Mini Submarine Unit

Operating Instructions

Original instructions

Table of Contents

1 Introduction

About this chapter

This chapter contains important user information, descriptions of safety notices, regulatory information, and intended use of the Mini Submarine Unit.

In this chapter

1.1 About this manual

Purpose of this manual

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

Scope of this manual

The *Operating Instructions* covers the Mini Submarine Unit. The illustration below shows the Mini Submarine Unit.

Illustrations

The images and annotations in this document are for illustrative purposes only. The configuration of individual products may vary, and therefore illustrations may not reflect the actual system delivered.

1.2 Important user information

Read this before operating the product

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

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

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

Intended use of the Mini Submarine Unit

The Mini Submarine Unit horizontal agarose unit is intended for rapid electrophoresis of small quantities of nucleic acids in agarose gels.

A gel is cast in the gel caster, which holds one or two combs. Eight different combs are available; a maximum of 32 samples can be run if two 16-well combs are used.

After the gel is solidified, the running tray is transferred to the platform of the horizontal unit. The base of the unit holds coolant that can be chilled before the run. This passive cooling capacity allows fast, high voltage runs.

Mini Submarine Unit can be bought in two variations: basic, or complete. The Mini Submarine Unit complete includes a comb back and a 1.5 mm thick, 8-well comb.

Prerequisites

In order to operate Mini Submarine Unit in the way it is intended:

- The user must have a general understanding of electrophoresis techniques.
- The user must read and understand the Safety Instructions chapter in the *Operating Instructions*.
- Mini Submarine Unit must be installed in accordance with the instructions in the *Operating Instructions*.

Safety notices

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

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. It is important not to proceed until all stated conditions are met and clearly understood.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. It is important not to proceed until all stated conditions are met and clearly understood.

NOTICE

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

Notes and tips

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

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

1.3 Regulatory information

Introduction

This section lists the regulations and standards that apply to the Mini Submarine Unit.

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

Introduction

This section describes the EU Directives that apply to Mini Submarine Unit.

Conformity with EU Directives

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

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

Directive	Title
2014/35/EU	Low Voltage Directive (LVD)
2011/65/EU	Restriction of Hazardous Substances (RoHS) Directive

CE marking

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

- used according to the Operating Instructions or user manuals, and
- used in the same state as it was delivered 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

Introduction

This section describes the regulations that apply to Mini Submarine Unit in the USA and Canada.

NRTL certification

This symbol indicates that the product has been certified by Intertek, which is a US Occupational Safety and Health Administration Nationally Recognized Testing Laboratory (NRTL).

1.3.4 Other regulations and standards

Introduction

This section describes the standards that apply to the Mini Submarine Unit.

Environmental conformity

This product conforms to the following environmental requirements.

Requirement	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.

Standards, applied to this product

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

Standard	Description
IEC/EN 61010-1, UL 61010-1, CAN/CSA-C22.2 No. 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.
EN 50581	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

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

2.1 Safety precautions

Introduction

Mini Submarine Unit is powered by an external power supply. Before installing, operating or maintaining the system, you must be aware of the hazards described in this manual.

Follow the instructions provided to avoid injury to the operator or other personnel, to the product, or to other equipment in the area.

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

- General precautions
- Personal protection
- Using flammable liquids
- Installing and moving the instrument
- Power supply
- System operation
- Maintenance

Always follow the instructions below to avoid injury when using the Mini Submarine Unit.

General precautions

WARNING

Ethidium bromide is a known mutagen. Always wear gloves when handling it.

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.

WARNING

Only properly trained personnel may operate and maintain the product.

WARNING

Do not operate the Mini Submarine Unit in any other way than described in the Mini Submarine Unit Operating Instructions.

WARNING

Do not damage the power supply cord by bending, twisting, heating or allowing them to become pinned under the equipment. Using damaged power cords could result in fire or electric shock.

If the power supply cords are damaged, contact your local GE representative for replacements.

WARNING

The safety lid must be in place before connecting the power leads to a power supply.

WARNING

Any liquid on the equipment must be dried off before connecting the power supply.

CAUTION

The product is designed for indoor use only.

Personal protection

WARNING

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

WARNING

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

WARNING

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

CAUTION

Handle the glass components with care! Wear appropriate personal protective equipment (PPE).

Using flammable liquids

WARNING

A fume hood or similar ventilation system shall be installed when flammable or noxious substances are used.

Installing and moving the instrument

CAUTION

When lifting and moving the instrument be careful not to drop it. This may cause injury.

CAUTION

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

CAUTION

Turn off the power switch and remove connecting cables before moving the equipment.

CAUTION

The electrophoresis unit is heavy, especially when filled with buffer. Handle the unit with care to avoid personal injury.

Power supply

WARNING

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

WARNING

Make sure that there is access to the instrument power supply cord at all times.

System operation

WARNING

Turn all power supply controls off and disconnect the power leads before removing the safety lid.

WARNING

The high voltage power supply must always be disconnected when the safety lid of the electrophoresis unit is taken off. The high voltage power supply must never be switched on unless the safety lid is on the electrophoresis unit.

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

Always disconnect the high voltage leads from the power supply before removing the lid from the unit.

WARNING

Wear UV safety goggles and protect skin when using a UV lamp.

CAUTION

Do not operate with buffer temperatures above the maximum specified technical specifications. Overheating will cause irreparable damage to the unit!

CAUTION

Circulate coolant through the heat exchanger to minimize heating. Overheating will cause irreparable damage to the unit! Do not connect the heat exchanger to a water tap or any coolant source where the water pressure is unregulated.

CAUTION

Use only water or 50/50 water/ethylene glycol in the base tray. Never use anti-freeze or any organic solvent in the heat exchanger.

CAUTION

At the maximum setting the unit begins overheating as soon as the chilled base reaches ambient temperature. If overheating is not controlled, the gel will melt and/or the base of the unit will warp!

Maintenance

WARNING

Decontaminate before maintenance. To avoid personnel being exposed to potentially hazardous substances, make sure that the Mini Submarine Unit is properly decontaminated and sanitized before maintenance or service.

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

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

WARNING

Decommissioning. Decontaminate the equipment before decommissioning to make sure that hazardous residues are removed.

CAUTION

Never autoclave any component of the electrophoresis unit or casting kit.

2.2 Labels

Introduction

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

Description of symbols on the system label

The table below describes the various symbols that may be found on the system label.

Label	Meaning
	**Warning!** Read the user documentation before using the system. Do not open any covers or replace parts unless specifically stated in the user documentation.
	This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.
	This symbol indicates that the product *does not* contain toxic or hazardous materials in excess of the limits established by the Chinese standard *GB/T 26572 Requirements of concentration limits for certain hazardous substances in electrical and electronic products*, and can be recycled after being discarded, and should not be casually discarded.
	The system complies with applicable European directives.
	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.

Label	Meaning
	This symbol indicates that the product has been certified by Intertek, which is a US Occupational Safety and Health Administration Nationally Recognized Testing Laboratory (NRTL).
Serial no.:	Serial number of the product
Manufactured:	Year (YYYY) and month (MM) of manufacture

Safety labels

The table below describes the various symbols that may be found on the product.

Symbol/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.
	**Warning! High Voltage**. Always make sure that the system is disconnected from electric power before removing the lid.

2.3 Emergency procedures

Introduction

This section describes how to shut down the product in an emergency situation, and the procedure for restarting the product.

The section also describes the result in the event of power failure.

Precautions

WARNING

Make sure that there is access to the instrument power supply cord at all times.

Emergency shutdown

In an emergency situation, shut down the power supply in accordance with its emergency procedure.

Power failure

In case of power failure to the product, the run is interrupted immediately.

Restart after emergency shutdown or power failure

To restart the run after an emergency shutdown or power failure, follow these steps:

Step	Action
1	Make sure all connections are in place.
2	Start the power supply as described in the power supply's User Manual.

2.4 Recycling information

Introduction

This section contains information about the decommissioning of the product.

Decontamination

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

Disposal of the product

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

Disposal of electrical components

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

该标志表明本产品不含有超过中国标准GB/T 26572《电子信息产品中有毒有害物质的限量要求》中限量的有毒有害物质,报废后可以进行回收处理,不能随意丢弃。

This symbol indicates that this electrical and electronic product does not contain any hazardous substances above the maximum concentration value established by the Chinese standard GB/T 26572 , and can be recycled after being discarded, and should not be casually discarded.

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)
80605264 (HE33B)	O	O	O	O	O	O
80605245 (HE33)	O	O	O	O	O	O

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.

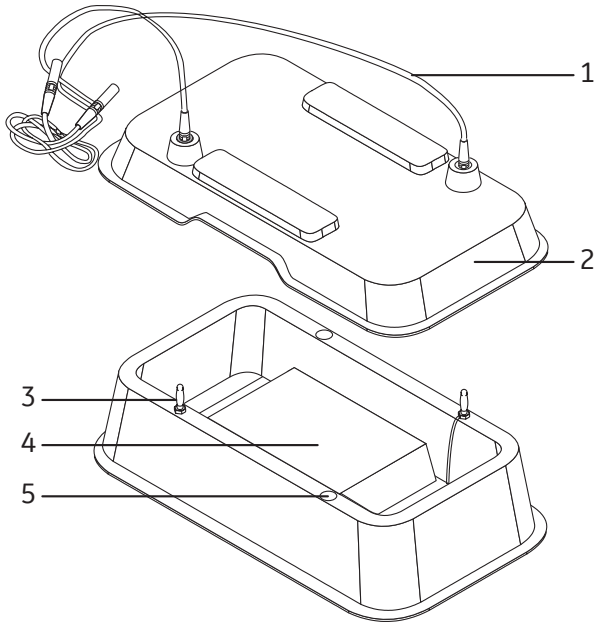
- Data listed in the table represents best information available at the time of publication.

3 System description

Introduction

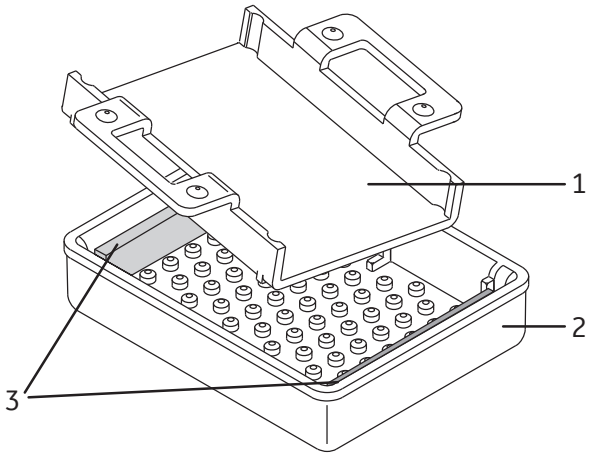
This chapter gives an overview of the Mini Submarine Unit.

Main components



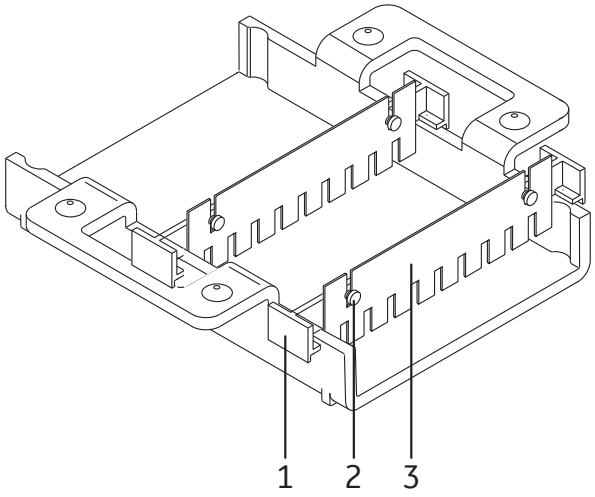
Part	Function
1	Color-coded leads that connect electrodes in the unit base to the power supply.
2	Lid assembly
3	Electrode connectors (2)
4	Running platform that supports the running tray.
5	Inlet to fill the base with 50/50 ethylene glycol/water.

Gel casting kit



Part	Function
1	UV-transparent running tray
2	Gel casting tray
3	Foam pads (2)

Combs



Part	Function
1	Comb back
2	Screws (2)
3	Comb

4 Installation

Introduction

This chapter provides required information to enable users and service personnel to unpack Mini Submarine Unit.

Safety precautions

CAUTION

When lifting and moving the instrument be careful not to drop it. This may cause injury.

CAUTION

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

Unpacking procedure

Unwrap all packages carefully.

Inspect all visible parts for damage or missing pieces. If any damage is observed, record this on the receiving documents and inform your GE representative. Make sure to keep all packing material for damage claims or to use should it become necessary to return the unit.

5 Operation

About this chapter

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

General procedure

Agarose gels are first prepared using the gel casting kit. Samples are then loaded into wells and electrophoretically separated. The fluorescent dye ethidium bromide can be added to the gel or electrophoresis buffer or both to track separation progress. After electrophoresis, the gel may be stained and photographed, blotted, or dried for autoradiography.

Safety precautions

WARNING

Ethidium bromide is a known mutagen. Always wear gloves when handling it.

WARNING

Wear UV safety goggles and protect skin when using a UV lamp.

CAUTION

At the maximum setting the unit begins overheating as soon as the chilled base reaches ambient temperature. If overheating is not controlled, the gel will melt and/or the base of the unit will warp!

CAUTION

Use only water or 50/50 water/ethylene glycol in the base tray. Never use anti-freeze or any organic solvent in the heat exchanger.

In this chapter

5.1 Preparations

Introduction

This section describes what preparations are needed before running an electrophoresis.

Fill the base with coolant

Even if no cooling is required, it is important to fill the base with the proper coolant solution before the first use because the solution provides a necessary heat sink.

Follow the instructions below to fill the base with coolant.

Step	Action
1	Prepare 600 ml of 50/50 ethylene glycol/water. ***Tip:*** *To help see wells more clearly while loading the sample, add a drop or two of soluble dye or food color to the coolant solution.*
2	Locate the two inlet holes in the top edge of the base. Fill the base cavity as full as possible with coolant using a 50 mL syringe or a pump. ***Note:*** *It is not necessary to replace the coolant*.
3	Push a gray rubber plug into each hole, taking care that the plug is securely seated.
4	Place the prepared base in an ice bucket or in a refrigerator or freezer set no lower than -20°C for about an hour before use. ***Tip:*** *The base will always be ready if you store it in the refrigerator or freezer.*

Prepare solutions

Follow the instructions below to prepare the solutions required to run a gel.

WARNING

Ethidium bromide is a known mutagen. Always wear gloves when handling it.

Step	Action
1	Prepare 250 mL of running buffer.
2	Prepare the sample loading buffer.
3	Prepare approximately 7 mL agarose solution per mm of gel thickness. For example, a 3 mm gel requires 0.3 cm × 7 cm × 10 cm = 21 mL. 1 Dissolve agarose in running buffer. 2 Heat according to instructions accompanying the agarose. 3 Allow the solution to cool to 50°C. 4 Pour the agarose solution into the casting tray. ***Tip:*** *Add 0.5 µg/mL ethidium bromide to the gel solution to observe separation during electrophoresis.*

Install running tray

Follow the instructions below to install the running tray.

Step	Action
1	Firmly grasp the casting tray with one hand.
2	With the other hand, place one end of the running tray against the foam pad at the bottom edge.
3	Press the running tray against the pad.
4	Lower the running tray to rest on the bottom of the casting tray, seating the other end of the tray against the opposite foam pad. See *Gel casting kit, on page 27*.

Combs

Follow the instructions below to prepare the comb(s).

To run twice as many samples, prepare two combs.

Step	Action
1	Loosen the thumb screw heads. See *Combs, on page 27*

Step	Action
2	Fit the two slots in the comb between the thumb screw heads and the comb back.
3	Tighten the screws until the comb is just supported.
4	Seat the comb assembly on the rim of the casting tray.
5	Adjust the bottom of the comb so that it is about 1.0 mm from the running tray.
6	Tighten the screws to secure the comb.

Cast the gel

Follow the instructions below to cast the agarose gel.

Step	Action
1	Remove the comb assembly.
2	Place the casting assembly on a leveling surface and level, using the spirit level on the running tray as a guide.
3	Pour the agarose solution (cooled to 50°C) into the casting tray.
4	Orient the comb assembly so that the comb faces the nearest foam pad and seat it on the tray rim.
5	To prevent well shape distortions, check that the comb is vertical.
6	To run twice as many samples, place the second comb assembly in the center of the tray.
7	Allow a minimum of 30 minutes for the gel to set.

Finalization of gel

Follow the instructions below to finalize the gel before running the electrophoresis.

Step	Action
1	Once the gel is set, remove the comb carefully.

Step	Action
2	Partially lift and slightly tilt the comb at one end and then slowly withdraw it from the gel. ***Note:*** *Pulling the comb straight up creates a vacuum in the wells that may lift the gel out of the tray.*
3	Remove the running tray and gel by grasping the handles of the tray and pressing against one of the foam pads.
4	Once the tray clears the opposite pad, lift it out.
5	Transfer the running tray and gel to the chilled base.

5.2 Electrophoresis run

Introduction

This section describes how to run an electrophoresis and what to think about after the run.

Precautions

WARNING

Ethidium bromide is a known mutagen. Always wear gloves when handling it.

WARNING

Make sure that there is access to the instrument power supply cord at all times.

WARNING

Wear UV safety goggles and protect skin when using a UV lamp.

WARNING

The safety lid must be in place before connecting the power leads to a power supply.

CAUTION

Do not operate with buffer temperatures above the maximum specified technical specifications. Overheating will cause irreparable damage to the unit!

CAUTION

Use only water or 50/50 water/ethylene glycol in the base tray. Never use anti-freeze or any organic solvent in the heat exchanger.

CAUTION

At the maximum setting the unit begins overheating as soon as the chilled base reaches ambient temperature. If overheating is not controlled, the gel will melt and/or the base of the unit will warp!

Running the gel

Follow the instructions below to run the agarose gel.

Note: *Chill the base before use, especially when higher voltage settings will be used or when the separation will require more than 30 minutes.*

Tip: *To monitor separation progress, either add 0.5 µg/mL (final conc.) of ethidium bromide to the running buffer now, or add 50 µg/mL (final conc.) ethidium bromide to the sample buffer. To visualize progress, turn off the power supply, remove the lid assembly, and hold a portable UV lamp near the gel. Adding ethidium bromide to the running or sample buffer slows migration slightly. Detection by this method is not as sensitive as staining and viewing on a transilluminator.*

Step	Action
1	Fill both buffer chambers with running buffer until the buffer is ~1 mm deep over the gel. This requires about 220 mL.
2	Add sample to 5× sample loading buffer and mix. Make sure that 1/5 of the final volume is loading buffer.
3	Use a micro-pipette to load each sample, taking care to avoid puncturing the well bottom or entrapping any bubbles. ***Tip:*** *If no dye was added to the coolant, place the base on a dark background to see the wells more easily.*
4	Place the lid so that the cathode (–) black lead is at the end nearest the sample well. Nucleic acid samples migrate toward the anode (+) red lead.

Step	Action
5	Connect the color-coded leads (red to red, and black to black) to an approved power supply.
6	Set the voltage level and timer (if available) according to the degree of resolution sought.

For recommended run settings, see *Section 5.3 Run settings, on page 39*. Note that optimal run settings must be determined empirically.

After the separation

Follow the instructions below to disassemble the assembly after a run.

WARNING

Turn all power supply controls off and disconnect the power leads before removing the safety lid.

WARNING

Ethidium bromide is a known mutagen. Always wear gloves when handling it.

Step	Action
1	Turn off the power supply.
2	Disconnect the leads.
3	Remove the lid.
4	If no ethidium bromide was added to the gel or sample before the run, stain the gel in a solution of 0.5 to 1.0 µg/mL ethidium bromide in water or buffer.
5	Clean the unit as described in *Chapter 6 Maintenance, on page 40*.

5.3 Run settings

Introduction

This section describes recommended settings for an electrophoresis run. The optimal settings must be determined empirically.

Quick, high-voltage runs

Certain applications, such as screening samples or checking sample purity, can be accomplished quickly under high voltage conditions. Chill the base (-20°C) and limit the run to 5 minutes or less at 500 V.

Slower, lower voltage runs

To calculate the voltage gradient, divide the voltage setting by the distance between the electrodes (12.7 cm).

A voltage gradient of 12 V/cm (150 V) separates 0.1 to 23 kb fragments of a Hind III digest of λ DNA in 30 to 40 minutes (using 1% agarose gel and 0.5× TBE running buffer). Alternatively, using the same solutions, this sample could be run at 24 V/ cm (300 V) with acceptable band resolution in 20 to 30 minutes. Chill the base before use.

Recommended settings

The following table shows recommended voltage and times for 1% Agarose NA, 0.5× TBE and a chilled base.

Voltage (V)	Gradient (V/cm)	Time (min)
500	40	5 [1]
400	31	10 [1]
300	24	20 [1]
200	16	30 to 40
150	12	30 to 60

1 For rapid runs of 20 minutes or less, use 0.5× TBE and chill the base to -20°C before use.

6 Maintenance

About this chapter

This chapter provides information to enable users and service personnel to clean and maintain the product.

Precautions

WARNING

Ethidium bromide is a known mutagen. Always wear gloves when handling it.

WARNING

Decontaminate before maintenance. To avoid personnel being exposed to potentially hazardous substances, make sure that the Mini Submarine Unit is properly decontaminated and sanitized before maintenance or service.

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.

CAUTION

Never autoclave any component of the electrophoresis unit or casting kit.

General cleaning

After each use, clean the unit with a mild detergent and water, rinse thoroughly with distilled water, and allow to air dry. Never use abrasive cleansers. Do not expose the unit to solutions or vapors of aromatic or halogenated hydrocarbons, ketones, esters, alcohols (over 30%), or concentrated acids (over 25%).

To reduce DNase and RNase contamination, soak the buffer chamber or casting kit for 10 minutes in a 3% hydrogen peroxide (H_2O_2) solution, then rinse thoroughly with Diethyl pyrocarbonate (DEPC)-treated, autoclaved, deionized water.

CAUTION

Never autoclave any component of the electrophoresis unit or casting kit.

Cleaning before planned maintenance/service

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

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

Copy the form you need from *Section 8.3 Health and Safety Declaration Forms, on page 48*.

Replacing foam pads

Remove worn foam pads from the gel casting tray. Peel off the adhesive cover on a new foam pad. Align the pad so that it will rest on the bottom of the tray along a short (7 cm) side, adhesive side toward the inside wall, and then press it in place. Repeat with second pad on the wall opposite the first pad.

Replacing the electrode

It is recommended that electrodes be replaced only by GE technicians. Call your local representative for advice.

7 Troubleshooting

About this chapter

This chapter provides information to assist users and service personnel to identify and correct problems that may occur when operating the product.

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

Precautions

WARNING

Ethidium bromide is a known mutagen. Always wear gloves when handling it.

Potential problems

Problem	Solution
Deformed sample well	Allow the gel to set for a minimum of 30 minutes and make sure it is at room temperature before removing the comb.
	When removing the comb, hold it at a slight angle and lift very slowly to prevent the gel from breaking.
	Take care to not damage the well with the pipet while loading the sample; aim for the center of the well and do not puncture the bottom with the pipet tip.

Problem	Solution
Samples not running along a straight path	If a comb or running tray is warped, replace.
	Reduce the voltage.
	Choose a buffer with the appropriate ionic strength and buffering capacity. The buffering capacity of TBE (Tris/Borate/EDTA), for example, is higher than that of TAE (Tris/Acetic acid/EDTA). If the buffer is depleted, stop the run, remove the lid, and pipette the buffer from each chamber into the opposite chamber to replenish the buffer.
	If the gel is uneven, level the casting tray before pouring the gel.
Double-banded pattern	The comb must be vertical to prevent well shape distortion.
	Decrease the buffer level to 1 mm above the top of the gel, to reduce the vertical temperature gradient.
Poor band resolution	Add Ficoll™, glycerol, or sucrose to the sample loading buffer to ensure that the sample sinks to the bottom of the well.
	Make sure the sample is completely dissolved.
	Reduce the voltage.
	Reduce the sample concentration.
	Reduce the sample volume.
	At least 1 mm of gel below the bottom of the comb is required to prevent samples from leaking out of the well bottom.
	Reduce the salt concentration of the sample.
	Check enzyme activity; the sample may require longer digestion or a different restriction buffer.
	Prepare fresh sample if you suspect nuclease contamination.
	Choose agarose with a low endosmosis value.

Problem	Solution
Foam pads peel off	Install the running tray as as described in *Cast the gel, on page 34* but do not press straight down into place.

8 Reference information

About this chapter

This chapter lists the technical specifications of the Mini Submarine Unit. The chapter also includes ordering information, and the Health and Safety Declaration form for service.

In this chapter

8.1 Specifications

Characteristic	Description
Gel size	7 × 10 cm
Maximum power	15 W
Maximum voltage	500 V for maximum 5 minutes
Maximum current	500 mA
Maximum operating temperature	50°C
Maximum buffer volume	250 mL
Coolant required	~600 mL 50/50 water/ethylene glycol
Environmental operating conditions	Indoor use: 4°C to 40°C Humidity up to 80% Altitude up to 2000 m
Installation category	II
Pollution degree	2
Dimensions (w × h × d)	24 × 7 × 13 cm (9.5 × 2.8 × 5.2")
Weight (base, lid, leads)	0.4 kg (0.9 lbs)

8.2 Ordering information

For product codes and information about how to order, please see www.gelifesciences.com

8.3 Health and Safety Declaration Forms

On site service

On Site Service Health & Safety Declaration Form

Service Ticket #:	

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

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

Equipment type / Product No:		Serial No:	

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

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

DOC1149542/28-9800-26 AC 05/2014

Product return or servicing

Health & Safety Declaration Form for Product Return or Servicing

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

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

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

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

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

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

Equipment type / Product No:		**Serial No:**	

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

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

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

DOC1149544/28-9800-27 AC 05/2014

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For local office contact information, visit
www.gelifesciences.com/contact

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