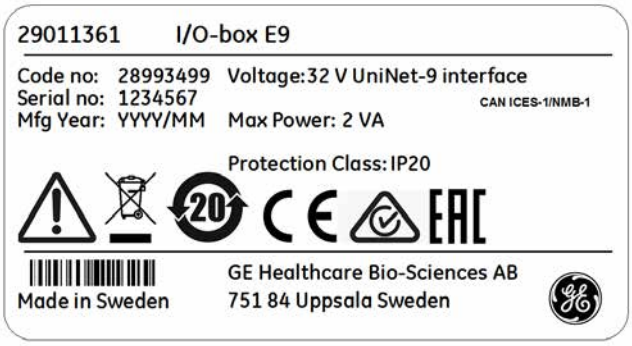
Rating label

The rating label is located on the back of the instrument.



I/O box E9 instrument label

The I/O-box serial number is printed on the I/O-box instrument label, located on the back of the I/O-box.



Description of symbols on the labels

Label	Meaning
	Warning! Read the Operating Instruction before using the system. **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. **Supply voltage.** Before connecting the power cord, make sure that the supply voltage at the wall outlet corresponds to the marking on the instrument.
	This symbol indicates that electrical and electronic equipment must not be disposed of 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 *GB/T 26572 Requirements of concentration limits for certain hazardous substances in electrical and electronic products.*

Label	Meaning
	The system complies with applicable European directives.
	The system complies with applicable requirements for Australia and New Zealand.
	This symbol indicates that ÄKTA pure has been certified by a Nationally Recognized Testing Laboratory (NRTL). This product Conforms to UL 61010-1, and is Certified to CAN/CSA-C22.2 No. 61010-1.
	Eurasian Conformity mark: the single conformity mark indicates that the product is approved for circulation on the markets of the member states of the Eurasian Customs Union.
CAN ICES-1/NMB-1	CAN ICES-1/NMB-1 indicates that this product complies with the Canadian standard ICES-001 concerning technical requirements relative to radiated noise emissions from Industrial, Scientific and Medical radio frequency generators.
Voltage **Frequency** **Max. Power**	Electrical requirements: • Mains voltage (VAC) or other input voltage (AC or DC) • Frequency (Hz) • Max. power (VA)
Mains In **Fuse** **Power** **Mains Out**	Electrical requirements: • Mains input voltage (VAC) and frequency (Hz) • Fuse rating • Max. power (VA) • Mains output voltage to other equipment: same as Mains input voltage (2 A max.)
Protection Class	Degree of protection provided by the enclosure.
Mfg. Year	Year (YYYY) and month (MM) of manufacture

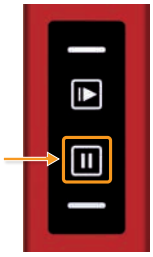
2.3 Emergency procedures

Introduction

This section describes how to perform an emergency shutdown of the ÄKTA pure instrument, including connected equipment. This section also describes the results in the event of power failure or network interruption.

Emergency shutdown

In an emergency situation, stop the run by either pausing the run or switching off the instrument as described below:

If you want to...	then...
pause the run	• press the **Pause** button on the Instrument control panel:  ***Note:*** *The buttons on the Instrument control panel may be locked. This is an option available in the **System settings**.* or • click the ***Pause*** icon in UNICORN™: *Result:* All pumps in the instrument are stopped.

If you want to...	then...
switch off the instrument	• press the **Power** switch to the **0** position, or • disconnect the power cord from the wall socket. *Result:* The run is interrupted immediately. ***Note:*** *The sample and data may be lost as a result of switching off the power.*

Power failure

The result of a power failure depends on which unit is affected.

Power failure to...	will result in...
ÄKTA pure instrument 	• The run is interrupted immediately • The data collected up to approx. 5 seconds before the power failure is available in UNICORN.

Power failure to...	will result in...
Computer 	• The UNICORN computer shuts down • The **Power/Communication** indicator (white) on the Instrument control panel displays a slowly flashing light. • The run is interrupted immediately • Data generated up to 10 seconds before the power failure can be recovered ***Note:*** *The UNICORN client may lose connection to the instrument during a temporary overload of the processor and display an error message. This may appear as a computer failure. The run continues and you can restart the UNICORN client to regain control. No data will be lost.*

Restart after emergency shutdown or power failure

Follow the instructions to restart the system after an emergency shutdown or power failure.

Step	Action
1	Make sure that the condition that caused the emergency shutdown or power failure is corrected.

Step	Action
2	If the instrument was switched off, press the **Power** switch on the instrument.

Result: The instrument should start and the Instrument control panel should display a white, slowly flashing light.

3	Turn on the computer and monitor.
4	Start UNICORN and connect to the system. See instructions in *Section 4.4 Start UNICORN and connect to system, on page 88*.

Uninterruptible power supply (UPS)

A UPS can prevent data loss during a power failure, and allow time for a controlled shut-down of ÄKTA pure.

For UPS power requirements, see the system specifications in this manual. Remember to also take into account the specifications for the computer and monitor. Refer to the manufacturers' documentation.

Note: *If using a UPS, the ÄKTA pure instrument, the computer and the monitor must be connected to the UPS.*

2.4 Recycling information

Introduction

This section contains information about the decommisioning of ÄKTA pure.

Decontamination

The product must be decontaminated before decommissioning. All local regulations must be followed with regard to scrapping of the equipment.

Disposal of the product

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

CAUTION

Always use appropriate personal protective equipment when decommissioning the equipment.

Disposal of electrical components

Waste comprising electrical and electronic equipment must not be disposed of 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/T11364-2014《电子电气产品有害物质限制使用标识要求》特提供如下有关污染控制方面的信息。

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

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

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

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

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

本产品在使用寿命结束时不可作为普通生活垃圾处理，应被单独收集妥善处理。

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

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

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

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

有害物质的名称及含量
Name and Concentration of Hazardous Substances

产品中有害物质的名称及含量
Table of Hazardous Substances' Name and Concentration

部件名称 Component name	有害物质 Hazardous substance					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
29018224	X	O	O	O	O	O
29018225	X	O	O	O	O	O
29018226	X	O	O	O	O	O
29018227	X	O	O	O	O	O
29018228	X	O	O	O	O	O
29011361	X	O	O	O	O	O
29046665	X	O	O	O	O	O
29046694	X	O	O	O	O	O
29046697	X	O	O	O	O	O

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

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

- 此表所列数据为发布时所能获得的最佳信息.

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

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

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

3 System description

About this chapter

This chapter gives an overview of the ÄKTA pure system: instrument, software and accessories.

In this chapter

This chapter contains the following sections:

Section	See page
3.1 ÄKTA pure instrument overview	39
3.2 UNICORN software	50

Illustration of the system

The illustration below shows the ÄKTA pure instrument with UNICORN software installed on a computer.

3.1 ÄKTA pure instrument overview

Introduction

This section gives an overview of the ÄKTA pure instrument. Technical details about the instrument and the individual modules are found in ÄKTA pure User Manual.

Exterior design

ÄKTA pure has a modular design, with all liquid handling modules placed on the exterior of the instrument. Buffer vessels are placed on the Buffer tray on top of the instrument. The liquid handling modules and the instrument control panel are located on the front of the instrument.

It is recommended that the fraction collectors, the sample pump, and the I/O-box are placed on the left side of the instrument and the computer on the right side of the instrument.

Core module configurations

ÄKTA pure is available with two core module configurations, one for flow rates up to 25 ml/min and one for flow rates up to 150 ml/min. In this manual they are referred to as ÄKTA pure 25 (25 ml/min) and ÄKTA pure 150 (150 ml/min).

The table below shows some of the operational limits for ÄKTA pure 25 and ÄKTA pure 150.

Parameter	Limits	
	ÄKTA pure 25	ÄKTA pure 150
Flow rate	0.001 – 25 ml/min ***Note:*** *When running the **Column packing flow** instruction, the maximum flow rate is 50 ml/min.*	0.01 – 150 ml/min ***Note:*** *When running the **Column packing flow** instruction, the maximum flow rate is 300 ml/min.*
Max. operating pressure	20 MPa	5 MPa

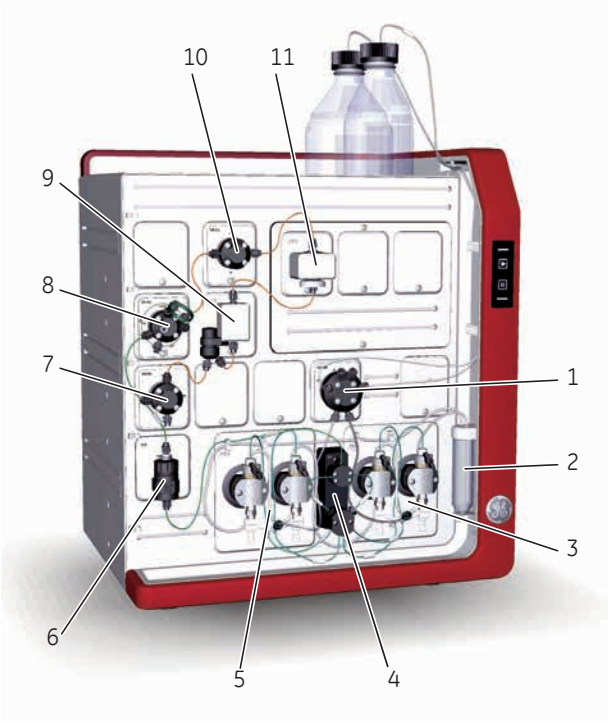
Illustrations of the main parts of the instrument

The illustrations below show the location of the main parts of the instrument.

Part	Function
1	Wet sides
2	Buffer tray
3	Holder rails
4	Instrument control panel
5	Power switch
6	Ventilation panel

Example of a typical configuration of the wet side

The descriptions of ÄKTA pure and the work flow in this manual are based on an instrument that consists of the modules and parts shown in the illustration below.



Part	Function
1	Inlet valve
2	Pump rinsing liquid tube
3	System pump B
4	Pressure monitor
5	System pump A
6	Mixer
7	Outlet valve
8	Injection valve
9	Conductivity monitor

Part	Function
10	Column valve
11	UV monitor

Available modules

The modular design allows the user to customize ÄKTA pure in multiple ways. The system is always delivered with the core modules of the selected configuration, but optional modules may be added to the flow path.

The table below lists the available modules forÄKTA pure 25 and ÄKTA pure 150. Core modules are indicated with an asterisk (*).

Note: *The valves for ÄKTA pure 25 and ÄKTA pure 150 are compatible with both systems but for the best performance the specific valve type should be used. The narrow channels in the valves for ÄKTA pure 25 will give too high back pressure if used above 50 ml/min. The larger volumes in the "H" valves for ÄKTA pure 150 may decrease resolution and increase peak broadening if used in ÄKTA pure 25.*

Module	Label in	
	ÄKTA pure 25	ÄKTA pure 150
System pump A*	**P9 A**	**P9H A**
System pump B*	**P9 B**	**P9H B**
Pressure monitor*	**R9**	**R9**
Mixer*	**M9**	**M9**
Injection valve*	**V9-Inj**	**V9H-Inj**
Inlet valve A	**V9-IA**	**V9H-IA**
Inlet valve B	**V9-IB**	**V9H-IB**
Inlet valve AB	**V9-IAB**	**V9H-IAB**
Inlet valve IX	**V9-IX**	**V9H-IX**
Sample inlet valve	**V9-IS**	**V9H-IS**
Mixer valve	**V9-M**	**V9H-M**
Loop valve	**V9-L**	**V9H-L**

Module	Label in	
	ÄKTA pure 25	ÄKTA pure 150
Column valves	**V9-C**	**V9H-C**
	V9-Cs	**V9H-Cs**
pH valve	**V9-pH**	**V9H-pH**
Outlet valves	**V9-O**	**V9H-O**
	V9-Os	**V9H-Os**
Versatile valve	**V9-V**	**V9H-V**
UV monitors	**U9-L**	**U9-L**
	U9-M	**U9-M**
Conductivity monitor	**C9**	**C9**
External air sensor	**L9-1.5**	**L9-1.5**
	L9-1.2	**L9-1.2**
Fraction collectors	**F9-C**	**F9-C**
	F9-R	**F9-R**
I/O-box	**E9**	**E9**
Sample pump	**S9**	**S9H**

Core modules

Core modules need to be installed for the system to run.

Core module	Description
System pump **P9 A** or **P9H A**	A high precision pump, which delivers buffer or sample in purification runs.
System pump **P9 B** or **P9H B**	A high precision pump, which delivers buffer in purification runs.
Pressure monitor **R9**	Reads the system pressure after System pump A and System pump B.

Core module	Description
Mixer **M9**	Mixes the buffers delivered from the system pumps to a homogeneous buffer composition. Three Mixer chambers are available for ÄKTA pure 25, their volumes are: 0.6 ml, 1.4 ml (mounted at delivery) and 5 ml. Three Mixer chambers are available for ÄKTA pure 150. Their volumes are: 1.4 ml (mounted at delivery), 5 ml (included in delivery), and 15 ml. **CAUTION** **Risk of explosion.** Do not use Mixer chamber 15 ml with an ÄKTA pure 25 system configuration. The maximum pressure for Mixer chamber 15 ml is 5 MPa.
Injection valve **V9-Inj** or **V9H-Inj**	Directs sample onto the column.

Optional modules

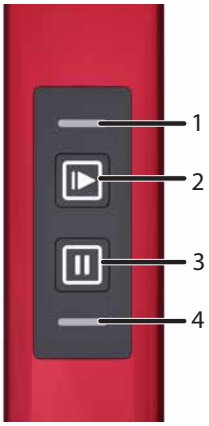
The following modules may be added to the flow path.

Option	Module	Description
Inlet valve	Inlet valve **V9-IA** or **V9H-IA**	Inlet valve with seven inlets.
	Inlet valve **V9-IB** or **V9H-IB**	Inlet valve with seven inlets.
	Inlet valve **V9-IAB** or **V9H-IAB**	Inlet valve with two A inlets and two B inlets.
	Inlet valve **V9-IX** or **V9H-IX**	Inlet valve with eight inlets.
	Sample inlet valve **V9-IS** or **V9H-IS**	Inlet valve with seven inlets. These valves require the external module Sample pump S9 or S9H.
Mixer valve	Mixer valve **V9-M** or **V9H-M**	Directs the flow to the Injection valve via the mixer or by bypassing the mixer.
Loop valve	Loop valve **V9-L** or **V9H-L**	Enables the use of up to five loops connected to the instrument.

Option	Module	Description
Column valve	Column valve **V9-C** or **V9H-C**	Connects up to five columns to the instrument, and directs the flow onto one column at a time.
	Column valve **V9-Cs** or **V9H-Cs**	Connects one column to the instrument.
pH valve	pH valve **V9-pH** or **V9H-pH**	Enables in-line monitoring of pH during the run.
Outlet valve	Outlet valve **V9-O** or **V9H-O**	Directs the flow to the fraction collector, to any of the ten outlet ports, or to waste.
	Outlet valve **V9-Os** or **V9H-Os**	Directs the flow to the fraction collector, to the outlet port, or to waste.
Versatile valve	Versatile valve **V9-V** or **V9H-V**	A 4-port, 4-position valve, which can be used to customize the flow path.
UV monitor	UV monitor **U9-L**	Measures the UV absorbance at the fixed wavelength 280 nm.
	UV monitor **U9-M**	Measures the UV/Vis absorbance at three wavelengths in the range of 190-700 nm.
Conductivity monitor	Conductivity monitor **C9**	Measures the conductivity of buffers and eluted proteins.
Air sensor	External air sensor **L9**	Prevents air from being introduced into the flow path.
Fraction collector	Fraction collector **F9-C**	Flexible fraction collector with up to 576 fractions.
	Fraction collector **F9-R**	Round fraction collector with up to 350 fractions.
I/O-box	I/O-box **E9**	Receives analog or digital signals from, or transfers analog or digital signals to, external equipment, which has been incorporated in the system.
Sample pump	Sample pump **S9** or **S9H**	A high precision pump, which delivers buffer or sample in purification runs.

Illustration of the Instrument control panel

The Instrument control panel is located to the right on the front of the instrument. It shows the current status of the system using four LED lights. The **Pause** and **Continue** buttons can be used to control an ongoing method run.

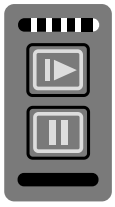


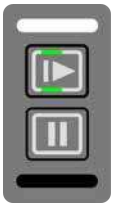
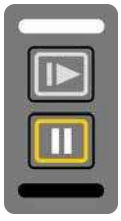
Part	Function
1	**Power/Communication** indicator (white)
2	**Continue** button with a green light indicator
3	**Pause** button with an orange light indicator
4	**Alarm and error** indicator (red)

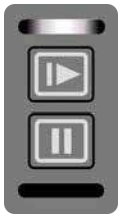
Status indications

The light indicators on the Instrument control panel indicate the current status of ÄKTA pure.

The table below describes the different states that can be displayed.

Display	State	Description
All light indicators are off.	***Off***	The instrument is turned off.
The **Power/Communication** indicator flashes slowly.	***Power-on***	The instrument has no communication with the Instrument server.
The **Power/Communication** indicator flashes quickly. 	***Connecting***	The system is starting up.
The **Power/Communication** indicator displays a constant light.	***Ready***	The instrument is ready to use.

Display	State	Description
Both the **Power/Communication** indicator and **Continue** button display a constant light.	***Run***	A run is ongoing.
The **Power/Communication** indicator displays a constant light and the **Continue** button flashes slowly. 	***Wash***	A wash instruction or a pump synchronization is ongoing.
	Hold	A run has been put on hold.
Both the **Power/Communication** indicator and **Pause** button display a constant light. 	***Pause***	A run has been paused.

Display	State	Description
The **Power/Communication** indicator displays a constant light. and the **Alarm and error** indicator flashes.	***Alarms and errors***	The system has been paused due to an alarm. To resume the run, acknowledge the alarm and continue the run in UNICORN.
The **Power/Communication** indicator displays a pulsating light. 	***Power-save***	The system is in power-saving mode.
All indicators are lit in a wave pattern.	***Re-programming***	A module is being re-programmed to be compatible with the current instrument configuration.

3.2 UNICORN software

Introduction

This section gives an overview of the UNICORN software. It also describes the ***System Control*** module.

To learn more about ***System Control*** and the other three modules ***Administration***, ***Method Editor*** and ***Evaluation***, see the UNICORN documentation package.

In this section

Section	See page
3.2.1 UNICORN software overview	51
3.2.2 The System Control module	53

3.2.1 UNICORN software overview

Introduction

This section gives a brief overview of the UNICORN software: a complete package for control, supervision and evaluation of chromatography instruments and purification runs.

From hereon, UNICORN refers to compatible versions of the software. The examples given in this manual are from UNICORN 6.4.

UNICORN modules overview

UNICORN consists of four modules: ***Administration***, ***Method Editor***, ***System Control*** and ***Evaluation***. The main functions of each module are described in the following table.

Module	Main functions
Administration	Perform user and system setup, system log and database administration.
Method Editor	Create and edit methods using one or a combination of: • Predefined methods with built-in application support • Drag-and-drop function to build methods with relevant steps • Line-by-line text editing The interface provides easy viewing and editing of run properties.
System Control	Start, monitor and control runs. The current flow path is illustrated in the ***Process Picture***, which allows manual interactions with the system and provides feedback on run parameters.
Evaluation	Open results, evaluate runs and create reports. • The default ***Evaluation*** module includes a user interface optimized for workflows like quick evaluation, compare results and work with peaks and fractions. • To perform operations like Design of Experiments, users can easily switch to ***Evaluation Classic***.

When working with the modules ***Administration***, ***Method Editor***, ***System Control*** and ***Evaluation Classic*** it is possible to access descriptions of the active window by pressing the **F1** key. This can be especially helpful when editing methods

3.2.2 The System Control module

Introduction

The ***System Control*** module is used to start, view, and control a manual or method run.

System Control panes

As seen in the following illustration, three panes are shown in the ***System Control*** module by default.

The ***Run Data*** pane (1) presents current data in numerical values.

The ***Chromatogram*** pane (2) illustrates data as curves during the entire run.

The current flow path is illustrated in the ***Process Picture*** (3), which allows manual interactions with the system and provides feedback on run parameters.

Note: *On the **View** menu, click **Run Log** to open the **Run Log** pane which presents all registered actions.*

System Control toolbar buttons

The following table shows the System Control toolbar buttons that are referred to in this manual.

Button	Function	Button	Function
	Open Method Navigator. Opens the ***Method Navigator*** where available methods are listed.		***Run***. Starts a method run.
	Hold. Suspends the method run, while current flow rate and valve positions are sustained.		***Pause***. Suspends the method run and stops all pumps.
	Continue. Resumes for example a held or paused method run.		***End***. Permanently ends the method run.
	Customize. Opens the ***Customize*** dialog box where curve settings, run data groups and run log contents can be set.		***Connect to Systems***. Opens the ***Connect to Systems*** dialog box where systems can be connected, and currently connected users are displayed.

4 Installation

About this chapter

This chapter provides the necessary instructions to enable users and service personnel to:

- unpack ÄKTA pure when delivered from the factory
- install the instrument
- install the computer
- install the software

Read the entire Installation chapter before starting to install ÄKTA pure.

In this chapter

This chapter contains the following sections:

Section	See page
4.1 Site preparation	56
4.2 Hardware installation	68
4.3 Software installation	87
4.4 Start UNICORN and connect to system	88
4.5 Prime inlets and purge pump heads	91
4.6 Performance test	99
4.7 Activate Power-save	100

4.1 Site preparation

Introduction

This section describes the site planning and the preparations necessary for the installation of ÄKTA pure. The purpose is to provide planners and technical staff with the data needed to prepare the laboratory for the installation.

The performance specifications of the system can be met only if the laboratory environment fulfills the requirements stated in this chapter.

In this section

Section	See page
4.1.1 Delivery and storage	57
4.1.2 Room requirements	59
4.1.3 Site environment	62
4.1.4 Power requirements	64
4.1.5 Computer requirements	65
4.1.6 Required materials	67

4.1.1 Delivery and storage

Introduction

This section describes the requirements for receiving the delivery box and storing the instrument before installation.

CAUTION

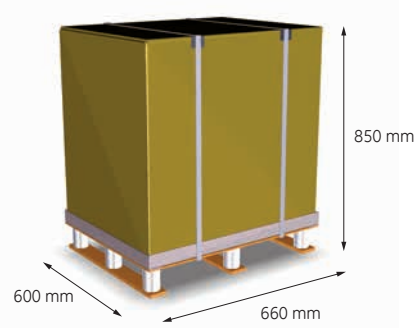
Heavy object. Use proper lifting equipment, or use two or more persons when moving the instrument. All lifting and moving must be performed in accordance with local regulations.

When you receive the delivery

- Record on the receiving documents if there is any apparent damage on the delivery box. Inform your GE representative of such damage.
- Move the delivery box to a protected location indoors.

ÄKTA pure delivery box

The ÄKTA pure instrument is shipped in a delivery box with the following dimensions and weight:

Contents	Dimensions (mm)	Weight
ÄKTA pure instrument with accessories	w660 × h850 × d600 	up to 64 kg

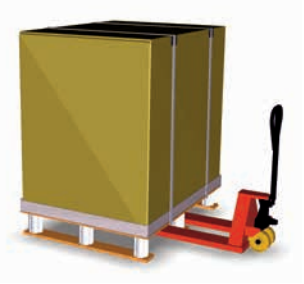
Storage requirements

The delivery box should be stored in a protected place indoors. The following storage requirements must be fulfilled for the unopened box:

Parameter	Allowed range
Ambient temperature, storage	-25°C to 60°C
Relative humidity	up to 90% atmospheric humidity at 40°C for 48 hrs

Equipment for transportation

The following equipment is recommended for handling the delivery boxes:

Equipment	Specifications
Pallet mover	Suitable for a lightweight pallet 80 × 100 cm 
Cart for transporting the instrument to the lab	Dimensioned to accommodate the size and weight of the instrument

4.1.2 Room requirements

Introduction

This section describes the requirements for the transportation route and the room where the ÄKTA pure instrument is placed.

WARNING

Protective ground. The ÄKTA pure instrument must always be connected to a grounded power outlet.

WARNING

Only use grounded power cords delivered or approved by GE.

WARNING

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

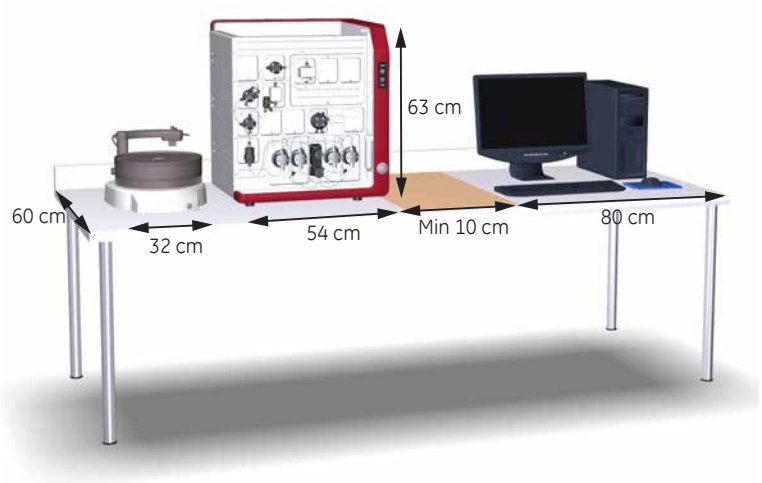
Explosion hazard. To avoid building up an explosive atmosphere when using flammable liquids, make sure that the room ventilation meets the local requirements.

Transportation route

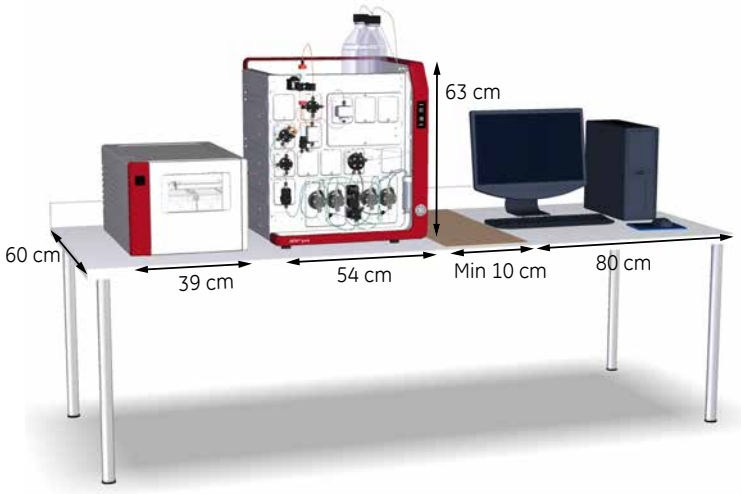
Doors, corridors and elevators must have a minimum width of 65 cm to allow for transporting the instrument. Allow additional space for moving around corners.

Space requirements

The illustration below shows the space recommended for ÄKTA pure with Fraction collector F9-R.



The illustration below shows the space recommended for ÄKTA pure with Fraction collector F9-C.



Note: *There must be at least 10 cm free space on all sides of the ÄKTA pure instrument.*

Laboratory bench

The bench must be clean, flat and stable and able to support the weight of ÄKTA pure, see table below.

Equipment dimensions

Equipment weight

Item	Weight
ÄKTA pure instrument	up to 53 kg
Computer	approximately 9 kg
Monitor	approximately 3 kg

4.1.3 Site environment

Introduction

This section describes the environmental requirements for installation of ÄKTA pure.

Environmental conditions

The following general requirements must be fulfilled:

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

The installation site must comply with the following specifications.

Environmental requirements

Parameter	Requirement
Allowed location	Indoor use only
Ambient temperature, operation	4°C to 35°C
Ambient temperature, storage	-25°C to 60°C
Relative humidity, operating	20% to 95%, noncondensing
Relative humidity, non-operating	20% to 95%, noncondensing
Altitude, operation	Up to 2000 m
Pollution degree of the intended environment	Pollution degree 2

Heat output

The heat output data is listed in the table below.

Component	Heat output
ÄKTA pure instrument	Typically 300 W Maximum 600 W

Component	Heat output
Computer, incl. monitor and printer	Typically 300 W Refer to manufacturer's instructions for more information.
Total	*Typically 600 W* *Maximum 900 W*

4.1.4 Power requirements

Introduction

This section describes the power supply requirements for ÄKTA pure.

Electrical power requirements

The table below specifies the electrical power requirements.

Parameter	Requirement
Supply voltage	100 to 240 V AC ±10%
Frequency	50/60 Hz
Transient overvoltages	Overvoltage category II
Typical power consumption	300 VA in state ***Run*** 165 VA in state ***Ready*** 25 VA in state ***Power-save***
Max power consumption	1100 VA
Number of sockets	1 socket per instrument, up to 3 sockets for computer equipment
Type of sockets	EU or US plugs. Grounded mains sockets, fused or protected by equivalent circuit breaker.
Location of sockets	Maximum 2 m from the instrument (due to length of mains cable). Extension cables can be used if required.

WARNING

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

4.1.5 Computer requirements

Introduction

ÄKTA pure systems are controlled by UNICORN software running on a PC. The PC can be part of the delivery or be supplied locally.

The PC used must fulfill the recommendations stated in this section.

General computer specifications

For information about compatibility between UNICORN versions and the supported operating systems and database versions see the UNICORN compatibility matrix at http://www.gelifesciences.com/UNICORNcompatibility.

	UNICORN Client	Database Server	Workstation installation	E-License Server
Min. free disk space	6 GB	6 GB	12 GB	500 MB
Min. available RAM	3 GB	3 GB	3 GB	2 GB
Disc format	NTFS	NTFS	NTFS	NTFS
Architecture	Intel Dual Core (or faster)	Intel Dual Core (or faster)	Intel Dual Core (or faster)	Intel Dual Core (or faster)

Note:

- *UNICORN is tested using the English (U.S.) Code 1033 operating system language version. Using other language versions of the operating system may cause errors.*
- *A screen resolution of 1280x1024 or higher is recommended. Parts of the UNICORN user interface may not be displayed properly using a lower resolution.*
- *Changing the default font and changing the font size from 100% in Windows may cause problems in the UNICORN user interface.*
- *The Windows basic color scheme is recommended*[1]*.*
- *Using the Windows 7 Aero color scheme is not recommended.*
- *Windows power save features should be turned off to avoid conflicts with system operations.*

1 *UNICORN must be closed when the color scheme is changed.*

- *UNICORN is not compatible with the Windows 7 feature High DPI Awareness, which allows the graphic user interface to be scaled. The interface scale must remain at 100% to avoid issues with clipping and misaligning of parts of the UNICORN user interface. Normally, the scale is set at 100% by default.*

4.1.6 Required materials

Introduction

This section describes the accessories required for the installation and operation of the ÄKTA pure instrument.

Buffers and solutions

The buffers and solutions listed in the following table are required during the installation procedure and should be provided at the installation site.

Buffer/solution	Required volume	Scope of use
Distilled water	1 liter	Air sensor test, Fraction collector test, and system test
1% acetone and 1 M NaCl in distilled water	0.5 liter	System test
20% ethanol	200 ml	Priming of the pump piston rinsing system

Laboratory equipment

The equipment listed in the following table is required during the installation procedure and should be provided at the installation site.

Equipment	Specification
Flasks, liquid containers	For buffers and waste
Gloves	For protection
Protective glasses	For protection

4.2 Hardware installation

Introduction

This section describes the unpacking and installation procedures for ÄKTA pure.

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.

In this section

This section contains the following subsections:

Section	See page
4.2.1 Unpack the instrument	70
4.2.2 Install the computer equipment	76
4.2.3 Connect system units	77
4.2.4 Install waste tubing	80
4.2.5 Prepare the pump rinsing system	83

Section	See page
4.2.6 Start the instrument and the computer	86

4.2.1 Unpack the instrument

Introduction

This section describes how to unpack the ÄKTA pure instrument, and how to lift the instrument onto the bench.

CAUTION

Heavy object. Use proper lifting equipment, or use two or more persons when moving the instrument. All lifting and moving must be performed in accordance with local regulations.

Lift the instrument onto the bench by hand

Follow the instruction below to remove the transport fixations and lift the instrument onto the bench.

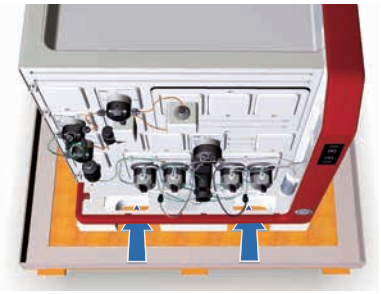
Step	Action
1	Cut and remove the plastic straps.

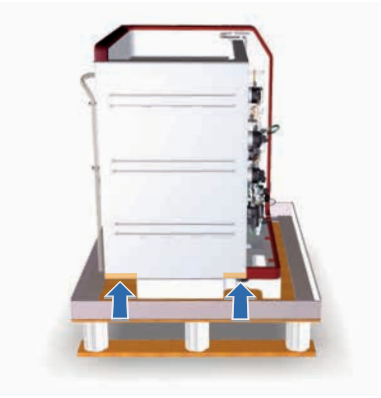
Step	Action
2	Lift off and remove the lid and protective foam.

3	Check the contents in the Buffer tray, and lift off the packages from the tray.
4	Lift off the cardboard hood and remove the protecting material from the instrument.

Step	Action
5	Lift off the tray on the wet side on the front of the instrument to access the instrument handles.

Step	Action
6	Prepare for lifting. Use two or more persons and grip the instrument from the front, from the back or from either side (only one side is shown below):





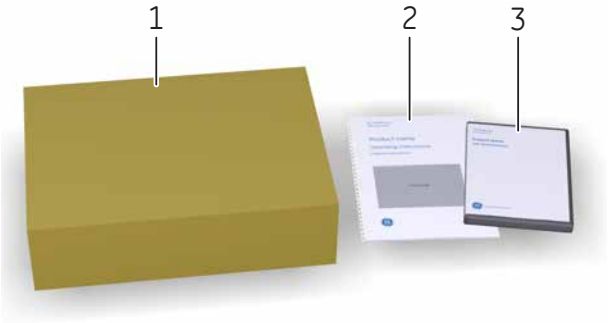
Step	Action
7	Lift the instrument over the foam attached to the plywood board, and pull away the board from under the instrument.

8	Dispose of the packaging material in accordance with local regulations.

Note: *The instrument flow path is filled with 50% ethanol at delivery.*

Accessories packages

The illustration below shows the accessories packages placed in the Buffer tray at delivery.



Part	Description
1	Accessories box

Part	Description
2	*ÄKTA pure Operating Instructions*
3	DVD packages with Instrument Configuration software and manuals

4.2.2 Install the computer equipment

Introduction

The computer is supplied as a part of the ÄKTA pure delivery, or supplied locally.

Unpacking and installing

Unpack and install the computer according to the manufacturer's instructions.

NOTICE

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

4.2.3 Connect system units

Introduction

The following interconnections must be made:

- Power supply to the ÄKTA pure instrument
- Power supply to the computer equipment
- Network connection between the computer and the ÄKTA pure instrument.

WARNING

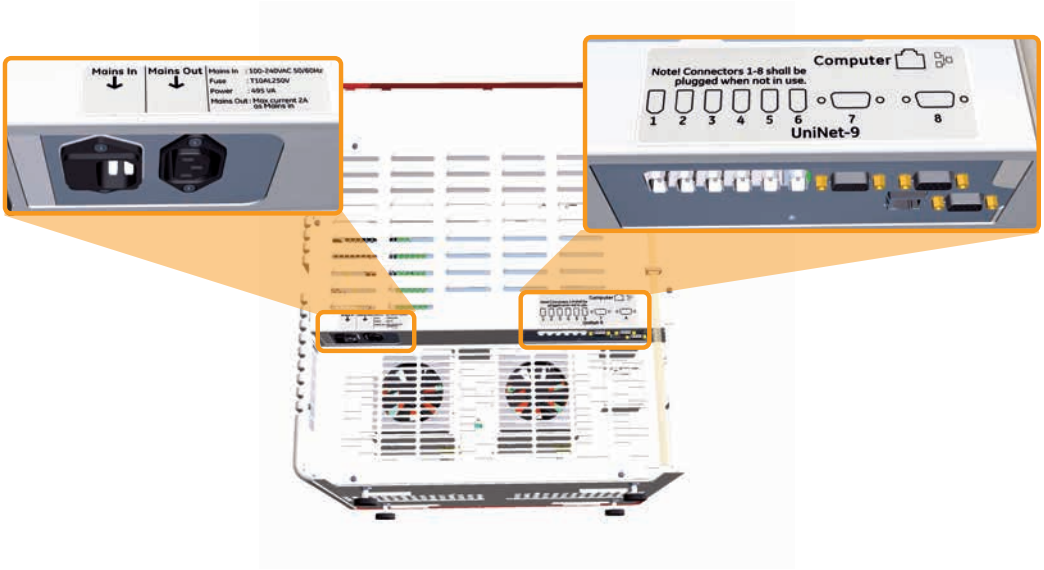
Power cord. Only use power cords with approved plugs delivered or approved by GE.

WARNING

Supply voltage. Before connecting the power cord, make sure that the supply voltage at the wall outlet corresponds to the marking on the instrument.

Connector illustration

The illustration below shows where the connectors are located on the ÄKTA pure instrument. For connectors on the computer equipment, refer to the manufacturer´s documentation.



Connect power to the ÄKTA pure instrument

Follow the instruction below to connect power to the ÄKTA pure instrument.

Step	Action
1	Select the correct power cord to be used. Each instrument is delivered with 2 alternative power cords: • Power cord with US-plug, 2 m • Power cord with EU-plug, 2 m Discard the power cord that is not to be used.
2	Connect the power cord to the **Mains IN** input connector on the back of the instrument and to a grounded wall outlet 100-240 V, ~ 50/60 Hz.

Connect power to computer equipment

Follow the manufacturer's instructions to connect power to the:

- computer
- monitor
- local printer, if used

Connect to network

Follow the instructions below to make network connections.

Step	Action
1	Connect a network cable between the **Computer** connector (network) on the back of the instrument and the computer network card. The illustration below shows the symbol of the network connector.
2	If the computer is to be connected to an external network, connect a network cable between the main network card of the computer and a network wall outlet. ***Note:*** *If the computer has not been supplied by GE and if network configuration is to be used, see Administration and Technical Manual for further information on network settings.*

4.2.4 Install waste tubing

Waste tubing overview

The table below lists the waste tubing of the instrument and where it is located. Make sure that the waste tubing is connected to the correct positions on the modules.

Module	Tubing connections	Location of tubing
Injection valve	Waste ports **W1** and **W2**	Front of the ÄKTA pure instrument.
pH valve (optional)	Waste port **W3**	Front of the ÄKTA pure instrument.
Outlet valve (optional)	Waste port **W**	Front of the ÄKTA pure instrument.
Buffer tray (Rescue drainage)	Drainage hole of the Buffer tray	Rear of the ÄKTA pure instrument.

Prepare waste tubing

Follow the instructions below to prepare the waste tubing.

CAUTION

Fasten the waste tubing. During operation at high pressure the ÄKTA pure instrument may release bursts of liquid in the waste tubing. Securely fasten all waste tubing to the ÄKTA pure instrument and to the waste vessel.

CAUTION

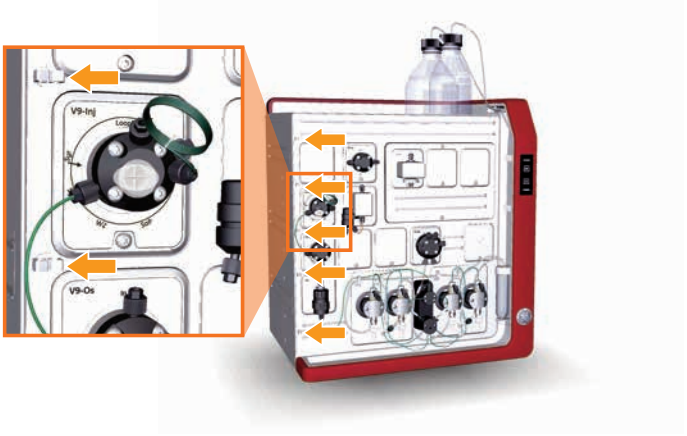
Make sure that the waste vessel will hold all the produced volume of the run. For ÄKTA pure, a suitable waste vessel should typically have a volume of 2 to 10 liters.

NOTICE

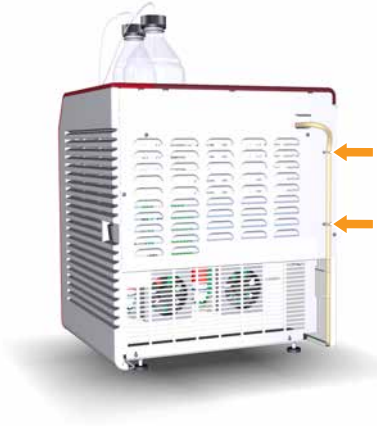
The maximum level of the waste vessel must be lower than the bottom of the ÄKTA pure instrument.

Step	Action
1	Insert the waste tubing from all installed modules in a vessel.
2	Make sure that the tubing is securely fastened to the ÄKTA pure instrument:

- Fasten waste tubing from the valves with the clips on the front of the system.



- Fasten waste tubing from the Buffer tray with the clips on the rear of the system.



Step	Action
3	Cut the waste tubing to appropriate length. It is important that the tubing is not bent and will not be submerged in liquid during the run.

Note:

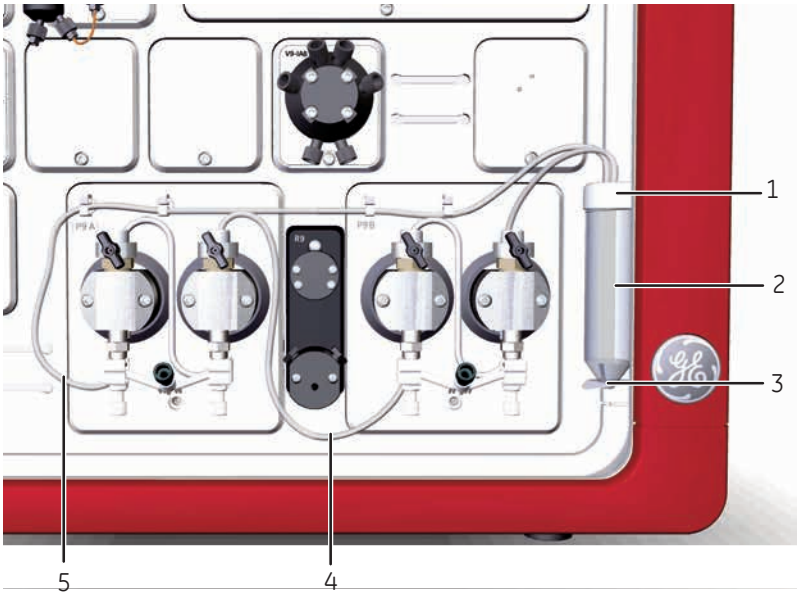
If the tubing is too short, replace it with new tubing. Do not lengthen the tubing as this might cause obstruction of the tubing.

4	Fasten all waste tubing securely to the waste vessel.

4.2.5 Prepare the pump rinsing system

Illustration of the pump piston rinsing system

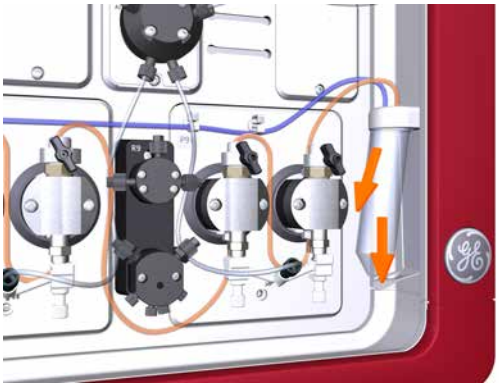
The pump piston rinsing system protects the seal that prevents leakage between the pump chamber and the drive mechanism of the pump. The illustration below shows the parts and tubing of the pump piston rinsing system.



Part	Description
1	Pump rinsing liquid tube holder, top
2	Pump rinsing liquid tube
3	Pump rinsing liquid tube holder, bottom
4	Outlet tubing
5	Inlet tubing

Prime the pump rinsing system

Follow the instructions below to fill the pump piston rinsing system with rinsing solution. See the tubing configuration of the rinsing system in the illustration above.

Step	Action
1	Remove the pump rinsing liquid tube from the holder. 
2	Fill the pump rinsing liquid tube with 50 ml of 20% ethanol.
3	Place the pump rinsing liquid tube back in the holder.
4	Insert the inlet tubing to the system pump piston rinsing system into the fluid in the rinsing solution tube. ***Note:*** *Make sure that the inlet tubing reaches close to the bottom of the rinsing solution tube.*
5	Connect a 25 to 30 ml syringe to the outlet tubing of the system pump piston rinsing system. Draw liquid slowly into the syringe.

Step	Action
6	Disconnect the syringe and discard its contents.
7	Insert the outlet tubing into the fluid in the rinsing solution tube.
8	Fill the rinsing solution tube so that the tube contains 50 ml of 20% ethanol.

4.2.6 Start the instrument and the computer

Introduction

This section describes how to start the instrument and the computer.

Instruction

Follow the instructions below to start the instrument and the computer.

Step	Action
1	Switch on the instrument by pressing the power switch to the **I** position.

Result: The instrument starts and the Instrument control panel displays a white, slowly flashing light.

2	Turn on the computer and monitor according to the manufacturer's instructions.

4.3 Software installation

Introduction

This section gives an overview of the different UNICORN installation types.

The software should be installed by an assigned UNICORN system administrator. Detailed information about software installation and configuration is available in the Administration and Technical Manual.

Software installations

You can install UNICORN in one of the following configurations:

- as a complete UNICORN installation on a stand-alone workstation (full installation)
- as a UNICORN database and license server (custom installation)
- as a UNICORN software client and instrument server software on a network client station (custom installation)

4.4 Start UNICORN and connect to system

Introduction

This section describes how to start and log on to UNICORN and how to connect the instrument to UNICORN.

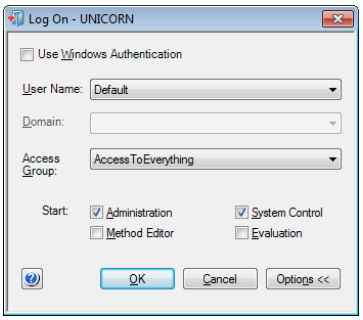
Prerequisites

UNICORN must be correctly installed according to instructions in the Administration and Technical Manual.

Start UNICORN and log on

Follow the instructions to start UNICORN and log on to the program. A valid e-license must be available for the workstation. See Administration and Technical Manual for more information about e-licenses.

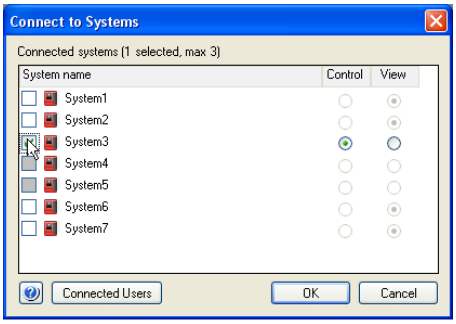
Step	Action
1	Double-click the UNICORN icon on the desktop. *Result*: The ***Log On*** dialog box opens.

Step	Action
2	In the ***Log On*** dialog box: • select ***User Name*** and • enter ***Password***. ***Note:*** *It is also possible to select the* ***Use Windows Authentication*** *checkbox and enter a network ID in the* ***User Name*** *field.*  • click ***OK***. *Result*: The selected UNICORN modules open.

Connect to system

Follow the instructions to connect the instrument to UNICORN.

Note: *The system must have been defined by the UNICORN system administrator.*

Step	Action
1	In the ***System Control*** module, click the ***Connect to Systems*** button. *Result:* The ***Connect to Systems*** dialog box opens. 
2	In the ***Connect to Systems*** dialog box: • Select a system check box. • Click ***Control*** for that system. • Click ***OK***. *Result:* The selected instrument can now be controlled by the software. ***Tip:*** *If UNICORN is unable to connect to the selected instrument, see Chapter Troubleshooting in ÄKTA pure User Manual.*

4.5 Prime inlets and purge pump heads

Introduction

Before usage of the system pumps, it is important to:

- Prime the inlets (fill the buffer inlets with liquid).
- Purge the system pumps (remove air from the pump heads).

Note: *Note that the procedures described in this section may have to be adapted if your system configuration differs from the one described in this manual.*

Overview

The procedure consists of the following stages:

Stage	Description
1	Prime all inlet tubing to be used during the run
2	Purge System pump B
3	Validate purge of System pump B
4	Purge System pump A
5	Validate purge of System pump A
6	End the run

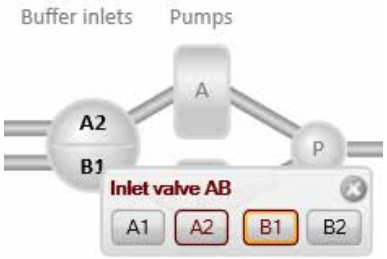
Tip: *The procedures for purging the pump heads and priming the inlets using the **Process Picture**, are described below. It is also possible to perform the procedures from the **Manual instructions** dialog.*

Prime inlet tubing

Follow the instructions below to fill all A and B inlet tubing to be used in the run with appropriate buffer/solution.

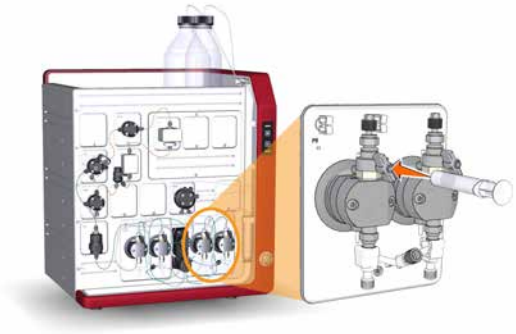
Step	Action
1	Make sure that all inlet tubing that is to be used during the method run is placed in the correct buffer.
2	Open the ***System Control*** module.

Step	Action
3	In the ***Process Picture***: • Click on the buffer inlets. • Select the position of the inlet to be filled. Select the positions in reverse alphabetical order and start with the highest number. For example, if all the four inlets in Inlet valve AB are to be filled, fill them in the following order: B2, B1, A2, A1.



Result: The inlet valve switches to the selected port.

4	Connect a 25 to 30 ml syringe to the purge valve of one of the pump heads of the pump that is being prepared. Make sure that the syringe fits tightly into the purge connector.



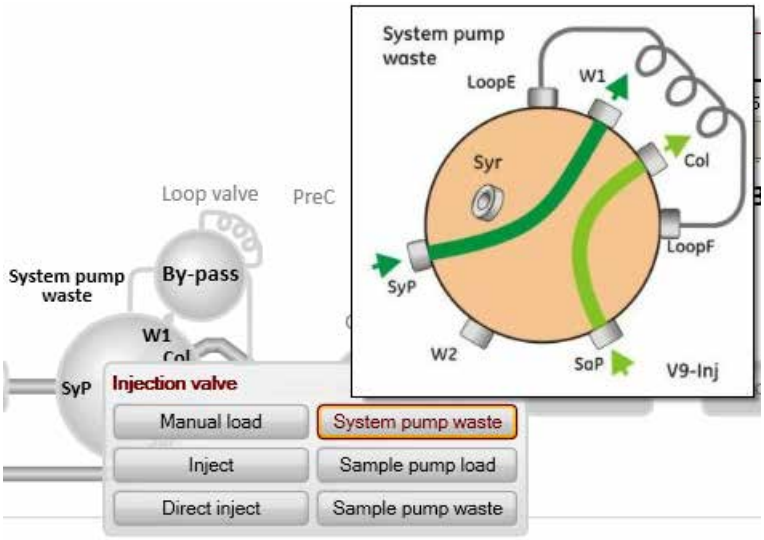
5	Open the purge valve by turning it counter-clockwise about three quarters of a turn. Draw liquid slowly into the syringe until the liquid reaches the pump.
6	Close the purge valve by turning it clockwise. Disconnect the syringe and discard its contents.

Step	Action
7	Repeat steps 3 to 6 for each piece of inlet tubing that is to be used during the run.

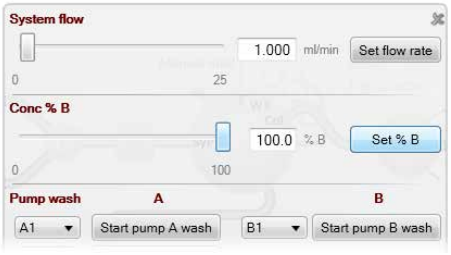
Purge System pump B

Follow the instruction below to purge both pump heads of System pump B.

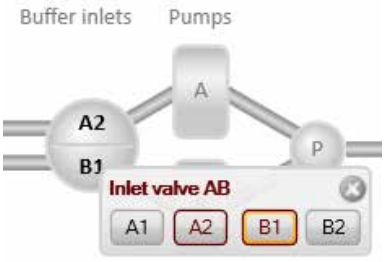
Step	Action
1	Make sure that the piece of waste tubing connected to the Injection valve port **W1** is placed in a waste vessel.
2	In the ***Process Picture***: • Click on the ***Injection valve*** and select ***System pump waste***. *Result:* The Injection valve switches to waste position. This is necessary to achieve a low back pressure during the purge procedure.



Step	Action
3	In the ***Process Picture***: • Click on the pumps. • Set ***Conc % B*** to 100% B.



	• Click ***Set % B***. *Result:* Only System pump B is active.
4	In the ***Process Picture***: • Click on the buffer inlets. • Select the position of one of the inlets that will be used at the beginning of the run.

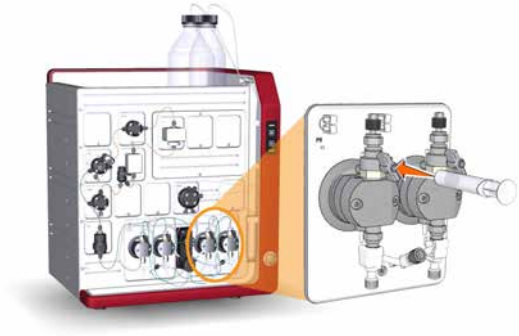


Result: The inlet valve switches to the selected port.

Step	Action
5	In the ***Process Picture***: • Click on the ***Pumps***. • Set the ***System flow*** to 1.0 ml/min for ÄKTA pure 25 or 10.0 ml/min for ÄKTA pure 150. • Click ***Set flow rate***.

Result: A system flow starts.

6 Connect a 25 to 30 ml syringe to the purge valve of the left pump head of System pump B. Make sure that the syringe fits tightly into the purge connector.



7 Open the purge valve by turning it counter-clockwise about three quarters of a turn. Draw a small volume of liquid slowly into the syringe (with a rate of about 1 ml per second).

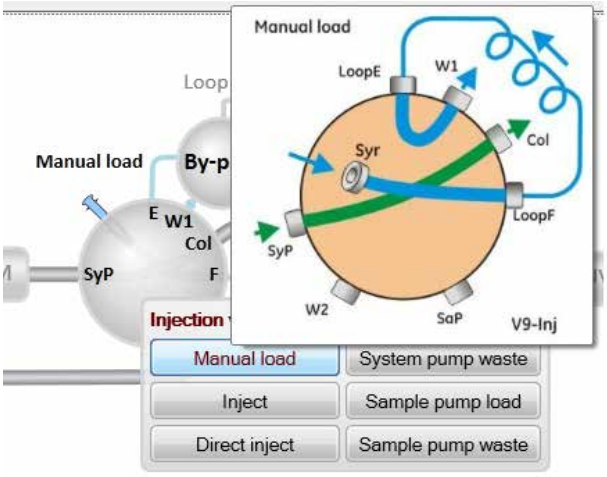
8 Close the purge valve by turning it clockwise. Disconnect the syringe and discard its contents.

Step	Action
9	Connect the syringe to the purge valve on the right pump head of System pump B, and repeat steps 6 to 8. Keep the system flow running.

Validate purge of pump B

Follow the instructions below to check that there is no air left in the pump after performing a purge.

Step	Action
1	In the ***Process Picture***: • Click on the ***Injection valve*** and select ***Manual load***. *Result:* The Injection valve switches to manual load position.



Step	Action
2	Make sure that the pump flow is on.
3	In the ***Chromatogram*** pane: Check the ***PreC pressure*** curve. If the PreC pressure do not stabilize within a few minutes there may be air left in the pump. Refer to ÄKTA pure User Manual for a troubleshooting guide.

Purge System pump A

Purge both pump heads of System pump A by following the same procedure as in *Purge System pump B, on page 93*, but replace step 3 with the following actions:

In the ***Process Picture***:

- Click on the pumps.
- Set ***Conc % B*** to 0% B.

- Click ***Set % B***

Result: Only System pump A is active.

Validate purge of pump A

Follow the procedure described in *Validate purge of pump B, on page 96* to check if there is air left in the pump.

End the run

Click the ***End*** button in the ***System Control*** toolbar to end the run.

4.6 Performance test

Before taking the ÄKTA pure instrument into use, run a performance test to check the function of the equipment. See the purifcation instrument *User manual* for further instructions.

4.7 Activate Power-save

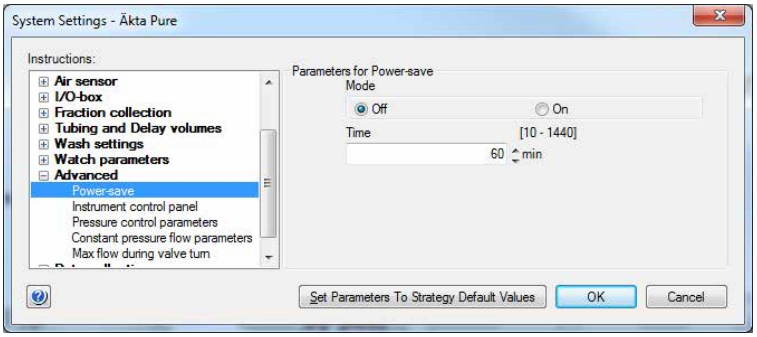
Introduction

ÄKTA pure has a power-save mode. The instrument enters ***Power-save*** after having been in the ***Ready*** state for a set period of time. The system enters the ***Ready*** state when a method run, a method queue or a manual run ends.

Enable power-save

To enable ***Power-save***, a system must be connected and in state ***Ready***.

Follow the instructions below to activate ***Power-save***.

Step	Action
1	In the ***System Control*** module, on the ***System*** menu. click ***Settings***. *Result:* The ***System Settings*** dialog opens.
2	• Click ***Advanced*** and • select ***Power-save***. 
3	• Click ***On*** in the ***Mode*** field and • type the number of minutes in the ***Time*** field. ***Note:*** *This is the time the instrument will be in state **Ready** before power-save mode is entered.* • Click ***OK***.

5 Prepare the system for a run

About this chapter

This chapter describes the preparations necessary to prepare the system before starting a run.

Safety precautions

WARNING

Do not use ÄKTA pure if it is not working properly, or if it has suffered any damage, for example:

- damage to the power cord or its plug
- damage caused by dropping the equipment
- damage caused by splashing liquid onto it

WARNING

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

WARNING

Do not use any accessories not supplied or recommended by GE.

CAUTION

Fire Hazard. Before the system is turned on, make sure that there is no unintentional leakage of flammable liquids, or other buffers, in ÄKTA pure or tubing.

WARNING

Fire Hazard. Before starting the system, make sure that there is no leakage.

WARNING

Explosion hazard. To avoid building up an explosive atmosphere when using flammable liquids, make sure that the room ventilation meets the local requirements.

In this chapter

This chapter contains the following sections:

Section	See page
5.1 Before you prepare the system	103
5.2 Prepare the flow path	104
5.3 Prime inlets and purge pump heads	108
5.4 Connect a column	109
5.5 Pressure alarms	114
5.6 Prepare for a run at cold room temperature	117

5.1 Before you prepare the system

Introduction

It is important to prepare the system in accordance with the settings in the method to be run. Before preparing the system, check the settings in the ***Method Editor*** and make sure that all accessories to be used are available.

Checklist

Make sure the system is prepared in accordance with the settings in the method to be run. Depending on configuration, remember to check:

- which valve ports to use for inlets and outlets
- which column type to use
- which column position to use
- which buffers and samples to prepare
- which sample application technique to use
- that the pH electrode is connected and calibrated

CAUTION

Reversed Phase Chromatography (RPC) runs with 100% acetonitrile in ÄKTA pure. Always replace the PEEK tubing between the used system pump and the pump pressure monitor with orange PEEK tubing, i.d. 0.5 mm, before running RPC with 100% acetonitrile. The tubing to be replaced is green for 25 ml/min systems and beige for 150 ml/min systems. Set the System pressure alarm to 10 MPa for 25 ml/min systems.

5.2 Prepare the flow path

Introduction

The flow path is defined by the user and may contain tubing, valves, pumps and monitors. This section gives an overview of a flow path and describes how to prepare the flow path before a run.

CAUTION

Fasten bottles and cassettes. Always fasten bottles and cassettes to the rails at the front and side panel. Use appropriate holders for bottles. Shattered glass from falling bottles may cause injury. Spilled liquid may cause fire hazard and personal injury.

CAUTION

Max. weight on Buffer tray. Do not place containers with a volume of more than 5 liters each on the Buffer tray. The total allowed weight on the Buffer tray is 20 kg.

CAUTION

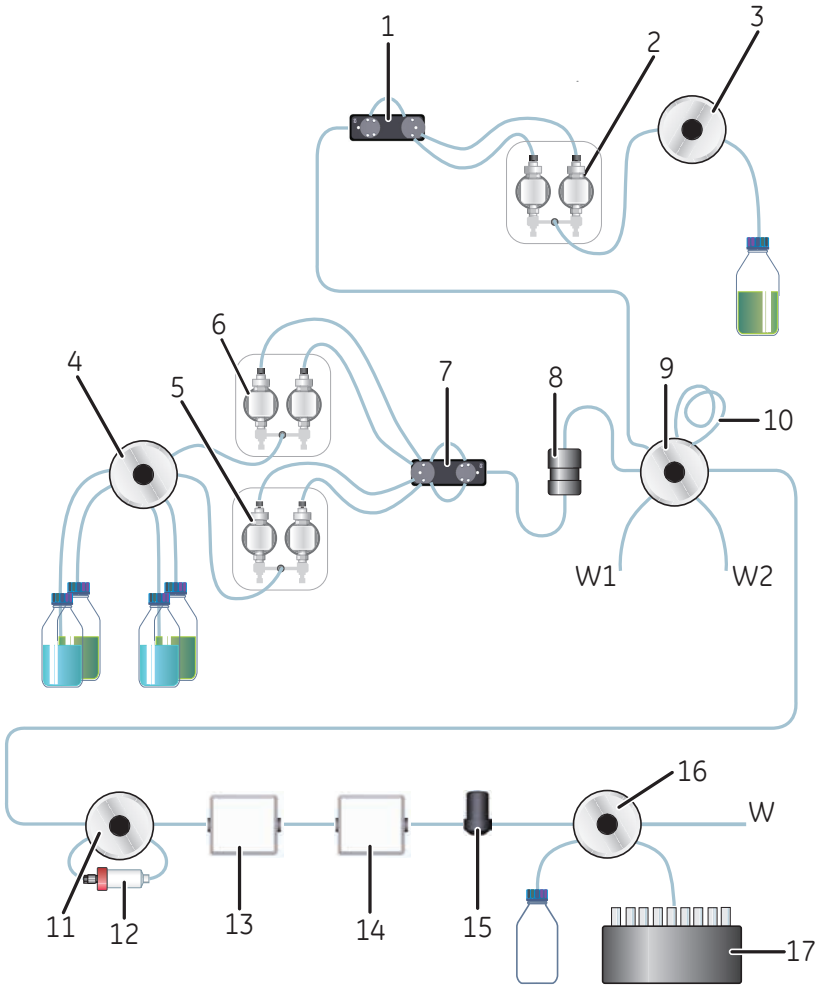
Avoid spillage and overflow. Make sure that the system is prepared according to the settings in the method to be run. For example make sure that the waste tubing is inserted in an appropriate waste container and secured in place.

CAUTION

Avoid spillage and overflow. Make sure that the waste tubing is inserted in an appropriate waste container and secured in place.

Illustration of the flow path

The illustration below shows the flow path for a typical system configuration. The individual instrument modules are presented in the table below. The configuration of the system is defined by the user.

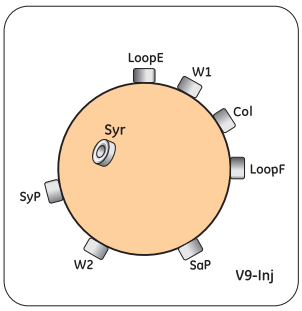


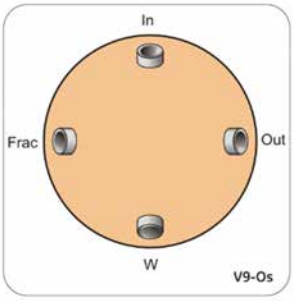
Part	Description
1	Pressure monitor
2	Sample pump
3	Sample inlet valve

Part	Description
4	Inlet valve
5	System pump B
6	System pump A
7	Pressure monitor
8	Mixer
9	Injection valve
10	Sample loop or Superloop
11	Column valve
12	Column
13	UV monitor
14	Conductivity monitor
15	Flow restrictor
16	Outlet valve
17	Fraction collector
W, W1, W2	Waste

Waste ports

The table below shows the waste ports of the Injection valve and outlet valves.

Valves and ports	Illustrations
Injection valve **V9-Inj** or **V9H-Inj** Waste ports: • **W1, W2**	

Valves and ports	Illustrations
Outlet valve **V9-Os** or **V9H-Os** Waste port: • **W** ***Note:*** *The waste ports on Outlet valve **V9-O** and **V9H-O** are also labelled **W**.*	

Note: *If the configuration of the ÄKTA pure instrument includes a pH valve (**V9-pH** or **V9H-pH**), there will be an additional waste port labelled **W3**.*

Prepare the waste tubing

Make sure that the waste tubing is prepared according to the instructions in *Section 4.2.4 Install waste tubing, on page 80*.

Prepare the outlet tubing

Connect tubing to the outlet ports of the outlet valve that are to be used during the run.

If no fraction collector is used, immerse the outlet tubing in suitable tubes or flasks.

If a fraction collector is used, make sure that tubing is connected between the fraction collector and the **Frac** port on the outlet valve, and prepare the fraction collector for a run.

Plug unused valve ports

It is recommended to plug all unused valve ports with stop plugs before starting a run. See ÄKTA pure User Manual for information about connectors.

5.3 Prime inlets and purge pump heads

Introduction

Before usage of the system pumps, it is important to:

- Prime the inlets (fill the buffer inlets with liquid).
- Purge the system pumps (remove air from the pump heads).

Note: *Note that the procedures described in this section may have to be adapted if your system configuration differs from the one described in this manual.*

For instructions on how to prime the inlets and purge the pump heads, see *Section 4.5 Prime inlets and purge pump heads, on page 91*.

5.4 Connect a column

Introduction

This section describes how to connect a column to the instrument using a column holder and without introducing air into the flow path. Several types of column holders are available for ÄKTA pure.

WARNING

To avoid exposing the column to excessive pressure, make sure that the pressure limit is set to the specified maximum pressure of the column. Before connecting a column to the ÄKTA pure instrument, read the instructions for use of the column.

Methods automatically include a pressure alarm based on the specifications of the chosen column type. However, when running manual runs you have to set the pressure limits yourself. Also, to protect the column media, special settings are needed. See *Section 5.5 Pressure alarms, on page 114* for more information on pressure alarms.

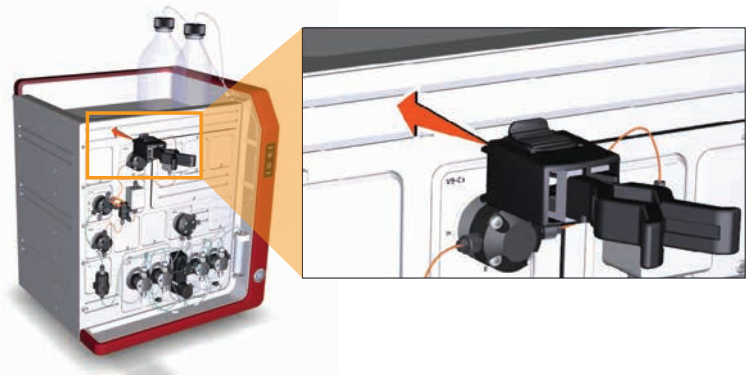
Note: *Do not overtighten when connecting columns. Overtightening might rupture the connectors or squeeze the tubing and thereby result in high back pressure.*

Note: *If no column valve is used, remove the column from the system before running a system wash. The pressure during a system wash may become too high for the column.*

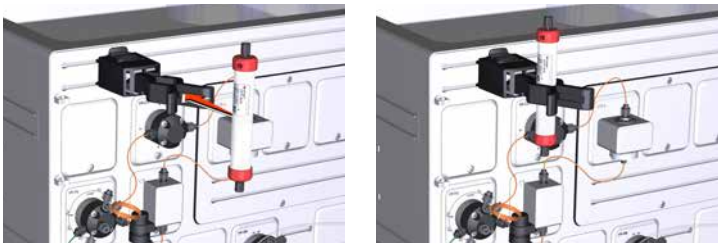
Attach a column holder and connect a column

Follow the instructions below to connect a column to the instrument. Always use a column holder. If a column valve is used, connect the column to the appropriate A and B ports on the valve. If no column valve is used, connect the column directly to the flow path tubing. Use appropriate tubing and connectors. The instructions below show a system configured with Column valve **V9-Cs**.

Step	Action
1	Attach an appropriate column holder to the rail on the instrument.

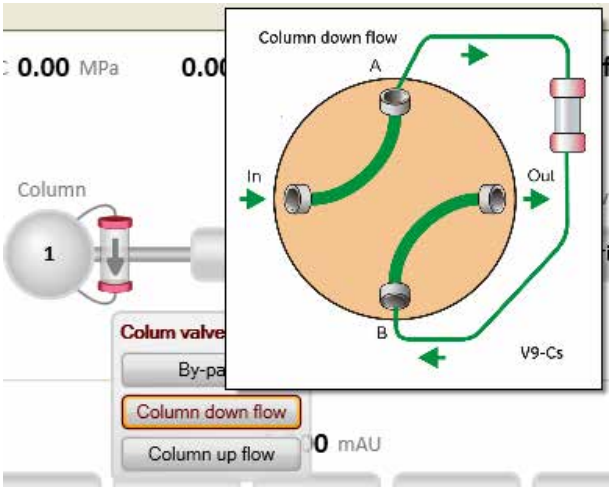


Step	Action
2	Attach the column to the column holder.



Step	Action
3	Connect a suitable tubing to a Column valve port, in this example port **1A**.
4	Open the ***System Control*** module.

Step	Action
5	In the ***Process Picture***: • Click on the ***Column***. • Select ***Column down flow***.



Result: The Column valve switches to position ***1***.

6	In the ***Process Picture***: • Click on the ***Pumps***. • Enter a low ***System flow*** (e.g., 0.2 ml/min). • Click ***Set flow rate***.

Result: A system flow of 0.2 ml/min starts.

Step	Action
7	When buffer leaves the tubing in a continuous mode and the top part of the column is filled with buffer, connect the tubing to the top of the column.

8	Connect a piece of tubing to the bottom of the column.

Step	Action
9	When buffer leaves the tubing at the bottom of the column in a continuous mode, connect this piece of tubing to the Column valve. Use the port opposite to the one already connected to the column, in this example port **1B**. If no column valve is used, connect the tubing to the next module in the flow path.
10	Click the ***End*** icon in the ***System Control*** toolbar to end the run.

5.5 Pressure alarms

Introduction

The columns can be protected by two different types of pressure alarms:

- The pre-column pressure alarm protects the column hardware
- The delta-column pressure alarm (only available when **V9-C** or **V9H-C** is installed) protects the column media

Column valves **V9-C** and **V9H-C** have built-in pressure sensors that automatically measure the pre-column and delta-column pressure. If Column valve **V9-C** or **V9H-C** is not used (column is connected without a Column valve or to Column valve **V9-Cs** or **V9H-Cs**), the pre-column pressure is calculated from the system pressure and tubing dimensions.

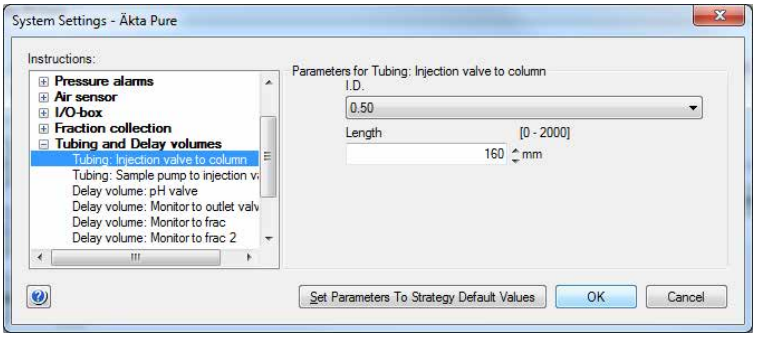
See the instructions below to set the pressure alarm for the column to be used in the run and, if applicable, to set the parameters for the tubing dimensions.

Set tubing dimension parameters to calculate pre-column pressure

For instruments where there is no pre-column pressure sensor, i.e. the column is connected without a Column valve or to Column valve **V9-Cs** or **V9H-Cs**, the pre-column pressure is calculated from the system pressure and tubing dimensions. Follow the instructions below to set the tubing dimension parameters.

Step	Action
1	Select ***System:Settings*** in the ***System Control*** module. *Result:* The ***System Settings*** dialog opens.

Step	Action
2	• Select ***Tubing and Delay Volumes*** and • select ***Tubing: Injection valve to column***
3	• Select the inner diameter of the tubing between the injection valve and the column from the ***I.D.*** drop-down list. • Type in the tubing ***Length***.
4	If the sample pump is used: • Select ***Tubing: Sample pump to injection***. • Set tubing i.d. and length, see step 3.
5	Click ***OK***. ***Note:*** *The system now calculates the Pre-column pressure.*



Pre-column pressure alarms

It is important that the pre-column pressure alarm is set during all runs where a column is used. The pressure alarm can be set in:

- the method to be run,
- the ***System Settings*** dialog , or
- during a manual run

Pre-column pressure alarm limits are automatically set in the method when a column from the column list is selected in the method. Refer to UNICORN Method Manual for more information on pressure alarms.

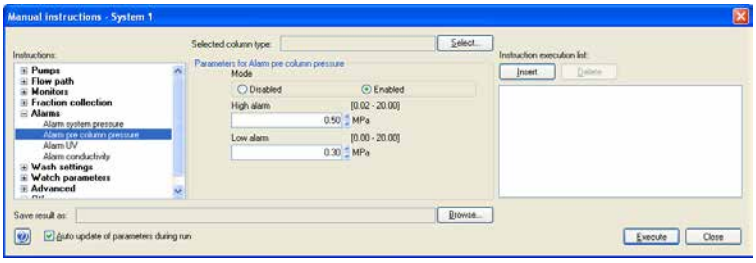
For some columns the max delta-column pressure (media) is significantly lower than the max pre-column pressure (hardware). To protect the media if a delta-column pressure measurement is not available (that is, when column valve **V9-C** or **V9H-C** is not used), the pre-column pressure alarm must be manually set to the value in the column list that is the lowest of the max pre-column pressure and the max delta-column pressure.

Delta-column pressure alarms

If column valve **V9-C** or **V9H-C** is installed the delta-column pressure will be measured, but the alarm must be set manually if needed.

Set pressure alarms

Pressure alarm limits may be set manually in ***System Control***. The example below describes how to set the high pressure limit for the column. Other alarms are set in a corresponding way.

Step	Action
1	Select ***Manual:Execute Manual Instructions...*** in the ***System Control*** module. *Result:* The ***Manual instructions*** dialog opens.
2	• Select ***Alarms*** and • select ***Alarm pre column pressure***. 
3	Select ***Enabled*** in the ***Mode*** field.
4	• Type the high pressure limit in the ***High alarm*** field. • Click ***Execute***.

5.6 Prepare for a run at cold room temperature

Introduction

When using the instrument in a cold room or cold cabinet, make sure to follow the precautions listed below.

Precautions concerning runs at cold room temperature

NOTICE

Avoid condensation. If ÄKTA pure is kept in a cold room, cold cabinet or similar, keep it switched on in order to avoid condensation.

NOTICE

Avoid overheating. If ÄKTA pure is kept in a cold cabinet and the cold cabinet is switched off, make sure to switch off ÄKTA pure and keep the cold cabinet open to avoid overheating.

NOTICE

Place the computer in room temperature. If the ÄKTA pure instrument is placed in a cold room, use a cold room compatible computer or place the computer outside the cold room and use the Ethernet cable delivered with the instrument to connect to the computer.

Note: *When the instrument is kept in a cold room, it is important to tighten all tubing connectors, also the inlet manifold connectors. Otherwise air might get into the flow path.*

Note: *Make sure that the instrument, buffers and sample have had time to reach the ambient temperature. When the instrument has reached the ambient temperature, calibrate all pressure sensors.*

6 Run a method

About this chapter

This chapter describes the safety aspects of performing a run and how to shut down and clean the system after a run.

For detailed information about how to run the system, see UNICORN System Control Manual.

In this chapter

This chapter contains the following sections:

Section	See page
6.1 Before you start	119
6.2 Applying the sample	122
6.3 Start a method run	125
6.4 Monitor the run	127
6.5 After run procedures	128

6.1 Before you start

Introduction

Before starting a run, it is necessary to read and understand the information in this section and to perform the checks listed below.

CAUTION

Reversed Phase Chromatography (RPC) runs with 100% acetonitrile in ÄKTA pure. Always replace the PEEK tubing between the used system pump and the pump pressure monitor with orange PEEK tubing, i.d. 0.5 mm, before running RPC with 100% acetonitrile. The tubing to be replaced is green for 25 ml/min systems and beige for 150 ml/min systems. Set the System pressure alarm to 10 MPa for 25 ml/min systems.

CAUTION

Always use appropriate personal protective equipment during operation and maintenance of ÄKTA pure.

CAUTION

Hazardous substances. 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, maintenance and decommissioning of the equipment.

CAUTION

High pressure. ÄKTA pure operates under high pressure. Wear protective glasses at all times.

CAUTION

Risk of explosion. Do not use Mixer chamber 15 ml in the low flow system. The maximum pressure for Mixer chamber 15 ml is 5 MPa.

Checklist

Make sure that the system is correctly prepared. Check that:

- The system is prepared according to the settings in the method to be run.
- A suitable column has been selected for the application (consider target protein and pressure range).
- The buffer inlet tubing is immersed in correct buffer vessels (consider solution identity and volume).
- All waste tubing is immersed in appropriate waste vessels (consider vessel size, placement and material).
- No tubing is twisted and the flow path is free from leakage.

Hold, pause or stop the run

At the end of a method the run stops automatically. All pumps stop and an acoustic end signal sounds and ***End*** is displayed in the ***Run Log***.

To interrupt a method during a run you may use the ***Hold***, ***Pause*** or ***End*** icons in ***System Control***. A held or paused method run can be resumed by using the ***Continue*** icon. See the instructions in the table below.

If you want to...	then...
temporarily hold the method, with current flow rate and valve positions sustained	click the ***Hold*** icon.
temporarily pause the method, and stop all pumps	click the ***Pause*** icon.
resume, for example, a held or paused method run.	click the ***Continue*** icon. ***Note:*** *An ended method cannot be continued.*

If you want to...	then...
permanently end the run	click the ***End*** icon.

Note: *When ending a method run in advance, it is possible to save the partial result.*

Warnings concerning use of hazardous substances

CAUTION

Hazardous chemicals during run. When using hazardous chemicals, run ***System CIP*** and ***Column CIP*** to flush the entire system tubing with distilled water, before service and maintenance.

6.2 Applying the sample

Introduction

A number of different sample application techniques are available. This section describes sample application using a syringe to manually fill a s loop. The two stages of the sample application are described in the table below. For detailed instructions and information regarding the different sample applications techniques, see ÄKTA pure User Manual.

Stage	Description
Load	The sample loop is filled with sample.
Inject	The sample is injected onto the column.

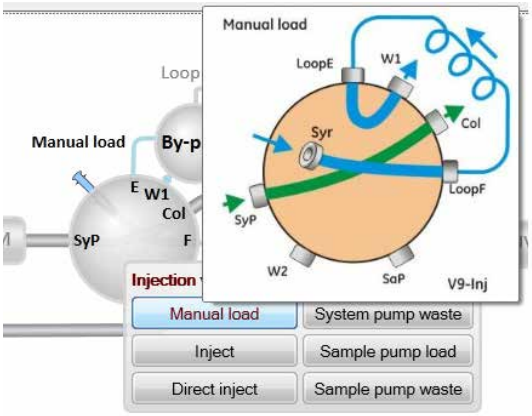
How to fill a sample loop

Follow the instructions below to fill the sample loop with sample.

Step	Action
1	Connect a suitable sample loop to the injection valve ports **LoopF** (fill) and **LoopE** (empty).
2	Fill a syringe with sample.

Step	Action
3	Connect the syringe to the injection valve port **Syr**.

4	Open the ***System Control*** module.
5	In the ***Process Picture***: • Click on the ***Injection valve*** and select ***Manual load***.

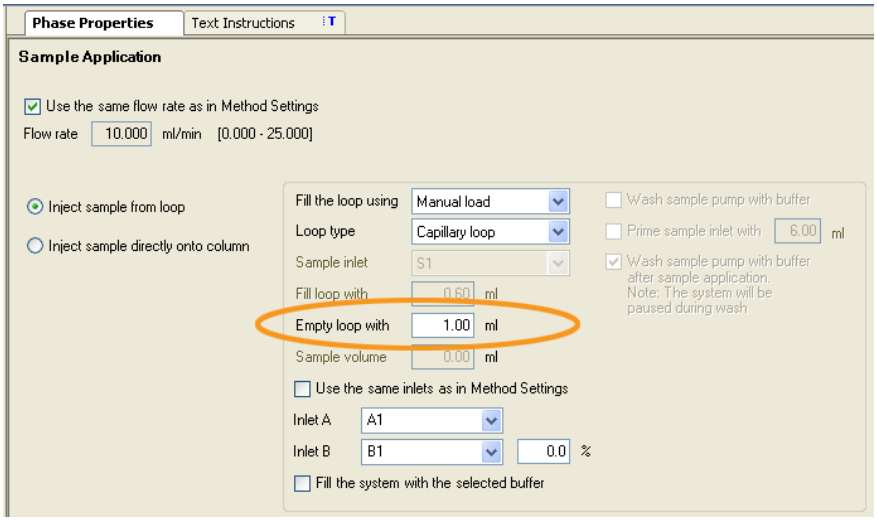


Result: The injection valve switches to manual load position.

6	Load sample into the sample loop. To avoid sample loss due to siphoning, leave the syringe in the port until the sample has been injected onto the column during the run. ***Tip:*** *It is recommended to overload the loop to make sure that the loop is completely filled. Excess of sample will leave the valve through port **W1**.*

Sample application through a sample loop

The method for how to apply a sample can be created beforehand, see *Section 6.3 Start a method run, on page 125*. During sample application, the sample is automatically injected onto the column and the loop is then emptied and washed out using buffer from the system pumps. The total buffer volume to be used for emptying and washing the sample loop is set in the ***Method Editor***, in the ***Phase Properties*** tab of the ***Sample Application*** phase at ***Empty loop with***.



Tip: *Empty the sample loop with a buffer volume that exceeds the volume of the loop. This will ensure that the loop is completely emptied.*

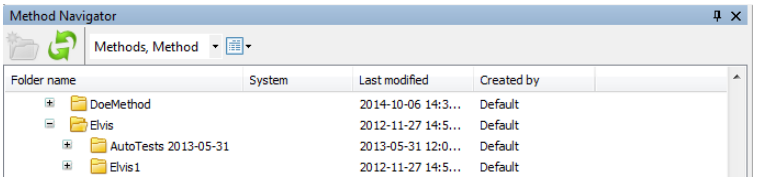
6.3 Start a method run

Introduction

This section describes how to start a run using a previously created method. For further information on method creation, please refer to UNICORN Method Manual.

Choose and start a method

The instruction below describes how to open a method and start a run.

Step	Action
1	Open the ***System Control*** module and click the ***Open Method Navigator*** button. *Result:* The ***Method Navigator*** pane opens. 
2	Select the method to run, and click the ***Run*** button. *Result:* The ***Start Protocol*** dialog opens.
3	Step through the displayed pages in the ***Start Protocol***, add requested input and make appropriate changes if necessary. Click ***Next***.

Step	Action
4	Click ***Start*** on the last page of the ***Start Protocol***. *Result*: • If column logging was included during installation of UNICORN and a column type was selected at method creation, the ***Select Columns*** dialog opens. For further information on column handling, please refer to UNICORN Method Manual and UNICORN System Control Manual. • If column logging was *not* chosen during installation of UNICORN and/or *no* column type was selected at method creation, the run starts directly.

6.4 Monitor the run

Introduction

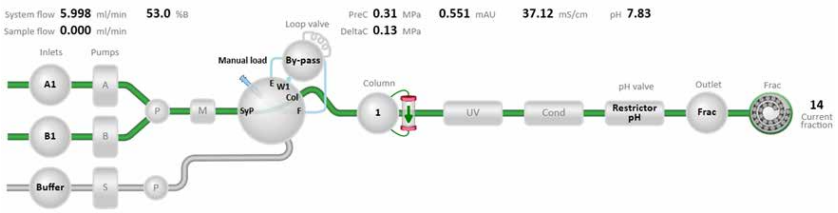
You may follow the on-going method run in the ***System Control*** module. The current system status is shown in the ***System state*** panel in the ***Run Data*** pane. For example, it may state ***Run***, ***Wash*** or ***Hold***.

See *Section 3.2.2 The System Control module, on page 53* for information about the data shown in ***System Control*** during a run, the layout of the module and the procedure to customize the view of the different panes.

Process picture

The ***Process picture*** pane displays the current flow path during the run and can be used to control the run. Color indication is applied, as shown in the table below. Real-time data from monitors are also displayed in the process picture. See illustration below.

Color	Indication
Green	Open flow path with flow
Grey	Closed flow path or an open path without flow.



6.5 After run procedures

Introduction

This section describes how to clean the instrument and columns after a chromatographic run, and how to prepare the system for storage.

The instrument and the columns should be cleaned between the runs. This will prevent, for example, sample contamination, protein precipitation and column clogging. If the instrument is not going to be used for a couple of days or longer, the instrument, columns and the pH flow cell should be filled with storage solution. For further information about cleaning and maintenance procedures, see *ÄKTA pure User Manual*.

Tip: *To clean and fill the instrument and columns with storage solution, use **System CIP** and **Column CIP** either as separate, predefined methods or as phases included in a chromatographic method.*

CAUTION

Hazardous chemicals and biological agents. Before maintenance, service and decommissioning, wash the ÄKTA pure instrument with a neutral solution to make sure that any hazardous solvents and biological agents have been flushed out from the system.

System cleaning

After a method run is completed, perform the following:

- Rinse the instrument with one or several cleaning solution(s) (e.g., NaOH, buffer solution or distilled water) using ***System CIP***.

  Note: *If Column valve **V9-C** or **V9H-C** is mounted, the integrated pressure sensor of the valve allows the system to monitor the post-column pressure. The limit for the pressure sensor in Column valve **V9-C** or **V9H-C** is automatically set so that the UV monitor and the pH monitor are protected from high pressure. If Column valve **V9-C** or **V9H-C** is not mounted, make sure to keep the pressure in the system after the column below the pressure limits for the modules in the flow path.*

- If applicable, empty the fraction collector.
- Clean all spills on the instrument and on the bench using a moist tissue.
- Empty the waste vessel.
- Clean the manual injection port of the injection valve.

- If applicable, clean the pH electrode manually and make sure to leave it in an appropriate buffer. See ÄKTA pure User Manual for detailed instructions.

System storage

If the instrument is not going to be used for a couple of days or longer, also perform the following:

- Fill the system and inlets with storage solution (e.g., 20% ethanol) using ***System CIP***.

  Note: *If Column valve **V9-C** or **V9H-C** is mounted, the integrated pressure sensor of the valve allows the system to monitor the post-column pressure. The limit for the pressure sensor in Column valve **V9-C** or **V9H-C** is automatically set so that the UV monitor and the pH monitor are protected from high pressure. If Column valve **V9-C** or **V9H-C** is not mounted, make sure to keep the pressure in the system after the column below the pressure limits for the modules in the flow path.*

- If applicable, prepare the pH electrode for storage as described in ÄKTA pure User Manual.

Column cleaning

After a method run is completed, perform the following:

- Clean the column with one or several cleaning solution(s) using ***Column CIP***.

Column storage

If the column is not going to be used for a couple of days or longer, also perform the following:

- Fill the column with storage solution (e.g., 20% ethanol) using ***Column CIP***.

pH electrode storage

If pH monitoring will not be used for a week or longer, perform one of the following actions:

- Inject new storage solution into the pH flow cell.
- Replace the pH electrode with the dummy electrode that is installed in the pH valve on delivery.

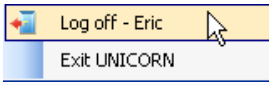
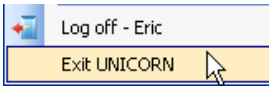
In the following situations, in order to increase the lifetime of the pH electrode, use the ***By-pass*** position and store the electrode in storage solution inside the pH flow cell:

- pH monitoring is not needed during the run.
- Organic solutions are used.
- Extremely acidic or extremely basic solutions are used.

For further information on how to prepare the pH electrode for storage, refer to ÄKTA pure User Manual.

Log off or exit UNICORN

Follow the instructions to log off or exit UNICORN. This can be performed from any of the UNICORN modules.

If you want to...	then...
log off UNICORN	on the ***File*** menu, click ***Log off***.  *Result*: All open UNICORN modules close and the ***Log On*** dialog box opens.
exit UNICORN	on the ***File*** menu, click ***Exit UNICORN***.  *Result*: All open UNICORN modules close.

Note: *If an edited method or result is open and not saved when you try to exit or log off UNICORN, you will see a warning. Click **Yes** to save, **No** to exit without saving, or **Cancel** to stay logged on.*

Shut down the instrument

Switch off the instrument by pressing the power switch to the **O** position.

7 Maintenance

About this chapter

This chapter provides schedules for preventive maintenance that should be performed by the user of ÄKTA pure. Regular maintenance is essential for reliable function and results. Refer to *ÄKTA pure User Manual* for detailed instructions.

WARNING

Always use appropriate personal protective equipment during operation and maintenance of ÄKTA pure system.

Maintenance program

An overview of the preventive maintenance to be performed on ÄKTA pure is outlined below. See ÄKTA pure User Manual for detailed information about the maintenance procedures.

Maintenance is divided into:

- Weekly maintenance
- Monthly maintenance
- Bi-annual maintenance
- Maintenance when required

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.

Periodic maintenance program

The following periodic maintenance should be performed by the user of ÄKTA pure.

Interval	Maintenance action
Weekly	Calibrate pressure monitors

Interval	Maintenance action
Weekly	Change pump rinsing solution
Weekly	Replace the inline filter in the Mixer
Monthly	Check the Flow restrictor
Twice a year	Clean the UV flow cell

Maintenance when required

The following maintenance should be performed by the user of ÄKTA pure when required.

Maintenance action
Clean the instrument externally
Perform System CIP
Perform Column CIP
Replace tubing and connectors
Clean the Conductivity flow cell
Calibrate the Conductivity monitor
Calibrate the UV monitor
Replace Mixer
Replace O-ring in Mixer
Replace the UV flow cell
Replace the Flow restrictor
Replace inlet filters
Clean the check valves
Replace check valves
Replace pump piston seals
Replace pump pistons
Replace pump rinsing system tubing
Replace valve modules

Maintenance action
Wipe off excess oil from the pump head

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 155* or print it from the PDF file available on the User Documentation CD.

8 Reference information

About this chapter

This chapter lists the allowed environmental and operational ranges for ÄKTA pure.

Refer to *ÄKTA pure Product Documentation* for detailed technical specifications.

In this chapter

This chapter contains the following sections:

Section	See page
8.1 System specifications	136
8.2 Chemical resistance guide	139
8.3 Ordering information	146
8.4 Health and Safety Declaration Form	155

8.1 System specifications

System specifications

Parameter	Data
System configuration	Benchtop system, external computer
Control system	UNICORN 6.3 or other compatible version
Connection between PC and instrument	Ethernet
Dimensions (W x D x H)	535 x 470 x 630 mm
Weight (excluding computer)	up to 53 kg
Power supply	100-240 V ~, 50-60 Hz
Power consumption	300 VA (typical) 25 VA (power-save)
Enclosure protective class	IP 21
Tubing and connectors	ÄKTA pure 25: • Inlet: FEP tubing, i.d. 1.6 mm, Tubing connector 5/16" + Ferrule (yellow), 1/8" • Pump to Injection valve: PEEK tubing, i.d. 0.75 mm, Fingertight connector, 1/16" • After Injection valve: PEEK tubing, i.d. 0.50 mm, Fingertight connector, 1/16" • Outlet and waste: ETFE tubing, i.d. 1.0 mm, Fingertight connector, 1/16" • Optional tubing kits: i.d. 0.25 mm, i.d. 0.75 mm, i.d. 1.0 mm

Parameter	Data
Tubing and connectors	ÄKTA pure 150: • Inlet: FEP tubing, i.d. 2.9 mm, Tubing connector 5/16" + Ferrule (blue), 3/16" • Pump to injection valve: PEEK tubing, i.d. 1.0 mm, 10-32 UNF connections • After Injection valve: PEEK tubing, i.d. 0.75 mm, 10-32 UNF connections • Outlet: FEP, i.d. 1.6 mm, 5/16-24 UNF connections • Waste: ETFE tubing, i.d. 1.0 mm, Fingertight connector, 1/16" • Optional tubing kits: i.d. 0.5 mm, i.d. 1.0 mm

Environmental ranges

Parameter	Data
Storage and transport temperature range	-25°C to +60°C
Chemical environment	See the relevant purification instrument *User manual*.

Operating ranges

Parameter	Data
Operating temperature range	4°C to 35°C
Relative humidity	20% to 95%, non-condensing

Equipment noise level

Equipment	Acoustic noise level
ÄKTA pure instrument	< 60 dB A

8.2 Chemical resistance guide

Introduction

This section provides general information about biocompatibilty and detailed information about chemical resistance of the ÄKTA pure instrument.

In this section

Section	See page
8.2.1 General information about biocompatibility and chemical resistance	140
8.2.2 Chemical resistance specifications	142

8.2.1 General information about biocompatibility and chemical resistance

Biocompatibility

The ÄKTA pure instrument is designed for maximum biocompatibility, with biochemically inert flow paths constructed mainly from titanium, PEEK and highly resistant fluoropolymers and fluoroelastomers. Titanium is used as far as possible to minimize contribution of potentially deactivating metal ions such as iron, nickel and chromium. There is no standard stainless steel in the flow path. Plastics and rubber materials are selected to avoid leakage of monomers, plasticizers or other additives.

Cleaning chemicals

Strong cleaning works well with 2 M sodium hydroxide, 70% acetic acid or the alcohols methanol, ethanol and isopropyl alcohol. Complete system cleaning using 1 M hydrochloric acid should be avoided in order to not damage the pressure sensors. If you are cleaning separation media using 1 M hydrochloric acid, use loop injections of the acid and make sure that the column is not mounted on the Column Valve **V9-C**. The Column Valve **V9-C** contains a pressure sensor which can be damaged by 1 M hydrochloric acid.

If sodium hypochlorite is used as sanitizing agent instead of 2 M sodium hydroxide, use a concentration up to 10%.

Organic solvents

Reversed phase chromatography of proteins works well with 100% acetonitrile and additives trifluoroacetic acid (TFA) up to 0.2% or formic acid up to 5%.

Strong organic solvents like ethyl acetate, 100% acetone or chlorinated organic solvents should be avoided. These might cause swelling of plastic material and reduce the pressure tolerance of PEEK tubing. For this reason, flash chromatography and straight ("normal") phase chromatography is generally not recommended on the system

Assumptions made

The ratings are based on the following assumptions:

- Synergy effects of chemical mixtures have not been taken into account.
- Room temperature and limited overpressure is assumed.

Note: *Chemical influences are time and pressure dependent. Unless otherwise stated, all concentrations are 100%.*

8.2.2 Chemical resistance specifications

Introduction

This section provides detailed information about chemical resistance of the ÄKTA pure instrument to some of the most commonly used chemicals in liquid chromatography. Regarding exposure to solutions not covered by this information, contact your GE representative for recommendations.

Note: *A user can be exposed to large volumes of chemical substances over a long time period. Material Safety Data Sheets (MSDS) provide the user with information regarding characteristics, human and environmental risks and preventive measures. Make sure that you have the MSDS available from your chemical distributor and/or databases on the internet.*

Aqueous buffers

The specified aqueous buffers are suitable for continuous use.

Chemical	Concentration	CAS no/EC no
Aqueous buffers pH 2-12	N/A	N/A

Strong chemicals and salts for CIP

The following chemicals are suitable for up to 2 h contact time at room temperature.

Chemical	Concentration	CAS no/EC no
Acetic acid	70%	75-05-8/ 200-835-2
Decon™ 90	10%	N/A
Ethanol	100%	75-08-1/ 200-837-3
Methanol	100%	67-56-1/ 200-659-6
Hydrochloric acid [1]	0.1 M	7647-01-0/ 231-595-7
Isopropanol	100%	67-63-0/ 200-661-7
Sodium hydroxide	2 M	1310-73-2/ 215-185-5

Chemical	Concentration	CAS no/EC no
Sodium hydroxide/ethanol	1 M/40%	N/A
Sodium chloride	4 M	7647-14-5/ 231-598-3
Sodium hypochlorite	10%	7681-52-9/231-668-3

1 If hydrochloric acid, HCl, is used as a cleaning agent when columns are connected to the system, the HCl concentration should not exceed 0.1 M in the pressure sensors. Remember that the ÄKTA pure system has pressure sensors in the column valve **V9-C**.

For other parts of the system up to 1 M HCl is acceptable for short periods of use. See *Cleaning chemicals, on page 140*

Solubilization and denaturing agents

The following chemicals are suitable for continuous use, as additives in separation and purification methods.

Chemical	Concentration	CAS no/EC no
Guanidinium hydrochloride	6 M	50-01-1/ 200-002-3
Sodium dodecyl sulfate (SDS)	1%	151-21-3/ 205-788-1
Tween™ 20	1%	9005-64-5/ 500-018-3
Urea	8 M	57-13-6/ 200-315-5

Chemicals used in reversed phase chromatography (RPC)

The following chemicals are suitable for continuous use.

Chemical	Concentration	CAS no/EC no
Acetonitrile[1]	100%	75-05-8/ 200-835-2
Acetonitrile/Tetrahydrofuran[1]	85%/15%	109-99-9/ 203-726-8

Chemical	Concentration	CAS no/EC no
Acetonitrile/water/Trifluoroacetic acid (TFA)[2]	Max 0.2% TFA	N/A
Ethanol	100%	75-08-1/ 200-837-3
Isopropanol	100%	67-63-0/ 200-661-7
Methanol	100%	74-93-1/ 200-659-6
Water/organic mobile phase/formic acid	Max 5% formic acid	N/A

1 Organic solvents can penetrate weaknesses in PEEK tubing walls more easily than water based buffers. Special care should therefore be taken with prolonged use of organic solvents close to pressure limits.

Depending on pressure, tubing between pump head and pressure monitor needs to be changed. See *ÄKTA pure User Manual* for more information.

2 Mobile phase system.

Note: *It is recommended to replace the mixer sealing ring with the highly resistant O-ring (product code 29-0113-26) if the system is to be exposed to organic solvents or high concentrations of organic acids, such as acetic acid and formic acid, for a longer period of time.*

Salts and additives for hydrophobic interaction chromatography (HIC)

The following chemicals are suitable for continuous use.

Chemical	Concentration	CAS no/EC no
Ammonium chloride	2 M	12125-02-9/ 235-186-4
Ammonium sulfate	3 M	7783-20-2/ 231-984-1
Ethylene glycol	50%	107-21-1/ 203-473-3
Glycerol	50%	56-81-5/ 200-289-5

Reducing agents and other additives

The following chemicals are suitable for continuous use.

Chemical	Concentration	CAS no/EC no
Arginine	2 M	74-79-3/ 200-811-1
Benzyl alcohol	2%	100-51-6/ 202-859-9
Dithioerythritol (DTE)	100 mM	3483-12-3 / 222-468-7
Dithiothreitol (DTT)	100 mM	3483-12-3 / 222-468-7
Ethylenediaminetetraacetic acid (EDTA)	100 mM	60-00-4/ 200-449-4
Mercaptoethanol	20 mM	37482-11-4/ 253-523-3
Potassium chloride	4 M	7447-40-7/ 231-211-8

Other substances

The following chemicals are suitable for continuous use.

Chemical	Concentration	CAS no/EC no
Acetone	10%	67-64-1/ 200-662-2
Ammonia	30%	7664-41-7/ 231-635-3
Dimethyl sulphoxide (DMSO)	5%	67-68-5/ 200-664-3
Ethanol for long-term storage	20%	75-08-1/ 200-837-3
Phosphoric acid	0.1 M	7664-38-2/ 231-633-2

8.3 Ordering information

Introduction

This section lists accessories and user replaceable spare parts available for ÄKTA pure.

Mixer

Item	Code no.
Mixer chamber 0.6 ml	28956186
Mixer chamber 1.4 ml (mounted at delivery)	28956225
Mixer chamber 5 ml (included with ÄKTA pure 150)	28956246
Mixer chamber 15 ml	28980309
O-ring 13.1 × 1.6 mm ***Note:*** *For Mixer chamber 0.6, 1.4, and 5 ml.*	28953545
O-ring 13.1 × 1.6 mm (highly resistant) (can be used as an alternative to 28953545)	29011326
O-ring 22.1 × 1.6 mm ***Note:*** *For Mixer chamber 15 ml.*	28981857
Online filter kit	18102711

Tubing

Item	Code no.
Reference capillary 1	28950749
Reference capillary 2	28950750
Tubing Kit 0.5 mm standard, ÄKTA pure 25	29011327
Tubing Kit 0.5 mm, ÄKTA pure 150	29051669
Tubing Kit 0.25 mm, ÄKTA pure 25	29011328

Item	Code no.
Tubing Kit 0.75 mm, ÄKTA pure 25	29011329
Tubing Kit 0.75 mm standard, ÄKTA pure 150	29048242
Tubing Kit 1.0 mm	29034551
Tubing kit 10×1.0 m, ETFE ID 1.0 mm OD 1/16	28980995
Tubing kit for sample inlet valve V9-IS (7-ports)	29035331
Tubing kit for sample inlet valve V9H-IS (7-ports)	29051166
Sample tubing kit for 7 inlets, i.d. 0.75 mm	28957217
Inlet tubing kit 2+2	29011330
V9-pH tubing kit	29011331
V9H-pH tubing kit standard	29051674
Tubing kit for inlet valve V9-IA (7 ports)	29011332
Tubing kit for inlet valve V9H-IA (7 ports)	29051197
Tubing kit for inlet valve V9-IB (7 ports)	29011333
Tubing kit for inlet valve V9H-IB (7 ports)	29051189
Outlet tubing kit, ÄKTA pure 25	29011334
Outlet tubing kit, ÄKTA pure 150	29048611
Rinse system tubing	29011348
Union 1/16 male/male, i.d. 0.5 mm (5-pack)	28954326
Tubing cutter	18111246
Inlet filter holder kit	11000407
Inlet filter set	11000414

Holders

Item	Code no.
Adapter for air sensor	28956342
Bottle holder	28956327

Item	Code no.
Column clamp o.d. 10–21 mm	28956319
Column holder	28956282
Column holder rod	28956270
Flexible column holder	28956295
Loop holder	29011350
Multi-purpose holder	29011349
Rail extension	29011352
Tube holder (5-pack)	28954329
Tubing holder comb	28956286
Tubing holder spool	28956274
Inlet filter holder kit	11000407
Screw lid GL45 kit	11000410

UV monitor

Item	Code no.
UV monitor **U9-L** (Fixed wavelength)	29011360
UV flow cell **U9-0.5** 0.5 mm for **U9-M**	28979386
UV flow cell **U9-2** 2 mm for **U9-M**	28979380
UV flow cell **U9-10** 10 mm for **U9-M**	28956378
UV flow cell 2 mm for **U9-L**	29011325
UV flow cell 5 mm for **U9-L**	18112824

I/O box

Item	Code no.
I/O box **E9**	29011361

Fraction collector F9-C

Item	Code no.
Fraction collector F9-C	29027743
Tubing kit for F9-C	29033632
Cassette tray	28-954209
Cassette, for deepwell plate (2-pack)	28954212
Deep well plate, 96 x 2 ml	77015200
Deep well plate, 48 x 5 ml	77015500
Deep well plate, 24 x 10 ml	77015102
Cassette, for 50 ml tubes (2-pack)	28956402
Cassette, for 3 ml tubes (2-pack)	28956427
Cassette, for 5 ml tubes (2-pack)	29133422
Cassette, for 8 ml tubes (2-pack)	28956425
Cassette, for 15 ml tubes (2-pack)	28956404
Rack, for 50 ml tubes	28980319
Rack, for 250 ml bottles	28981873
Cable 2.5 m, UniNet-9 D-type	29032425

Fraction collector F9-R

Item	Code no.
Fraction collector **F9-R**	29011362
Tube Rack Complete, 175 x 12 mm	19868403
Tube Rack Complete, 95 x 10-18 mm	18305003
Tube Rack Complete, 40 x 30 mm	18112467
Bowl	18305103
Tube support	18305402
Tube holder	18646401
Tube rack upgrade kit, 175 x 12 mm	19724202
Tube rack upgrade kit, 95 x 18 mm	19868902
Tube rack upgrade kit, 40 x 30 mm	18112468
Drive sleeve	19606702

Valves

Item	Code no.
Column valve kit **V9-C**	29011367
Column valve kit **V9H-C**	29050951
Column valve **V9-Cs**	29011355
Column valve **V9H-Cs**	29090693
Inlet valve **V9-X1**	28957227
Inlet valve **V9H-X1**	28979326
Inlet valve **V9-X2**	28957234
Inlet valve **V9H-X2**	28979328
Inlet valve kit **V9-IA**	29012263
Inlet valve kit **V9H-IA**	29050945

Item	Code no.
Inlet valve kit **V9-IB**	29012370
Inlet valve kit **V9H-IB**	29050946
Inlet valve kit **V9-IAB**	29011357
Inlet valve kit **V9H-IAB**	29089652
Sample inlet valve kit **V9-IS**	29027746
Sample inlet valve kit **V9H-IS**	29050943
Loop valve kit **V9-L**	29011358
Loop valve kit **V9H-L**	29090689
Mixer valve kit **V9-M**	29011354
Mixer valve kit **V9H-M**	29090692
Outlet valve kit **V9-O**	29012261
Outlet valve kit **V9H-O**	29050949
Outlet valve kit **V9-Os** (1 outlet)	29011356
Outlet valve kit **V9H-Os** (1 outlet)	29090694
pH valve kit **V9-pH**	29011359
pH valve kit **V9H-pH**	29051684
Versatile valve **V9-V**	29011353
Versatile valve **V9H-V**	29090691

Note: *All valve kits include the necessary tubing.*

Injection valve accessories

Item	Code no.
Sample loop 10 µl	18112039
Sample loop 100 µl	18111398
Sample loop 500 µl (mounted at delivery)	18111399
Sample loop 1 ml	18111401

Item	Code no.
Sample loop 2 ml	18111402
Sample loop 10 ml	18116124
Superloop 10 ml	19758501
Superloop 50 ml	18111382
Superloop 150 ml	18102385
Fill port	18112766
Injection kit	18111089
Connector 1/16" male and Luer female	28985812

External air sensors

Item	Code no.
Air sensor L9-1.2 mm	28956502
Air sensor L9-1.5 mm	28956500

pH monitor

Item	Code no.
pH electrode	28954215
O-ring 5.3 × 2.4 mm	28956497

Conductivity monitor

Item	Code no.
Conductivity monitor **C9**	29011363

Flow restrictor

Item	Code no.
Flow restrictor **FR-902**	18112135

Module components

Item	Code no.
Module Panel	29011364
Multi-module front	29011351
Extension box	29110806

Cables

Item	Code no.
Jumper 1 IEC 1394 (F-type)	28956489
Jumper D-SUB (D-type)	29011365
External module cable, short (F-type)	29012474
External module cable, long (F-type)	29011366
Cable 2.5 m UniNet-9 D-type	29032425

System Pumps and Sample pump S9H

Item	Code no.
P9 Seal kit 25 ml	28952642
P9 Piston kit 25 ml	28952640
P9H Seal kit 150 ml	28979373
P9H Piston kit 150 ml	28979368
Check valve kit	28979364

Item	Code no.
Sample pump S9H	29050593

Sample Pump S9

Item	Code no.
Sample pump S9	29027745
P9-S Seal kit	28960250
P9-S Piston kit	18111213
Check valve kit	28979364
Cable 2.5 m UniNet-9 D-type	29032425

UNICORN

There are different UNICORN products and licenses available for different purposes, for example licenses for use with a workstation or for working remotely. Contact your local GE salesperson for more information on UNICORN products and licenses and how to order.

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:			

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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.

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Index

A

ÄKTA pure
  illustrations, 40
Ambient environment, 62
Apply sample, 122
  sample loop, 122

C

CE
  conformity, 9
  marking, 9
Cleaning
  column, 129
  system, 128
Cold cabinet
  precautions, 117
Cold room temperature, 117
Column
  attach column holder, 110
  cleaning, 129
  connect column, 109
  pressure alarm, 114
  storage, 129
Connector ports
  placement, 78
Connect system units, 77

D

Delivery box
  instrument, 57
Dimensions
  instrument, 61
Documentation, 14

E

Emergency procedures
  emergency shutdown, 31
  power failure, 32
Environmental conditions, 62
Explosive environment, precautions, 20

F

FCC compliance, 11
Flammable liquids, precautions, 20
Flow path
  illustration, 105
  prepare, 104

G

General precautions, 18

H

Holders
  ordering information, 148

I

Important user information, 6
Inlet tubing
  prime inlets, 91, 108
  prime inlet tubing B, 91
Installation
  computer, 76
  hardware, 68
  performance test, 99
  prepare waste tubing, 80
  prime and purge pumps, 91
  site preparation, 56
  software, 87
Instrument control panel, 46
  status indications, 46
Instrument overview, 39
  exterior design, 39
  Instrument configurations, 39
  Instrument control panel, 46
  main parts, 40
  modules, 42
  operating ranges, 39

L

Log on
  UNICORN, 88

M

Maintenance program, 132
  periodic, 132
  when required, 133

Manufacturing information, 8

N

Notes and tips, 7

O

Ordering information
  cables, 153
  conductivity monitor, 152
  dummy module, 153
  external air sensors, 152
  flow restrictor, 153
  fraction collector, 150
  holders, 148
  I/O-box E9, 148
  mixer, 146
  pH monitor, 152
  pump, 154
  tubing, 147
  UV monitor, 148–149, 152
  valves, 151
Outlet tubing
  prepare, 107

P

Personal protection, 19
pH monitor
  storage of the pH electrode, 130
Power requirements, 64
Power save, 100
Prepare the system
  connect column, 109
  prime inlets, 91, 108
  purge system pumps, 91, 108
  Start UNICORN, 88
  waste tubing, 80
Pressure alarm
  set, 114
Prime inlet tubing B, 91
Process picture, 127
Pump piston rinsing system
  illustration, 83
  prime, 84
Pumps
  purge system pumps, 91, 108
Purpose of this manual, 5

R

Recycling information
  decontamination, 35
Reference information, 135
  chemical resistance guide, 139
Regulatory information, 8
Room requirements
  introduction, 59
  laboratory bench, 61
Run
  after run procedures, 128
  cold room temperature, 117
  start, 125

S

Safety notices, 7
Safety precautions
  emergency procedures, 31
  introduction, 18
  labels, 28–29
  personal protection, 132
Site preparation, 56
Software overview, 51
  software modules, 51
Space requirements, 60
Standards, 12
Storage, 58
  column, 129
  pH electrode, 130
  system, 129
System cleaning, 128
System Control module
  description, 53
  icons, 54
System preparation
  before preparation, 103
System recommendations
  computer specifications, 65
System storage, 129

T

Typographical conventions, 5

U

UNICORN, 51
  connect to system, 89
  Log on, 88
  Start, 88

System Control module, 53
Unpack the instrument, 70

W

Waste ports, 106
Waste tubing, 80
prepare, 80, 107
Weight
instrument, 61

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