ÄKTA™ pure

Operating Instructions

Original instructions

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Table of Contents

1 Introduction

About this chapter

This chapter contains important user information, description of safety notices, regulatory information and a general description of the intended use of ÄKTA pure.

In this chapter

This chapter contains the following sections:

1.1 About this manual

Purpose of the *Operating Instructions*

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

Typographical conventions

Software items are identified in the text by ***bold italic*** text. A colon separates items in a group, thus ***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 ÄKTA pure

All users must read the entire *ÄKTA pure Operating Instructions* before installing, operating, or maintaining the instrument. Always keep the *ÄKTA pure Operating Instructions* at hand when operating ÄKTA pure.

Do not operate ÄKTA pure in any other way than described in the *Operating Instructions*. Otherwise, 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 of these *Operating Instructions*.
- a user account has been created according to *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 directives and standards that are fulfilled by ÄKTA pure.

Manufacturing information

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

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

Conformity with EU Directives

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

Directive	Title
2006/42/EC	Machinery Directive (MD)
2004/108/EC	Electromagnetic Compatibility (EMC) Directive
2006/95/EC	Low Voltage Directive (LVD)
1999/5/EC	Radio Equipment and Telecommunications Terminal Equipment (R&TTE) Directive.

International standards

This product fulfills the requirements of the following standards:

Standard	Description	Notes
EN ISO 12100	Safety of machinery. General principles for design. Risk assessment and risk reduction.	EN ISO standard is harmonized with EU directive 2006/42/EC

Standard	Description	Notes
EN/IEC 61010-1, UL 61010-1, CAN/CSA C22.2 No. 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use.	EN standard is harmonized with EU directive 2006/95/EC
EN/IEC 61326-1 (Emission according to CISPR 11, Group 1, class A)	Electrical equipment for measurement, control and laboratory use - EMC requirements	EN standard is harmonized with EU directive 2004/108/EC
ETSI EN 301 489-3	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services.	EN standard is harmonized with EU directives 1999/5/EC
ETSI 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.	EN standard is harmonized with EU directive 1999/5/EC

FCC compliance

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

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

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

Environmental conformity

This product complies with the following environmental regulations.

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

CE marking

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

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

Regulatory compliance of connected equipment

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

2 Safety instructions

About this chapter

This chapter describes safety precautions, safety labels and emergency shutdown procedures for ÄKTA pure. Decommissioning information is also described.

In this chapter

This chapter contains the following sections:

2.1 Safety precautions

Introduction

The ÄKTA pure instrument is powered by mains voltage and handles pressurized liquids 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 equipment**.

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

- General precautions
- Flammable liquids
- Personal protection
- Installing and moving the instrument
- System operation
- Maintenance

Some of the safety precautions in this chapter concern modules or situations that are described in other manuals.

General precautions

WARNING

Do not operate ÄKTA pure in any other way than described in the *Operating Instructions*.

WARNING

Operation and user maintenance of ÄKTA pure should be performed by properly trained personnel only.

WARNING

Before connecting a column to ÄKTA pure, 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 of 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, nor 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 by letting the instrument equilibrate to ambient temperature.

Flammable liquids

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.

CAUTION

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

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

Moving tubes with flammable liquids. Move tubes filled with flammable liquids carefully, to prevent spillages that may come in contact with an ignition source.

Personal protection

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

Cut injuries. The tubing cutter is very sharp and must be handled with care to avoid injuries.

Installing and moving the instrument

Warnings

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.

Cautions

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.

CAUTION

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

Notices

NOTICE

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

NOTICE

Disconnect power. To prevent equipment damage, always switch off power to the ÄKTA pure instrument 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 confused with Firewire connectors. Only connect GE marked products to the **UniNet-9** connectors. Do not disconnect or move the **UniNet-9** bus cable.

NOTICE

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

System operation

Warnings

WARNING

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

Cautions

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.

Notices

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 ÄKTA pure 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.

Maintenance

Warnings

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.

Cautions

CAUTION

Disconnect power. Always switch off power to the ÄKTA pure instrument before replacing any of its components, 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

Hazardous UV light. Always switch off the power to the instrument before replacing the UV cell.

CAUTION

Always use appropriate personal protective equipment when decommissioning the equipment.

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.

Notices

NOTICE

Cleaning. Keep the ÄKTA pure instrument dry and clean. Wipe regularly with a soft damp tissue and, if necessary, a mild cleaning agent. Let the ÄKTA pure instrument dry completely before use.

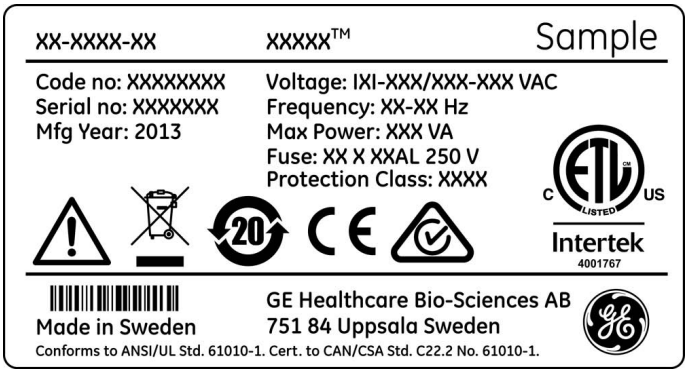
2.2 Labels

Introduction

This section describes the safety labels that are attached to the ÄKTA pure instrument. For information about marking of the computer equipment, refer to the manufacturer's instructions.

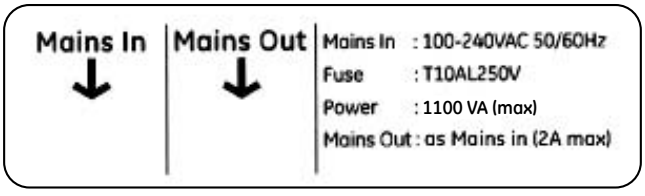
ÄKTA pure instrument label

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.



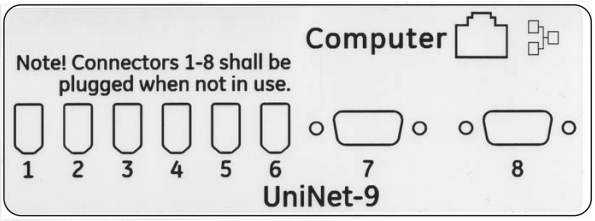
Rating label

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



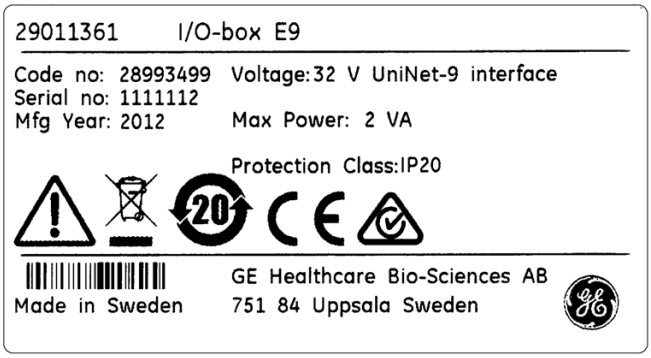
Connector label

The connector 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 underneath the I/O-box.



Safety symbols

The following safety symbols are used in the labels:

Label	Meaning
	Warning! Read the Operating Instruction before using the system. Do not open any covers or replace parts unless specifically stated in the *Operating Instructions*.

Label	Meaning
	The system complies with applicable requirements for Australia and New Zealand.
	The system complies with applicable European directives.
	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 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 might contain hazardous materials in excess of the limits established by the Chinese standard *SJ/T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products*.

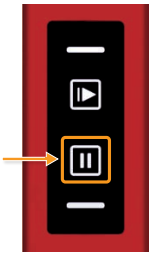
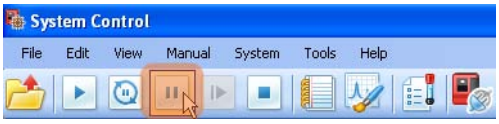
2.3 Emergency procedures

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 the time of 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.*

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 ÄKTA pure User Manual. Remember to also take into account the specifications for the computer and monitor. Refer to the manufacturers' documentation.

2.4 Recycling information

About this section

This section describes the procedures for disposal and recycling of ÄKTA pure.

Decommissioning and disposal of the equipment

When taking ÄKTA pure out of service:

- The equipment must be decontaminated.
- The components 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/T11364-2006《电子信息产品污染控制标识要求》特提供如下有关污染 控制方面的信息。

The following product pollution control information is provided according to SJ/T11364-2006 Marking for Control of Pollution caused by Electronic Information Products.

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

该标志表明本产品含有超过SJ/T11363-2006《电子信息产品中有毒有害物质的限量要求》中限量的有毒有害物质。标志中的数字为本产品的环保使用期，表明本产品在正常使用的条件下，有毒有害物质不会发生外泄或突变，用户使用本产品不会对环境造成严重污染或对其人身、财产造成严重损害的期限。单位为年。

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

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

本产品在使用寿命结束时不可作为普通生活垃圾处理，应被单独收集妥善处理。

This symbol indicates the product contains hazardous materials in excess of the limits established by the Chinese standard SJ/T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products. The number in the symbol is the Environment-friendly Use Period (EFUP), which indicates the period during which the toxic or hazardous substances or elements contained in electronic information products will not leak or mutate under normal operating conditions so that the use of such electronic information products will not result in any severe environmental pollution, any bodily injury or damage to any assets. The unit of the period is “Year”.

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

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

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

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

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

部件名称 Component name	有毒有害物质或元素 Hazardous substance					
	铅 Pb	汞 Hg	镉 Cd	六价铬 Cr6+	多溴联苯 PBB	多溴二苯醚 PBDE
29-0182-24	X	0	0	0	0	0
29-0182-25	X	0	0	0	0	0
29-0182-26	X	0	0	0	0	0
29-0182-27	X	0	0	0	0	0
29-0182-28	X	0	0	0	0	0
29-0113-61	X	0	0	0	0	0
29-0466-65	X	0	0	0	0	0
29-0466-94	X	0	0	0	0	0
29-0466-97	X	0	0	0	0	0

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

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

- 此表所列数据为发布时所能获得的最佳信息

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

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

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

3 The instrument and software

About this chapter

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

In this chapter

This chapter contains the following sections:

3.1 ÄKTA pure instrument overview

Introduction

This section shows 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.

Instrument 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 of ÄKTA pure 25 and ÄKTA pure 150.

ÄKTA pure

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

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 one or more optional modules may be added to the flow path.

The table below contains information on the core modules and the optional modules of ÄKTA pure 25 and ÄKTA pure 150. The sections that follows contain descriptions of the modules.

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**
Column valves	**V9-C**	**V9H-C**
	V9-Cs	**V9H-Cs**
pH valve	**V9-pH**	**V9H-pH**

Module	Label in	
	ÄKTA pure 25	ÄKTA pure 150
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 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.

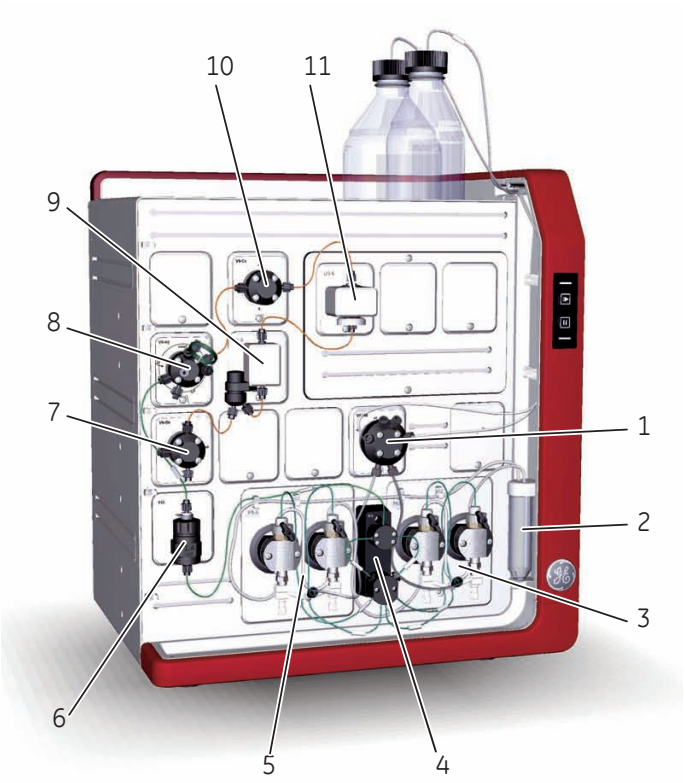
Optional modules

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.

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 ÄKTA pure that consists of the modules and parts shown in the illustration below.

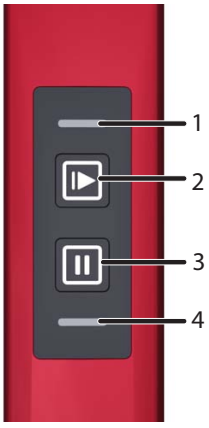


Part	Function
1	Inlet valve
2	Pump rinsing liquid tube
3	System pump B
4	Pressure monitor
5	System pump A
6	Mixer
7	Outlet valve

Part	Function
8	Injection valve
9	Conductivity monitor
10	Column valve
11	UV monitor

Illustration of 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.

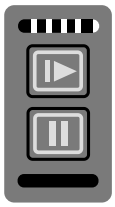


Part	Function
1	**Power/Communication** indicator (white)
2	**Continue** button with a green light indicator
3	**Pause** button with an orange light indicator
4	**Alarm and error** indicator (red)

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

This chapter contains the following sections:

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. Real-time flow scheme shows current flow path, valve positions, and monitor values.
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***.

3.2.2 System Control module

Introduction

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

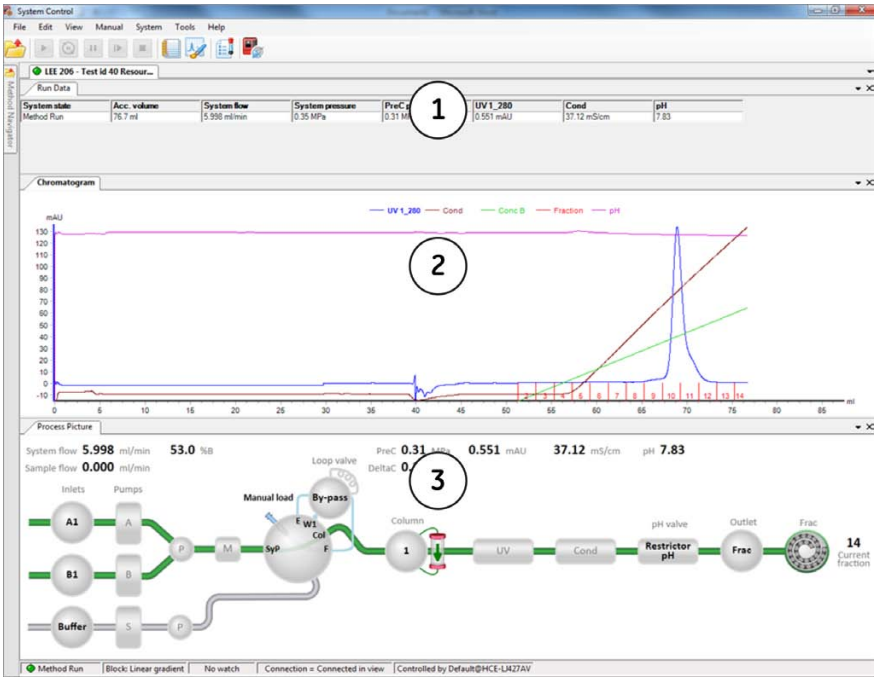
System Control panes

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.

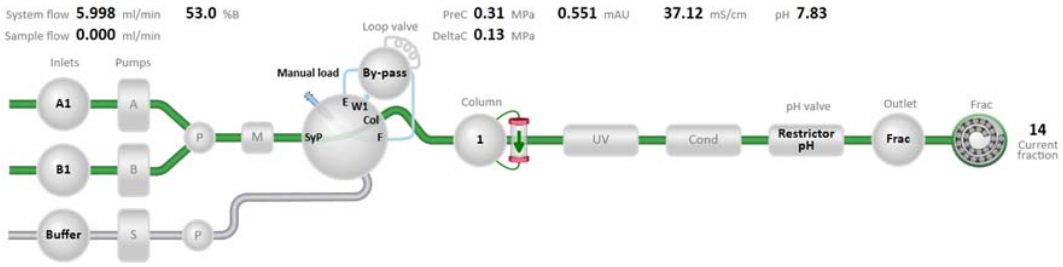
The current flow path is illustrated in the ***Process Picture*** (3), which allows manual interactions with the system and provides feedback on run parameters.



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

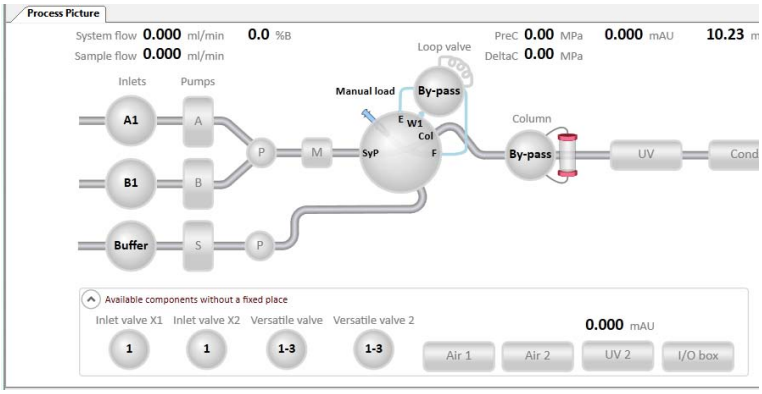
Process picture

The ***Process Picture*** displays the current flow path, run parameters and real-time data from monitors during a run. It also allows manual interactions with the system. Color indication is applied in the ***Process Picture***, as is shown in the following illustration and described in the following table.



Color	Indication
Green	Open flow path with flow.
Grey	Closed flow path or an open path without flow.
Blue	Syringe port in loop open for manual injection.

Modules without a fixed place in the system are shown in a panel below the process picture (modules are called components in the process picture):



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 where curve settings, run data groups and run log contents can be set.		***Connect to Systems***. Opens the ***Connect to Systems*** dialog 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:

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. The time spent in preparing the laboratory will contribute to the long term performance of the system.

In this section

This section contains the following subsections:

4.1.1 Delivery and storage

Introduction

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

CAUTION

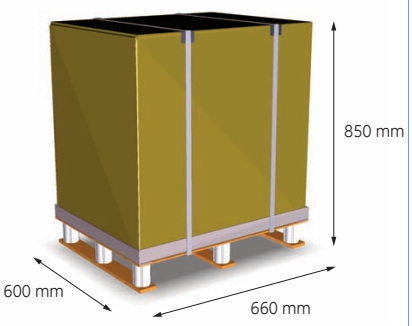
Heavy object. Use proper lifting equipment, or use two or more persons when moving the instrument. All lifting and moving must be performed in accordance with local regulations.

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

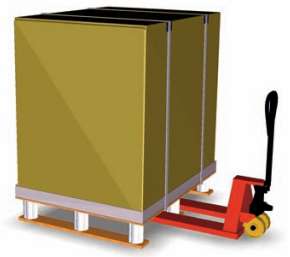
Storage requirements

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.

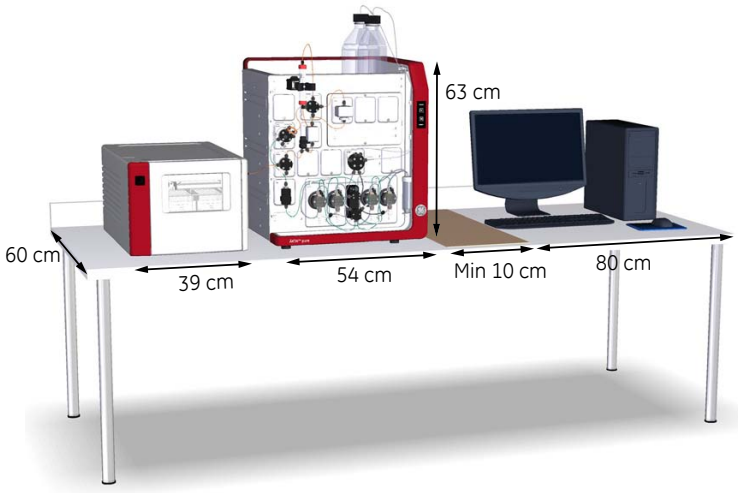
Transportation route

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.



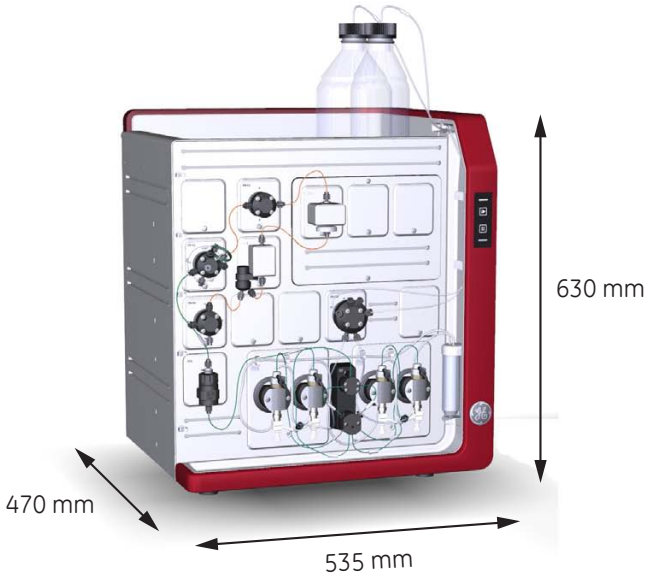
Laboratory bench

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

Equipment weight

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

ÄKTA pure dimensions



4.1.3 Site environment

Introduction

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

Operating conditions

The following requirements must be fulfilled:

- The instrument is intended for indoor use only.
- The room must have exhaust ventilation.
- The instrument should not be exposed to direct sunlight.
- Dust in the atmosphere should be kept to a minimum.

Allowed operating conditions are specified in the table below.

Parameter	Allowed range
Ambient temperature, operating	4°C to 35°C
Ambient temperature, storage	-25°C to +60°C
Relative humidity, operating	20% to 95%, non condensing
Altitude	Maximum 2000 m
Pollution degree	2

Note: *Do not use buffers with a freezing point close to or below the temperature in the room or in the cold room cabinet.*

Heat output

The heat output data is listed in the table below.

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

Component	Heat output
Total	*Typically 600 W* *Maximum 900 W*

4.1.4 Power requirements

Introduction

This section describes the power supply requirements for ÄKTA pure.

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

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

Requirements

The table below specifies the power requirements.

Parameter	Requirement
Supply voltage	100-240 V ~ ±10%
Frequency	50/60 Hz
Transient level	Overvoltage category II

Parameter	Requirement
Typical power consumption	300 VA in state ***Run*** 165 VA in state ***Ready*** 25 VA in state ***Power-save***
Maximum 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.

Quality of power

The mains power supply must be stable and conform to specifications at all times to ensure reliable operation of ÄKTA pure. There should be no transient or slow changes in average voltage outside the limits specified above.

4.2 Hardware installation

Introduction

This section describes the installation procedure for ÄKTA pure.

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.

In this section

This section contains the following subsections:

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.

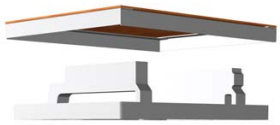
> **CAUTION**
>
> **Heavy object**. Use proper lifting equipment, or use two or more persons when moving the instrument. All lifting and moving must be performed in accordance with local regulations.

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.

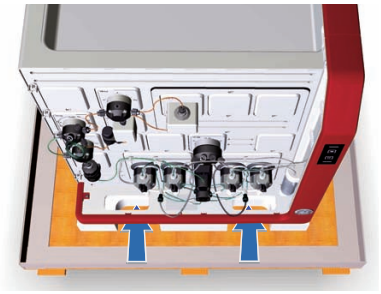
Step	Action
2	Lift off and remove the lid and protective foam.

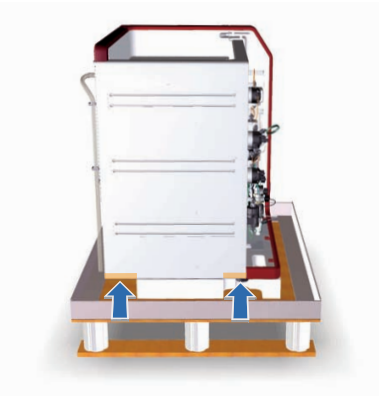


3	Check the contents in the Buffer tray, and lift off the packages from the tray.
4	Lift off the cardboard hood and remove the protecting material from the instrument.

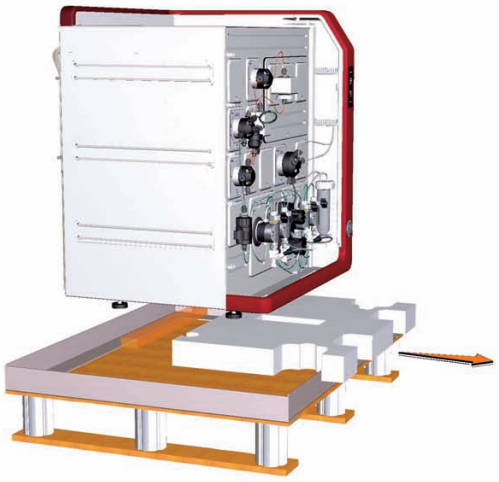
Step	Action
5	Lift off the tray on the wet side on the front of the instrument to access the instrument handles.

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.

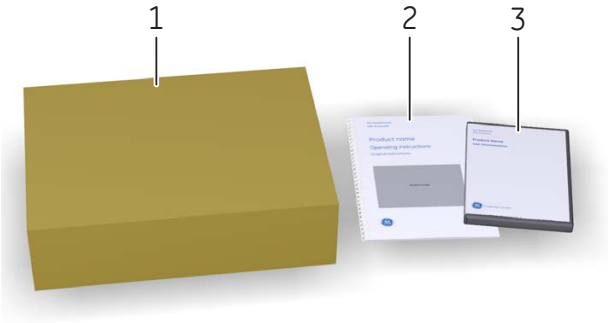


8	Dispose of the packaging material in accordance with local regulations.

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 either:

- Supplied as a part of the ÄKTA pure delivery
- Supplied locally

Unpacking and installing

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

NOTICE

Any computer used with the equipment shall 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

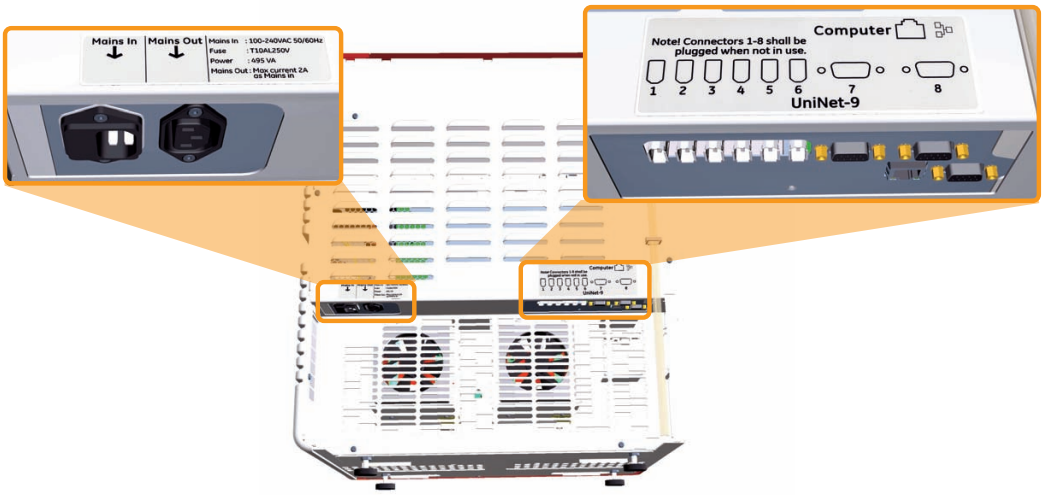
Only use grounded power cords delivered or approved by GE.

CAUTION

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

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 **Power** 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 network connector (Ethernet) on the back of the instrument and the computer network card. The illustration below shows the symbol of the Ethernet 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 Prepare waste tubing

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.

Instructions

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

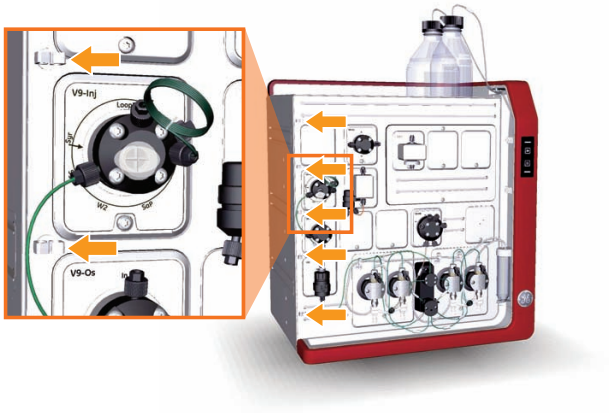
Make sure that the waste vessel will hold all the produced volume of the run. For ÄKTA pure, a suitable waste vessel should typically have a volume of 2 to 10 liters.

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:

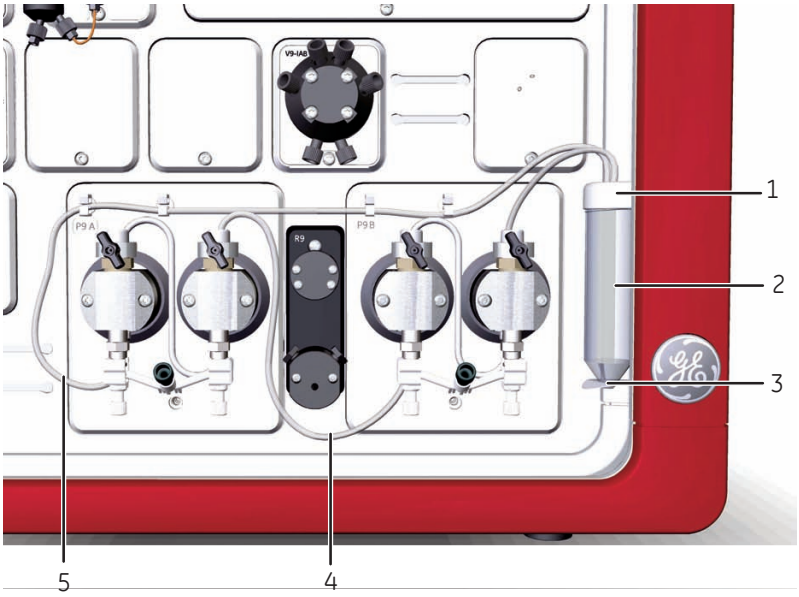
If the tubing is too short, replace it with new tubing. Do not lengthen the tubing as this might cause obstruction of the tubing.

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.

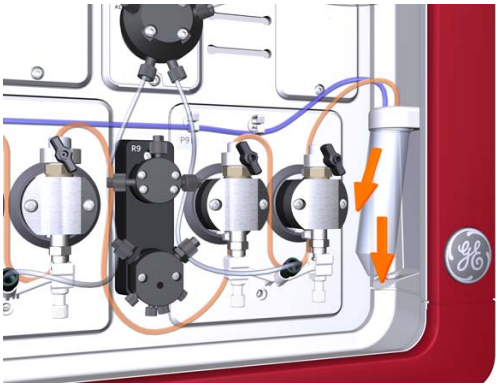


Part	Description
1	Pump rinsing liquid tube holder, top
2	Pump rinsing liquid tube
3	Pump rinsing liquid tube holder, bottom
4	Outlet tubing
5	Inlet tubing

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.

Detailed information about software installation and configuration is available in the Administration and Technical Manual.

Software installations

UNICORN can be installed as listed below:

- a complete UNICORN installation on a stand-alone workstation (Full installation)
- a UNICORN database and license server (Custom installation)

  and
- UNICORN software client and instrument server software on a network client station (Custom installation).

It is also possible to:

- define a system as part of the installation
- configure E-licenses
- configure Windows settings necessary for the UNICORN process pictures in a network deployment
- configure firewall settings, when necessary
- upgrade UNICORN
- remove UNICORN installations

  and
- set up a system printer.

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.

Start UNICORN and log on

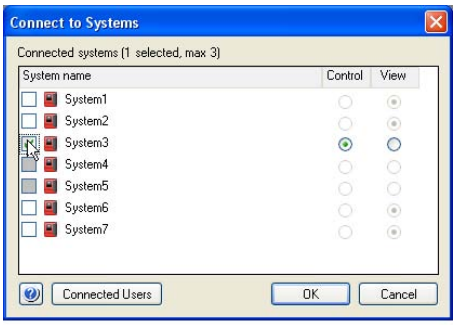
Follow the instructions to start UNICORN and log on to the program. A valid e-license must be available for the workstation. See Administration and Technical Manual for more information about e-licenses.

Step	Action
1	Double-click the UNICORN icon on the desktop. *Result*: The ***Log On*** dialog opens. ***Note:*** *If there is no connection to the database it is still possible to log on to UNICORN and control a running system. The* ***Log On*** *dialog will give the option to start* ***System Control*** *without a database. Click* ***Start System Control*** *to proceed to the next* ***Log On*** *dialog.*

Step	Action
2	In the ***Log On*** dialog: • 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.

Step	Action
1	In the ***System Control*** module, click the ***Connect to Systems*** button.  *Result:* The ***Connect to Systems*** dialog opens. 
2	In the ***Connect to Systems*** dialog: • 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

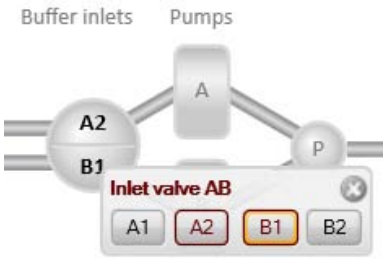
Tip: *The procedures for purging the pump heads and priming the inlets using the **Process Picture**, are described below. It is also possible to perform the procedures from the **Manual instructions** dialog.*

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.

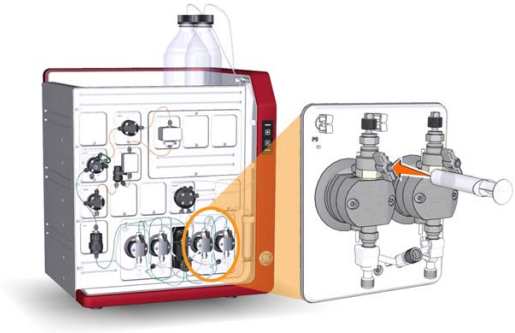
Step	Action
1	Make sure that all inlet tubing that is to be used during the method run is placed in the correct buffer.
2	Open the ***System Control*** module.

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.



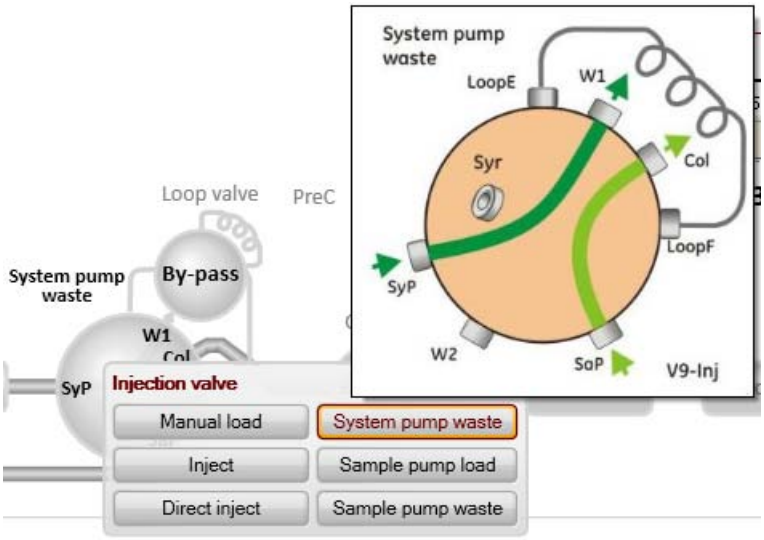
5	Open the purge valve by turning it counter-clockwise about three quarters of a turn. Draw liquid slowly into the syringe until the liquid reaches the pump.
6	Close the purge valve by turning it clockwise. Disconnect the syringe and discard its contents.

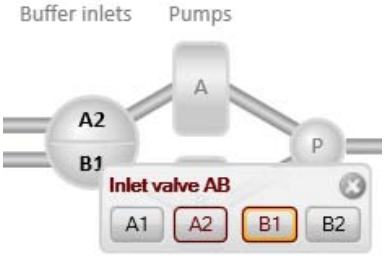
Step	Action
7	Repeat steps 3 to 6 for each piece of inlet tubing that is to be used during the run.

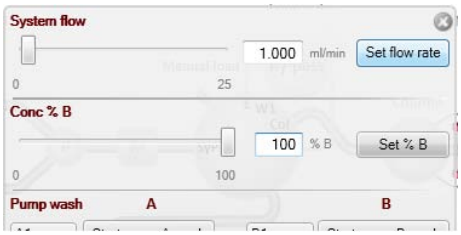
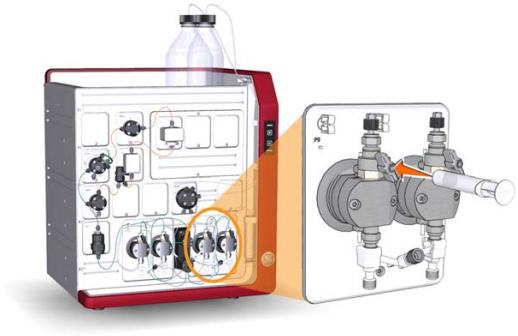
Purge System pump B

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

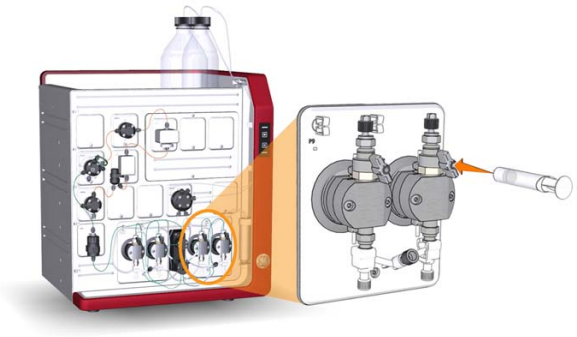
Step	Action
1	Make sure that the piece of waste tubing connected to the Injection valve port **W1** is placed in a waste vessel.
2	In the ***Process Picture***: • Click on the ***Injection valve*** and select ***System pump waste***. *Result:* The Injection valve switches to waste position. This is necessary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

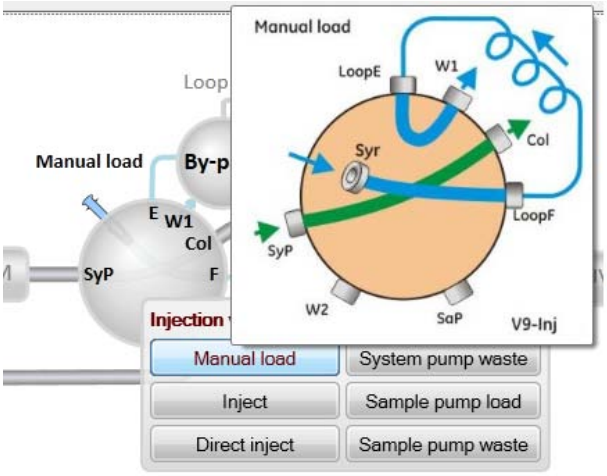
Step	Action
9	Connect the syringe to the purge valve on the right pump head of System pump B, and repeat steps 6 to 8. Keep the system flow running.



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 84*, 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 87* to check if there is air left in the pump.

End the run

Click the ***End*** icon 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 ÄKTA pure User Manual for further instructions.

4.7 Activate Power-save

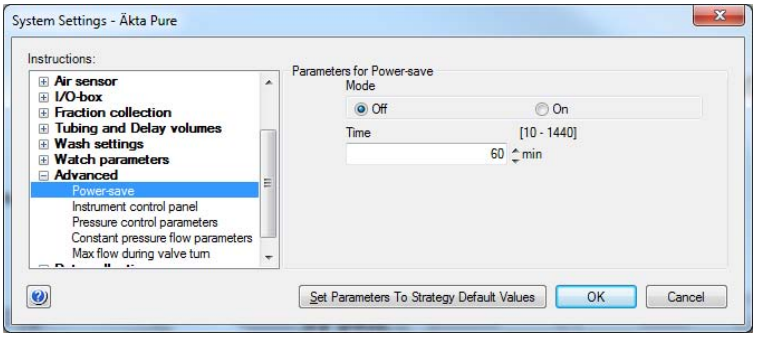
Introduction

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.

WARNING

Do not use ÄKTA pure if it is not working properly, nor 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 during operation and maintenance of ÄKTA pure system.

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.

In this chapter

This chapter contains the following sections:

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

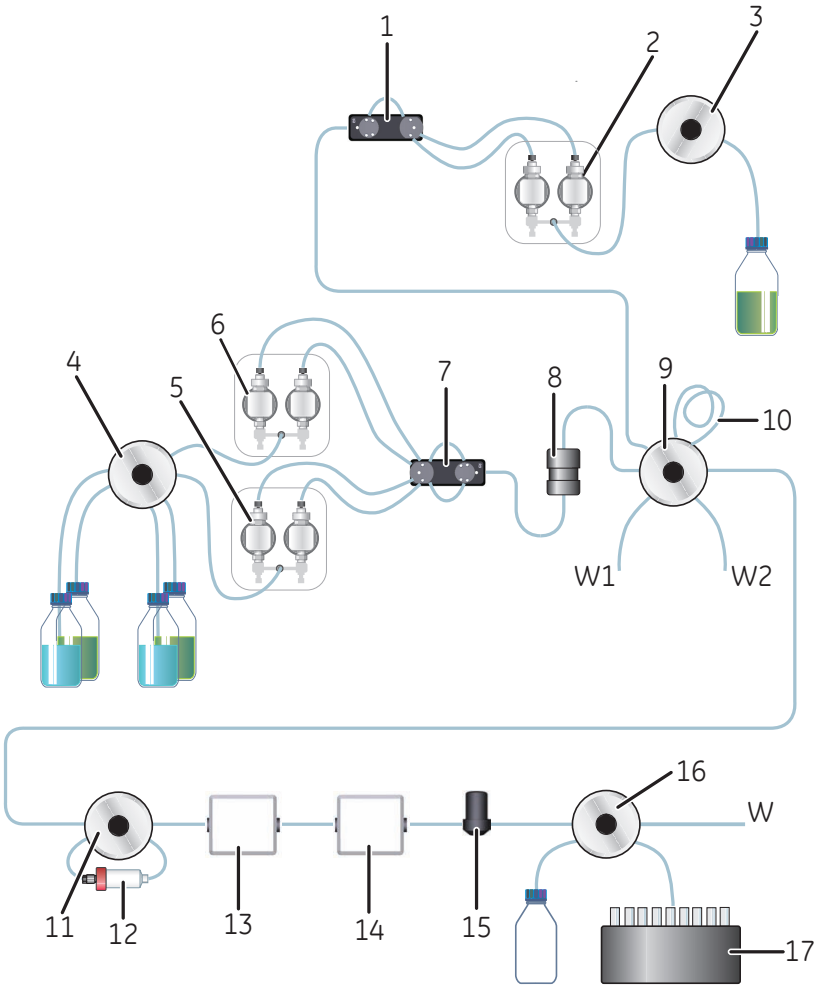
Avoid spillage and overflow. Make sure that the system is prepared according to the settings in the method to be run. For example make sure that the waste tubing is inserted in an appropriate waste container and secured in place.

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.

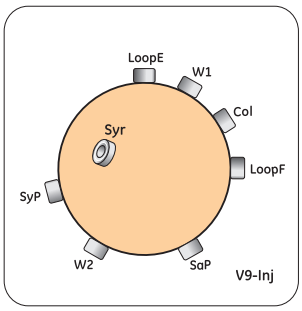


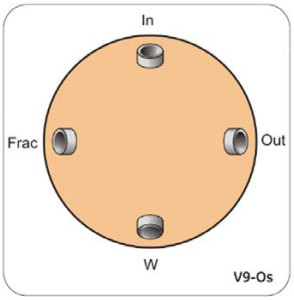
Part	Description
1	Pressure monitor
2	Sample pump
3	Sample inlet valve

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 Prepare waste tubing, on page 71*.

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 82*.

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 105* for more information on pressure alarms.

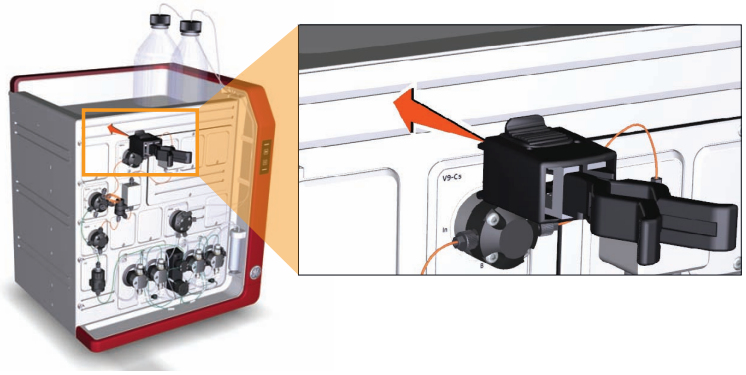
Note: *Do not overtighten when connecting columns. Overtightening might rupture the connectors or squeeze the tubing and thereby result in high back pressure.*

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**.

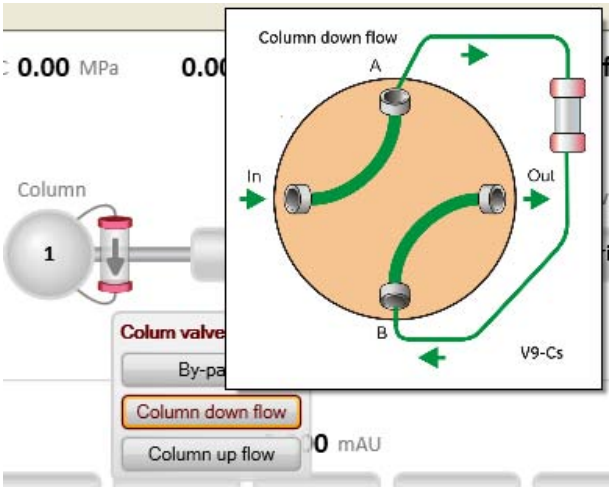
Step	Action
1	Attach an appropriate column holder to the rail on the instrument.



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***.

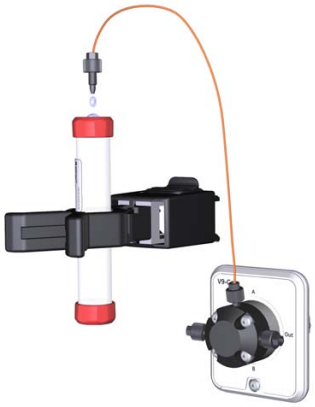


Result: The Column valve switches to position ***1***.

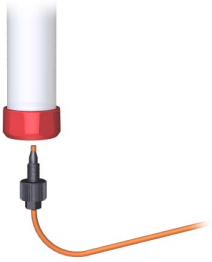
6	In the ***Process Picture***: • Click on the ***Pumps***. • Enter a low ***System flow*** (e.g., 0.2 ml/min). • Click ***Set flow rate***.

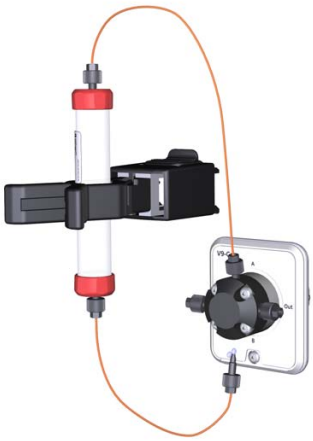
Result: A system flow of 0.2 ml/min starts.

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.

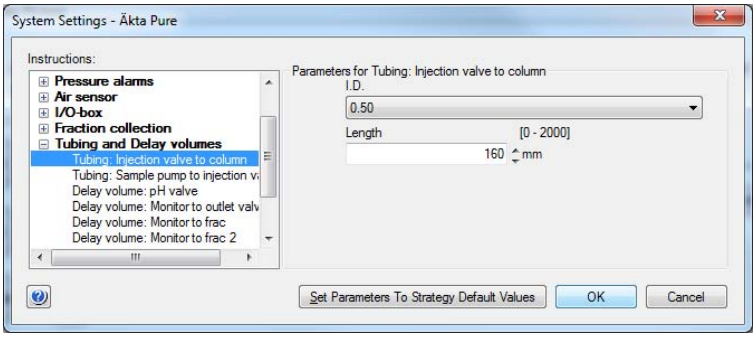
See the instructions below to set the pressure alarm for the column to be used in the run and, if applicable, to set the parameters for the tubing dimensions.

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.

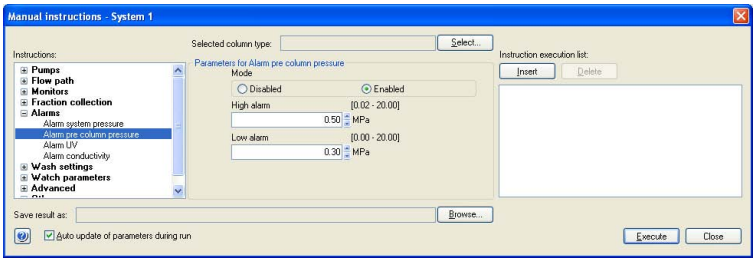
For some columns the max delta-column pressure (media) is significantly lower than the max pre-column pressure (hardware). To protect the media if a delta-column pressure measurement is not available (that is, when column valve **V9-C** or **V9H-C** is not used), the pre-column pressure alarm must be 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:

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

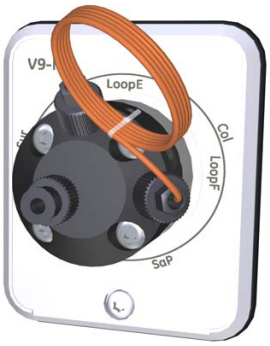
A number of different sample application techniques are available. This section describes sample application using a syringe to manually fill a s loop. The two stages of the sample application are described in the table below. For detailed instructions and information regarding the different sample applications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

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

How to fill a sample loop

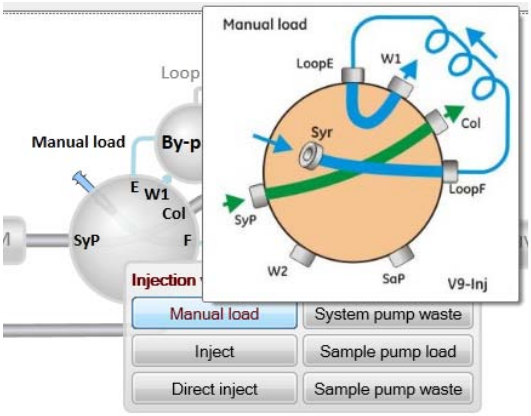
Follow the instructions below to fill the sample loop with sample.

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***.

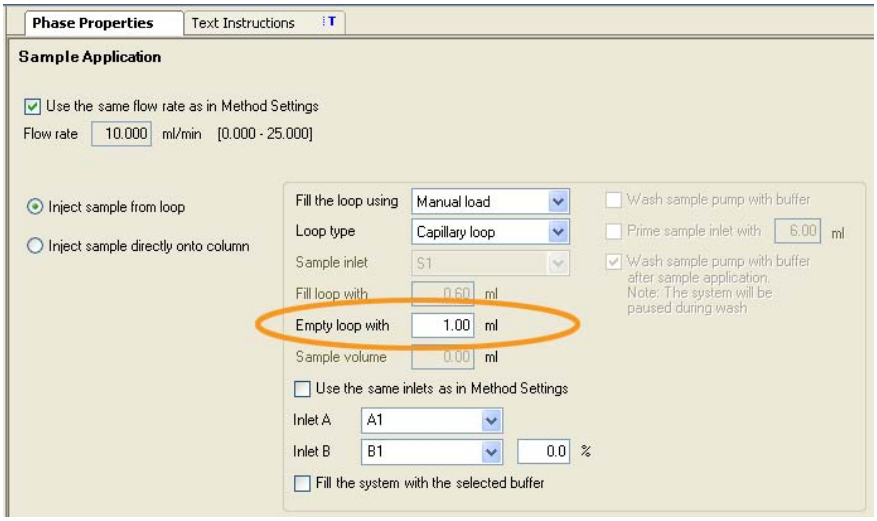


Result: The injection valve switches to manual load position.

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 116*. 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.*

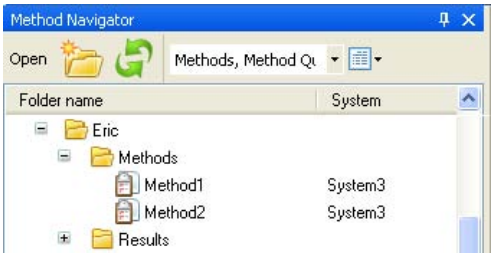
6.3 Start a method run

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

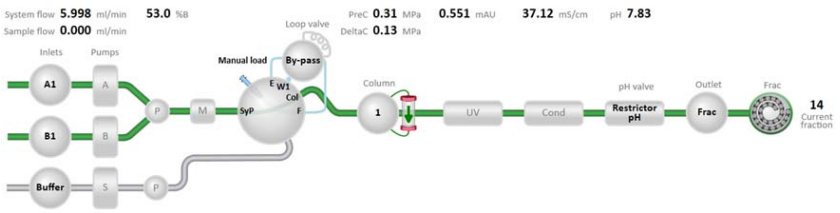
You may follow the on-going method run in the ***System Control*** module. The current system status is shown in the ***System state*** panel in the ***Run Data*** pane. For example, it may state ***Run***, ***Wash*** or ***Hold***.

See *Section 3.2.2 System Control module, on page 46* 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 System Handbook*.

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.

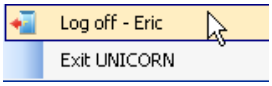
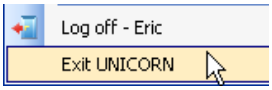
In the following situations, in order to increase the lifetime of the pH electrode, use the ***By-pass*** position and store the electrode in storage solution inside the pH flow cell:

- 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 System Handbook.

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 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

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:

8.1 System specifications

System specifications

Parameter	Data
System configuration	Benchtop system, external computer
Control system	UNICORN 6.4 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

Parameter	Data
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
	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 ÄKTA pure User Manual. *Section 8.2 Chemical resistance guide, on page 130*

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 specifies the chemical resistance of ÄKTA pure to some of the most commonly used chemicals in liquid chromatography.

Biocompatibility

ÄKTA pure 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.

Long time use of 0.2 M HCl connected to the Quaternary valve as part of a ***BufferPro*** recipe is acceptable. The solution becomes diluted further down in the system.

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%.*

List of chemicals

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

Continuous use.

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

Strong chemicals and salts for CIP

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
Sodium hydroxide/ethanol	1 M/40%	N/A

Chemical	Concentration	CAS no/EC no
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 130*

Solubilization and denaturing agents

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
TRITON™ X-100	1%	9002-93-1
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)

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
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.

Note: *Quaternary valve is not resistant*.

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 (code no 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)

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

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

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 Check/Change the Node ID of a module

Introduction

Node ID is a unit number designation that is used by the instrument to distinguish between several units of the same type. All standard valves and available optional modules are pre-configured to give the desired function. However, the function of a valve or module can be changed by changing the Node ID. Also, in a troubleshooting situation it may be useful to check a valve's or module's Node ID.

Note: *The function of a valve or module is defined by its Node ID, not by its physical position.*

Node ID for core modules

The table below lists the Node ID for the core modules.

Core module	Label	Node ID
System pump A	**P9 A** / **P9H A**	0
System pump B	**P9 B** / **P9H B**	1
Pressure monitor	**R9**	0
Mixer	**M9**	0
Injection valve	**V9-Inj** / **V9H-Inj**	4

Node ID for optional modules

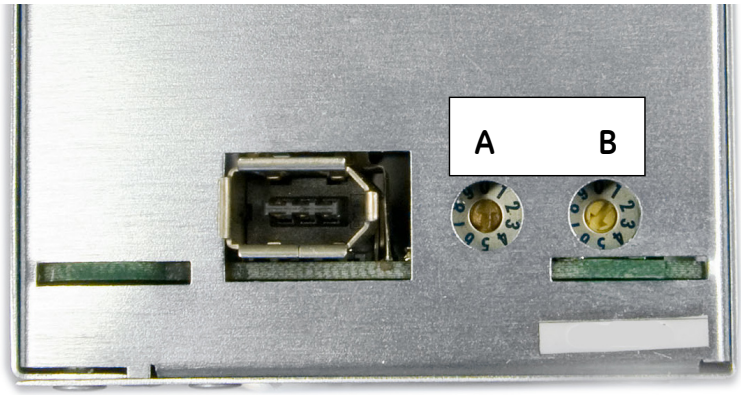
The table below lists the Node ID for the optional modules.

Module	Label	Node ID
Inlet valve A	**V9-IA** / **V9H-IA**	0
Inlet valve B	**V9-IB** / **V9H-IB**	1
Inlet valve AB	**V9-IAB** / **V9H-IAB**	3
Inlet valve X1	**V9-IX** / **V9H-IX**	15
Inlet valve X2	**V9-IX** / **V9H-IX**	16
Mixer valve	**V9-M** / **V9H-M**	22

Module	Label	Node ID
Sample inlet valve	**V9-IS** / **V9H-IS**	2
Loop valve	**V9-L** / **V9H-L**	17
Column valve (5-columns)	**V9-C** / **V9H-C**	5
Pre-column pressure monitor	N/A	2
Post-column pressure monitor	N/A	3
Column valve (1-column)	**V9-Cs** / **V9H-Cs**	7
pH valve	**V9-pH** / **V9H-pH**	11
Outlet valve (10-outlets)	**V9-O** / **V9H-O**	8
Outlet valve (1-outlet)	**V9-Os** / **V9H-Os**	19
Versatile valve	**V9-V** / **V9H-V**	20
Versatile valve 2	**V9-V** / **V9H-V**	21
Versatile valve 3	**V9-V** / **V9H-V**	23
Versatile valve 4	**V9-V** / **V9H-V**	24
UV monitor (fixed)	**U9-L**	0
UV monitor 2nd	**U9-L**	1
UV monitor (variable)	**U9-M**	0
UV detector	**U9-D**	0
Conductivity monitor	**C9**	0
External air sensor	**L9**	0
External air sensor 2	**L9**	1
External air sensor 3	**L9**	2
External air sensor 4	**L9**	3
Fraction collector (cassettes)	**F9-C**	0
Fraction collector (round)	**F9-R**	0
Fraction collector (round), 2nd	**F9-R**	1
Sample pump	**P9-S** / **P9H S**	2
I/O-box	**E9**	0

Module	Label	Node ID
I/O-box, 2nd	**E9**	1

Check/Change the Node ID

Step	Action
1	If applicable, remove the module according to the instruction in ÄKTA pure User Manual.
2	The Node ID of a module is set by the position of an arrow on a rotating switch at the back of the module. Valve modules have two rotating switches, as shown in the image below: • the first switch, labeled **A**, sets the tens and • the second switch, labeled **B**, sets the units. For example, to set the Node ID to **6** for a valve module, switch **A** is set to **0** and switch **B** is set to **6**. 
3	Check the Node ID and compare it with the listed Node IDs in the tables above.
4	To change the Node ID, use a screw driver to set the arrows of the switches to the desired number.
5	Re-install the module in the instrument, if applicable.

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29-0229-97 AE 01/2015 a2028