ÄKTA™ flux 6

Operating Instructions

Original instructions

Table of Contents

           ÄKTA flux 6 Operating Instructions 29046896 AC

1 Introduction

About this chapter

This chapter contains important user information, descriptions of safety notices, regulatory information, and intended use of ÄKTA flux 6.

In this chapter

This chapter contains the following sections:

1.1   About this manual

Purpose of this manual

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

Typographical conventions

Software items are identified in the text by **_bold italic_** text. A colon separates menu levels, thus **_File:Open_** refers to the **_Open_** command in the **_File_** menu.

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

1.2 Important user information

Read this before operating the product

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

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

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

Intended use of ÄKTA flux 6

ÄKTA flux 6 is intended for research and process development use, as well as small scale pharmaceutical production.

The system is configurable for operating hollow fiber cartridges suited for microfiltration applications, such as cell clarification/harvesting, or cassettes/hollow fibers for ultrafiltration applications, such as protein concentration and diafiltration in downstream unit operations.

ÄKTA flux 6 is not intended for diagnostic purposes.

Prerequisites

In order to operate ÄKTA flux 6 safely and according to the intended purpose, the following prerequisites must be met:

- You should be acquainted with handling of biological materials.

- You must read and understand the Safety instructions chapter of these *Operating Instructions*.

- The system must be installed according to the instructions in *Chapter 5 Installation, on page 72*.

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 flux 6.

Manufacturing information

The table below summarizes the required manufacturing information.

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

In this section

1.3.1   EU Directives

Conformity with EU Directives

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

A copy of the EU Declaration of Conformity is included in the documentation package.

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

CE marking

ϵ

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

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

1.3.2   Eurasian Customs Union

Introduction

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

Manufacturer and importer information

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

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

1.3.3 Regulations for USA and Canada

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.

1.3.4 Other regulations and standards

Introduction

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

Environmental Conformity

Directive	Title
2012/19/EU	Waste Electrical and Electronic Equipment (WEEE) Directive
China RoHS	Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products.

Biological and chemical compatibility

The Wetted parts of the ÄKTA flux system/instrument/column meet the material requirements of the following standards and regulations:

Requirement	Description
USP <88> Class VI	Material requirements from United States Pharmacopeia. Biological Reactivity Tests, "In Vivo".
EMEA/410/01	Guidance on minimizing the risk of transmitting animal spongiform encephalopathy agents via human and veterinary medicinal products. Animal origin-free material.
21 CFR 177	Indirect food additives: Polymers

Regulatory compliance of connected equipment

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

Standards, machinery and electrical equipment

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

Standard	Description
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 61326-1	EMC emissions and immunity requirements for electrical equipment for measurement, control and laboratory use. Emission according to CISPR 11, Group 1, class A **NOTICE** This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.
EN ISO 12100	Safety of machinery. General principles for design. Risk assessment and risk reduction
ICES-001	Industrial, Scientific and Medical (ISM) Radio Frequency Generators (Canada)

1.4   Associated documentation

Introduction

This section describes the user documentation that is delivered with the product, and how to find related literature that can be downloaded or ordered from GE.

Data files, application notes and user documentation on the web

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

Step	Action
1	Go to www.gelifesciences.com/aktaflux.
2	Select **ÄKTA flux 6** from the list.
3	Click **Related Documents**.
4	Select to download the chosen literature.

2   Safety instructions

About this chapter

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

Important

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

In this chapter

This chapter contains the following sections:

2.1   Safety precautions

Introduction

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

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

General precautions

WARNING

Operation and user maintenance of ÄKTA flux 6 should be performed by properly trained personnel only.

WARNING

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

> **WARNING**
>
> **Risk assessment**. Perform a risk assessment for any risks due to the process or process environment. Evaluate the effects the use of the product and the operational processes may have on the classification of the hazardous area. The process might cause the area to increase or the zone classification to change. Implement the risk reduction measures needed, including use of personal protective equipment.

> **CAUTION**
>
> ÄKTA flux 6 is designed for indoor use only.

> **CAUTION**
>
> Always use appropriate personal protective equipment when decommissioning the equipment.

Personal protection

> **WARNING**
>
> Always use appropriate Personal Protective Equipment (PPE) during operation and maintenance of ÄKTA flux 6.

> **WARNING**
>
> When using hazardous chemical and biological agents, take all suitable protective measures, such as wearing protective glasses and gloves resistant to the substances used. Follow local and/or national regulations for safe operation and maintenance of ÄKTA flux 6.

WARNING

Use fume mask during tank opening when processing hazardous liquids, to avoid possible exposure to aerosols.

WARNING

Hot circulating fluids in ÄKTA flux 6 may cause hot fluidic lines, hot tank and hot chassis components.

CAUTION

Risk of pinching by moving parts inside the tank or inside the pumps. Do not insert your fingers or other objects into the tank or other moving parts while ÄKTA flux 6 is powered.

Flammable liquids and explosive environment

WARNING

ÄKTA flux 6 is **not approved** to handle flammable liquids.

WARNING

ÄKTA flux 6 is **not approved** for work in a potentially explosive atmosphere, in areas classified as Zone 0 to Zone 2 according to IEC 60079-10 2002. ÄKTA flux 6 does not fulfill the requirements of the ATEX Directive.

WARNING

Some of the chemicals used with ÄKTA flux 6 columns may be flammable under certain conditions. Make sure to use chemicals only under conditions where they are not flammable. Refer to local and/or national classifications of flammable liquids.

Installing and moving

CAUTION

Before moving ÄKTA flux 6 the following must be done:

1 Empty ÄKTA flux 6.

2 Shut down ÄKTA flux 6 and disconnect the power cord.

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.

WARNING

Disconnect power to ÄKTA flux 6 before installation of the optional pump.

WARNING

Before connecting the filter to ÄKTA flux 6, read the instructions for use of the filter. To avoid exposing the filter to excessive pressure, make sure that the pressure limit is set to the specified maximum pressure of the filter.

CAUTION

Handle tank with care.

• Make sure the tank is not damaged or dropped during handling.

• Do not install or remove the tank in any other way than described in this manual.

CAUTION

Whenever packing, unpacking, transporting or moving ÄKTA flux 6, wear:

- Protective footwear, preferably with steel lining.

- Working gloves, protecting against sharp edges.

- Protective glasses.

CAUTION

Do not transport, handle and store ÄKTA flux 6 in any other way than described in this manual.

CAUTION

Two persons are required to lift ÄKTA flux 6. Lift only in the bottom part of the system.

CAUTION

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

CAUTION

Make sure your fingers not are pinched under ÄKTA flux 6 when the instrument is placed onto a bench.

CAUTION

Use only tubing supplied by GE.

CAUTION

Take care not to drop the optional pump assembly during installation as it may result in damage to the unit or injury to yourself.

CAUTION

Avoid that the filter falls when installing filters.

- Handle filter with care.

- Do not install or remove the filter in any other way than described in this manual.

CAUTION

Because of the weight of the KvickLab Cassette Holder ll, great care must be taken not to cause squeezing or crushing injuries during movement. To prevent injury from dropping a cassette holder on your feet or hands, make sure you have a secure, controlled grip, or the proper equipment to move the cassette holder.

Wear safety shoes.

CAUTION

Make sure that the USB port is protected from moisture and liquid by always having a protective cap on.

Power supply

WARNING

National Codes and standards (NEC, VDE, BSI, IEC, UL etc.) and local codes outline provisions for safely installing electrical equipment. Installation must comply with specifications regarding wire types, conductor sizes, plugs, branch circuit protection and disconnect devices. Non-compliance may result in personal injury and/or equipment damage.

WARNING

All electrical installations must be performed by authorized personnel only unless stated in this manual.

WARNING

The supply voltage must correspond to the markings on the system.

WARNING

ÄKTA flux 6 must always be connected to a grounded power outlet.

WARNING

Only use grounded power cords delivered or approved by GE.

WARNING

Always disconnect power to ÄKTA flux 6 before replacing fuses.

System operation

WARNING

Do not use ÄKTA flux 6 if it is not working properly, or if it has suffered any damage, for example:

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

WARNING

All alarm signals must be set within the limits specified in the system documentation. Pressure and temperature control must be activated while the system is in use to prevent the tubing system to leak or break.

WARNING

Never exceed the operating limits stated in this document and on the system label. Operation of the product outside these limits can damage equipment and cause personal injury or death.

WARNING

Disconnect power to ÄKTA flux 6 before installing the pump tubing.

WARNING

Before connecting the filter to ÄKTA flux 6, read the instructions for use of the filter. To avoid exposing the filter to excessive pressure, make sure that the pressure limit is set to the specified maximum pressure of the filter.

WARNING

Make sure that the filter is installed according to instructions for use of the filter.

WARNING

Never block the outlet tubing and/or the check valves outlet with, for example, stop plugs, since this will create overpressure or hardware failure and may result in injury.

WARNING

Make sure integrity of flowpath through pre-run with harmless liquids before use and sanitization.

CAUTION

Let ÄKTA flux 6 cool down after use as the components and internal compartments may become hot during use.

> **CAUTION**
>
> Handle fluids with care when adding fluid to the system or collecting fluid from drain valves. Always use appropriate Personal Protective Equipment (PPE) when operating and interacting with ÄKTA flux 6.

> **CAUTION**
>
> Make sure the control valve is released when there is no active filtration.

Maintenance

> **WARNING**
>
> All repairs should be done by service personnel authorized by GE. Do not open any covers or replace parts unless specifically stated in this operating instruction.

> **WARNING**
>
> Disconnect the power supply to the system before performing any form of maintenance on ÄKTA flux 6. Only personnel authorized by GE may perform maintenance other than maintenance procedures described in ÄKTA flux user documentation. The power supply unit contains high voltage that may cause injury or death.

> **WARNING**
>
> Maintenance should be scheduled regularly with GE to assure a proper function of the system.

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

WARNING

When using hazardous chemicals, run **System CIP** and **Membrane CIP** to flush the entire system, including filters, with distilled water until a pH of approximately pH 7.0 is reached, before performing service or maintenance.

WARNING

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

WARNING

Periodically inspect the system's tubing, gaskets, seals, and connections for wear and damage to prevent leaks and the release of potentially hazardous fluids.

WARNING

Before maintenance/service is performed, the system owner must first clean the system and complete a Health & Safety Declaration Form . Contact GE for further information.

CAUTION

To prevent exposure to leaking hot fluids:

- Do not use non-approved tubing and components together with or inside the system.

- Maintenance and pump tubing replacement of the ÄKTA flux 6 must be scheduled on regular basis with a GE representative and performed by properly trained personnel only.

- Always use appropriate Personal Protective Equipment (PPE) when operating and interacting with ÄKTA flux 6.

> **CAUTION**
>
> Changing of tubing exposes operator to residual fluid that may cause contamination of skin and clothing. Always use appropriate Personal Protective Equipment (PPE) when operating and interacting with ÄKTA flux 6.

Service

> **WARNING**
>
> Decontaminate the equipment before service to make sure that hazardous residues are removed.

Decommissioning

> **WARNING**
>
> Decontaminate the equipment before decommissioning to make sure that hazardous residues are removed.
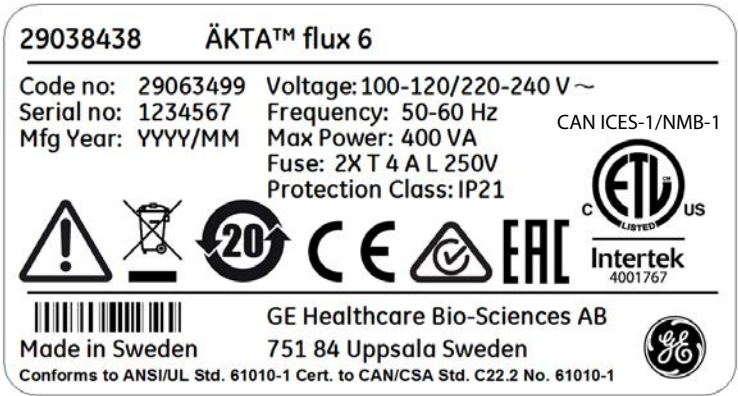
2.2 Labels

Introduction

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

System label

The illustration below shows an example of a system label.

The system label information is explained in the table below.

Label text	Description
Code no	System code number
Serial no	System serial number
Mfg Year	Manufacturing year and month
Voltage	Supply voltage
Frequency	Supply voltage frequency
Max power	Max power consumption
Fuse	System fuse
Protection class	Protection class, ingress protection according to IEC 60529. This covers the electric cabinet only.

Label text	Description
⚠	**Warning!** Read the user documentation before using the system. Do not open any covers or replace parts unless specifically stated in the user documentation.
(crossed-out wheeled bin symbol)	This symbol indicates that waste electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.
(symbol with 20)	This symbol indicates that the product contains hazardous materials in excess of the limits established by the Chinese standard *GB/T 26572 Requirements of Concentration Limits for Certain Hazardous Substances in electrical and electriconic products.*
CE	The system complies with applicable European directives.
EAC	Eurasian Conformity mark: the single conformity mark indicates that the product is approved for circulation on the markets of the member states of the Eurasian Customs Union.
(RCM mark)	The system complies with applicable requirements for Australia and New Zealand.
cETLus Intertek	This symbol indicates that the system has been certified by a Nationally Recognized Testing Laboratory (NTRL). An NRTL is an organization that the Occupational Safety and Health Administration (OSHA) has recognized as meeting the legal requirements in USA title 29 of the Code of Federal Regulations (29 CFR) Part 1910.7.
CAN ICES-1/NMB-1	CAN ICES-1/NMB-1 indicates that this product complies with the Canadian standard ICES-001 concerning technical requirements relative to radiated noise emissions from Industrial, Scientific and Medical radio frequency generators.

Safety label

The warning label on the pumps indicates that the fingers should be kept away from the moving rotor.
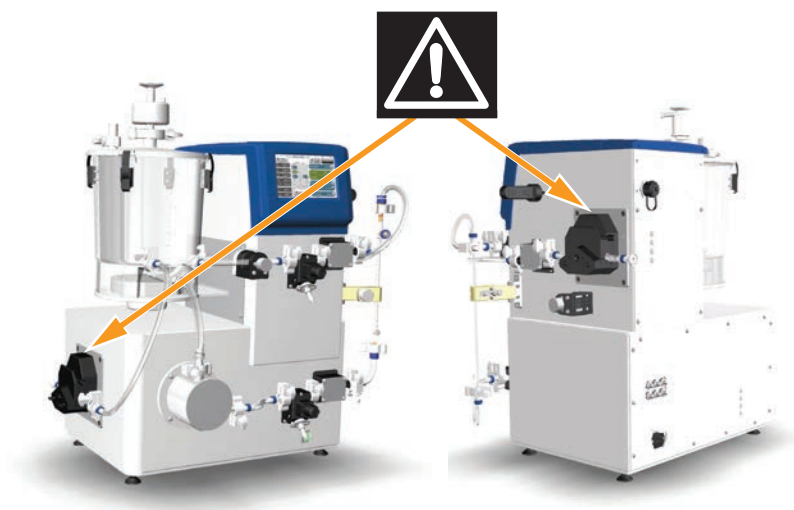
2.3   Emergency procedures

Introduction

This section describes how to do an emergency shutdown of ÄKTA flux 6, and the result in the event of power failure.

The section also describes how to restart the system after emergency shut down or power failure.

Emergency shutdown

Switch off the mains power supply by pushing the power switch to the **0** position (1), or disconnecting the power cord (2).

Result: The entire system becomes powerless, data is lost or corrupt.

Restart after emergency shut down or power failure

Follow the instruction below to restart ÄKTA flux 6 after emergency shut down or power failure.

Step	Action
1	Make sure that the condition that caused the emergency stop or power failure is corrected.
2	If the power has been lost: switch on power to ÄKTA flux 6 by turning on the power switch to the **I** position. *Result:* The system computer starts automatically.
3	Restart the process.

2.4   Recycling information

Introduction

This section describes the procedures for disposal and recycling of the ÄKTA flux 6.

> ⚠️ **CAUTION**
>
> Always use appropriate personal protective equipment when de-commissioning the equipment.

Decontamination

ÄKTA flux 6 must be decontaminated before decommissioning. All local regulations must be followed with regard to scrapping of the equipment.

Disposal of the product

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

Disposal of electrical components

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

2.5   Declaration of Hazardous Substances (DoHS)

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

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

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

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

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

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

本产品在使用寿命结束时不可作为普通生活垃圾处理，应被单独收集妥善处理。

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

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

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

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

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

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

部件名称 Component name	有害物质 Hazardous substance					
	铅 Pb	汞 Hg	镉 Cd	六价铬 (Cr(VI))	多溴联苯 PBB	多溴二苯醚 PBDE
29038438	X	0	0	0	0	0

本表格依据SJ/T 11364**的规定编制**

。

This table is prepared according to SJ/T 11364.

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

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

• **此表所列数据为发布时所能获得的最佳信息.**

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

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

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

3   System description

About this chapter

This chapter provides an overview of the technical properties of ÄKTA flux 6.

In this chapter
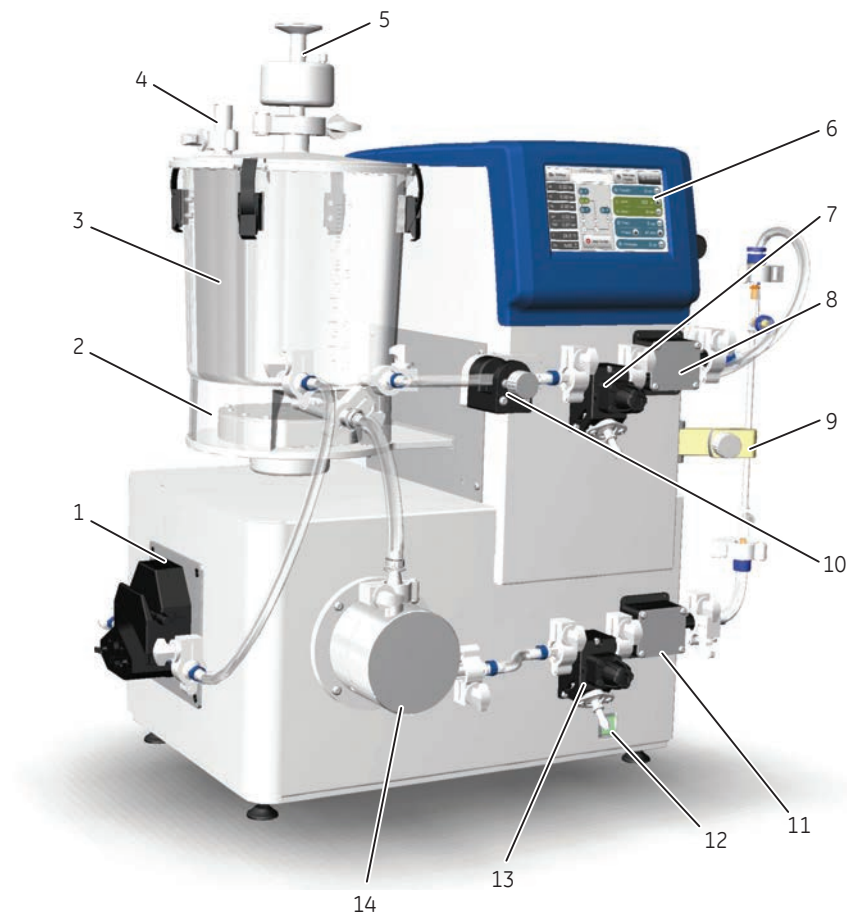
This chapter contains the following sections:

3.1   Illustrations of ÄKTA flux 6

Front view with all options

Part	Function
1	Transfer pump (optional)
2	Tank holder with tank balance and motor for mixer
3	Tank
4	Check valve
5	Air filter

Part	Function
6	Operator touchscreen
7	Upper drain valve
8	Retentate pressure sensor **Pr**
9	Filter holder for hollow fiber cartridge. Hollow fiber cartridge shown.
10	Retentate pressure control valve
11	Feed pressure sensor **Pf** and temperature sensor
12	Power switch
13	Lower drain valve
14	Feed pump

Rear view with all options
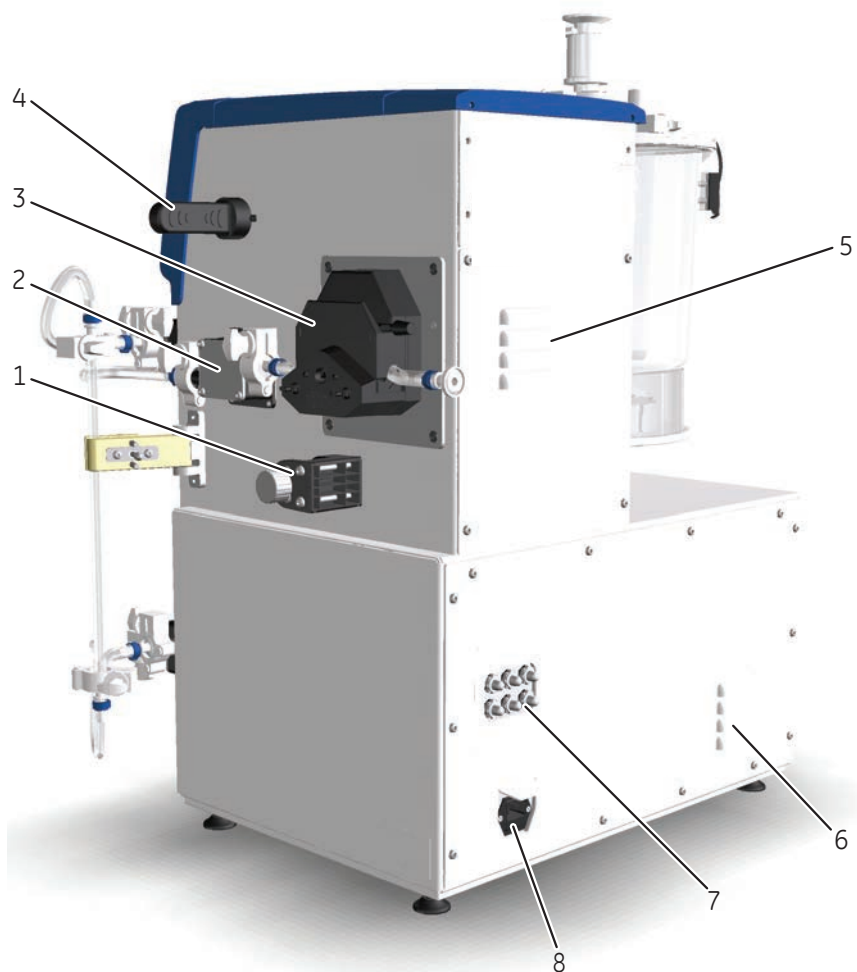
Part	Function
1	Permeate pressure control valve
2	Permeate pressure sensor **Pp** (optional)
3	Permeate pump (optional)
4	USB-connector protection
5	Ventilation holes for cabinet cooling fan

Part	Function
6	Air inlet
7	Circuit breakers
8	Power cord connection and fuse drawer

3.2   System control

Built-in computer

ÄKTA flux 6 is controlled by a process and control software from a built-in computer. The computer starts automatically when the system power is turned on.

Operator touchscreen

The user interacts with the system from the touchscreen. System warnings and alarms are displayed, indicators show system status and commands are entered from a control panel. Settings related to pumps, tank mixer and level control are entered from the touchscreen by the user. The user can also monitor flow, temperature and pressure.

System warnings

System warnings can appear on the touchscreen. A system warning is informative and will not cause a system shutdown. It consists of a sound in combination with a warning message. The warning message will remain until the warning is acknowledged. Several warnings can appear at the same time. The user must monitor the system and, if needed, adjust the parameter causing the warning.

For further information on warning parameters, see *Set system alarm parameters, on page 165*.
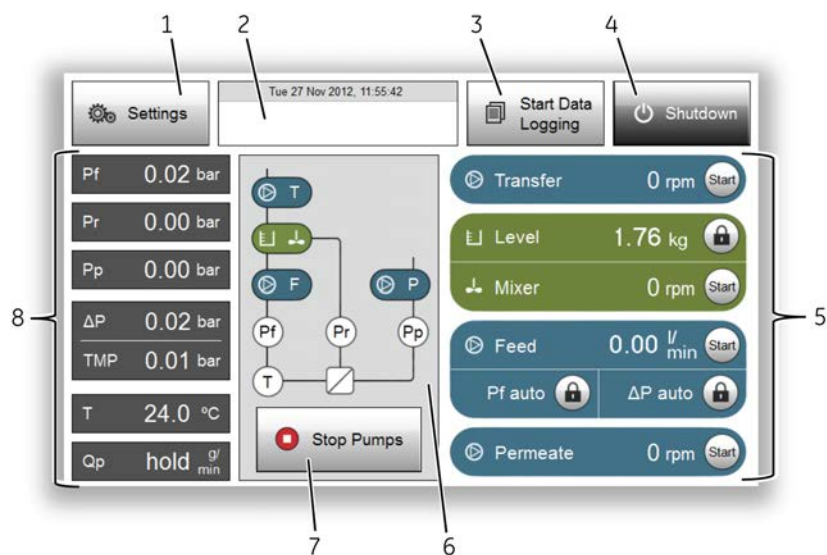
System alarms

System alarms can appear on the touchscreen. A system alarm will stop all pumps. It consists of a sound in combination with an alarm message. The alarm message will remain until the alarm is acknowledged. The alarm makes all set-points change to default settings, and they need to be set again in order to restart. The mixer remains active during the system alarm.

For further information on alarm parameters *Set system alarm parameters, on page 165*.

Main screen

The panel to the right on the main screen is used to control ÄKTA flux 6. To the left is a parameter panel which shows current status of the run. In the middle is a process flowchart showing the connected equipment. A small information panel and some command buttons are also included on the main screen.
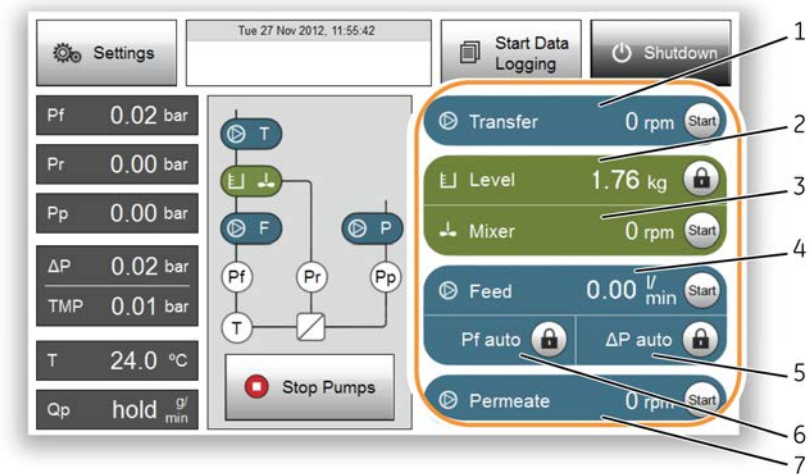

Part	Description	Function
1	**Settings** button	Submenus: **USB Device**, **Alarms**, **Configure**, **Calibration** and **System Information**.
2	Information panel	Displays active automated functions and the settings for these.
3	**Start** and **Stop Data Logging**	This function is active when a USB device is connected.
4	**Shutdown** button	Shuts down the system. Always use this button during normal shutdown.
5	Control panel	Starts and stops functions operated from this panel.
6	Process flowchart panel	An overview of the system flow scheme.
7	**Stop Pumps** button	Stops all pumps.
8	Parameter panel	Displays the process parameters.

Main screen with no optional pumps installed

If the optional pumps not are installed, they are gray on the main screen. The *Lock* button on the tank level control is dimmed and not possible to use.
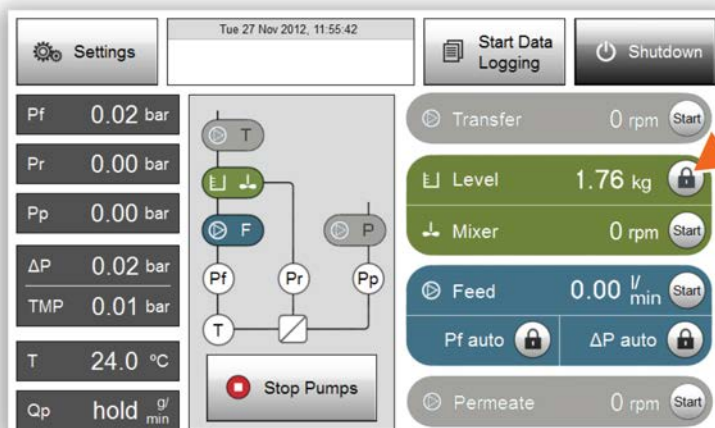
Control panel

| Part	Description	Function
1	*Transfer*	Adjusts the transfer pump (optional) and displays transfer pump rotation speed or flow rate.
2	*Level*	Adjusts level control and displays amount of fluid in the tank.
3	*Mixer*	Adjusts the mixer and displays rotational speed of the mixer.
4	*Feed*	Adjusts the feed pump and displays feed pump speed, flow rate or shear rate.
5	*ΔP auto*	Used to set retentate *ΔP* (*Pf* minus *Pr*) to be kept constant by controlling feed pump speed, flow rate or shear rate.
6	*Pf auto*	Used to set *Pf* to be kept constant. Controls feed pump speed when automated feed pressure control is active.
7	*Permeate*	Adjusts the permeate pump (optional) and displays permeate pump speed or flow rate.

Buttons

The control panel includes the following command buttons:

Button	Description
(Start)	A **Start** button with surrounding blue circle indicates that the parameter is not active.
(Stop)	A **Stop** button with a surrounding green circle indicates that the parameter is active. The **Start** button automatically changes to a **Stop** button when a pump is started.
(Start)	A **Start** button with a surrounding red circle indicates the **Stop Pumps** button has been pressed.
(Lock)	The **Lock** button indicates an automatic parameter. A **Lock** button with surrounding blue circle indicates that the parameter is not active.
(Lock)	The **Lock** button with a surrounding green circle indicates an active parameter.
(Lock)	When the **Lock** button is dimmed the function is not activated (option).

Process flowchart panel
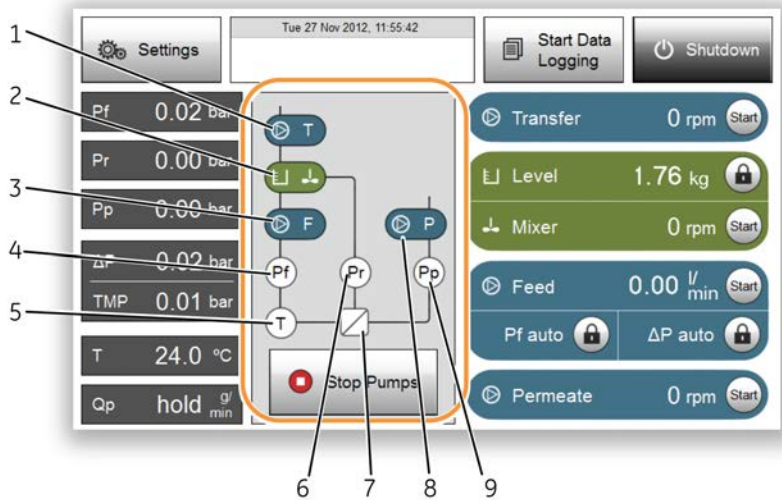
Part	Function
1	Transfer pump (optional)
2	Mixer and tank
3	Feed pump
4	Feed pressure sensor (*Pf*)
5	Temperature sensor
6	Retentate pressure sensor (*Pr*)
7	Filter
8	Permeate pump (optional)
9	Permeate pressure sensor (*Pp*) (optional)

Indicators

The process flowchart panel includes the following indicators:

Indicator	Description
	A blue circle around the motor symbol indicates that the pump is not running.
	A green circle around the motor symbol indicates that the pump is running.
	A yellow circle around the motor symbol indicates a pump warning.
	A red circle around the motor symbol indicates a pump alarm.
Pf	A yellow sensor indicator is used for a warning.
Pf	A red sensor indicator is used for an alarm.

Parameter panel
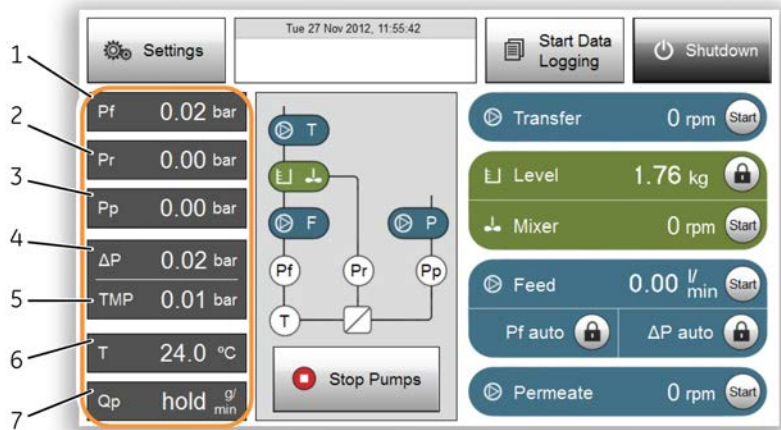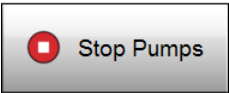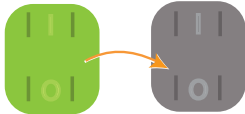
Part	Symbol	Function
1	P_f	Displays feed pressure
2	P_r	Displays retentate pressure
3	P_p	Displays permeate pressure
4	ΔP	Displays Δpressure ΔP = Pf - Pr
5	TMP	Displays transmembrane pressure TMP = [(Pf + Pr)/2] - Pp
6	T	Displays system temperature
7	Q_p	Calculated permeate flow

Stopping the process

Button	Function
Stop	A run can be ended at any time. To end a run, tap **Stop** button for the running process.

Button	Function
	The pumps can be stopped at any time by tapping the *Stop Pumps* button on the main screen.
	All running pumps on the system will be stopped. A red circle will be shown on the *Start* button.
	Use the *Stop Pumps* button if the pumps needs to be stopped quickly during an unexpected occurrence.
	The **Stop** button is recommended under normal use.
	Shutdown of the whole system is done with the *Shutdown* button on the main screen. Always use this button during normal shutdown.
	Power off the system in two steps:
	1 Tap *Shutdown* to shut down the software.
	2 Confirm shutdown software.
	3 Turn off the instrument by pushing the power switch to the **0** position when the blinking cursor has disappeared from the screen.

3.3 Standard equipment

Introduction

This section provides an overview of the standard components of ÄKTA flux 6.

In this section

This section contains the following subsections:

3.3.1   Feed pump, pressure sensors and pressure control valve

ÄKTA flux 6 feed pump

The feed pump used in ÄKTA flux 6 is of the diaphragm type.

Pressure sensors

The feed pressure sensor, **Pf**, and the retentate pressure sensor, **Pr**, are both used in the recirculation loop, see *Section 4.1 Recirculation loop, on page 65*.

The permeate line can be equipped with an optional permeate pressure sensor.
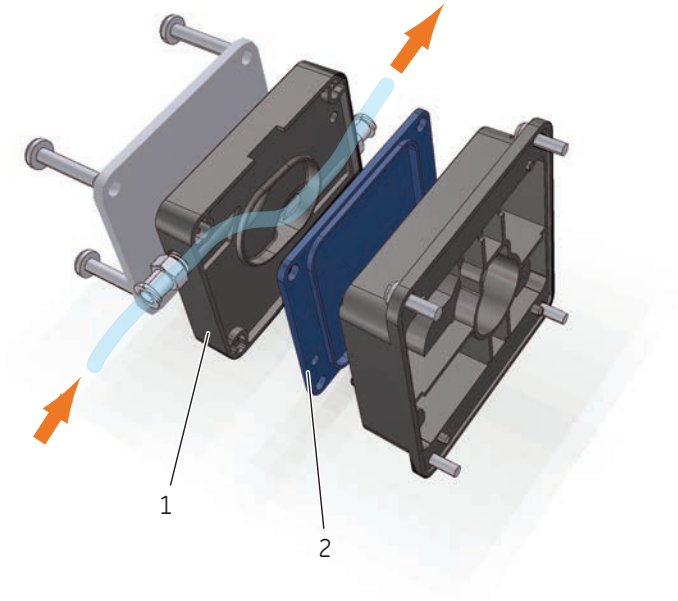
Pressure control valves

There are two pressure control valves installed on the instrument:

- The retentate pressure control valve used in the retentate line enables manual regulation of the liquid flow by adjusting the pressure upstream the filter. The entire retentate line can be shut off by closing the retentate pressure control valve.

- The pressure control valve, placed on the permeate side of the instrument, is used to shut off the permeate filter outlet and be used to manually control the permeate pressure.

3.3.2   Tank

Illustration

Part	Description
1	Air filter
2	Check valve
3	Tank lid
4	Level indication
5	Magnetic stir bar
6	Retentate inlet

Part	Description
7	Feed outlet
8	Transfer inlet

Description

ÄKTA flux 6 has an an eight liter tank. The tank has a feed outlet, transfer and retentate inlets. It is equipped with a check valve and an air filter.

The volume in the tank is calculated on the basis of the weight. The weight is measured with a tank balance. The tank is equipped with a magnetic stir bar.

3.3.3 Communication connection

USB connection

The USB memory stick is used to save process data and produce a system health report. A protective cap is used to cover the USB memory stick.

3.4   Optional equipment

Introduction

Optional pumps can be installed to transfer liquid to the tank and to control the permeate flow. A permeate pressure sensor can also be installed in the permeate line. A holder for Kvick Lab™ cassettes is an optional item.

Transfer pump

An optional transfer pump is available to set up the transfer line. The pump tubing needs to be ordered separately.

Permeate pump

An optional permeate pump is available to control the permeate flow. When using the permeate pump it is recommended to also include the optional permeate pressure sensor. The pump tubing needs to be ordered separately.

Permeate pressure sensor

An optional permeate pressure sensor is available to monitor the pressure in the permeate line. The pressure sensor is recommended when controlling the permeate pressure.

Kvick Lab Cassette Holder ll

When using Kvick Lab cassettes the Kvick Lab Cassette Holder ll is needed. The cassette holder is mounted on a stand placed next to the system. For more information see *Kvick Lab Cassette Holder ll User Manual*, article number 29027161.

3.5   Filter devices

Introduction

This section contains a description and an overview of the filter types that can be installed with ÄKTA flux 6:

The following filter types can be used:

- Hollow fiber cartridges
- Filter cassettes

In this section

This section contains the following subsections:

3.5.1   Hollow fiber cartridges

Introduction

The hollow fiber cartridges Start AXM, Xampler™ 3M, 3×M, 4M and 2×4M can be used with ÄKTA flux 6. Inlet and outlet filter tubing in correct dimensions and lengths can be ordered separately from GE.

Illustration

Description

Hollow fiber (HF) cartridges may contain several hollow fiber lumens. Each fiber is open in both ends and the feed enters in one end and exits as retentate from the other end.

The size of the pores determines the filtering characteristics of the cartridge, that is, the cut-off size for particles or molecules that either will be retained or filtered out with the permeate.

The permeate passes the lumen wall in the fibers and flows to the outside to be collected through one of the side connectors.

More information

- Refer to *Section 6.1.1 Install hollow fiber cartridges, on page 107* for more information on how to install hollow fiber cartridges.

- Refer to *Hollow fiber cartridges for membrane separations operating handbook*, article number 18116530 for more information.

- Refer to *Cross flow filtration Method Handbook*, article number 29085076 for information about crossflow filtration.

- Contact GE for more information about other hollow fiber cartridges that can be used with ÄKTA flux 6.

3.5.2   Kvick Lab Cassette Holder II

Introduction

Kvick Lab Cassette Holder II can be used with ÄKTA flux 6. It is recommended to use a maximum of three Kvick Lab cassettes although the holder can take up to five cassettes. The Kvick Lab Cassette Holder II is mounted on a stand which is placed on the laboratory bench next to ÄKTA flux 6.

Illustration
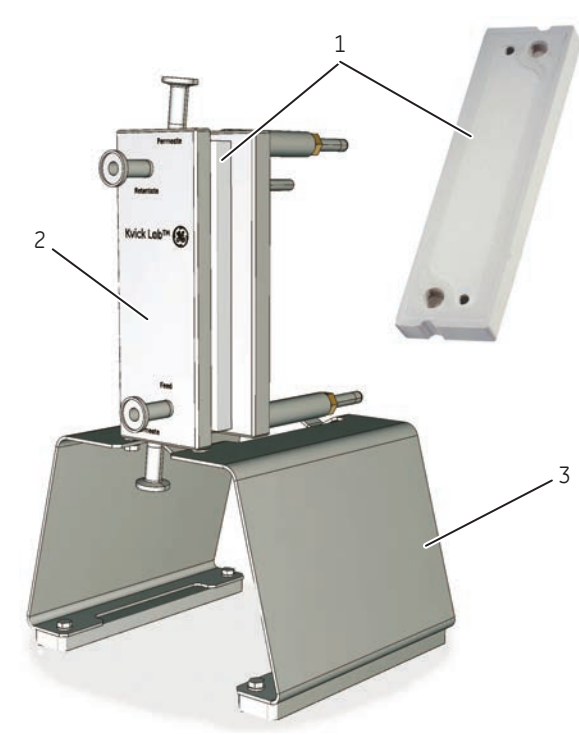
Part	Function
1	Kvick Lab cassette
2	Holder
3	Stand

Description

The Kvick Lab cassette is intended for concentration and diafiltration of small process volumes.

A Kvick Lab CIP cassette is available for cleaning.

More information

- Refer to *Section 6.1.2 Install Kvick Lab cassettes, on page 113*, for more information on how to install filter cassettes.

- Refer to *Kvick Lab Cassette Holder ll User Manual*, article number 29027161 for more information regarding Kvick Lab Cassette Holder ll.

- Refer to *Kvick Lab and Kvick Flow Cassettes User Manual*, article number 18117169 for more information regarding Kvick Lab cassettes.

- Refer to *Cross flow filtration Method Handbook*, article number 29085076 for general information regarding crossflow filtration.

- Contact GE for more information about other filtration products that can be used with the ÄKTA flux 6.

3.6   Flowchart

Introduction

This section contains a flowchart for ÄKTA flux 6. The process components and pressure sensors are listed.

Flowchart illustration
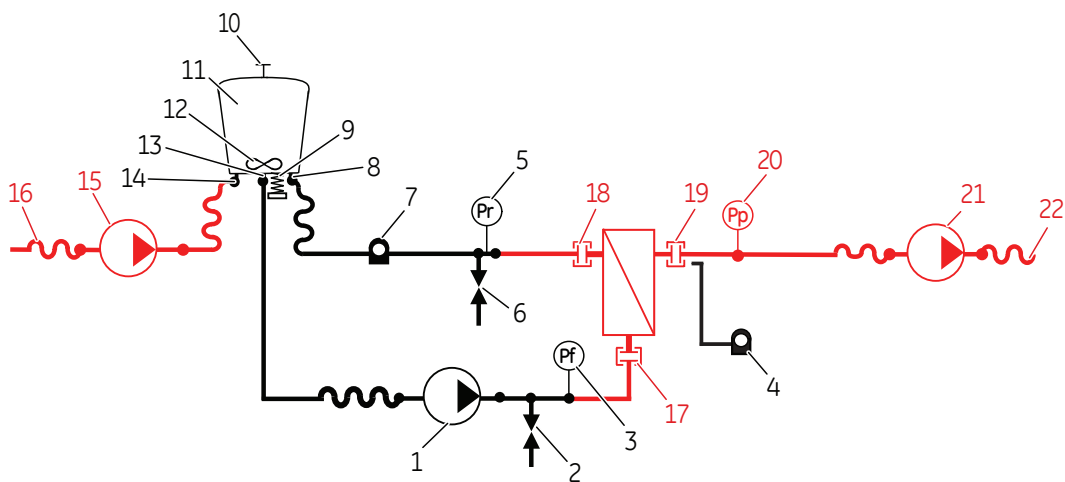
Black: standard components; Red: optional components

Process components

The following table lists the process components that are shown in the flowchart.

Tag	Function
1	Feed pump
2	Lower drain valve
3	Feed pressure sensor **Pf** (equipped with a temperature sensor)
4	Permeate pressure control valve
5	Retentate pressure sensor **Pr**
6	Upper drain valve
7	Retentate pressure control valve

Tag	Function
8	Retentate inlet
9	Tank balance
10	Air filter
11	Tank
12	Mixer
13	Feed outlet from tank
14	Tank transfer inlet
15	Transfer pump (optional)
16	External tank connection
17	Filter feed inlet
18	Filter retentate outlet
19	Filter permeate outlet
20	Permeate pressure sensor **Pp** (optional)
21	Permeate pump (optional)
22	Permeate outlet

4 Flow lines

About this chapter

This chapter provides an overview of the flow lines in ÄKTA flux 6.

In this chapter

This chapter contains the following sections:

4.1   Recirculation loop

Illustration
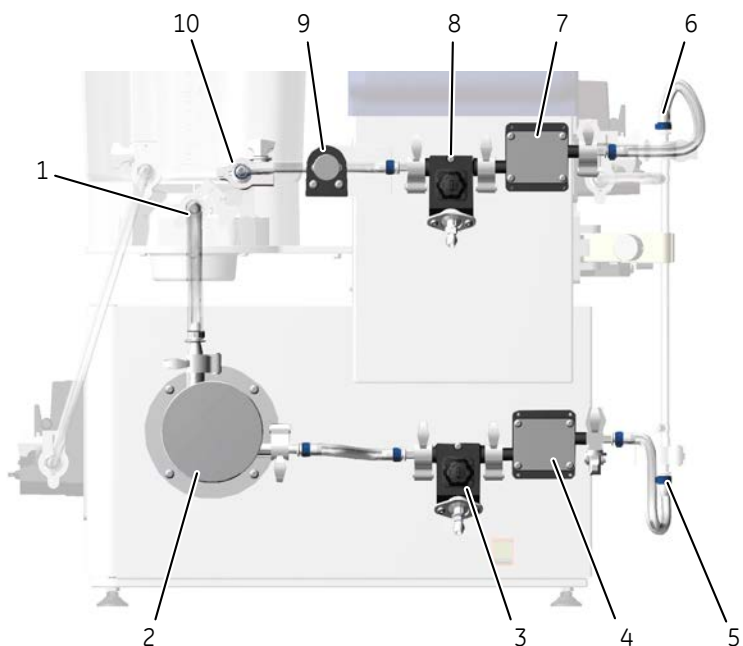
Part	Function
1	Feed outlet from tank
2	Feed pump
3	Lower drain valve
4	Feed pressure sensor **Pf** and temperature sensor
5	Feed inlet to filter
6	Retentate outlet from filter
7	Retentate pressure sensor **Pr**
8	Upper drain valve
9	Retentate pressure control valve
10	Retentate inlet to tank

Flow path

The recirculation loop consists of the feed line and the retentate line. The feed line transfers liquid from the tank to the filter via the feed pump. The retentate with particles or molecules too large to pass through the filter pores is returned to the tank via the retentate line.

Drainage

There are two drain valves. The lower drain valve (before the filter) drains the tank without passing the filter. The upper drain valve (after the filter) enables flow over the filter without returning to the tank.

Flow control

The pressure sensor **Pf** provides pressure data for the filter feed inlet pressure and protects the system against overpressure. If the pressure sensor should fail, an alarm will be triggered in the control system.

The **Pf** sensor housing also contains the temperature sensor.

The retentate outlet on the filter is connected to the retentate pressure sensor, **Pr**. The transmembrane pressure (TMP) over the filter is controlled via the opening and closing function of the retentate pressure control valve.

DeltaP

The retentate **ΔP** is the difference between the retentate pressure and the feed pressure.

Formula: $\Delta P = Pf - Pr$

where

Pf is feed pressure

Pr is retentate pressure

Transmembrane pressure

Formula: TMP = [(**Pf**+ **Pr**)/**2** - **Pp**]

where under ultrafiltration

Pp is 0 bar

Pf, **Pr**, and **Δp** are dependent upon filter and feed flow

Pf can be adjusted via controlling the feed flow or the back pressure in the recirculation line via the retentate pressure control valve placed after the filter.

The process is normally optimized to minimize the process time which is done by maximizing the flux, (permeate flow/filter area). To keep the flux at max possible over the whole process the combination(s) of flux versus TMP is normally studied for the start and end products of the process.

4.2   Permeate line

Permeate flow control

Liquid containing particles or molecules small enough to pass through the filter pores is collected as permeate.

Permeate exits the filter through the permeate outlet on the filter.

The permeate pressure control valve, placed on the permeate side of the instrument, is used to shut off the permeate filter outlet and to manually control the permeate pressure.


Recycling

The permeate outlet can be coupled to the tank. This allows permeate to be routed back to the tank when, for example, the process is set up and calibrated or during CIP.

Permeate recycling is also used when the objective is to run the system at steady state conditions, this can be applied during TMP scouting, for example.

Optional permeate equipment

The permeate line can be equipped with a permeate pump and a pressure sensor. The permeate pump is used to control the permeate flow rate and the permeate pressure sensor, **Pp**, measures permeate pressure.
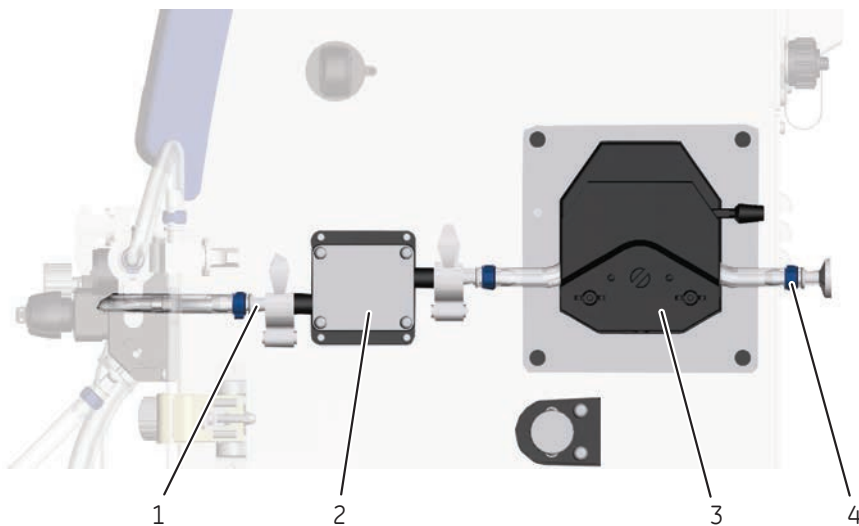
Part	Function
1	Permeate pressure sensor inlet
2	Permeate pressure sensor
3	Permeate pump
4	Tubing outlet permeate pump

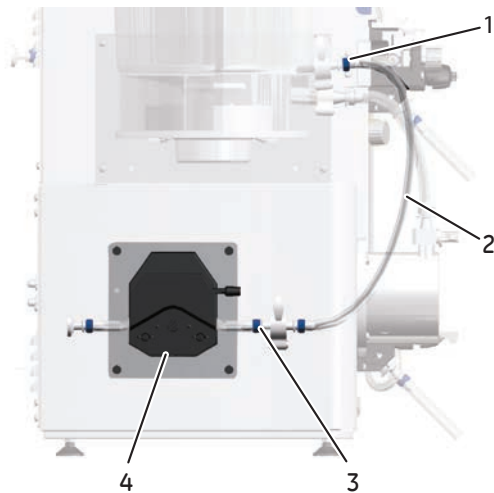## 4.3   Transfer line

Introduction

The transfer line requires the optional transfer pump.

Illustration

Part	Function
1	Transfer inlet to tank
2	Transfer line
3	Tubing outlet from transfer pump
4	Transfer pump

Description

The transfer line transfers liquid from an external tank to the ÄKTA flux tank via the transfer pump.

Constant retentate volume

The transfer pump supplies material to the tank from an external source. As material is separated out from the feed as permeate, the transfer pump can keep the tank level within set limits by filling new liquid replacing the volume leaving the system as permeate.

5 Installation

About this chapter

This chapter provides required information to enable users and service personnel to unpack, transport, install and setup ÄKTA flux 6.

In this chapter

This chapter contains the following sections:

Precautions

	WARNING
⚠	Before performing any of the procedures described in this chapter, you must read and understand all contents of the corresponding sections in *Chapter 2 Safety instructions, on page 16*, as listed below:

- *General precautions, on page 17*
- *Personal protection, on page 18*
- *Installing and moving, on page 20*
- *Power supply, on page 22*

CAUTION

Whenever packing, unpacking, transporting or moving ÄKTA flux 6, wear:

• Protective footwear, preferably with steel lining.

• Working gloves, protecting against sharp edges.

• Protective glasses.

CAUTION

Do not transport, handle and store ÄKTA flux 6 in any other way than described in this manual.

5.1   Site requirements

Summary of requirements

The following table gives a summary of power supply and environmental requirements.

Parameter	Requirement
Supply voltage	100-120/220-240 V AC, ± 10%
Phases	Single phase (with 3P ground pole)
Frequency	50 to 60 Hz
Maximum power	Nominally 400 W
Grounding	ÄKTA flux 6 must be connected to a grounded AC power outlet.
Ambient environment	Avoid: • Direct sunlight • Strong magnetic or electric fields • Vibrations • Corrosive gas • Dust
Positioning	The placement of the ÄKTA flux 6 must fulfill the following requirements: • A flat, stable and clean bench which can handle ÄKTA flux 6 weight at fully loaded conditions. • Sufficient space at all sides of the ÄKTA flux 6 when installed at the intended production location to allow convenient working conditions.
Computer	Built-in computer.
Location	Indoor use only.

5.2   Unpacking

Introduction

This section describes the requirements for receiving the delivery box and storing the instrument before installation. It also describes how to unpack ÄKTA flux 6.

The unpacking instruction is attached to the delivery box for ÄKTA flux 6, refer to *ÄKTA flux 6 Unpacking instructions*, article number 29056122.

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	-20°C to +60°C See detailed information in *Operating limits, on page 196*.
Relative humidity	Up to 95% atmospheric humidity at 40°C for 48 hrs

Visual inspection

Check

• that all equipment is enclosed in the delivery box according to the packing list.

• the equipment for any apparent damage and document carefully if found.

If any equipment is missing or damages are found, contact GE immediately.

Delivery box

ÄKTA flux 6 is shipped in a delivery box with the following dimensions and weight:

Contents	Dimensions (w × h × d)	Weight
ÄKTA flux 6 (without optional pumps)	800 × 960 × 620 mm	66 kg

Dimensions and weight

The weight of ÄKTA flux 6 is 53 kg, for dimensions refer to *Dimensions, on page 195*.

Unpacking

The following precautions must be considered when unpacking the product.

CAUTION

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

CAUTION

Two persons are required to lift ÄKTA flux 6. Lift only in the bottom part of the system.

Refer to *ÄKTA flux 6 Unpacking Instructions, article number 29056122,* for a full description of the unpacking procedure.

5.3   Transport

Introduction

This section outlines important information that must be considered when transporting ÄKTA flux 6.

Moving ÄKTA flux 6

> ⚠️ **CAUTION**
>
> Before moving ÄKTA flux 6 the following must be done:
>
> 1   Empty ÄKTA flux 6.
>
> 2   Shut down ÄKTA flux 6 and disconnect the power cord.

Transport requirements

Parameter	Allowed range
Ambient temperature, transport	-25°C to +60°C Temperature gradients of ≤ ±1°C/min See detailed information in *Operating limits, on page 196*.

Balance shipping protection

> ➡️ **NOTICE**
>
> If the ÄKTA flux 6 is moved without a balance shipping protection in place, the tank must be empty and only small gentle movements are allowed. If the tank shall be transported or put into storage, a balance shipping protection should always be in place.

5.4   Setup

Introduction

This section describes the steps that need to be taken to set up ÄKTA flux 6 before use.

In this section

This section contains the following subsections:

5.4.1 Power supply and USB connection

Power supply and fuses

> ⚠ **WARNING**
> The supply voltage must correspond to the markings on the system.

Part	Function
1	Fuse drawer with two mains fuses.
	For specification of the fuses, see *Electric power, on page 196*.
2	Power connection
3	Automatic circuit breakers

Connect power supply

|	
⚠	**WARNING** ÄKTA flux 6 must always be connected to a grounded power outlet.

⚠	**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.

Step	Action
1	Connect the power cord to the instrument.
2	Connect the power cord to a grounded power outlet specified in *Section 5.1 Site requirements, on page 74*.

Built-in circuit breakers

All pumps, the operator touchscreen (the user interface), and the mixer are equipped with automatic circuit breakers, which are located at the rear side of ÄKTA flux 6.
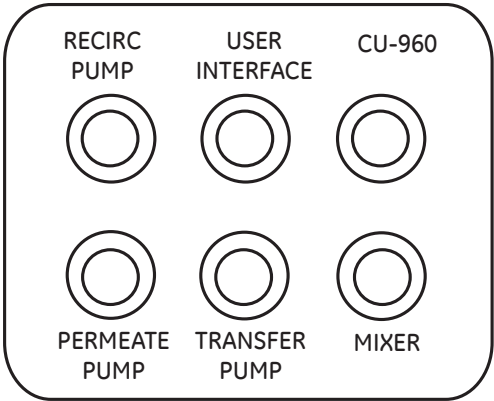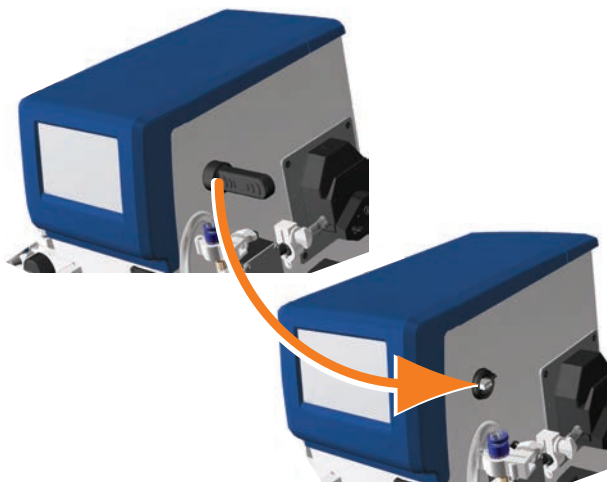
USB connection

⚠	**CAUTION**
	Make sure that the USB port is protected from moisture and liquid by always having a protective cap on.

The protective cap for the USB memory stick is placed on the right side of ÄKTA flux 6 seen from the front. Unscrew the protective cap to insert the USB memory stick.

Note: *The protective cap should always be used, both with and without a USB memory stick.*

5.4.2   Install and remove the tank

Precautions

⚠️	**WARNING** Use fume mask during tank opening when processing hazardous liquids, to avoid possible exposure to aerosols.

⚠️	**CAUTION** Handle tank with care. • Make sure the tank is not damaged or dropped during handling. • Do not install or remove the tank in any other way than described in this manual.

➡️	**NOTICE** Blocked vents may cause overpressure in tank.

Install the tank

Step	Action
1	Fit the tank to the tank holder.
2	Attach the inlet and outlet tubing.

Remove the tank

Step	Action
1	Empty the tank.
2	Remove the inlet and outlet tubing.
3	Remove the tank.

5.4.3   Tubing

Introduction

ÄKTA flux 6 is delivered with necessary tubing for the recirculation loop. Other optional tubing is available from GE.

### Precautions

> ⚠ **WARNING**
>
> Use only approved tubing and components together with ÄKTA flux 6.

> ⚠ **CAUTION**
>
> Changing of tubing exposes operator to residual fluid that may cause contamination of skin and clothing. Always use appropriate Personal Protective Equipment (PPE) when operating and interacting with ÄKTA flux 6.

Tubing tags

All tubing for the flow lines is tagged. The illustration below shows an example of a tubing tag. The characters on the tag are explained in the table.
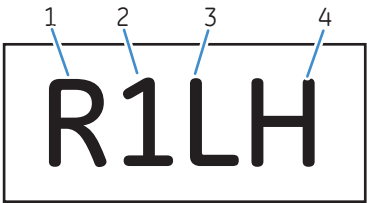
Loca-tion	Tag	Description
1	**D**	Drain line
	F	Feed line
	P	Permeate line
	R	Retentate line
	T	Transfer line
2	1, 2, 3…	Order in the line
3	**L**	Line tubing
4	**H**, **L**	H High flow rate L Low flow rate
	PE	Pump tubing for optional pumps, i.e. transfer pump and permeate pump
	UL	Tubing included for user flexibility

Mounting of tubing

The illustration shows the tubing in the recirculation loop in ÄKTA flux 6. The tubing is connected with TC clamps and TC gaskets.
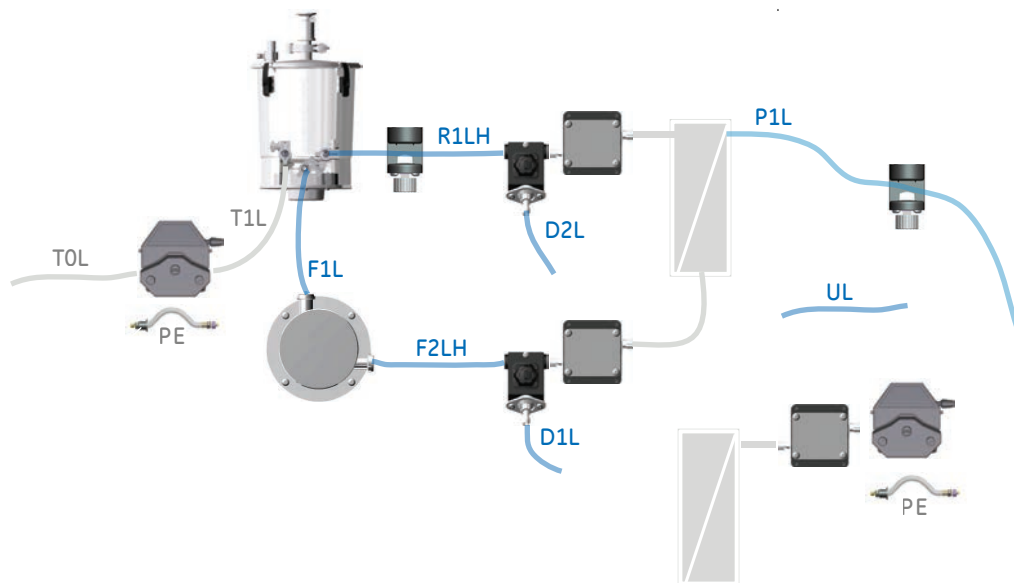
Tubing

The tubing in the table below are delivered with ÄKTA flux 6.

Tag	Tubing	Tubing size (inner diameter)
D1L	Tubing for drain line	6.4 mm
D2L	Tubing for drain line	6.4 mm
F1L	Tubing from tank outlet to feed pump	9.5 mm
F2LH	Tubing from feed pump to feed pressure sensor	9.5 mm
R1LH	Tubing from retentate pressure sensor to tank	9.5 mm
P1L	Tubing from permeate filter outlet	6.4 mm
UL	User tubing	6.4 mm

Optional pumps tubing

The tubing in the table below are used with the optional pumps.

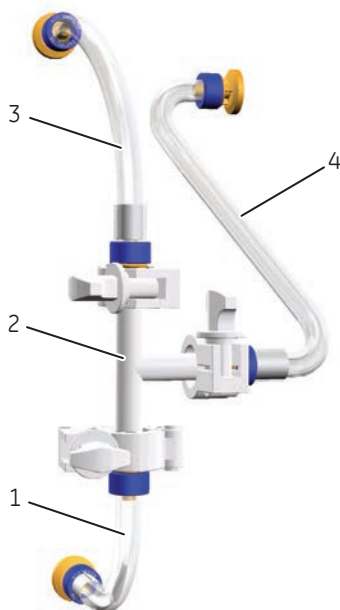| Tag	Tubing	Tubing size (inner diameter)
T0L	Tubing to transfer pump inlet	6.4 mm
T1L	Tubing from transfer tank outlet	6.4 mm
PE	Pump tubing for optional pumps	8.0 mm

Low flow kit

The low flow kit consists of the tubing listed in the table below.

Tag	Tubing	Tubing size (inner diameter)
F2LL	Tubing from feed pump to pressure sensor	6.4 mm
R1LL	Tubing from pressure sensor to tank	6.4 mm

Tubing for Cleaning in Place (CIP)

A T-piece is used for Cleaning in Place (CIP). It is attached with TC clamps and TC gaskets. For tubing tags, see table below.

Part	Tag	Description	Tubing size (inner diameter)
1	**FF2L**	Tubing from feed pressure sensor	6.4 mm
2		T-piece for CIP	
3	**FF3L**	Tubing to retentate pressure sensor	6.4 mm
4	**FF5**	Tubing to permeate pressure sensor	6.4 mm

5.4.4 Setup the transfer pump

Introduction

This section describes how to install the optional transfer pump.

Precautions

	WARNING
⚠️	Disconnect power to ÄKTA flux 6 before installation of the optional pump.

	CAUTION
⚠️	Take care not to drop the optional pump assembly during installation as it may result in damage to the unit or injury to yourself.

Tools required

A flat screwdriver is needed for the installation.

Mount the transfer pump

Step	Action
1	Disconnect the power.
2	Unscrew the screws holding the casing for the transfer pump connections and remove the casing.

Step	Action
3	Pull out the power and communication cables.

Step	Action
4	Connect the communication cable to the corresponding connection on the transfer pump.

| 5 | Connect the power cable to the corresponding connection on the transfer pump. |
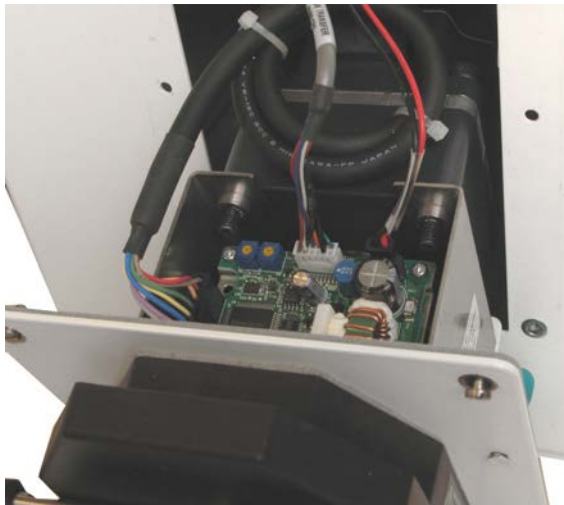
Step	Action
6	Attach the pump to ÄKTA flux 6 and make sure that the fittings for the screws on the chassis match the ones on the transfer pump.

7	Fasten the screws.
8	When the transfer pump is installed, perform the following actions:

- Perform a motor control, see *Perform a motor control, on page 140*.

- Install the pump tubing, refer to *Install the pump tubing, on page 99*.

- Perform a calibration of the transfer pump, see *Calibrate the transfer pump, on page 126* (optional action).

5.4.5 Setup the permeate pump

Introduction

This section describes how to install the optional permeate pump.

Precautions

> ⚠️ **WARNING**
>
> Disconnect power to ÄKTA flux 6 before installation of the optional pump.

> ⚠️ **CAUTION**
>
> Take care not to drop the optional pump assembly during installation as it may result in damage to the unit or injury to yourself.

Tools required

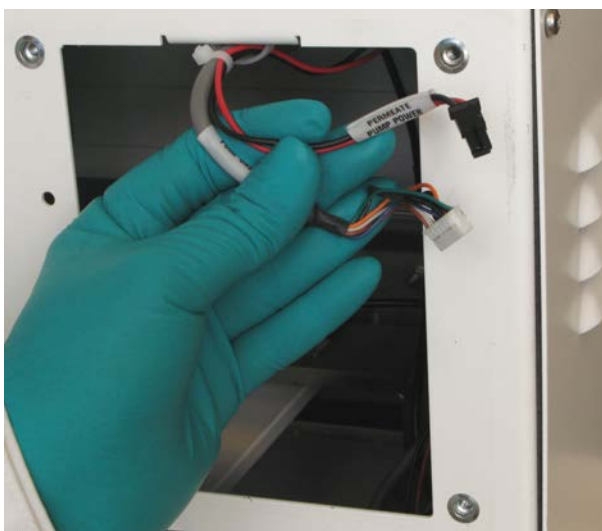A flat screwdriver is needed for the installation of the permeate pump.

Mount the permeate pump

Step	Action
1	Disconnect the power.

Step	Action
2	Unscrew the screws holding the casing for the permeate pump connections and remove the casing.

3	Pull out the power and communication cables.

Step	Action
4	Connect the communication cable to the corresponding connection on the permeate pump.

| 5 | Connect the power cable to the corresponding connection on the permeate pump. |
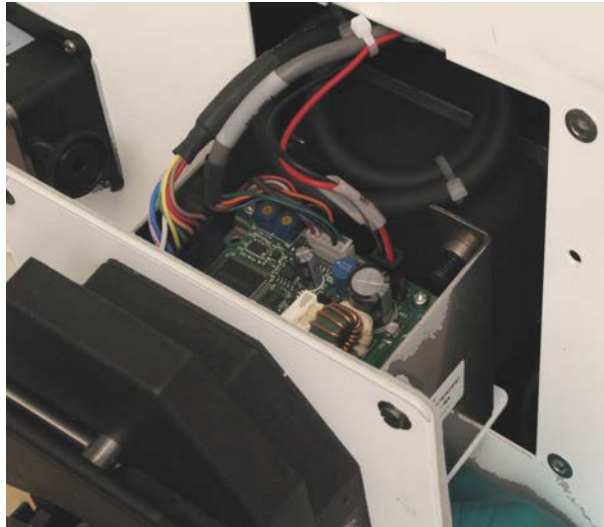
Step	Action
6	Attach the pump to ÄKTA flux 6 and make sure that the fittings for the screws on the chassis match the ones on the permeate pump.

7	Fasten the screws.
8	When the permeate pump is installed, perform the following actions: • Perform a motor control, see *Perform a motor control, on page 140*. • Install the pump tubing, refer to *Install the pump tubing, on page 99*. • Perform a calibration of the permeate pump, see *Calibrate the permeate pump, on page 132* (optional action).

5.4.6 Setup the permeate pressure sensor

Introduction

This section describes how to install the optional permeate pressure sensor.

Precautions

Disconnect power to ÄKTA flux 6 before installation of the permeate pressure sensor.

Tools required

A T20 Torx□ screwdriver is needed for the installation of the permeate pressure sensor.

Mount the permeate pressure sensor

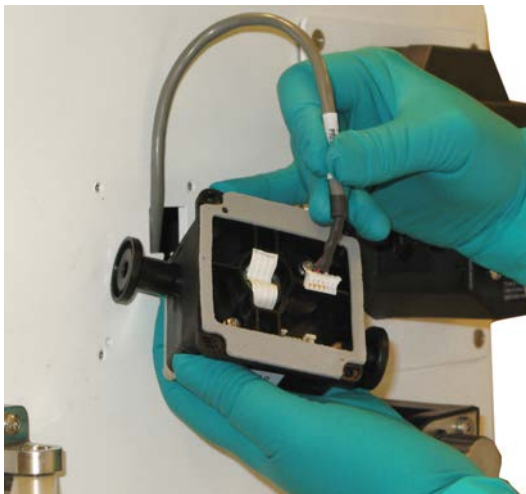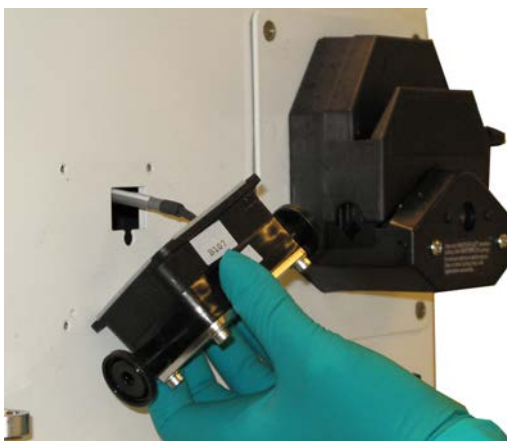| Step	Action
1	Disconnect the power.
2	Remove the screws holding the casing for the pressure sensor connections. Disconnect the power and communication cable from the casing.

Step	Action
3	Connect the power and communication cable to the connection on the pressure sensor.

| 4 | Place the pressure sensor over the fittings for the screws on the chassis so that they match. |

Step	Action
5	Fasten the screws.

| 6 | Calibrate the pressure sensor using the supplied factory settings. |

5.4.7 Pump tubing

Install the pump tubing

> ⚠️ **WARNING**
>
> Disconnect power to ÄKTA flux 6 before installing the pump tubing.

Follow the instructions below to install the pump tubing on the optional pumps.

Step	Action
1	Rotate the lever to the left to open the pump.
2	Route the pump tubing through the pump. Center the tubing between the retainers.

> ➡️ **NOTICE**
>
> Make sure the tubing is straight where it enters and exits the pump. Twisting can cause damage to the tubing.

Step	Action
3	Rotate the lever to the right to close.

5.5   Installation test

Performance

The following performance tests should be done after installation:

- Feed pump motor control, see *Perform a motor control, on page 140*.

- Tank level calibration, refer to *Calibrate the tank level, on page 141*.

- Feed pump calibration, see *Calibrate the feed pump, on page 120*.

- Check that the pressure sensors display 0 bar when connected to atmospheric pressure.

- Check that all options are correct installed and functioning.

6   Run preparations

About this chapter

This chapter provides the information required to prepare ÄKTA flux 6 for operation.

Before ÄKTA flux 6 is taken into operation, make sure that all procedures in the following chapter and section have been performed:

- *Chapter 5 Installation, on page 72* and

- actions before operation in *Section 9.1 User maintenance schedule, on page 180*

In this chapter

This chapter contains the following sections:

Section	See page
6.1 Filter installation	104
6.2 Testing filters	117
6.3 Calibration	119

Precautions

WARNING

Before performing any of the procedures described in this chapter, you must read and understand all contents of the corresponding sections in *Chapter 2 Safety instructions, on page 16*, as listed below:

- *General precautions, on page 17*
- *Personal protection, on page 18*
- *System operation, on page 23*

NOTICE

Only use specified chemicals that have been proven not to be harmful to the wetted parts of the unit.

Refer to *Section 11.4 Chemical resistance, on page 208* for more information.

6.1   Filter installation

Precautions

> ⚠️ **WARNING**
>
> Make sure that the filter is installed according to instructions for use of the filter.

> ⚠️ **WARNING**
>
> Before connecting the filter to ÄKTA flux 6, read the instructions for use of the filter. To avoid exposing the filter to excessive pressure, make sure that the pressure limit is set to the specified maximum pressure of the filter.

> ⚠️ **CAUTION**
>
> Avoid that the filter falls when installing filters.
>
> • Handle filter with care.
>
> • Do not install or remove the filter in any other way than described in this manual.

Introduction

This section contains general information on where and how to install the following filter types on ÄKTA flux 6:

• HF cartridges

• Kvick Lab cassettes and cassette holder

Using the P1L tubing

If the permeate control valve is used on the permeate side, the **P1L** tubing is connected to the permeate filter outlet.

The descriptions on the following pages refer to installations with the optional permeate pressure sensor and the permeate pump installed. Each filter type used in these installations has its own set of filter tubing.

Filtration tubing

All tubing for the flow lines is tagged. The illustration below shows an example of a tubing tag. The characters on the tag are explained in the table below.
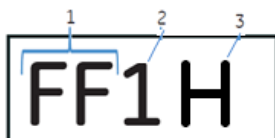
Location	Tag	Description	Length
1	**FF**	Female Female type	
	F	Female type	
	MF	Male Female type	
2	1	Tube Length 1	96 mm
	2	Tube Length 2	110 mm
	3	Tube Length 3	190 mm
	4	Tube Length 4	260 mm
	5	Tube Length 5	270 mm
	6	Tube Length 6	300 mm
	7	Tube Length 7	420 mm
	8	Tube Length 8	580 mm
	9	Tube Length 9	685 mm
3	**H**, **L** (if applicable)	H - High Flow Rate L - High Flow Rate	

6.1.1   Install hollow fiber cartridges

3M

The filter tubing listed below can be used with 3M hollow fiber cartridges and ÄKTA flux 6.
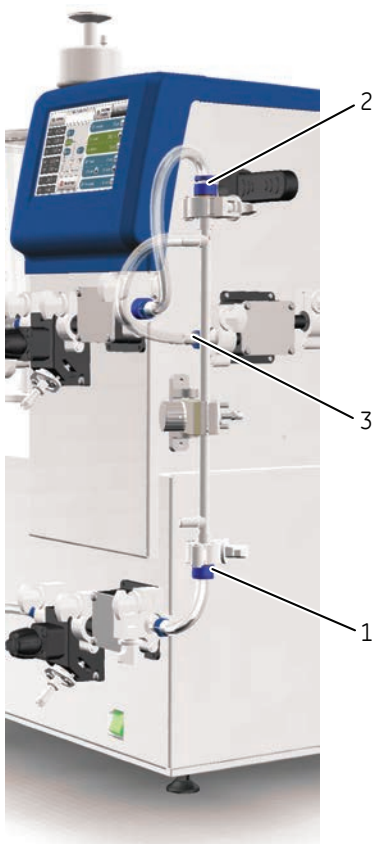
Part	Tag	Description
1	**FF2L**	From feed pressure sensor to filter
2	**FF6L**	From filter to retentate pressure sensor
3	**F4**	From filter to permeate pressure sensor [1]

[1]   If the optional permeate pressure sensor and permeate pump not are installed the tubing **P1L** is to be attached on the filter permeate outlet.

3x2M

The filter tubing listed below can be used with 3x2M hollow fiber cartridges and
ÄKTA flux 6.

Part	Tag	Description
1	**FF2L**	From feed pressure sensor to filter
2	**FF9L**	From filter to retentate pressure sensor
3	**F8**	From filter to permeate pressure sensor [1]

[1]   If the optional permeate pressure sensor and permeate pump not are installed the tubing **P1L** is to be attached on the filter permeate outlet.

4M

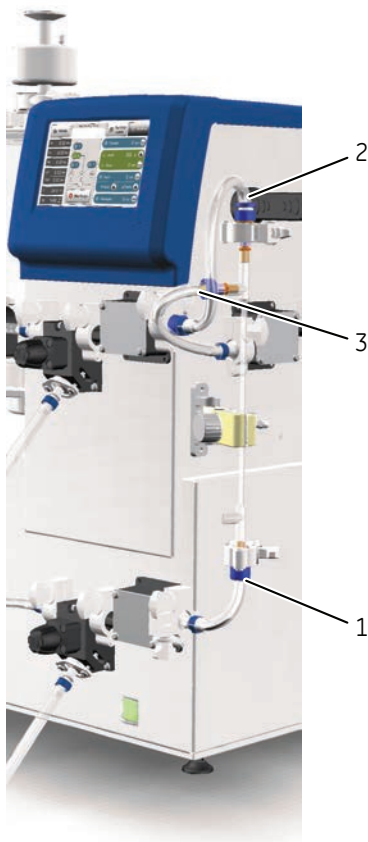The filter tubing listed below can be used with 4M hollow fiber cartridges and ÄKTA flux 6.
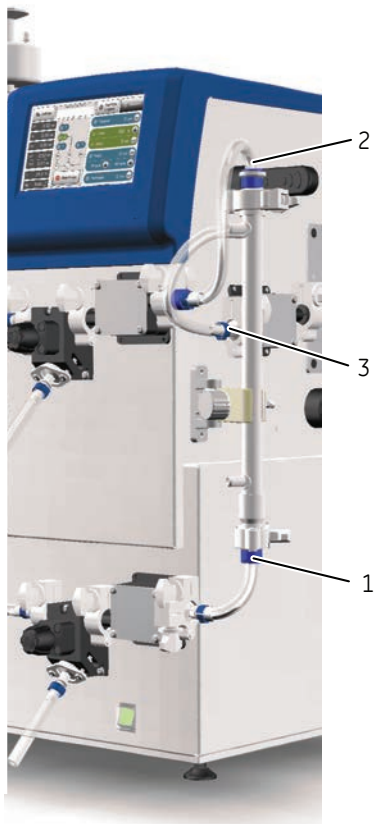
Part	Tag	Description
1	**FF2L**	From feed pressure sensor to filter
2	**FF6L**	From filter to retentate pressure sensor
3	**F4**	From filter to permeate pressure sensor [1]

[1] If the optional permeate pressure sensor and permeate pump not are installed the tubing **P1L** is to be attached on the filter permeate outlet.

4x2M

The filter tubing listed below can be used with 4x2M hollow fiber cartridges and ÄKTA flux 6.

Part	Tag	Description
1	**FF2L**	From feed pressure sensor to filter
2	**FF9L**	From filter to retentate pressure sensor
3	**F8**	From filter to permeate pressure sensor [1]

[1] If the optional permeate pressure sensor and permeate pump not are installed the tubing **P1L** is to be attached on the filter permeate outlet.

AXM

The filter tubing listed below can be used with AXM hollow fiber cartridges and ÄKTA flux 6.

Part	Tag	Description
1	**FF1L**	From feed pressure sensor to filter
2	**FF7L**	From filter to retentate pressure sensor
3	**FF4**	From filter to permeate pressure sensor [1]

[1] If the optional permeate pressure sensor and permeate pump not are installed the tubing **P1L** is to be attached on the filter permeate outlet.

HF cartridges draining

Hollow fiber cartridges are provided with two connections to the permeate compartment, one in each end.

When mounted vertically, which is the case for ÄKTA flux 6, the bottom connection serves as drain for the permeate. This allows a better recovery of the permeate.

Filter installation

Follow the instructions below to install a HF cartridge to ÄKTA flux 6.

Step	Action
1	Prepare and check the HF cartridges according to the manufacturer´s instructions.
2	Attach the HF cartridges on the filter holder.
3	Connect the feed pressure sensor outlet to the feed inlet on the filter.
4	Connect the retentate outlet filter to the retentate pressure sensor inlet.
5	• Connect the permeate outlet filer to either the permeate pressure control valve, or • if the optional permeate pump and permeate pressure sensor are installed, connect the permeate outlet filter to the permeate pressure sensor inlet on the system. *Tip:* *Keep connected tubing short to minimize holdup volume.*
6	Collect the permeate in a beaker.
7	Attach a stop plug to the lower permeate port.
8	Continue preparation.

More information

For more information regarding hollow filter cartridges, refer to:

- *Hollow fiber cartridges for membrane separations operating handbook*, article number 18116530, and

- *Cross flow filtration Method Handbook*, article number 29085076.

6.1.2   Install Kvick Lab cassettes

Precautions

> ⚠️ **CAUTION**
>
> Because of the weight of the KvickLab Cassette Holder ll, great care must be taken not to cause squeezing or crushing injuries during movement. To prevent injury from dropping a cassette holder on your feet or hands, make sure you have a secure, controlled grip, or the proper equipment to move the cassette holder.
>
> Wear safety shoes.

Kvick Lab cassettes

The filter tubing listed below can be used with Kvick Lab Cassette Holder ll and ÄKTA flux 6.

Part	Tag	Description
1	**FF2L**	From feed pressure sensor to filter
2	**FF3L**	From filter to retentate pressure sensor
3	**FF5**	From filter to permeate pressure sensor [1]

[1] If the optional permeate pressure sensor and permeate pump not are installed the tubing **P1L** is to be attached on the filter permeate outlet.

Filter installation

The illustration shows the filter outlets on Kvick Lab cassette Holder ll without any tubing connected. Follow the steps below to install the Kvick Lab cassette in ÄKTA flux 6:
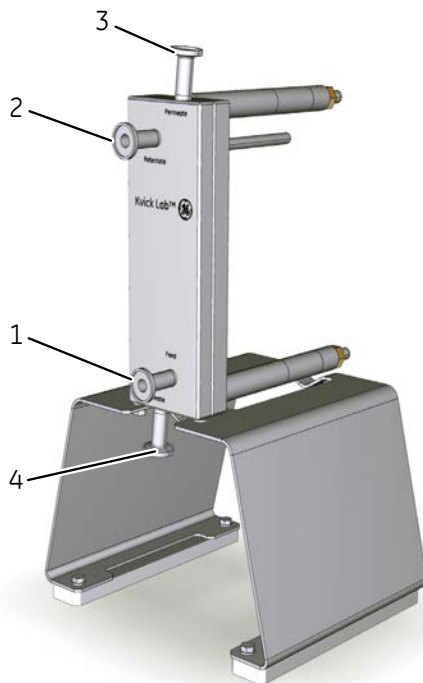
Step	Action
1	Place the Kvick Lab cassette holder ll near ÄKTA flux 6.
2	Connect the feed pressure sensor outlet to the **Feed** inlet (1) on the filter using a TC gasket and a TC clamp.
3	Connect the **Retentate** outlet (2) to the retentate pressure sensor inlet using a TC gasket and a TC clamp.
4	Connect the **Permeate** outlet (3) to the permeate filter inlet using a TC gasket and a TC clamp.

Step	Action
5	• Connect the permeate outlet filter to either the permeate pressure control valve, or
	• if the optional permeate pump and permeate pressure sensor are installed, connect the permeate outlet filter to the permeate pressure sensor inlet on the system.
	Tip:
	Keep connected tubing short to minimize holdup volume.
6	Attach a stop plug to the lower **Permeate** port (4).
	Note:
	*The lower **Permeate** port can be used for drainage, in such case connect a valve to the lower port.*
7	Continue preparation.

More information

For more information refer to:

- *Kvick Lab and Kvick Flow Cassettes User Manual*, article number 18117169,

- *Kvick Lab Cassette Holder ll User Manual*, article number 29027161, and

- *Cross flow filtration Method Handbook*, article number 29085076.

6.2   Testing filters

Introduction

Before using your ÄKTA flux 6 and cassette to process a product, the following preprocess procedures should be performed:

1   A filter integrity test

2   A leakage test

3   Clean Water Flux Test

4   Equilibrate flow path with a buffer flush

Filter integrity test

It is recommended to perform a filter integrity test on each filter before usage. Perform tests according to the filter manufacturer's instructions. This is usually some form of air diffusion test using a water wetted filter. Refer to *GE integrity test guides 18117269* or *18117173*, or your filter manufacturer's instructions.

Leakage test

Follow the instructions below to perform a leakage test:

Step	Action
1	Pressurize the system to the maximum intended process pressure:
	1 Tap **Feed** on the main screen.
	2 Use the displayed keypad to set the desired feed pump speed and tap **OK**.
	For an instruction how to use set-points, see *Adjust set-points, on page 174*.
	3 Close the retentate valve.
2	Check the system for leaks while maintaining the pressure. Pay special attention to the filter installation.

Step	Action
3	If leakage is discovered, there may be a cassette, gasket, or surface finish irregularity present. Proceed as follows:

    1   Remove the filters and inspect the sealing surfaces.

    2   If you use Kvick Lab Cassette Holder II, check torque of filter holder and adjust as required (20.3 Nm), refer to *Kvick Lab Cassette Holder ll User Manual*, article number 29-0271-61.

    3   Correct any problems, reinstall the filters and execute the test again.

6.3   Calibration

About this section

This section describes the procedures used to perform calibration of the pumps and other parts in ÄKTA flux 6.

When to use these procedures

It is recommended to perform calibrations before each run.

Allowed user performed calibrations:

- Pump flow rate for installed pumps

- Tank level

- Re-zero function of installed pressure sensors

- Motor RPM range calibration for installed motors (pumps and mixer)

Allowed service performed calibrations:

- All user allowed calibration

- Full range calibration of installed pressure sensors

The pressure and tubing dimension used when calibrating the system should always correspond to the pressure and tubing dimension used when performing a run.

6.3.1   Calibration of the feed pump

Calibrate the feed pump

Follow the instructions below to calibrate the system flow for the feed pump.

Step	Action
1	Put a stopper (1) in the transfer inlet to the tank.
2	Fill the tank with water (2).
3	Shut off the retentate pressure control valve (3)
4	Replace the filter with tubing (4) between the feed pump pressure sensor and retentate pressure sensor.
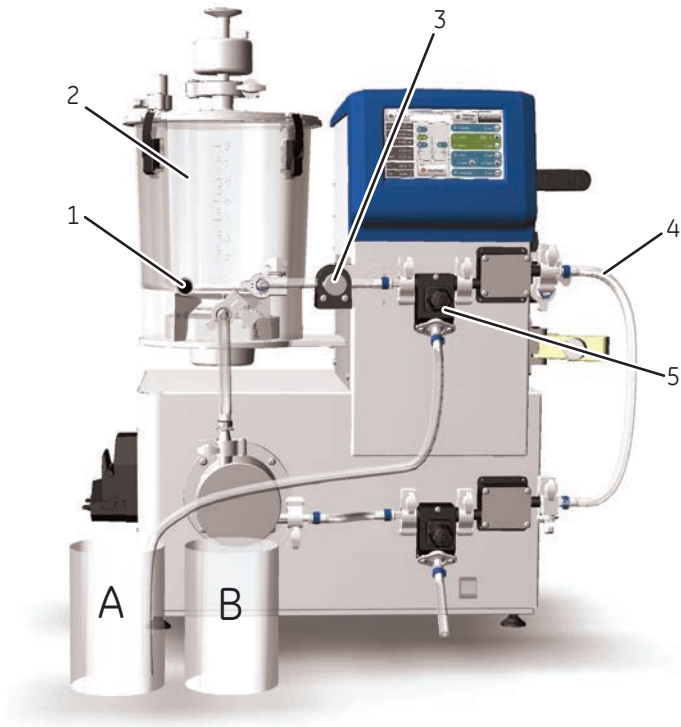
5	Open the upper drain valve to collect the flow (5) in beaker A.

Step	Action
6	Set a low RPM value of the feed pump on the control panel and tap **Start**. Let the pump run for a couple of minutes. Fill more water in the tank, if needed. For an instruction how to use set-points, see *Adjust set-points, on page 174*.
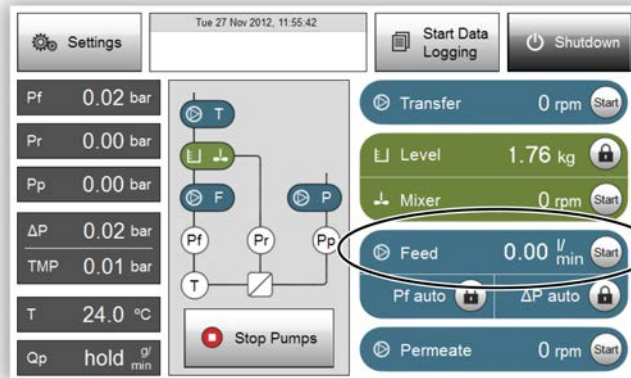
7	Adjust the back pressure on the upper drain valve with a pinch on the drain line tubing, if desired.
8	Note the **Pf** feed pressure sensor value on the indicator panel.

Step	Action
9	Remove the tubing from beaker A and put it in beaker B. Collect water between time point 0 and time point T, where T is at least one minute.
	Measure the mass of the water in beaker B with an external balance and calculate the flow rate (weight/time). Assuming that the density is 1, the measured value in kg/l will correspond to l/min.
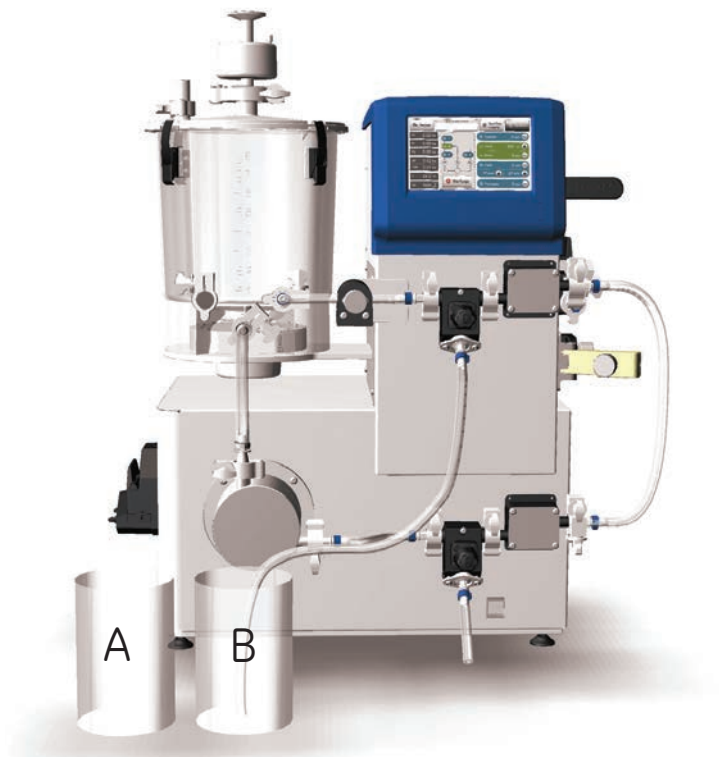
10	Perform the corresponding procedure (step 6 to 9) at a high RPM value for the feed pump.
11	Tap **Settings** on the main screen.
12	Tap **Calibration** on the screen that appears.

Step	Action
13	Tap *Feed pump* on the *Calibration Settings* screen.

|	
14	Enter the low RPM value of the feed pump and the corresponding calculated flow value in the gray field indicated with ①. Assuming that the density is 1, the measured value in kg/l will correspond to l/min.

Step	Action
15	Enter the high RPM value of the feed pump and the corresponding calculated flow value in the gray field indicated with ②.
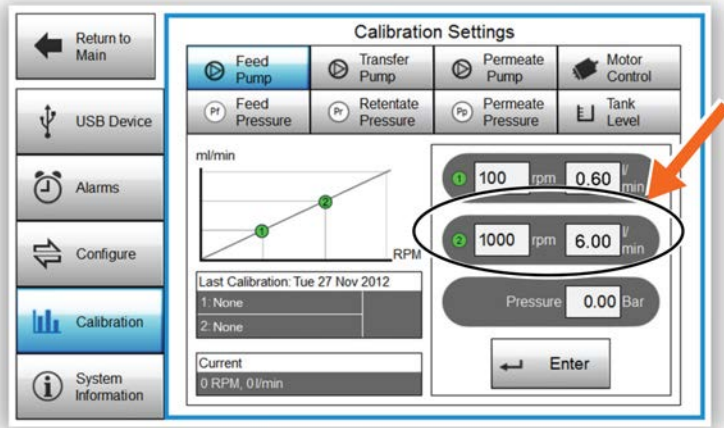
Step	Action
16	Enter the saved **Pf** feed pressure sensor value measured in the gray field marked with ***Pressure***.
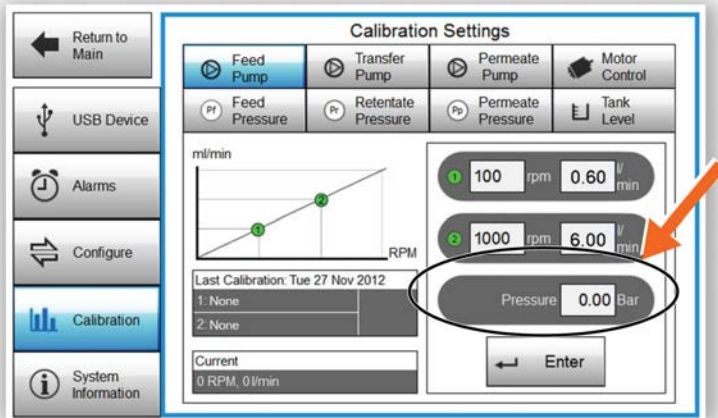
Step	Action
17	Tap *Enter*.
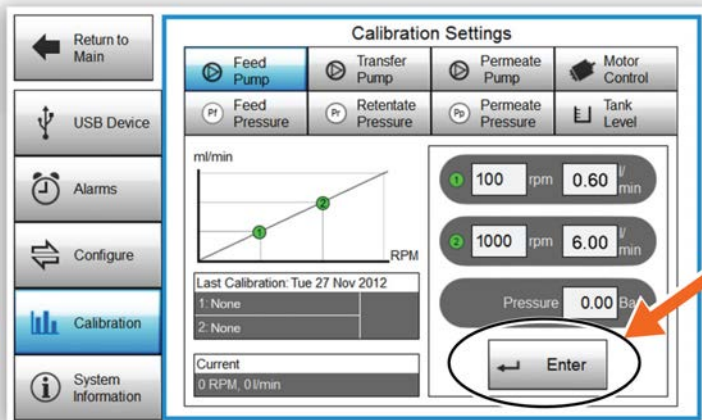
Result: The software calculates the correlation between used RPM and achieved flow and the feed pump is calibrated.

Note:

If the optional pump tubing is changed the pump calibration needs to be repeated.

Note:

To avoid tank draining during calibration route the tubing at higher level than the tank or place the collection beaker A/B at higher level than the tank.

6.3.2   Calibration of the transfer pump

Calibrate the transfer pump

Normally the transfer pump is calibrated at a back pressure of 0 Bar. If the transfer pump should be calibrated at another back pressure an external pressure sensor must be used together with a pinch to apply the back pressure.

Follow the instructions below to calibrate the system flow for the transfer pump at 0 bar back pressure. The transfer pump is optional.

Step	Action
1	Connect tubing to the transfer pump inlet (1) and the transfer pump outlet (2).

Step	Action
2	Fill beaker A with process liquid and put the tubing in the beaker.
3	Set a low RPM value of the transfer pump on the control panel and tap **Start**. Let the pump run for a couple of minutes. For an instruction how to use set-points, see *Adjust set-points, on page 174*.
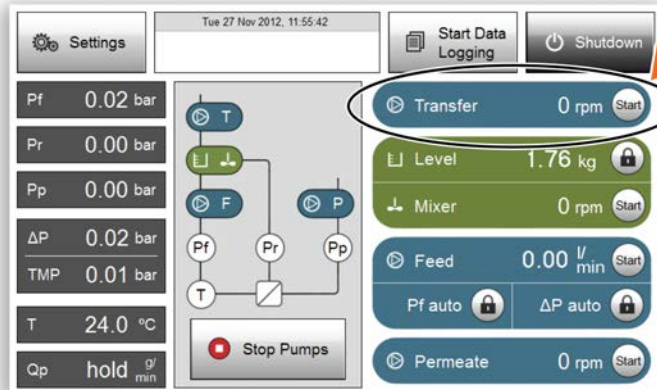
Step	Action
4	Move the tubing connected to the transfer pump outlet, from beaker A to beaker B (empty beaker), and start to collect flow at the transfer pump outlet.

Step	Action
5	Collect fluid between time point 0 and time point T. Measure the mass of the fluid in beaker B with an external balance and calculate the flow rate (weight/time).
6	Perform the corresponding procedure (step 2 to 5) at a high RPM value of the transfer pump.
7	Tap **Settings** on the main screen.
8	Tap **Calibration** on the screen that appears.

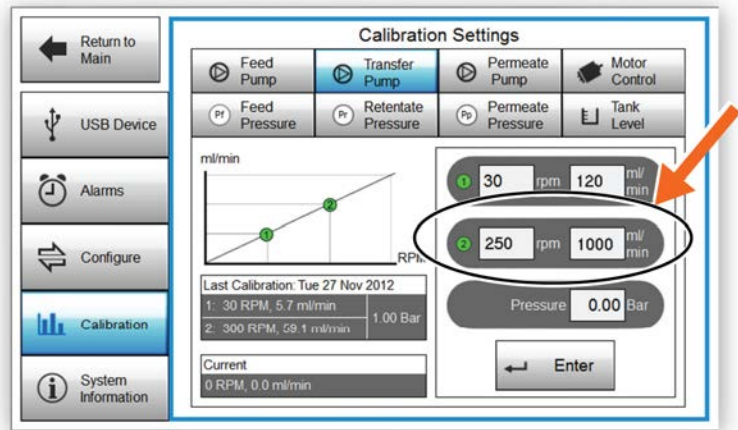| Step	Action
9	Tap *Transfer pump* on the *Calibration Settings* screen.
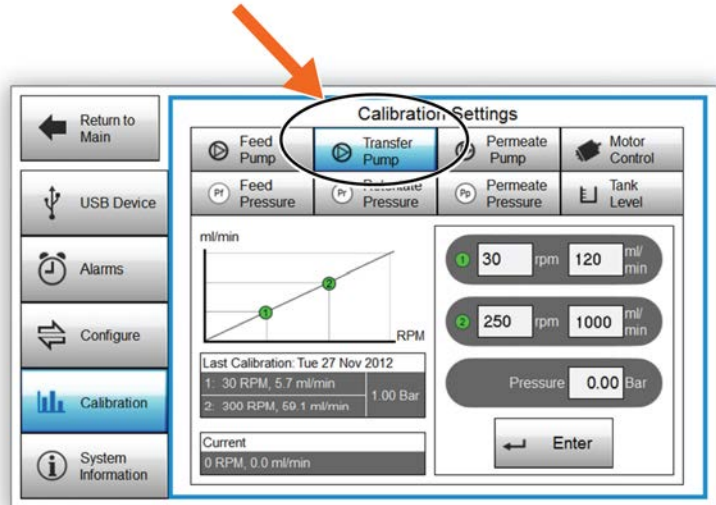
| 10	Enter the low RPM value of the transfer pump and the corresponding calculated flow value in the gray field indicated with ①. Assuming that the density is 1, the measured value in g/min will correspond to ml/min.
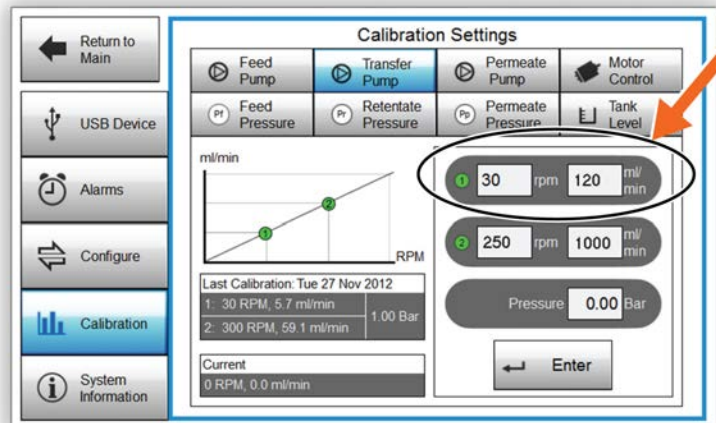
Step	Action
11	Enter the high RPM value of the transfer pump and the corresponding calculated flow value in the gray field indicated with ②.

Step	Action
12	The transfer pump is calibrated at 0 bar back pressure.
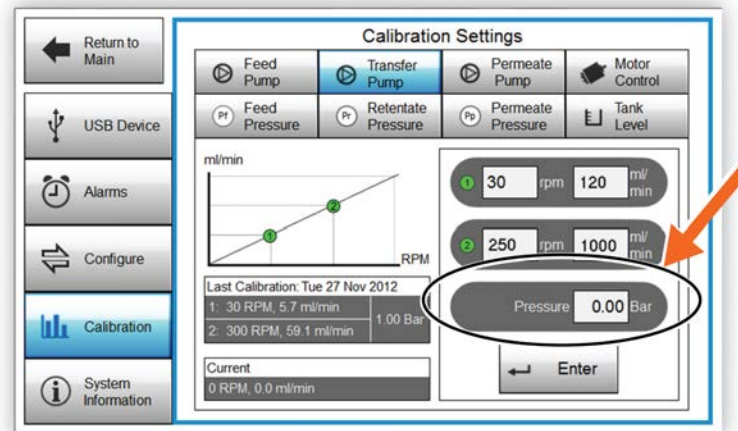
Step	Action
13	Tap **Enter**.

Result: The software calculates the correlation between used RPM and achieved flow and the transfer pump is calibrated.
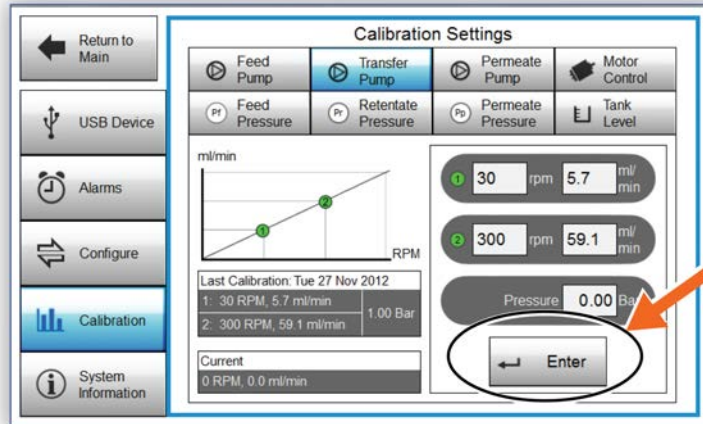
14	To see the flow in ml/min on the main screen after calibration, set the flow rate for the transfer pump to ml/min, see *Set units, on page 167*.

6.3.3 Calibration of the permeate pump

Calibrate the permeate pump

Follow the instructions below to calibrate the system flow for the permeate pump. The permeate pump is optional.
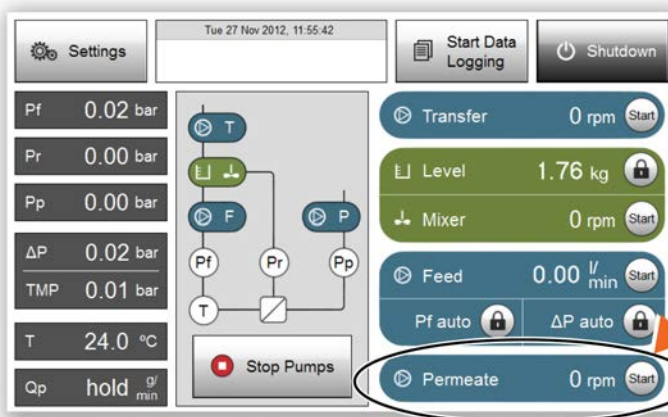
Step	Action
1	Connect tubing to the permeate pressure sensor inlet (1) and the permeate pump outlet (2).

2	Fill beaker A with process liquid and put the tubing in the beaker.

Step	Action
3	Set a low RPM value of the permeate pump on the control panel and tap **Start**. Let the pump run for a couple of minutes.

For an instruction how to use set-points, see *Adjust set-points, on page 174*.
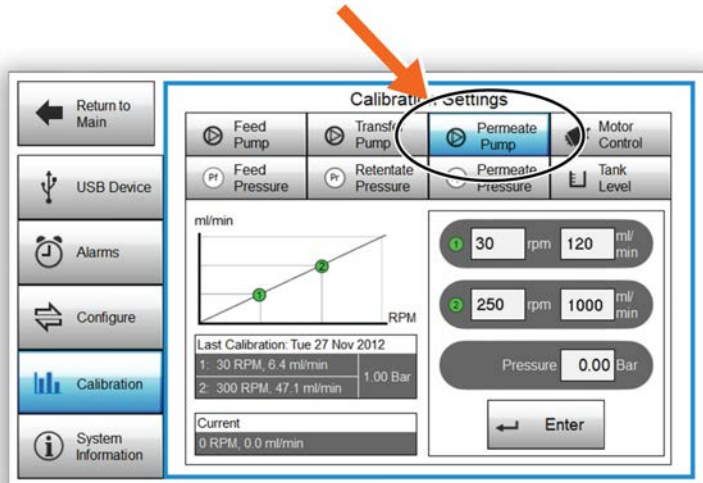
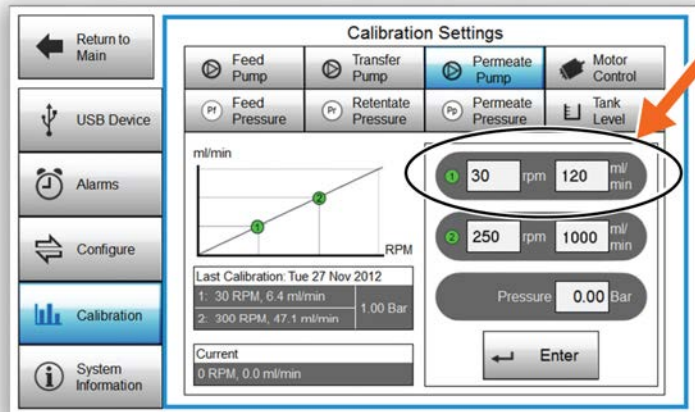| Step	Action
4	Move the tubing connected to the permeate pump outlet, from beaker A to beaker B (empty beaker), and start to collect flow at the permeate pump outlet in beaker B.

5	Note the **Pp** permeate pressure sensor value shown on the indicator panel.

Collect fluid between time point 0 and time point T. Measure the mass of the fluid in beaker B with an external balance and calculate the flow rate (weight/time). |
6	Perform the corresponding procedure (step 2 to 6) at a high RPM value of the permeate pump.
7	Tap **Settings** on the main screen.
8	Tap **Calibration** on the screen that appears.

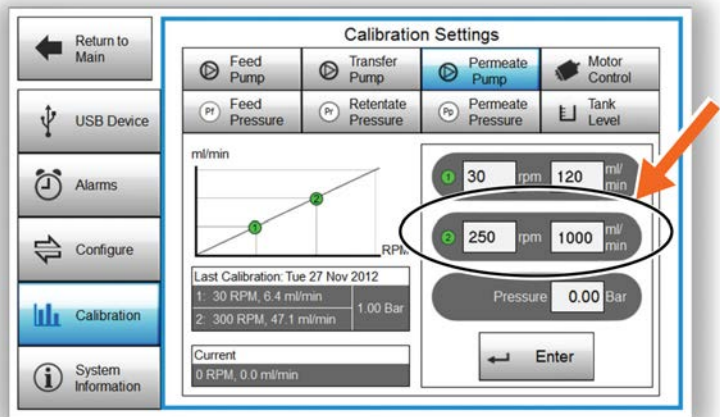| Step	Action
9	Tap *Permeate pump* on the *Calibration Settings* screen.

| 10	Enter the low RPM value of the permeate pump and the corresponding calculated flow value in the gray field indicated with ①. Assuming that the density is 1, the measured value in g/min will correspond to ml/min.

Step	Action
11	Enter the high RPM value of the permeate pump and the corresponding calculated flow value in the gray field indicated with ②.

Step	Action
12	Enter the saved **Pp** permeate pressure sensor value in the gray field marked with ***Pressure***.
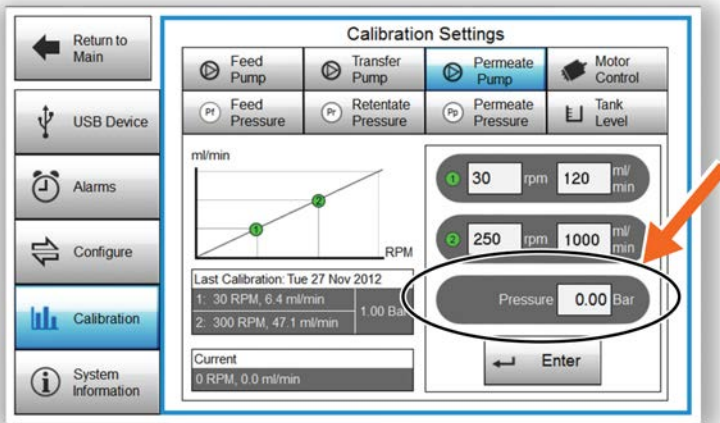
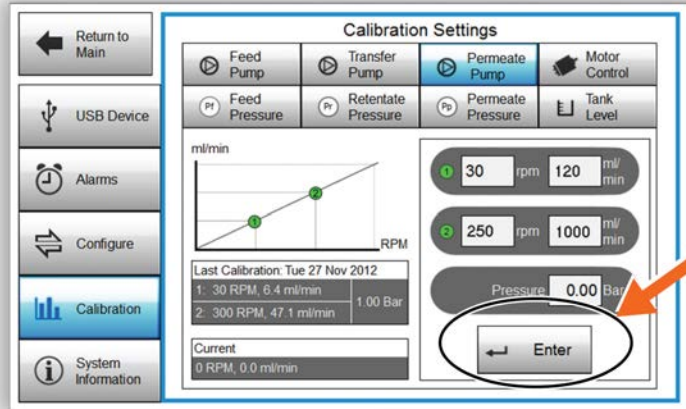| Step	Action
13	Tap *Enter*.

Result: The software calculates the correlation between used RPM and achieved flow and the permeate pump is calibrated.

| 14 | To see the flow in ml/min on the main screen after calibration, set the flow rate for the permeate pump to ml/min, see *Set units, on page 167*. |

6.3.4   Calibration of the pressure sensors

Calibrate the permeate pressure sensor

Follow the instructions below to calibrate the permeate pressure sensor. The permeate pressure sensor is optional.

Step	Action
1	Tap **Settings** on the main screen.
2	Tap **Calibration** to open **Calibration Settings**.
3	Tap **Permeate pressure** (1).
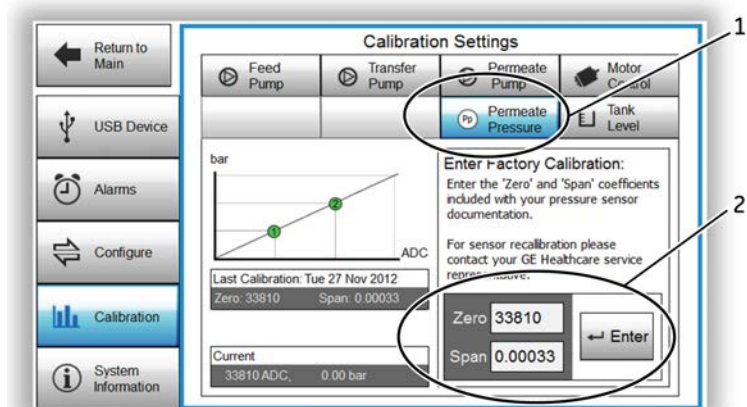
4	Enter the factory settings for the pressure unit connected to the system, in the gray fields (2) marked **Zero** and **Span**. For an instruction how to use set-points, see *Adjust set-points, on page 174*.
5	Tap **Enter**. *Result:* The permeate pressure factory calibration settings for the installed unit are applied to system.

Calibrate pressure sensors

Contact GE for a full-range calibration for the following sensors:

- Feed pressure sensor **Pf**

- Permeate pressure sensor **Pp**

- Retentate pressure sensor **Pr**

6.3.5   Motor control

Perform a motor control

A motor control calibration is performed in order to recognize which motors that are connected to the system and shall always be performed when the optional transfer or permeate pump is installed. Follow the instructions below to perform the motor control.

Step	Action
1	Tap **Settings** on the main screen.
2	Tap **Calibration** to open **Calibration Settings** screen.
3	Tap **Motor Control** (1).
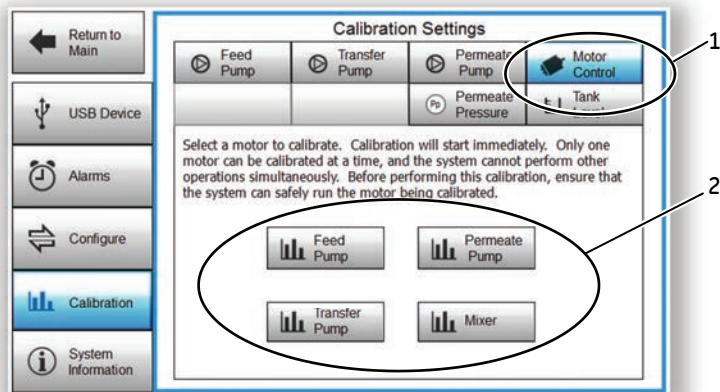
| 4 | Tap (2) the **Feed Pump**, **Permeate Pump**, **Transfer pump**, or the **Mixer**, depending on which of the motors you intend to calibrate.

Result: The selected motor calibrates itself by starting on the lowest rotation speed and accelerating to the highest rotation speed. |
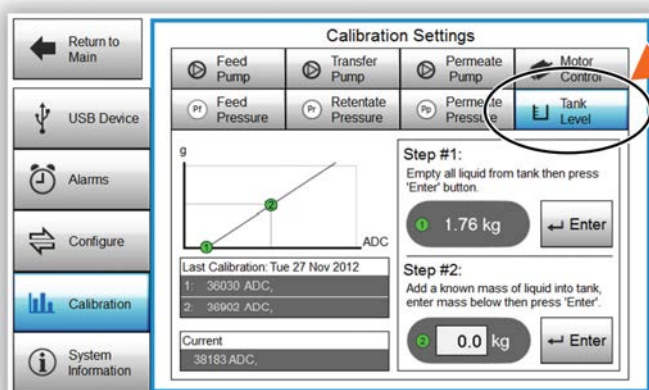
6.3.6 Tank level

Tank balance

It is recommended to calibrate the tank balance prior to each run to ensure a reliable output. The tank balance should also be calibrated every time the system has been moved, or if there has been any interference with the balance.

Note: *Do not interfere with the tank balance during the calibration procedure and filter run.*

Calibrate the tank level

Step	Action
1	Tap **Settings** on the main screen.
2	Tap **Calibration** to open **Calibration Settings**.
3	Tap **Tank Level**.

| 4 | Empty the tank. |

Step	Action

5   Tap the gray field indicated with ① in *Step #1:* panel.
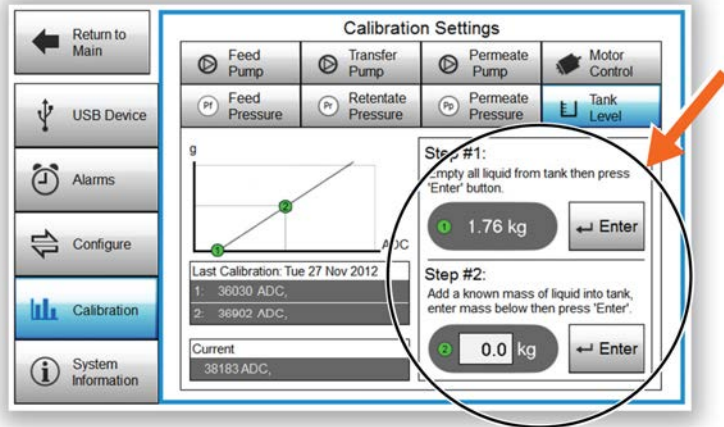
6   Tap *Enter* in *Step #1:* panel for zero point calibration.

7   Fill in the tank with a known mass of water measured from a measuring jar.

8   Tap the gray field indicated with ② in *Step #2*: panel.

Set the value using the keypad. For an instruction how to use set-points, see *Adjust set-points, on page 174*.

9   Tap *Enter* in *Step #2*: panel.

Result: The software calculates the calibration and saves the data.

10   Check that the mass reading is correct by emptying the tank. Read the value on the main screen. The value should be zero.

7   Operation

About this chapter

This chapter provides the information required to operate ÄKTA flux 6 in a safe way.

In this chapter

This chapter contains the following sections:

Section	See page
7.1 Start the system	144
7.2 Perform a run	146
7.3 Procedures after the run	156

Precautions

> ⚠️ **WARNING**
>
> Before performing any of the procedures described in this chapter, you must read and understand all contents of the corresponding sections in *Chapter 2 Safety instructions, on page 16*, as listed below:

- *General precautions, on page 17*
- *Personal protection, on page 18*
- *System operation, on page 23*

> ⚠️ **WARNING**
>
> Never exceed the operating limits stated in this document and on the system label. Operation of the product outside these limits can damage equipment and cause personal injury or death.

7.1 Start the system

Precautions

⚠	**WARNING** Do not use ÄKTA flux 6 if it is not working properly, or if it has suffered any damage, for example: • damage to the power cord or its plug • damage caused by dropping the equipment • damage caused by splashing liquid onto it

⚠	**WARNING** Make sure integrity of flowpath through pre-run with harmless liquids before use and sanitization.

⚠	**CAUTION** To prevent exposure to leaking hot fluids: • Do not use non-approved tubing and components together with or inside the system. • Maintenance and pump tubing replacement of the ÄKTA flux 6 must be scheduled on regular basis with a GE representative and performed by properly trained personnel only. • Always use appropriate Personal Protective Equipment (PPE) when operating and interacting with ÄKTA flux 6.

| ⮕	**NOTICE** Only use specified chemicals that have been proven not to be harmful to the wetted parts of the unit. Refer to *Section 11.4 Chemical resistance, on page 208* for more information.

Final checks before start

> **NOTICE**
>
> Make sure that the actions listed below are completed before ÄKTA flux 6 is started.

- Check that there is process liquid in the tank.
- Check that all inlets and outlets to the system are connected, closed or in appropriate state depending on the designed process. Inlets and outlets that are not in use shall be closed.
- Check the condition of all connections and gaskets. Tighten connections and replace gaskets if needed.
- Check that only chemicals specified for the system are used.

System start up
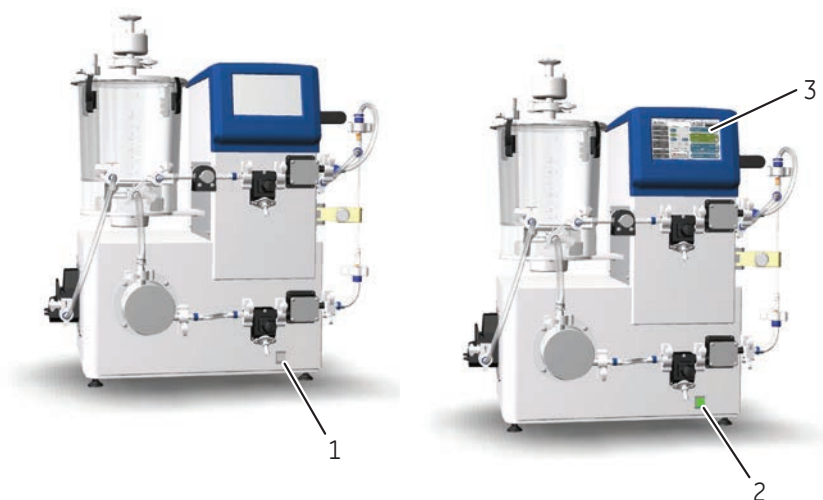
Step	Action
1	Switch on the power by turning on the power switch to the **I** position (1).
2	A green lamp (2) lights up.
3	The system starts automatically and the main screen appears (3).

7.2 Perform a run

Precautions

	WARNING
⚠	Never block the outlet tubing and/or the check valves outlet with, for example, stop plugs, since this will create overpressure or hardware failure and may result in injury.

	WARNING
⚠	Hot circulating fluids in ÄKTA flux 6 may cause hot fluidic lines, hot tank and hot chassis components.

	CAUTION
⚠	Risk of pinching by moving parts inside the tank or inside the pumps. Do not insert your fingers or other objects into the tank or other moving parts while ÄKTA flux 6 is powered.

	CAUTION
⚠	Handle fluids with care when adding fluid to the system or collecting fluid from drain valves. Always use appropriate Personal Protective Equipment (PPE) when operating and interacting with ÄKTA flux 6.

	NOTICE
➡	Excessive temperatures may damage the equipment. Do not run the system at higher temperatures than the specified maximum operation temperature as stated on the system label.

	NOTICE
➡	Blockage in the pump may cause overpressure.

7.2.1   Basic filtration

Perform a basic filtration

Step	Action
1	Fill the tank.
2	Tap *Mixer* (1) on the control panel.

3	Use the displayed keypad to set the desired mixer speed (rpm) and tap *OK*.
	For an instruction how to use set-points, see *Adjust set-points, on page 174*.
4	Tap *Start* mixer (2).
	Result: The software increases the mixer speed to match the set speed.
5	Make sure that the retentate pressure control valve is fully open and that the recirculation path (from tank and back to tank again) is completely open.
6	Tap *Feed* (3).
7	Use the displayed keypad to set the desired feed pump speed (rpm) and tap *OK*.
8	Tap *Start* feed pump.
	Result: The software increases the feed pump speed to match the set speed. The software will begin to calculate the estimated permeate flux and the actual measured feed pressure(s) will be displayed.
9	If desired, use the retentate pressure control valve to adjust the pressure.

7.2.2   Automated features

Constant retentate volume

The transfer pump and the level function can be used to keep a constant retentate volume (CRV) in the tank.

Note: *It is not recommended to use the CRV function with low volume in the the tank (< 1 liter). If necessary, use a low feed flow.*

Note: *The CRV QP function is valid within <120 sec after start of the measurement with ± 10% of volume set point for range 100-1000ml/min.*
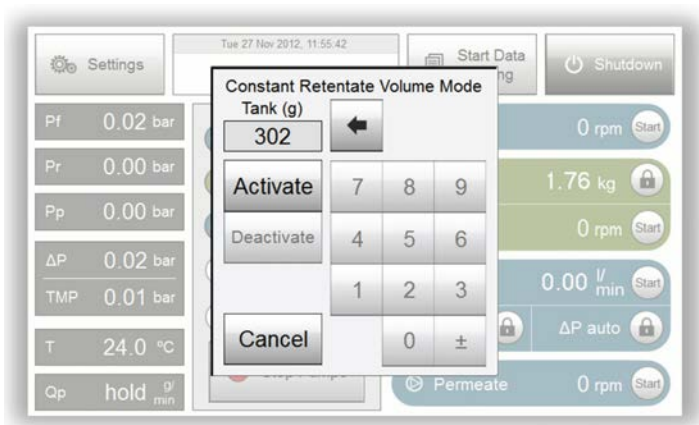
Step	Action
1	Tap **Lock** button (1) on **Level** on the control panel.

Step	Action
2	Use the displayed keypad to insert set-points for the constant retentate volume and tap **Activate**.

|	
3	Tap **Start** (2) to activate the mixer. *Result:* **Level** will control start and stop the transfer pump to keep the level of the tank constant.
4	To stop the function, tap **Lock** button and use the displayed keypad to tap **Deactivate**. ***Note:*** *The CRV warning function does not stop the filtration process. In order to stop the process while running in CRV mode, the tank low level alarm should be activated.*

Pf control

The feed pressure can be used to control the feed flow rate.

Step	Action
1	Perform a basic filtration, refer to step 1 – 5 in *Perform a basic filtration, on page 147*.
2	Tap *Lock* button next to *Pf auto* on the control panel, set constant pressure on the keypad that appears and tap *Activate*.
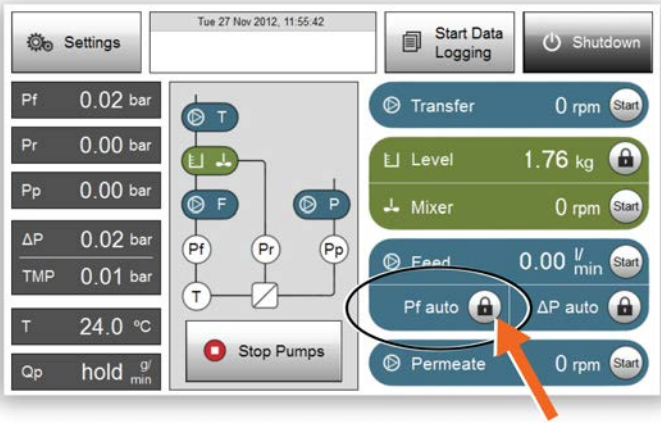
| Step	Action
3	Tap *Deactivate* to stop the feed pressure control.

ΔP auto

The delta pressure, measured by the feed and retentate pressure sensors, can be used to control the feed flow rate.

Auto delta pressure works between feed flow rate from 0.4 l/min to 6 l/min with tolerance of +/- 0.3 bar.

Step	Action
1	Perform a basic filtration, refer to step 1 – 5 in *Perform a basic filtration, on page 147*.
2	Tap *Lock* button next *ΔP auto* pressure on the control panel, set the value on the keypad that appears and press *Activate*.
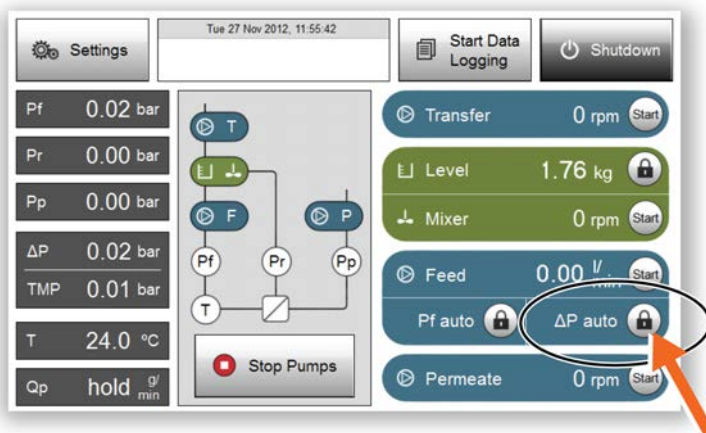
3	To stop the function, tap the *Lock* button and tap *Deactivate* on the displayed keypad.

Note:

When using delta pressure to control the feed flow the pressure control valve must be closed slowly to avoid large fluctuations in pressure.
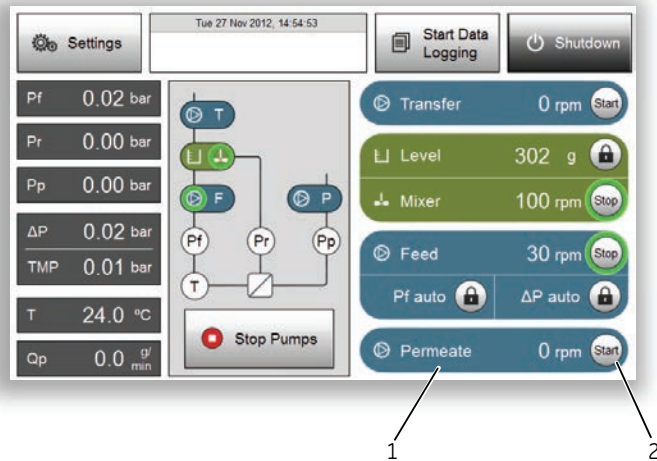
Constant permeate flow

The following steps require that the optional permeate pump is installed. Make sure that the feed pump is running at stable conditions before starting the permeate pump.

Step	Action
1	Tap *Permeate* (1) on the control panel.

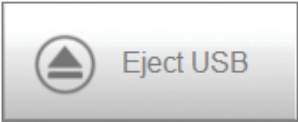|	
2	Use the displayed keypad to set the desired permeate pump speed (rpm) and tap *OK*.
	For an instruction how to use set-points, see *Adjust set-points, on page 174*.
3	Tap *Start* (2).
	*Result:*The software increases or decreases the permeate pump speed to match the set speed.

7.2.3   Data logging

USB memory stick

Data in a run can be captured on a USB memory stick. The file format is CSV (Comma Separated Value). The format CSV can be read by Microsoft® Excel®, for example.

The USB memory stick needs to be formatted as FAT32.

Create run report log file

Step	Action
1	Connect a USB memory stick to ÄKTA flux 6, for location see *USB connection, on page 55*.
2	Tap **Start Data Logging** on the main screen.

Result: Data is captured from the current run.

Note:

It is not possible to generate data after the run.

3	To end data logging, tap **Stop Report Logging** on the main screen.

Note:

The data logging can be stopped at any time during a run.

4	Tap **Settings** on the main screen.
5	Tap **USB Device** to open **USB Device Management**.

Step	Action
6	Tap **Eject USB**.

Note:

The data can be lost if this step is ignored.

Step	Action
7	Manually disconnect the USB memory stick from ÄKTA flux 6.

Save the result file

Step	Action
1	Insert the USB memory stick in the computer.
2	Open the .csv file in Excel.
3	Select the first column and then ***Data:Text to Columns***. Click ***Next***.
4	Select ***Comma*** as delimiter. Click ***Finish***.
	Result: The report file is displayed with columns.

7.2.4 Shutdown ÄKTA flux 6

Shutdown the process

Step	Action
1	Tap **Shutdown** on the main screen.

Step	Action
2	Tap **Yes** to power off the instrument.

Step	Action
3	Turn off the instrument by pushing the power switch to the **0** position when the blinking cursor has disappeared from the screen..
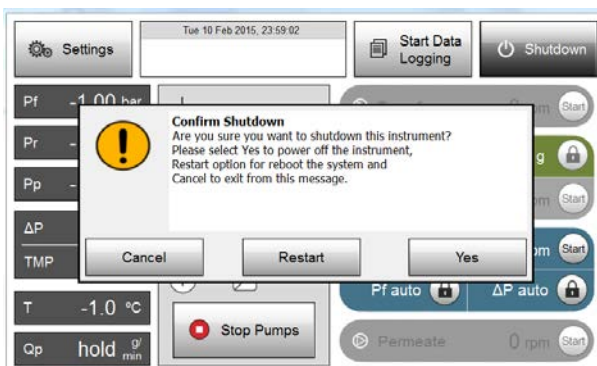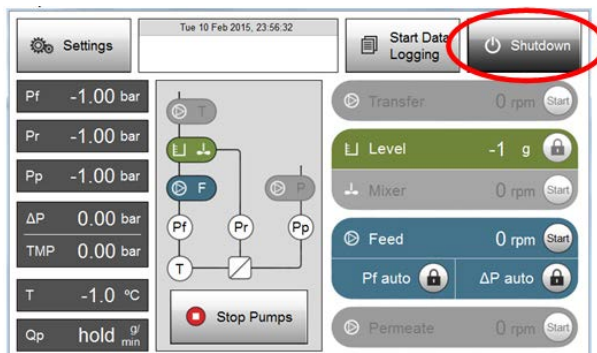
7.3   Procedures after the run

Introduction

The procedures after the run should be performed in the following order:

1   Empty the system.

2   Clean the system and filters after every run.

3   Prepare ÄKTA flux 6 for storage.

Precautions

> ⚠️ **CAUTION**
>
> Let ÄKTA flux 6 cool down after use as the components and internal compartments may become hot during use.

> ⚠️ **CAUTION**
>
> Make sure the control valve is released when there is no active filtration.

Empty the system

Empty the system by:

- Open the upper and lower drain valve.
- Run feed pump at low velocity until the system is empty.
- Shut down the pump.
- Open the pressure control valves.

> ➡️ **NOTICE**
>
> Make sure the pressure control valves not are pinching the tubing while there is no filtration. The tubing can be deformed.

CIP

Perform CIP after the run, see *Section 9.2 Sanitization and cleaning, on page 182*.

Clean the filters

Clean the filters according to instructions from the manufacturer.

Prepare for storage

If desired, prepare the system for storage as described in *Section 9.3 Storage, on page 186*.

8 Settings

About this chapter

This chapter describes the submenus in **Settings**. It also includes a description on how to change the settings of the parameters.

In this chapter

This chapter contains the following subsections:

8.1   USB Device Management screen and software update

USB storage device panel

The *USB Storage Device* panel shows if a USB memory stick is connected to the system, information about the type of USB memory stick and the storage capacity are displayed on the *USB Storage Device* panel.

How the USB memory stick shall be removed is described in *Create run report log file, on page 153*.
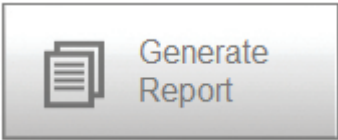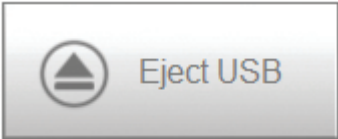
System health report

A system health report is a system status report that can be generated if a USB memory stick is connected to the system.

Follow the instructions below to generate a system health report and send the information to the USB memory stick. The system health report is created with the format CSV.

Step	Action
1	Insert a USB memory stick into the USB port.
2	Tap *Settings* on the main screen.
3	Tap *USB Device* to open *USB Device Management*.

Step	Action
4	Tap **Generate Report**.

Result: A text file is created onto the USB memory stick.

Step	Action
5	Tap **Eject USB**.

Step	Action
6	Remove the USB memory stick from the USB port.

Software update

The steps below explain how to upgrade software or install software.

Step	Action
1	Format a USB memory stick in FAT32.
2	Copy the package file (manualx_1.04.X. xxxxxx_x86_(release). opk) to the root-directory on the USB drive.
3	Remove all other versions from root-directory if present in the USB (This step is required if USB is not formatted and old version of software is present in the USB else skip it).
4	Insert USB memory stick into the USB port.
5	Navigate to **Settings** and select **USB Device**.

Step	Action
6	In the **USB Device Management** screen select **Update Software**.

7	Select **Yes**.
8	Wait for software to update and for the application to restart.
9	Navigate to **Settings:USB Device:USB Device Management**.
10	Select **Eject USB**.
11	To get the new default values for upgradation, reset the system with the **Restore default** (optional step).

8.2   Configure Alarms screen

Precautions

<table>
<tr>
<td>⚠️</td>
<td>

WARNING

All alarm signals must be set within the limits specified in the system documentation. Pressure and temperature control must be activated while the system is in use to prevent the tubing system to leak or break.

</td>
</tr>
</table>

Warnings and alarms

ÄKTA flux 6 can generate the following types of warnings and alarms.

If...	Then
Process related warning The warning level has been configured by the user in **Configure Alarms** screen.	The triggered warning is displayed on the main screen and ÄKTA flux 6 will keep on running.
Process related alarm The alarm level has been configured by the user in **Configure Alarms** screen.	The triggered alarm is displayed on the main screen and will stop the system's feed pump (and transfer and permeate pumps, if applicable) and thereby pause the process until manual interaction.
System related warning The warning message concerns an internal error in the system.	The triggered warning is displayed on the main screen and ÄKTA flux 6 will keep on running.
System related alarm The alarm is generated from the internal system.	The triggered alarm is displayed on the main screen and will stop the system's feed pump (and transfer and permeate pumps, if applicable) and thereby pause the process until manual interaction.

Process related warnings and alarms

For all parameters shown on the right hand side of the **Configure Alarms** screen, a definition of warnings and alarms can be set, both on high and low levels.

The illustration below shows an example of a screen for setting of **Feed Pressure** alarms.
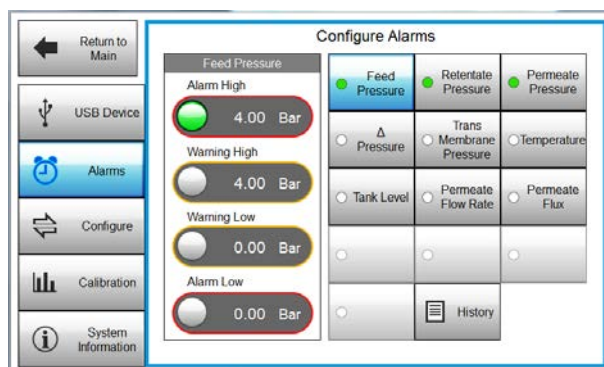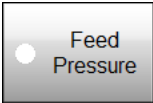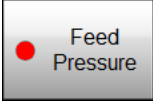

See the table below for an overview of the possible alarm or warning settings of each parameter.

Parameter	Alarm High	Alarm Low	Warning High	Warning Low
Feed pressure	X	X	X	X
Retentate pressure	X	X	X	X
Permeate pressure	X	X	X	X
Temperature			X	X
Permeate Flow Rate			X	X
Permeate Flux			X	X
Tank Level	X	X	X	X

Note: *The **Alarm High** settings for **Feed Pressure**, **Retentate Pressure** and **Permeate Pressure** can be adjusted, but can never be set to a value higher than the highest system pressure (4 bar) bar and cannot be disabled. A high alarm setting is always active as a pressure cutout for safety reasons for these parameters.*

Alarm indicators

The indicator on the parameter have different meanings depending on the color.

| Part	Function
Feed Pressure	A blank indicator means that no warning or alarm is set for the parameter.
Feed Pressure	A green indicator shows that at least one high or low warning or alarm has been set for the parameter.
Feed Pressure	A red indicator shows that an alarm or a warning is triggered.

Set system alarm parameters

The example below shows how the *Alarm High* is set for feed pressure.

Step	Action
1	Tap *Settings* on the main screen.
2	Tap *Alarms* to open *Configure Alarms* screen.
3	Tap *Feed Pressure* on the right hand of the screen.
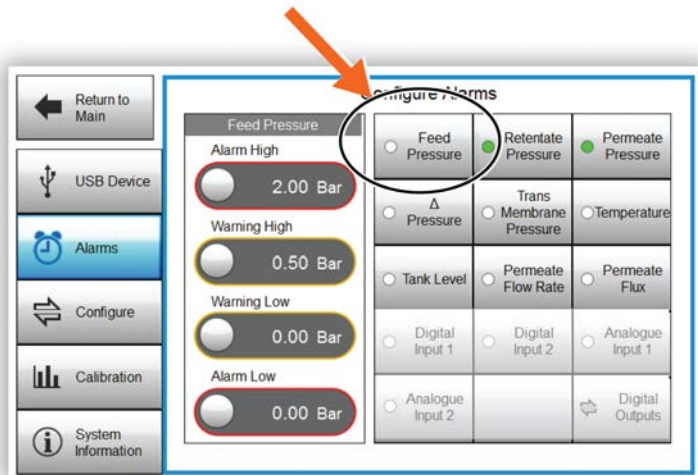
Step	Action
4	Tap the **Alarm High** button and use the **-** or **+** to set the preferred values for **Alarm High**, or use the displayed keypad to set points.

For an instruction how to use set-points, see *Adjust set-points, on page 174*.
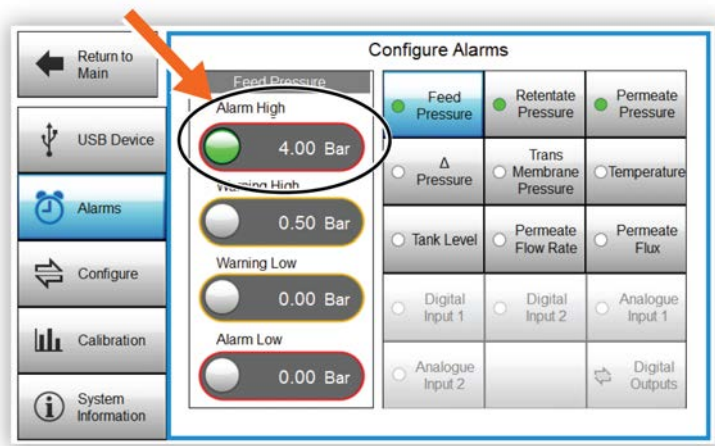
| 5 | The **Feed Pressure** indicator turns green showing that an alarm high is triggered. |

Note:

To deactivate an alarm or warning tap the activated alarm and check that the indicator turns white.

8.3   Configure System screen

System parameters

User configuration of system parameter units is set from the **Configure System** screen. The following units can be configured:

Parameter	Units
Pressure	bar, psi
Temperature	Celsius, Fahrenheit
Feed Pump	RPM, l/min, Shear Rate
Permeate Flux	g/min, LMH
Transfer & Permeate Pump	RPM, l/min

Set units

Follow the instructions below to set the units.

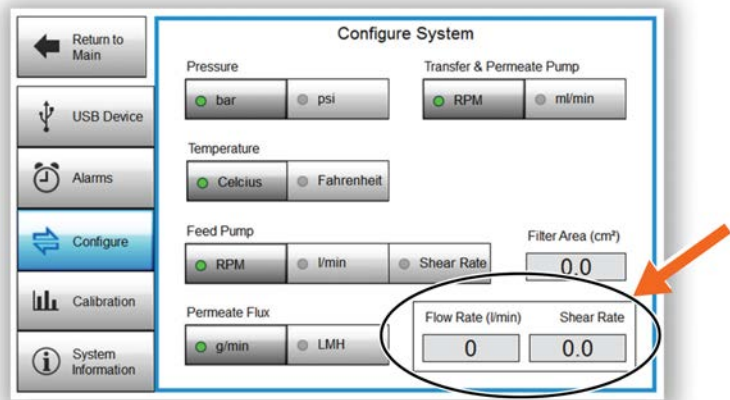| Step	Action
1	Tap **Settings** on the main screen.
2	Tap **Configure** to open **Configure System** screen.
3	Tap the system parameter button you want to set.
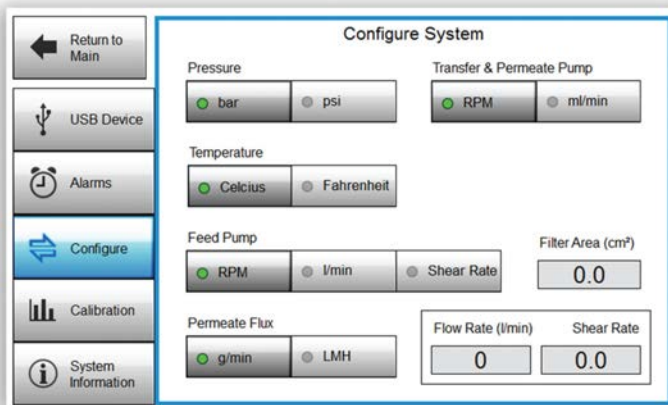
Result: The indicator on the selected button turns green.

Step	Action
4	If **Shear Rate** is chosen as the unit for **Feed Pump**, you also have to set the values for **Flow Rate (l/min)**, and the corresponding **Shear Rate** (values provided by the hollow fiber manufacturer).

Step	Action
5	Tap the **Flow Rate (l/min)** field and the **Shear Rate** field to set the preferred values with the displayed keypad. Digits can be deleted using the arrow sign button in the upper right corner of the keypad.
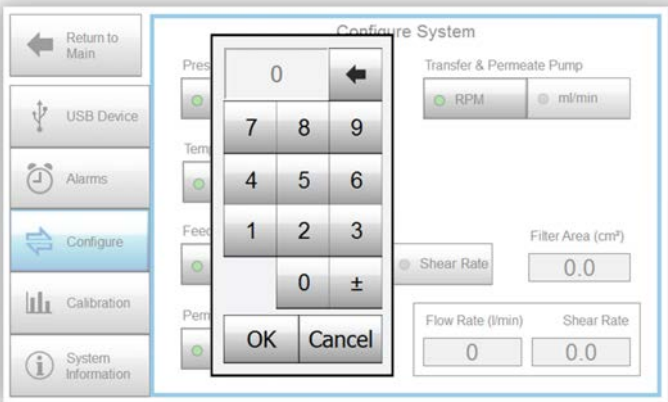
Step	Action
	Nominal cartridge feed flow rate and pressure drop as a function of shear rate

| Style	Nominal Lumen ID (mm)	Shear Rate 2000 sec^{-1} Flow (l/min)	Shear Rate 4000 sec^{-1} Flow (l/min)	Shear Rate 8000 sec^{-1} Flow (l/min)	Shear Rate 16000 sec^{-1} Flow (l/min)
AXM	0.5	0.025	0.05	0.1	0.2
	0.75	0.04	0.08	0.16	0.32
	1	0.07	0.14	0.28	0.56
3M, 3x2M	0.25	0.05	0.11	0.23	0.4
	0.5	0.06	0.12	0.25	0.5
	0.75	0.1	0.2	0.4	0.8
	1	0.15	0.3	0.6	1.2
4M, 4X2M	0.25	0.19	0.38	0.76	1.5
	0.5	0.3	0.6	1.2	2.4
	0.75	0.4	0.8	1.5	3
	1	0.6	1.2	2.5	5

6	Tap **OK** to save the settings.
7	Tap **Cancel** to close the displayed keypad without saving.
8	If **LMH** is chosen as the unit for **Permeate Flux**, you also have to set the value for the **Filter Area (cm^2)**.
9	Tap the **Filter Area (cm^2)** field and use the keypad to set the preferred value.

8.4 Calibration Settings screen

Calibration Settings

All the pumps, the pressure sensors and the tank level can be calibrated from the *Calibration Settings* screen. For information on how to perform calibration in ÄKTA flux 6, see *Section 6.3 Calibration, on page 119*
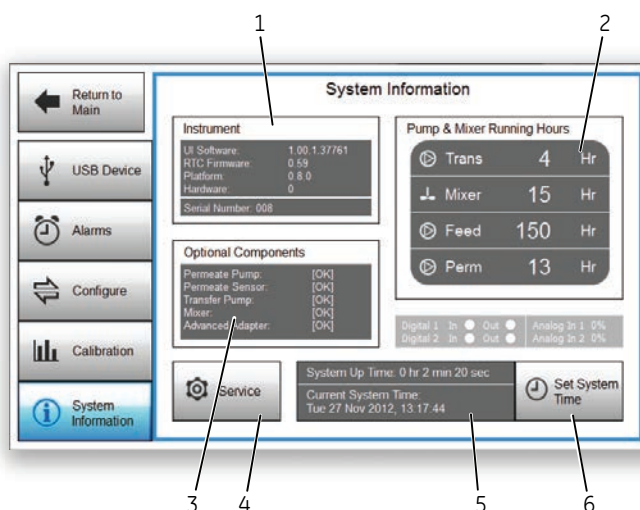
The illustration below is just an example of a calibration screen.
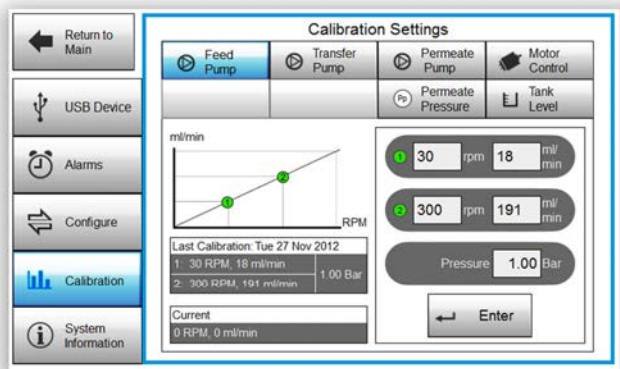
8.5   System Information screen

System information

The *System Information* panels provide information on the different parts of the system. See the screen and table below for descriptions.


Part	Function	Description
1	*Instrument* panel	Provides information about installed software and the serial number of the system.
2	*Pump & Mixer Running Hours*	Overview of the running hours of pumps and mixer.
3	*Optional Components* panel	Provides information of the following components: • *Permeate Pump* • *Permeate Sensor* • *Transfer Pump* Installed components are indicated with *OK* and missing components are indicated with *None*.
4	*Service* button	Password protected sub-menu used by service personnel.

| Part	Function	Description
5	**System Up Time** and **Current System Time** panel	Shows the system up time and the current system time.
6	**Set System Time** button	Sub-menu to set the system date and time, see instructions below.

Set system date and time

Follow the instructions below to set the system time and date.

Step	Action
1	Tap **Settings** on the main screen.
2	Tap **System Information** to open **System Information** screen.
3	Tap **Set System Time** and a **Date and Time** keypad appears.
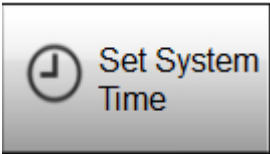
4	Tap the **Date** fields **date**, **month** and **year** to set the date, and the **Time (24 hr)** fields **hour** and **minutes** to set the time.
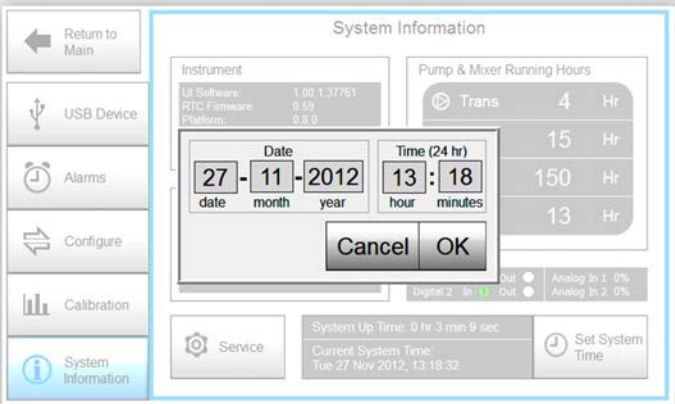
Step	Action
5	Use the keypad that appears to enter new values. Digits can be deleted using the arrow sign button in the upper right corner of the keypad.

|	
6	Tap **OK**.
7	Tap **Cancel** to close the keypad set without saving.

8.6   Set-points

Introduction

This section describes how to enter set-points for *Transfer*, *Level*, *Mixer*, *Feed*, *Pf auto*, *ΔP auto*, and *Permeate*.

Adjust set-points

Step	Action
1	On the main screen, tap the parameter you want to set, for instance *Transfer*. If the button contains a lock symbol, i.e. for *Level*, *Pf auto* and *ΔP auto*, tap the lock symbol instead of the parameter name. The parameter field turns gray, with **-** to the left and **+** to the right.
	Tap **-** or **+** signs to adjust the set-points.
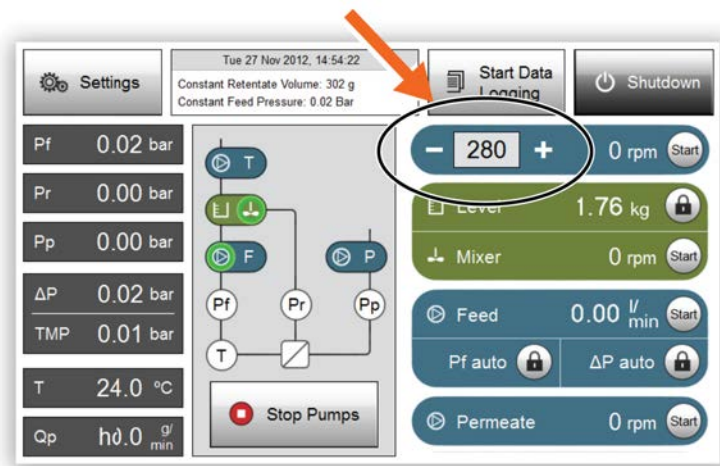
Step	Action
2	Alternatively, tap the gray field and set the preferred values by using the displayed keypad. Digits can be deleted using the arrow sign button in the upper right corner of the keypad.

| 3 | Tap *OK* to save the settings. |
| 4 | Tap *Cancel* to close the keypad without saving. |

Configure Log Interval

To log the content interval follow the steps below.

Step	Action
1	To configure the content interval, tap *Log Interval (sec)* on the *Configure System* screen.
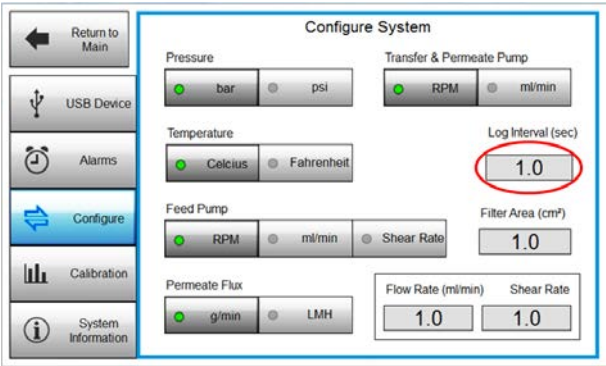
2	Enter the time interval and tap *OK*.

Step	Action
3	A run report will be of recorded at the selected log interval.

9 Maintenance

About this chapter

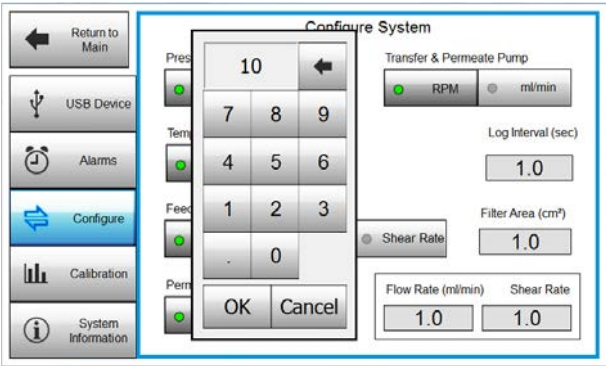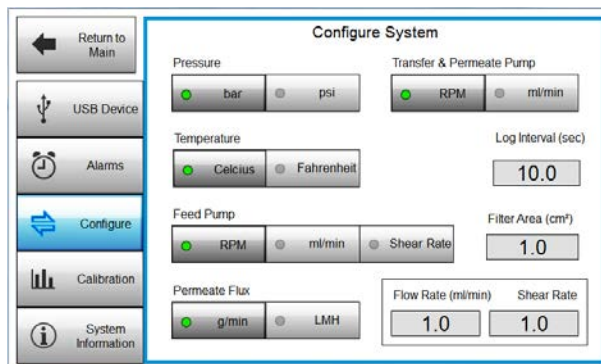This chapter provides required information to enable users and service personnel to maintain ÄKTA flux 6.

In this chapter

This chapter contains the following sections:

Section	See page
9.1 User maintenance schedule	180
9.2 Sanitization and cleaning	182
9.3 Storage	186
9.4 Repair and calibration	188
9.5 Replace mains fuse	189

Precautions

> ⚠️ **WARNING**
>
> Before performing any of the procedures described in this chapter, you must read and understand all contents of the corresponding sections in *Chapter 2 Safety instructions, on page 16*, as listed below:

- *General precautions, on page 17*
- *Personal protection, on page 18*
- *Power supply, on page 22*
- *Maintenance, on page 25*

> **CAUTION**
>
> Always use appropriate personal protective equipment when de-commissioning the equipment.

> **WARNING**
>
> When using hazardous chemicals, run **System CIP** and **Membrane CIP** to flush the entire system, including filters, with distilled water until a pH of approximately pH 7.0 is reached, before performing service or maintenance.

> **WARNING**
>
> Periodically inspect the system's tubing, gaskets, seals, and connections for wear and damage to prevent leaks and the release of potentially hazardous fluids.

> **WARNING**
>
> Before maintenance/service is performed, the system owner must first clean the system and complete a Health & Safety Declaration Form . Contact GE for further information.

9.1 User maintenance schedule

Introduction

The maintenance recommendations are different depending on how often ÄKTA flux 6 is used. Note that the recommendation may not apply to your specific use of the system. The system owner is solely responsible for establishing applicable routines for periodic maintenance.

Precautions

WARNING

Maintenance should be scheduled regularly with GE to assure a proper function of the system.

WARNING

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

For each run

This section covers maintenance actions required for each run or weekly (depending on which happens first).

Component	Action
Complete system	Clean the system according to the procedure described in *Section 9.2 Sanitization and cleaning, on page 182*.
Protective earth	Make sure that the protective earth wiring is not disconnected or damaged.
Tubing, connections and seals	Check for leakage. Replace seals if needed. Perform a leakage test at maximum operating pressure.
Feed pump	Listen and look for unusual noises, vibration and temperature change.

Annually or as needed

This table below covers maintenance actions required annually or as needed.

Component	Action
Complete system	A preventive maintenance test procedure on all systems, sensors, pumps and valves should be performed annually by trained and certified personnel. Contact your local GE representative. Replace all gaskets, O-rings, and valve or pressure sensor diaphragms.
Pump of peristaltic type	Replace all wear and tear parts.
Feed pump	Contact GE for service of the feed pump.

9.2   Sanitization and cleaning

General

A suitable frequency of routine cleaning is determined by the nature of the starting material and the type of process. However, routine cleaning shall be performed at intervals aimed at prevention rather than cleaning ÄKTA flux 6 (and connected equipment) from growth or contamination.

Precautions

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

Sanitization

Sanitization is the use of chemical agents to reduce microbiological contamination to an acceptable level.

A sanitization procedure is used when there is a need to reduce microbial levels, for example between product batches, or when there has been unwanted microbial contamination.

Cleaning-in-place (CIP)

Cleaning-in-place (CIP) is the removal of every kind of contaminant, protein, lipid, other particulates and microorganisms.

Note: *Make sure the instrument withstands the chemicals used for CIP, refer to Section 11.4 Chemical resistance, on page 208.*

The **CIP feature** allows the feed pump to run up to maximum speed 1600 rpm or equivalent l/min. (Ref : In Chapter 9, section 9.2, (page 184)).

Note: *Replace the filter with a T-piece and appropriate CIP tubing during cleaning and pump the CIP solution through the instrument. For information regarding CIP tubing, see Tubing for Cleaning in Place (CIP), on page 87.*
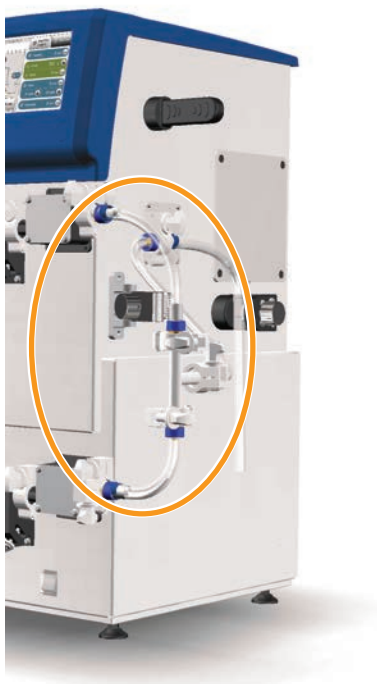
Step	Action
1	To enable CIP feature, tap *CIP* on the *Configure System* screen.
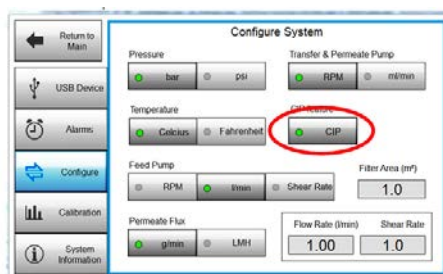
| 2 | The feed pump speed can be altered for CIP if required. Refer section [6.3.1] |

Step	Action
3	Tap **Start** and confirm with **Yes** to start the feed pump .

Note:

The feed pump will reach the maximum speed of 1600 rpm within 1 minute when CIP is enabled. Under normal conditions the feed pump speed is 1200 rpm or 6 l/min.

Extended cleaning performance

If ÄKTA flux 6 has been heavily contaminated and the normal CIP-procedure is not sufficient, cleaning performance can be improved by:

- Extending the total CIP time period.

- Changing to an alternative CIP-agent.

- Filling ÄKTA flux 6 and attached components with cleaning agent to dissolve contaminants for an extended time period before applying CIP.

Rinsing

After completed CIP, rinse the ÄKTA flux 6 interior and all cleaned components thoroughly with water of desired quality, for example Water For Injection (WFI), to remove all traces of the cleaning agent.

Cleaning external surfaces

ÄKTA flux 6 is designed to be operated in a clean environment and the external surfaces should not normally accumulate any substantial amount of dust or dirt.

Regularly, wipe the outside of the ÄKTA flux 6 with a clean cloth. Use water, with a mild detergent if needed, followed by 70% Ethanol. Regular wiping and care of the equipment will help keep prevent corrosion.

It is not recommended to spray or splash liquids on the external surfaces of the system.

Cleaning of components

All components can be cleaned with the most commonly used agents, such as detergents, 70% ethanol, weak acids, sodium hydroxide and salt solutions.

Refer to *Section 11.4 Chemical resistance, on page 208*.

Cleaning of filters

Perform a leakage test of the filters before cleaning, refer to *Leakage test, on page 117*.

For more information about cleaning of filters refer to:

- Hollow fiber cartridges cleaning procedures are provided in the *Hollow fiber cartridges for membrane separations operating handbook*, article number 18116530,

- Kvick Lab cassettes cleaning procedures are provided in *Kvick Lab and Kvick Flow Cassettes User Manual*, article number 18117169, and

- Kvick Lab cassettes cleaning instructions in *Kvick Lab Cassette Holder ll User Manual*, article number 29027161.

Filter units provided by other manufacturers shall be cleaned according to the instructions from the respective manufacturer.

Cleaning before maintenance/service

The system must be thoroughly cleaned to remove any infectious or aggressive fluids before maintenance or service.

9.3   Storage

Introduction

This section describes the procedures for storage of ÄKTA flux 6.

Precautions

> **NOTICE**
>
> Fit protective caps on all electrical and optical connectors when not in use.

> **NOTICE**
>
> When the product is filled with a storage solution, the temperature must be high enough to prevent freezing, and low enough to prevent evaporation.

Storage requirements

Parameter	Allowed range
Ambient temperature, storage	-25°C to +50°C
	Temperature gradients of ≤ ±1°C/min
	See detailed information in *Operating limits, on page 196*.

Short term storage

The procedure described below is applicable for storage durations up to one month.

Step	Action
1	Perform cleaning as described in *Section 9.2 Sanitization and cleaning, on page 182*.

Step	Action
2	Fill ÄKTA flux 6 with 20% ethanol to prevent microbial growth.
	Make sure that the filter cassettes are at least partially wetted during storage.
3	Seal off ÄKTA flux 6 to prevent contamination caused by the surrounding environment.
4	Release the tubing from the transfer and permeate pump heads by moving the lever from right to left, if these optional pumps are installed.

Long term storage

To prevent microbial growth, the storage solution must be replaced regularly if ÄKTA flux 6 is stored for long periods of time.

The procedure described below is applicable for storage duration longer than one month.

Step	Action
1	Follow the steps below to empty the system.
	1 Open the upper and lower drain valves.
	2 Run the feed pump at low velocity until the system is empty.
	3 Clear and dry lines with compressed gas.
	4 Shut down the pump.
	5 Release the tubing from the transfer and permeate pump heads by moving the lever from right to left, if these optional pumps are installed.
	6 Close the valves.
	7 Cover all un-connected connectors.
2	Perform the actions described for short term storage, see above.
3	Place ÄKTA flux 6 in a dust free environment with well-controlled climate.
	The temperature should be in the range 4°C to 25°C and stable.
	The air humidity and air temperature differences should be kept as low as possible to prevent condensation and corrosion.

9.4 Repair and calibration

Introduction

Components not covered in this manual may not be calibrated or repaired by the user. If any ÄKTA flux 6 components do not operate according to specifications, contact your GE representative.

> ⚠️ **WARNING**
>
> Do not attempt to perform any actions not described in this document.
>
> Always contact your GE representative for advice if such a need should arise.

Filter integrity test

This method can be used to check that the filter is not damaged and that it has been mounted correctly.

Refer to *Filter integrity test, on page 117*.

9.5   Replace mains fuse

Introduction

A blown fuse may indicate the existence of another problem in the instrument. If a replacement fuse blows, do not replace it and contact GE.

Precautions

> **WARNING**
>
> Always disconnect power to ÄKTA flux 6 before replacing fuses.

Replace the mains fuse

Note: *A small screwdriver is used to remove the mains fuses.*

The mains fuses are placed in a fuse drawer under the power supply input at the rear side of ÄKTA flux 6.

Step	Action
1	Disconnect the power supply.

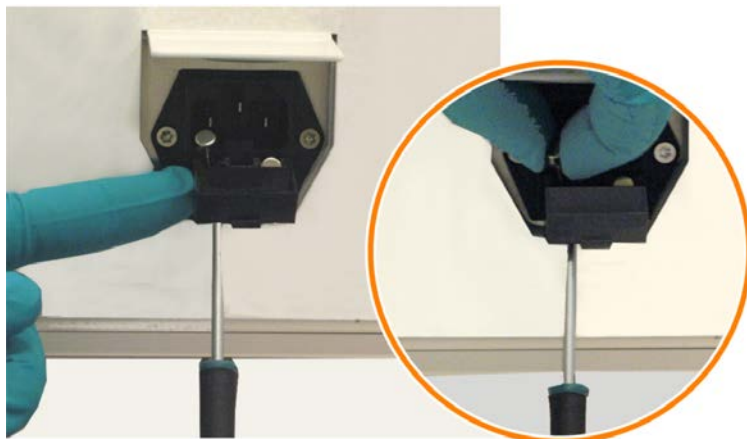| Step	Action
2	Grip the fuse drawer and loosen it.

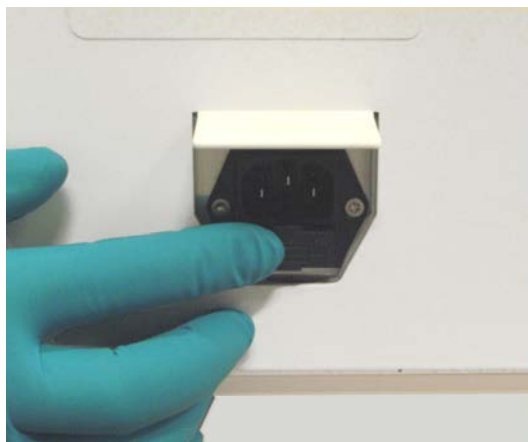|	
3	Fold the drawer lid to locate the mains fuses.
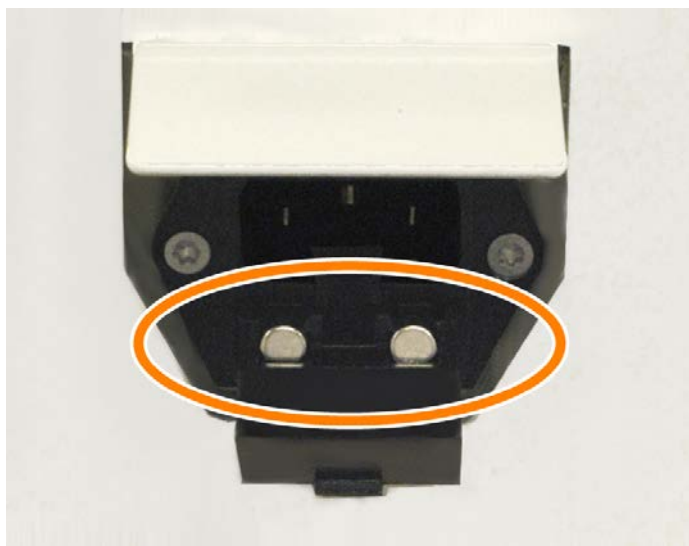
Step	Action
	Remove the old fuse with help of a small screwdriver that is inserted in the hole under the fuse drawer.

4	Insert the new fuses.
	For specification of the fuses, see *Electric power, on page 196*.
5	Push the fuse drawer in its holder.

10 Troubleshooting

About this chapter

This chapter provides information for users and service personnel to identify and correct problems that may occur when operating ÄKTA flux 6.

If the suggested actions in this guide do not solve the problem or if the problem is not covered by this guide then contact GE for advice.

Precautions

> ⚠️ **WARNING**
>
> Before performing any of the procedures described in this chapter, you must read and understand all contents of the corresponding sections in *Chapter 2 Safety instructions, on page 16*, as listed below:

- *General precautions, on page 17*
- *Personal protection, on page 18*
- *Power supply, on page 22*
- *Maintenance, on page 25*

System

Component	Possible cause	Corrective action
Power	An automatic circuit breaker has triggered	• Turn off the instrument and visually inspect for damage. If damaged then contact GE. • Check if any of the automatic fuses has popped out and push them back in.
	A replaceable fuse has gone	• Check the replaceable fuses in the fuse drawer at the power input. • Replace fuse if broken with correct fuse rating see *Electric power, on page 196*. • Turn on the system and if the problem persists, contact GE.
Pumps	Pump not working	• The **Stop** button on main screen has been pressed. • If problem persists, contact GE.
	Little or no flow	• Check that connected inlet is actually used. • Check if liquid is supplied to the system. Check inlet containers. • Check if pressure control valve is open. • Check if tubing from inlet container causes pressure or flow loss. Reasons may be too long tubing, too small internal diameter, tubing may have a narrow section or is partly plugged. • Peristaltic tubing worn out and flattened or not properly tensioned inside pump head, re-tension or replace tubing inside pump head.
	Too high feed outlet pressure	• Check the outlet to see if the sensor is not plugged. • Filter cassette plugged with particulates, replace cassette and filter feed material with 0.2 micron before performing protein concentration.
Peristaltic pumps	Little or no flow due to broken or damaged tubing	• Check if pressure control valve is open. • Check the pump tubing. • If problem persists, contact GE.

11   Reference information

About this chapter

This chapter provides reference information that may become useful when installing, operating, maintaining and troubleshooting ÄKTA flux 6.
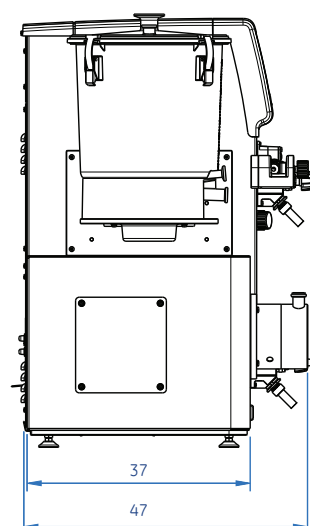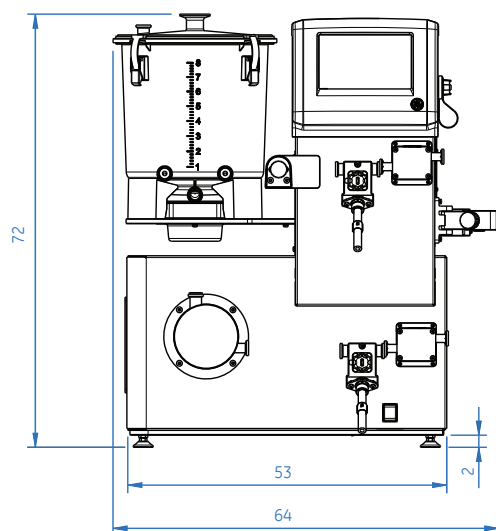
In this chapter

This chapter contains the following sections:

11.1 Specifications

Dimensions

All dimensions are presented in cm.

Dimensions	Value
Length (bottom part)	53 cm
Length (including filter holder)	64 cm
Width (bottom part)	37 cm
Width (including feed pump)	47 cm
Height (including feet)	72 cm
Height (feet)	2 cm

Weight and volume

Data	Value
Weight	53 kg

Data	Value
Tank volume	8 liters

System sound levels

Properties	Value
Max	75 dBA
Typical value under normal running conditions	65 dBA

Electric power

Property	Value
Supply voltage	100-120/220-240 V AC ±10%, 50 to 60 Hz
Phases	Single
Max power	400 VA
Ingress protection	IP 21
Fuses	2x T 4AL 250V
Over voltage category	II
Pollution degree	2

Operating limits

Parts and properties		Value
Feed pump	Pressure at 20°C	Max 4.0 bar pressure alarm/cut-out
Transfer pump	Feed temperature	2°C to 50°C
	Outlet pressure	Max 1 bar

Parts and properties		Value
Permeate pump	Permeate temperature	2°C to 50°C
	Inlet pressure	Max 1 bar
	Outlet pressure	Max 1 bar
Environmental ranges	Ambient temperature	2°C to 35°C
	Temperature, transport	-25 to 60°C Temperature gradients of ≤ ±1°C/min Dry instrument (drained fluid path)
	Temperature, storage	-25°C to 50°C Temperature gradients of ≤ ±1°C/min Dry instrument (drained fluid path)
	Air humidity	Max. relative humidity 80% for temperatures up to 31°C, decreasing linearity to 50% relative humidity at 40°C
	Altitude	Max 2000 m
Liquid temperature	Process temperature	2°C to 40°C
	CIP	Max 50°C
Fluid line (tubing and wetted components excl. tank)	Components and piping	-0.4 bar g to 4.0 bar
	Tank	-0.1 bar to 0.05 bar

System capacity

Data	Value
Filter inlet pressure	4.0 bar
Feed flow range	0.1 to 6 l/min
Transfer flow range	20 to 1000 ml/min
Permeate flow range	20 to 1000 ml/min
TMP range produced	0.3 to 4.0 bar
Hold-up volume (recoverable)	78.5 ml
Minimum tank volume (tested)	30 ml
Minimum working volume	108.5 ml

11.2 Filter specifications

Hollow fiber

HF filters	Fitting type
3M	1/2" TC
3x2M	1/2" TC
4M	1/2" TC
4x2M	1/2" TC
AXM	UNF 5/16" female

Membrane cassette

Holder type	Cassette types	Cassette size	Number of cassettes	Nut torque	Fitting type
Kvick Lab Cassette Holder II	Kvick Lab	0.11 m² (1.2 ft²)	1 to 5	20.3 Nm (180 in-lb)	1/2" TC

11.3   Wetted parts

Materials used

The materials used in the manufacturing of ÄKTA flux 6 have been chosen for their biological and chemical compatibility with the solvents used during operation.

List of wetted materials

The table below lists the materials that come into contact with process fluids in ÄKTA flux 6.

| Material	Designation
Ethylene-propylene-diene monomer	EPDM
Platinum cured silicone	Platinum cured silicone
Polypropylene	PP
Polytetrafluoroethylene	PTFE
Polyvinylidene fluoride	PVDF
Santoprene™	Santoprene
Silicone	Silicone
Bioprene®	Bioprene

Flow path scheme all components

The following illustration shows an overview of the flow between different components in the ÄKTA flux 6. Blue tubing lines are included in the standard instrument, while gray tubing lines are optional. Equipment connected to gray tubing is optional.
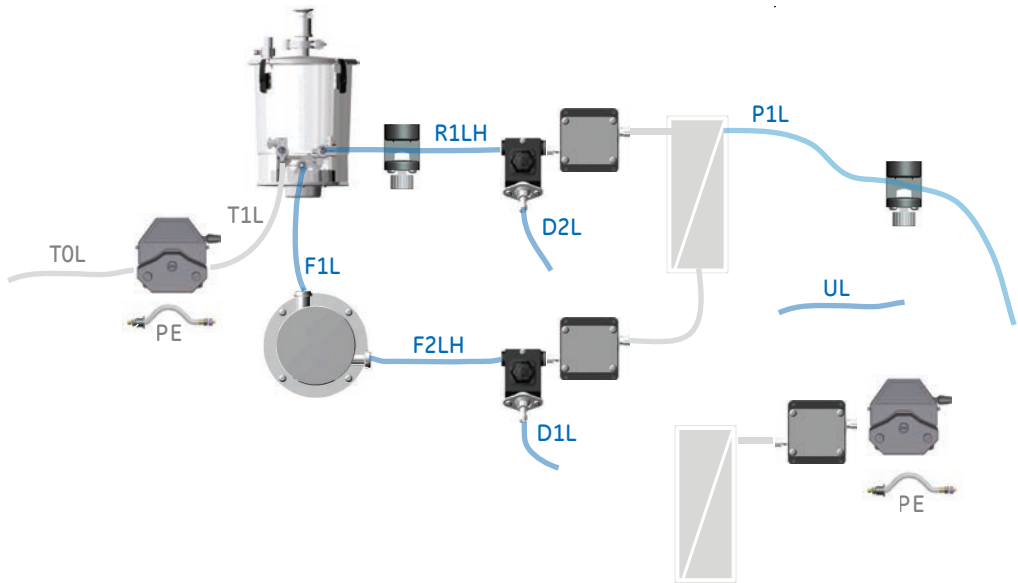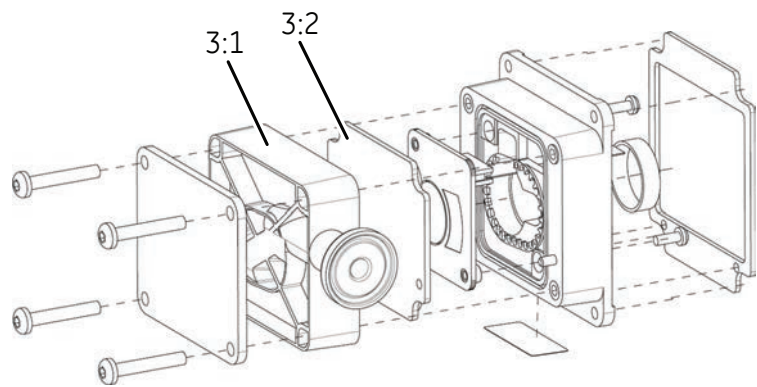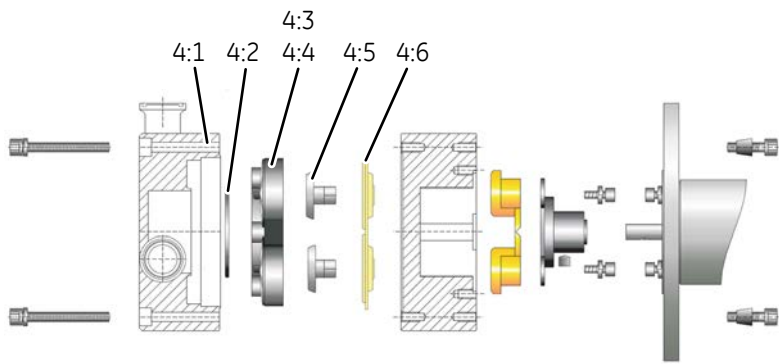
Tank assembly

Drain valve parts

2:1

2:2
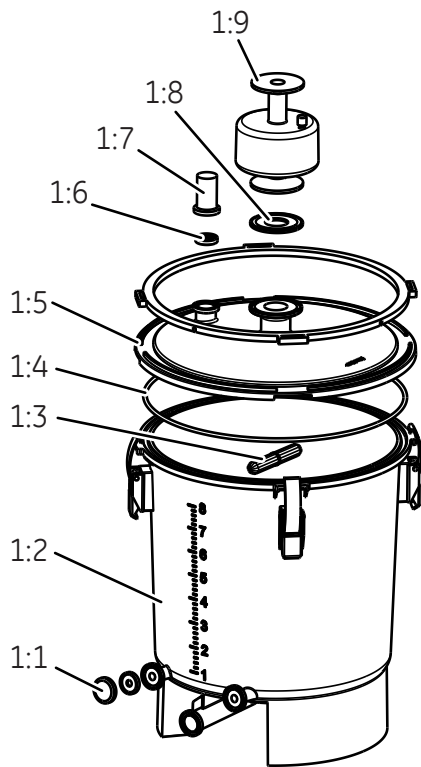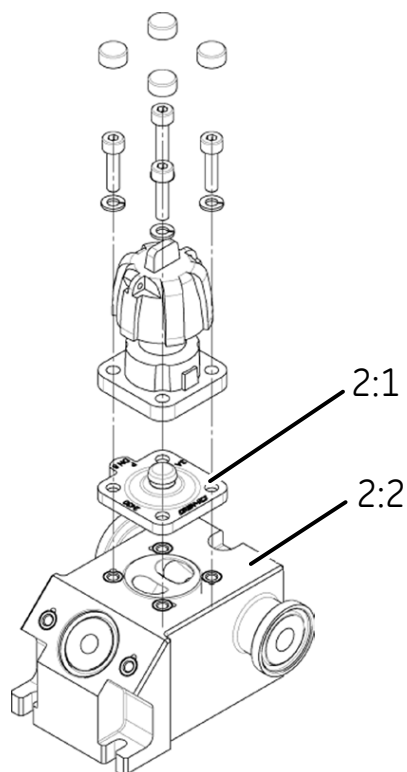
Pressure sensor

Feed pump parts

Standard components

The tables below list the materials that come into contact with process fluids in ÄKTA flux 6. The part numbers in the table below correspond to the numbers in the illustration above.

Part	Code number	Component	Materials
1	29063719	Tank assembly	

Part	Code number	Component	Materials
1:1	28400937	Stop plug	PP
1:2	28063663	Tank	PP
1:3	29063969	Stir bar	Magnet with PTFE coating
1:4	29063989	O-ring	Platinum cured silicone
1:5	29063686	Tank lid	
1.6	29063332	O-ring	Platinum cured silicone
1:7	29063953	Check valve	PVDF
1:8	29064009	Circular sealing washer	Platinum cured silicone
1:9	2602S	Air filter	PTFE
2	**29065940**	**Drain valve**	
2:1	29103875	Diaphragm for valve	PTFE EPDM
2:2	29103874	Body for valve	PVDF
3	**29095152**	**Pressure sensor assembly**	
3:1	29063688	Pressure sensor front housing	PP
3:2	29047844	Pressure sensor disposable gasket	Silicone
4	**29063978**	**Feed pump**	
4:1	29103727	Pump housing	Stainless steel 316L (1.4404)
4:2	29103680	O-Ring	EPDM
4:3	29103728	Valve housing	PP
4:4	29103729	Valve	EPDM
4:5	29103725	Piston	Stainless steel 316L (1.4404)
4:6	29103726	Diaphragm	Santoprene
5	**2138012**	**Pump tubing** Transfer and permeate pump tubing	Bioprene PP

Part	Code number	Component	Materials
6		**Standard tubing**, see *Standard tubing, on page 206*.	
7		**Optional tubing**, see *Optional tubing, on page 207*.	

Standard tubing

The standard tubing, blue in the illustration above, part 6, include the following materials.

Part	Article number	Tag	Component	Materials
6	29063941	**D1L**	Drain tubing	Platinum cured silicone PP
	29063942	**F1L**	Tank outlet to feed pump tubing	Platinum cured silicone PP
	29102862	**F2LH**	Recirculation pump to pressure sensor tubing	Platinum cured silicone PP
	29093980	**P1L**	Permeate out tubing	Platinum cured silicone PP
	29102872	**R1LH**	Drain valve to tank inlet tubing	Silicone PP
	29094472	**UL**	User tubing (not shown in illustration above)	Platinum cured silicone PP
	29063956		Fitting	PP
	29063961		Fitting	PP
	29064008		Circular Sealing Washer	Platinum cured silicone
	29064007		Circular Sealing Washer	Platinum cured silicone
	29104765		T-Fitting	PP

Optional tubing

The optional tubing, gray in the illustration above, part number 10, include the following materials.

Part	Article number	Tag	Component	Materials
7	29063288	F4	Filter out to permeate tubing	SBP Braid reinforced 1/4" ID
	29063280	F8	Filter out to permeate tubing	SBP Braid reinforced 1/4" ID
	29063324	FF2L	Pressure sensor to filter in tubing	SBP Braid reinforced 1/4" ID
	29063291	FF6L	Filter out to pressure sensor tubing	SBP Braid reinforced 1/4" ID
	29063283	FF9L	Filter out to pressure sensor tubing	SBP Braid reinforced 1/4" ID
	29094877	FF3L	Filter out to retentate tubing	SBP Braid reinforced 1/4" ID
	29094876	FF5	Filter out to permeate tubing	SBP Braid reinforced 1/4" ID
	29063262	FF1L	Pressure sensor to filter in tubing	SBP Braid reinforced 1/4" ID
	29063247	FF4	Filter out to permeate tubing	SBP Braid reinforced 1/4" ID
	29063258	FF7L	Filter out to retentate	SBP Braid reinforced 1/4" ID
	29056847		Fitting AXM	PP
	29063943	F2LL	Recirculation pump to pressure sensor tubing	Platinum cured silicone / PP
	29063944	R2LL	Drain valve to tank inlet tubing	Platinum cured silicone / PP
	29094009	T0L	Transfer in tubing (optional)	Platinum cured silicone / PP
	29063329	T1L	Transfer pump to tank in (optional)	Platinum cured silicone / PP
	29063332		Circular sealing washer with **T1L** (optional), article number 29063329	Platinum cured silicone
	29089734	D2L	Drain tube	SBP Braid reinforced 1/4" ID
	29114054	FF2H	Tubing - pressure sensor to filter in	SBP Braid reinforced 3/8" ID
	29114059	FF6H	Tubing - filter out to retentate	SBP Braid reinforced 3/8" ID
	29114062	FF9H	Tubing - filter out to retentate	SBP Braid reinforced 3/8" ID
	29114064	FF3H	Tubing - filter out to retentate	SBP Braid reinforced 3/8" ID

11.4 Chemical resistance

Introduction

The tables below list allowed exposure concentrations and times for various chemicals that may be used for ÄKTA flux 6.

> ⚠ **WARNING**
>
> **Flammable liquids.** ÄKTA flux 6 is **not approved** to handle flammable liquids.

Allowed chemicals for wetted surfaces

Chemical	Concentration	Max time / cycle	Max acc. expos.	Usage
Acetic acid	25%	3 h	3000 h	CIP
Citric acid	pH 2 to 2.5	1 h at temp ≤ 60°C	1000 h	CIP
Ethanol	20%	12 months	Unlimited	Storage
Ethanol / Acetic acid	20%/10%	3 h	3000 h	CIP
Guanidine hydrochloride	6 M	5 h	5000 h	CIP
Phosphoric acid	5%	Overnight	Unlimited	For SS passivation
2-propanol	30%	1 h	1000 h	CIP
Sodium chloride	0 to 3 M	3 h	3000 h	Purification, CIP
Sodium hydroxide	1 M at pH=14 0.5 M 0.1 M at pH=13	24 h at temp ≤40°C 3 h at temp ≤ 50°C 12 months	1000 days 3000 h Unlimited	CIP CIP Storage
Sodium hypochlorite	300 ppm	3 h at temp ≤ 50°C	3000 h	CIP
Sodium hydroxide/ethanol	1 M NaOH and 20% ethanol	3 h	3000 h	CIP
Urea	8 M	5 h	5000 h	Purification, CIP
Cleaning solutions	1% to 6% Steris™ CIP 100™, 0.5% Henkel P3™-11, 0.2% Micro, 0.2% Terg-a-zyme™, 0.1% Tween™ 80	3 h at temp ≤ 50°C	3000 h	CIP

Allowed chemicals for outer surfaces

Chemical	Concentration
Acetic acid	25%
Ethanol	70%
Guanidine hydrochloride	6 M
Hydrogen peroxide solution	6%
Minncare® cold sterilant solution (fogging)	4,5% per-acetic acid and 22% hydrogen peroxide
Minncare cold sterilant solution (Wiping)	3% Minncare solution
Phosphoric acid	5%
2-propanol	70%
Sodium chloride	0 to 3 M
Sodium hydroxide	1 M at pH 14
Sodium hydroxide	0.5 M
Sodium hypochlorite	300 ppm
Urea	8 M

11.5   Ordering information

Introduction

This section lists accessories and user replaceable spare parts that are available for ÄKTA flux 6.

Please visit www.gelifesciences.com/aktaflux to find the latest information.

ÄKTA flux 6 accessories

Part number	Description
29094019	Transfer Pump
29094675	Permeate Pump
29136668	Pump tubing
29094677	Stirrer
29094678	Air filter
29094679	Check valve
29094680	Tank assembly
29094681	Line tubing kit
29094674	Kvick Lab holder with stand
29095152	Pressure sensor assembly

For more information about accessories, please visit www.gelifesciences.com/aktaflux

ÄKTA flux 6 spare parts

Part number	Description
29092476	Load cell
29092477	Power supply
29092482	Feed pump
29092506	Pressure sensor assembly
29092515	Mains fuse
29092519	Interface PCA K5
29097566	Valve housing kit
29097585	Cam kit
29097606	Pump head
29097955	Drain valve
29102003	Flowcell, pressure sensor
29102031	Tank O-ring
29092515	Mains fuse
29097606	Pump head
29049196	Cover USB flash
29049208	Diaphragm
29049210	Pinch valve retentate

For more information about spare parts, please visit www.gelifesciences.com/aktaflux

11.6   Health and Safety Declaration Form

On site service

On Site Service Health & Safety Declaration Form

Service Ticket #:	

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

Yes	No	Please review the actions below and answer "Yes" or "No". Provide explanation for any "No" answers in box below.
○	○	**Instrument has been cleaned of hazardous substances**. Please rinse tubing or piping, wipe down scanner surfaces, or otherwise ensure removal of any dangerous residue. Ensure the area around the instrument is clean. If radioactivity has been used, please perform a wipe test or other suitable survey.
○	○	Adequate space and clearance is provided to allow safe access for instrument service, repair or installation. In some cases this may require customer to move equipment from normal operating location prior to GE arrival.
○	○	**Consumables, such as columns or gels, have been removed or isolated from the instrument and from any area that may impede access to the instrument.**
○	○	**All buffer / waste vessels are labeled. Excess containers have been removed from the area to provide access.**
Provide explanation for any "No" answers here:		
Equipment type / Product No:		**Serial No:**

I hereby confirm that the equipment specified above has been cleaned to remove any hazardous substances and that the area has been made safe and accessible.

Name:		**Company or institution:**	
Position or job title:		**Date (YYYY/MM/DD):**	
Signed:			

Product return or servicing

Health & Safety Declaration Form
for Product Return or Servicing

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

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

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

Yes	No	Please specify if the equipment has been in contact with any of the following:	
		Radioactivity (please specify)	
		Infectious or hazardous biological substances (please specify)	
		Other Hazardous Chemicals (please specify)	

Equipment must be decontaminated prior to service / return. Please provide a telephone number where GE can contact you for additional information concerning the system / equipment.

Telephone No:			
Liquid and/or gas in equipment is:		Water	
		Ethanol	
		None, empty	
		Argon, Helium, Nitrogen	
		Liquid Nitrogen	
	Other, please specify		
Equipment type / Product No:		Serial No:	

I hereby confirm that the equipment specified above has been cleaned to remove any hazardous substances and that the area has been made safe and accessible.

Name:		Company or institution:	
Position or job title:		Date (YYYY/MM/DD)	
Signed:			

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

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