

# Ettan™ IPGphor™ 3

## Operating Instructions

Original instructions



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# 1 Introduction

## About this chapter

This chapter contains information about this Operating Instruction, important user information, regulatory information and lists of associated documentation.

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## In this chapter

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## 1.1 About this manual

### Purpose of this Operating Instruction

The Operating Instruction provides you with the instructions needed to install, operate and maintain the Ettan IPGphor 3 Isoelectric Focusing System in a safe way.

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### Scope of this manual

The document provides you with the instructions needed to use the Ettan IPGphor 3 Isoelectric Focusing System together with Ettan IPGphor 3.

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### 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 (e.g., **Power** switch).

---

## 1.2 Important user information

### Read this before operating Ettan IPGphor 3



**All users must read the entire *Ettan IPGphor 3 Operating Instructions* before installing, operating or maintaining the instrument.** Always keep the *Operating Instructions* at hand when using Ettan IPGphor 3.

Do not operate Ettan IPGphor 3 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.

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### Intended use

Ettan IPGphor 3 Isoelectric Focusing System performs the first-dimension isoelectric focusing (IEF) step in 2-dimensional (2-D) electrophoresis. The system comprises GE's Ettan IPGphor 3, combined with separate strip holders or a manifold. Two types of manifolds are available; the ceramic manifold and the light manifold. The IEF separation protocols are programmed, run and controlled from the Ettan IPGphor 3 control panel or from a PC running the Ettan IPGphor 3 Control Software.

Ettan IPGphor 3 is intended to be used as a laboratory unit for research purposes.

Ettan IPGphor 3 shall not be used in any clinical procedures, or for diagnostic purposes.

For larger sample volumes the *Ettan IPGphor 3 Cup Loading Manifold* facilitates paper bridge loading and in gel rehydration loading, for more information see *Ettan IPGphor Cup Loading Manifold User Manual*.

---

## Safety notices

This user documentation contains WARNINGS, CAUTIONS and NOTICES concerning the safe use of the product. See definitions below.

### Warnings



#### **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.

### Cautions



#### **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.

### Notices



#### **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.*

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## 1.3 Regulatory information

### Introduction

This section lists the directives and standards that are fulfilled by Ettan IPGphor 3 Isoelectric Focusing System.

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### Manufacturing information

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

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

### Conformity with EU Directives

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

Directive	Title
2006/42/EC	Machinery Directive (MD)
2004/108/EC	Electromagnetic Compatibility (EMC) Directive
2006/95/EC	Low Voltage Directive (LVD)

CE marking



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

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

International standards

Standard	Description	Notes
EN/ IEC 61010-1, CAN/CSA-C22.2 No. 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use	EN standard is harmonized with EU directive 2006/95/EC
EN/IEC 61326-1 (Emission according to CISPR 11, Group 1, class A)	Electrical equipment for measurement, control and laboratory use - EMC requirements	EN standard is harmonized with EU directive 2004/108/EC
EN ISO 12100	Safety of machinery. General principles for design. Risk assessment and risk reduction.	EN ISO standard is harmonized with EU directive 2006/42/EC

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.

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## Regulatory compliance of connected equipment

Any equipment connected to Ettan IPGphor 3 Isoelectric Focusing System should meet the safety requirements of EN 61010-1/IEC 61010-1 or relevant harmonized standards. Within the European Union, connected equipment must be CE-marked.

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## Environmental conformity

This product conforms to the following environmental requirements.

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

## 1.4 Associated documentation

### Introduction

This section describes associated documentation and how to find related literature that can be downloaded or ordered from GE.

- *Ettan IPGphor Cup Loading Manifold User Manual* contains instructions for first-dimension isoelectric focusing of proteins on IPG strips.
  - *Ettan IPGphor 3 Control Software User Manual*
  - *2-D Electrophoresis, principles and methods guide*
  - *Instructions attached to each package of Immobiline™ DryStrip.*
-

# 2 Safety instructions

## About this chapter

This chapter describes safety precautions and emergency shutdown procedures for the Ettan IPGphor 3 Isoelectric Focusing System. The labels on the system and information regarding recycling are also described.

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## In this chapter

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2.2 Labels	20
2.3 Emergency procedures	22
2.4 Recycling information	24
2.5 Declaration of Hazardous Substances (DoHS)	25

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## 2.1 Safety precautions

### Introduction

Before operating the instrument, you must be aware of the hazards described in the user documentation. Follow the instructions provided to avoid personal injury or damage to the equipment.

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

- *General precautions, on page 14*
  - *Personal protection, on page 15*
  - *Using flammable liquids, on page 16*
  - *Maintenance, on page 19*
  - *System operation, on page 17*
  - *Maintenance, on page 19*
- 

### General precautions



#### **WARNING**

Perform a risk assessment for any risks due to the process or process environment. Evaluate the effect the system and the processes where it is used have to 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 protection equipment.



#### **WARNING**

The customer must make sure that all installation, maintenance, operation and inspection is carried out by qualified personnel who are adequately trained, understand and adhere to local regulations and the operating instructions, and have a thorough knowledge of the product and the entire process.



#### **WARNING**

Do not operate Ettan IPGphor 3 in any other way than described in the Operating Instructions.



#### **WARNING**

Operation and user maintenance of Ettan IPGphor 3 should be performed by properly trained personnel only.



#### **WARNING**

Only use spare parts and accessories that are approved or supplied by GE for maintaining or servicing the system.

## Personal protection



#### **WARNING**

Always use appropriate personal protective equipment during installation, operation, inspection, maintenance and cleaning of Ettan IPGphor 3.



#### **WARNING**

When using hazardous chemical and biological agents, take all suitable protective measures, such as wearing protective glasses, masks and gloves resistant to the substances used and protect self from hazardous substances that are used. Follow local and/or national regulations for safe operation and maintenance of the system.

## 2 Safety instructions

### 2.1 Safety precautions



#### **WARNING**

The operator has to take all necessary actions to avoid spreading hazardous biological agents in the vicinity of the instrument. The facility should comply with the national code of practice for biosafety.



#### **WARNING**

Ettan IPGphor 3 is a Class A product. In a domestic environment, it might cause radio interference, in which case the user might be required to take appropriate measures.

## Using flammable liquids



#### **WARNING**

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



#### **WARNING**

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

## Installation



#### **WARNING**

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



#### **WARNING**

The Ettan IPGphor 3 must always be connected to a grounded power outlet.





**WARNING**

Only use power cords delivered or approved by GE.



**WARNING**

Do not block the rear and side panel of Ettan IPGphor 3. The power switch must always be easy to access. The power cord must always be easy to disconnect.



**NOTICE**

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

## System operation



**WARNING**

The Ettan IPGphor 3 is capable of producing thousands of volts. Before operating the unit, read and fully understand the Ettan IPGphor 3 operating instructions and warnings.



**WARNING**

Check that the high voltage is turned off before opening the safety lid. The **HV ON** indicator on the front panel should not light.



**WARNING**

Ettan IPGphor 3 must never be used if any safety functions are out of order. Contact your GEservic operator for more information.

## 2 Safety instructions

### 2.1 Safety precautions



#### **WARNING**

Ettan IPGphor 3 is a high voltage instrument that can cause fatal electrical shock if the safety features are disabled. The safety lid must be securely closed before starting a protocol.



#### **WARNING**

In a situation where there is a risk of injury, turn off the instrument by switching the mains power switch (located on the rear panel) to position **0**. Malfunctions must be rectified before Ettan IPGphor 3 Isoelectric Focusing System is restarted.



#### **WARNING**

The vents at the front, back, and bottom of Ettan IPGphor 3 must not be obstructed. Air must be free to circulate for the cooling apparatus to function correctly. There should be a minimum of 10 cm unobstructed space behind the rear panel of the instrument.



#### **WARNING**

Avoid spilling liquids on the body of the instrument. If large volumes of liquid have penetrated the casing of the instrument and come into contact with the electrical components, immediately switch off the instrument and contact an authorized service technician.



#### **CAUTION**

Always wear protective gloves when working with rehydration solution.



#### **CAUTION**

Always wear gloves when handling IPG strips and the equipment that comes in contact with them. This will help minimize protein contamination which can result in artifactual spots in stained 2-D gel patterns.



**CAUTION**

The safety lid must be properly closed before power is applied.

## Maintenance



**WARNING**

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



**WARNING**

Ettan IPGphor 3 covers must not be opened by the user. It contains electrical circuits which can give a lethal electric shock. Service and planned maintenance should be performed by personnel authorized by GE.



**WARNING**

Do not remove the main cover. There are no userserviceable components inside, and you can be exposed to high voltage.



**WARNING**

Always disconnect power from the instrument and detach the power cord before replacing fuses.



**CAUTION**

Do not use any organic solvents during cleaning.

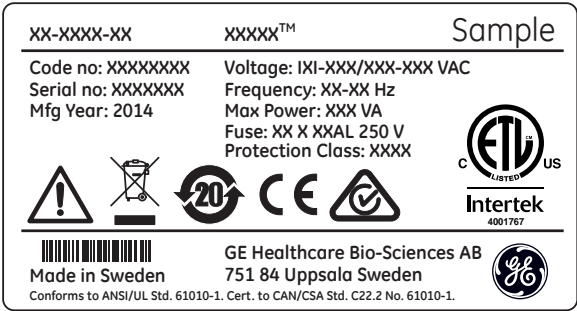
## 2.2 Labels

### Introduction

This section describes the system label and the safety labels on Ettan IPGphor 3.







### System label illustration

The illustration below shows an example of a system label.



### System label description

Label	Description
Product name	Name of product
Code no	Instrument Assembly Number
Serial no	Instrument serial number
Mfg Year	Manufacturing year
Voltage	Voltage
Frequency	Frequency
Max Power	Max Power rating
Fuse	Fuse

Label	Description
	<b>Warning!</b> 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 contains hazardous materials in excess of the limits established by the Chinese standard SJ/T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronics.
	The system complies with applicable European directives. Refer to <i>Conformity with EU Directives</i> , on page 9.
	The system complies with the requirements for electromagnetic compliance (EMC) in Australia and New Zealand.
	This symbol indicates that Ettan IPGphor has been certified by a Nationally Recognized Testing Laboratory (NRTL). NRTL means an organization, which is recognized by the US Occupational Safety and Health Administration (OSHA) as meeting the legal requirements of Title 29 of the Code of Federal Regulations (29 CFR), Part 1910.7.

## Safety label description

Safety labels (see figure below) are attached to both the light protective cover and the transparent lid of the safety lid. The safety label warns the user of risk for personal injury. Do not proceed until the instructions are clearly understood and all stated conditions are met.



## 2.3 Emergency procedures

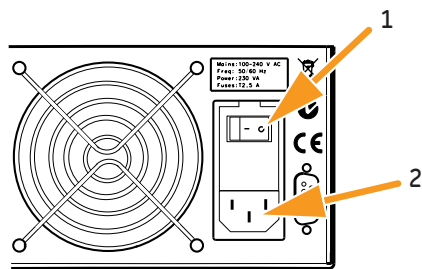
### Introduction

This section describes how to perform an emergency shutdown of Ettan IPGphor 3 and the result in the event of power failure.

### Emergency shutdown

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

This will ensure that the power is cut immediately even if an uninterruptible power supply (UPS) is used.



### Power failure

In the event of system shutdown due to power failure, emergency stop or process interruption, malfunctions must be rectified before the Ettan IPGphor 3 is restarted.

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

Power failure to...	will result in...
Ettan IPGphor 3 instrument	<ul style="list-style-type: none"><li>Any experiments that are running will stop.</li><li>The time for the stop will be logged in the instrument.</li><li>The run is interrupted in an undefined state.</li></ul>

Power failure to...	will result in...
Computer	<ul style="list-style-type: none"> <li>• The Ettan IPGphor computer shuts down.</li> <li>• Any running experiments will be continued and completed.</li> <li>• Scanned images will be saved and uploaded to the computer when computer contact has been re-established.</li> </ul>

**Note:** *A UPS can eliminate data loss during and after a power failure, and allow time for a controlled shut-down of Ettan IPGphor 3.*

## Restart after emergency shutdown/power failure

When the power returns to normal no experiments that were running at the time of emergency shutdown will be continued. Proceed as follows:

Step	Action
1	Start the instrument, see <i>Turn on power and run diagnostic program</i> , on page 66.
2	Restart the software. When the system is connected, the log event will be stored in the system log.
3	If you wish to continue a run, set up and run a new experiment with the appropriate/remaining steps to complete the run in the best way.

## 2.4 Recycling information

### Introduction

This section contains information about the decommissioning of Ettan IPGphor 3.

---

### Decontamination

Ettan IPGphor 3 shall be decontaminated before decommissioning and all local regulations shall be followed with regard to scrapping of the equipment.

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### Disposal, general instructions

When taking Ettan IPGphor 3 out of service, the different materials must be separated and recycled according to national and local environmental regulations.

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### Recycling of hazardous substances

Ettan IPGphor 3 contains hazardous substances. Detailed information is available from your GE representative.

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### Disposal of electrical components

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.





## 2.5 Declaration of Hazardous Substances (DoHS)

根据SJ/T11364-2006《电子信息产品污染控制标识要求》特提供如下有关污染控制方面的信息。

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

### 电子信息产品污染控制标志说明

#### Explanation of Pollution Control Label



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

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

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

本产品在使用寿命结束时不可作为普通生活垃圾处理，应被单独收集妥善处理。

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

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

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

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

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

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

部件名称 Component name	有毒有害物质或元素 Hazardous substance					
	铅	汞	镉	六价铬	多溴联苯	多溴二苯醚
	Pb	Hg	Cd	Cr6+	PBB	PBDE
28-9269-30	X	0	0	0	0	0

- 0: 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006标准规定的限量要求以下
- X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006标准规定的限量要求
- 此表所列数据为发布时所能获得的最佳信息
- 0: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.
- X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.
- Data listed in the table represents best information available at the time of publication.

# 3 System description

## About this chapter

This section provides a description of Ettan IPGphor 3 Isoelectric Focusing System and an overview of its components.

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## In this chapter

This chapter contains the following sections:

Section	See page
3.1 Illustrations of Ettan IPGphor 3	28
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3.3 Ettan IPGphor 3 Control Software	34
3.4 Strip holders	35

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### 3.1 Illustrations of Ettan IPGphor 3

#### Ettan IPGphor 3 Isoelectric Focusing System



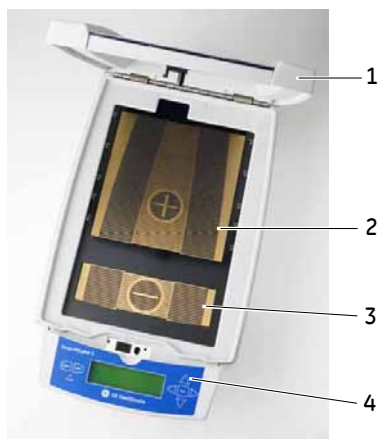
Part	Function
1	Ettan IPGphor 3 Control Software
2	Ettan IPGphor 3 instrument

**Note:** Ettan IPGphor 3 instrument is used together with separate strip holders or a manifold. Two types of manifolds are available; the ceramic manifold and the light manifold.

Ettan IPGphor 3 Isoelectric Focusing System also includes Immobiline DryStrip gel strips, which contain an immobilized pH gradient (IPG).

For more information about the manifolds, see Ettan IPGphor Cup Loading Manifold User Manual.

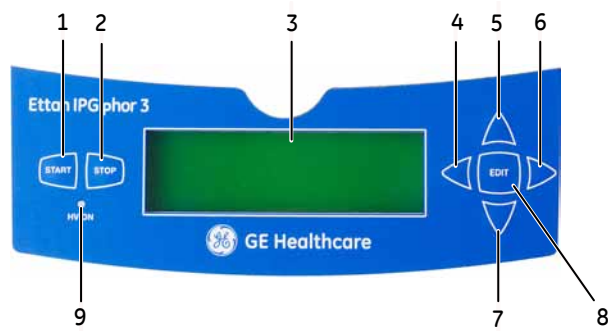
## Ettan IPGphor 3 platform



Part	Function
1	Safety lid
2	Positive (anode) electrode area
3	Negative (cathode) electrode area
4	Control panel

Ettan IPGphor 3 control panel

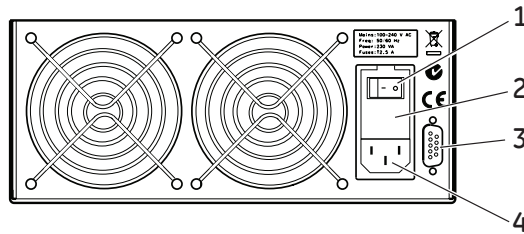
Ettan IPGphor 3 is controlled by a 7-key membrane keypad. The instrument status is indicated on the LCD screen.



Part	Function
1	<b>START</b> button
2	<b>STOP</b> button
3	LCD screen (Main screen)
4	<b>Left arrow</b> button
5	<b>Up arrow</b> button
6	<b>Right arrow</b> button
7	<b>Down arrow</b> button
8	<b>EDIT</b> button
9	<b>HV ON</b> indicator lamp

## Ettan IPGphor 3 rear panel

Electrical and communication connections are placed on the rear panel of the Ettan IPGphor 3.



Part	Function
1	<b>Power switch</b>
2	Fuse holder
3	RS232 for connection to computer
4	Power inlet

## 3.2 Ettan IPGphor 3 instrument

### Platform

The platform accommodates one manifold for the first dimension isoelectric focusing (IEF) run. Up to 12 fixed-length strip holders can be placed on the platform for rehydration and IEF. The embedded electrode areas provide the electrical connection between strip holder or manifold electrodes and an integrated high-voltage DC power supply delivering up to 10 kV. Platform temperature is controlled by Peltier thermoelectric modules.

Both electrode areas are gold-plated copper. Placing a manifold or a strip holder so that it bridges both electrode areas completes the electrical circuit (once the safety lid is in position).

---

### Protective cover

When analyzing proteins labeled with light sensitive stains like CyDye™, a light protective cover is used. The cover is applied by magnetic force but is easy to partially remove for checking the isoelectric focusing procedure, especially the migration of bromo-phenol-blue at start.

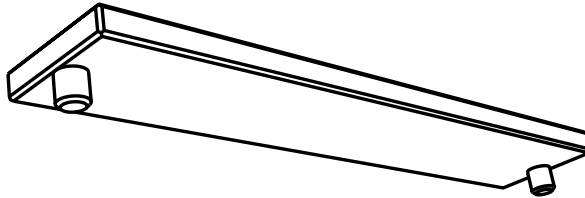
The voltage is cutoff when the safety lid is opened.





### Lid adapter for strip holders

When using Ettan IPGphor 3 standard strip holders a lid adapter must be used to apply the correct amount of pressure to the lids of the Ettan IPGphor 3 strip holders.



### 3.3 Ettan IPGphor 3 Control Software

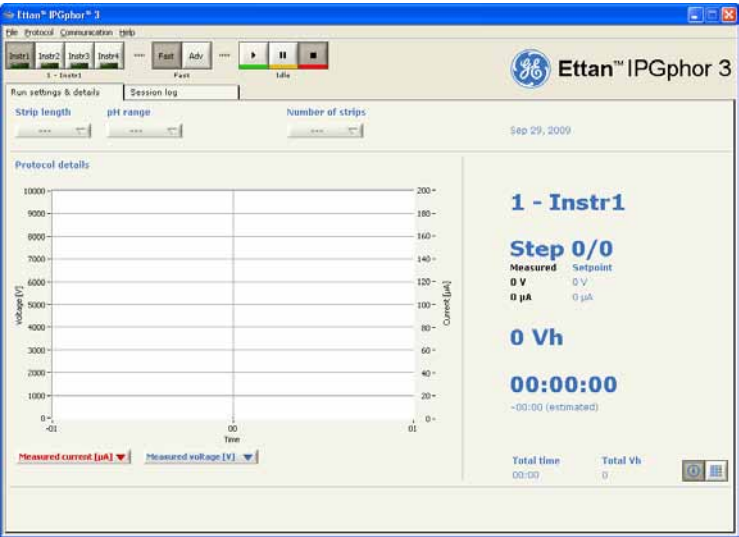
#### Control software

Ettan IPGphor 3 Control Software is used to control the Ettan IPGphor 3 Isoelectric Focusing System. The software provides data presentation, data storage, and protocol handling. The PC is connected to the Ettan IPGphor 3 by a serial cable or USB converter.

Ettan IPGphor 3 Control Software controls up to four Ettan IPGphor 3 systems at one time, each running a different set of run parameters.

The software allows programming and recommended protocols are generated by providing instrument configuration, IPG strip length and pH gradient.

The software records the run parameters over time and presents data as graphs and log files. Data is saved or can be exported to Microsoft Excel.



## 3.4 Strip holders

### Two models of strip manifolds

IPG strip manifolds are available in two models:

- One produced from a ceramic material providing greater temperature uniformity
- One produced from a light polymeric material for less critical experimentation

Both are designed for analytical analysis using cup application and preparative runs applying sample to the gel during the rehydration step or by paper bridge loading.

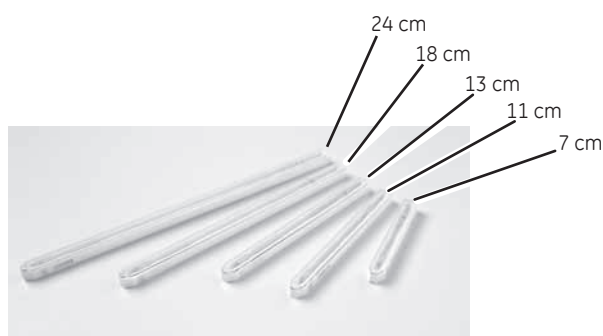
### Strip holder

The strip holders are made of aluminum oxide ceramic with electrodes of platinum on titanium. The ceramic is very brittle so the holders are fragile and must be handled with care.

The ceramic is treated with a special coating to minimize protein binding and must be cleaned only with the Ettan IPGphor Cleaning Solution supplied to retain that coating.

Each fixed-length strip holder base holds a single IPG strip throughout rehydration and isoelectric focusing. A matching length holder is available for each size strip. All strips (and holders) used at any one time must be of the same length.

Five strip holder lengths are available, 7, 11, 13, 18, and 24 cm, one for each IPG strip length and a number of pH ranges, several linear and non-linear. Refer to *Section 8.3 Ordering information, on page 116*.

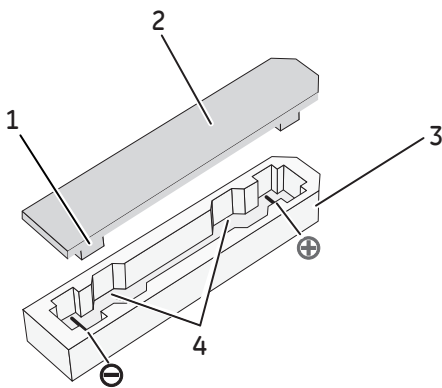


Part	Function
Sample application wells	Each of the two wells can contain to 15 µl of sample (7.5 µl on either side of the strip) in excess of the rehydration volume (i.e. 30 µl maximum for both wells). Introduce the sample through the wells if it is not included in the rehydration solution.
Cover	The cover is made of acrylic and protects the IPG strip during rehydration. The shape of the underside of the cover ensures electrical continuity during IEF by pressing the strip against the electrode while allowing electrolysis gases to escape. Rehydration and separation progress can be monitored visually through the clear cover.

Strip holder cover

The cover is made of acrylic and protects the IPG strip during rehydration. The shape of the underside of the cover ensures electrical continuity during IEF by pressing the strip against the electrode while allowing electrolysis gases to escape.

Rehydration and separation progress can be monitored visually through the transparent cover.



Part	Function
1	Pressure block
2	Cover
3	Base
4	Sample application walls

# 4 Installation

## Introduction

This chapter provides information about safe installation of Ettan IPGphor 3 Isoelectric Focusing System.

---

## In this chapter

This chapter contains the following sections:

Section	See page
4.1 Site requirements	38
4.2 Unpacking and transport	40
4.3 Setup	41
4.4 Software installation for isoelectric focusing process	45

---

## 4.1 Site requirements

### Space requirements

Parameter	Specification
Minimum bench area ( w × d)	480 × 670 mm

### Dimensions and weight of Ettan IPGphor 3

Parameter	Specification
Dimensions (h × w × d)	160 × 278 × 471 mm
Weight	8.3 kg

### Operating environment

Parameter	Specification
Operation site	Indoor use
Altitude	Maximum 2000 m
Ambient temperature	15°C to 32°C
Relative humidity	0% to 70% <sup>1</sup>
Pollution degree	2
Noise emission	<80 dB A

<sup>1</sup> High relative humidity may result in condensation forming on the platform surface. Runs conducted at a platform temperature of 20°C and relative humidity less than 70% will generally not cause condensation. Platform temperatures greater than 20°C allow for higher relative humidity without condensation. Environments for which condensation occurs on the platform surface may vary. If condensation occurs, the unit may require conditioned air to reduce temperature and relative humidity.

## Power requirements

Parameter	Specification
Mains supply voltage	100-240 V AC $\pm 10\%$
Frequency	50/60 Hz
Power consumption	230 VA
Transient overvoltages	Overvoltage category II

## 4.2 Unpacking and transport

### Unpacking

Carefully unpack all items delivered and make sure that all items are present by comparing the contents with the packing list. If any part is missing, please contact your local GE sales office.

Inspect all components. If any part appears damaged, please contact the courier immediately.

Please keep all packing material and use if damaged parts need to be returned for repair or replacement.

- Check the equipment for damage before starting assembly and installation.
  - Document any damage and contact your local GE.
  - Remove straps and packing material and stand equipment upright before starting installation.
- 

### Transport

Before moving the system:

- Disconnect all cables.
  - Lift the instrument by the base unit.
-



## 4.3 Setup

### Place the instrument



#### WARNING

The vents at the front, back, and bottom of Ettan IPGphor 3 must not be obstructed. Air must be free to circulate for the cooling apparatus to function correctly. There should be a minimum of 10 cm unobstructed space behind the rear panel of the instrument.

Step	Action
1	Select a place for Ettan IPGphor 3 where it is possible to access the mains power switch on the rear panel of the instrument.
2	Position the instrument on a flat surface with the spirit level in the center. Turn the leveling feet as necessary to make the instrument level and stable.

### Power connection



#### WARNING

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



#### WARNING

Only use power cords delivered or approved by GE.



#### WARNING

The Ettan IPGphor 3 must always be connected to a grounded power outlet.



**WARNING**

Do not block the rear and side panel of Ettan IPGphor 3. The power switch must always be easy to access. The power cord must always be easy to disconnect.

Two power cords are supplied: one cord has a “North American” style (UL817) 3-pronged plug for 115 V AC power outlets, and the other has a “Central European” style (CEE7/VII) plug for 230 V AC power outlets.

Step	Action
1	Select the cord with the appropriate plug for the power outlet in your laboratory. If neither of these cords are suitable for your power outlets, obtain a detachable cord with an IEC/320/C13 (CEE22/V) outlet.
2	Plug the connectors into the power cord receptacle on the rear panel and into a properly grounded power outlet.

Turn on power and run diagnostic program

Turn on the instrument and run a diagnostic program according to the description in *Section 5.2 Start up the instrument, on page 66*.

Serial port connector for a computer connection



**NOTICE**

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

The RS232 serial port for a computer connection is placed at the rear of Ettan IPGphor 3. The type of cable required (shielded straight serial or shielded null modem) depends on the type of device (DTE or DCE) that it is connected to:

- If the computer is configured to receive data on pin 2 and transmit on pin 3, a regular straight serial cable is required.
- For any other configuration, a null modem cable is required.

Pin number assignments and device set up details are mentioned below:

Ettan IPGphor 3 RS232 signal and pin number assignments	
Pin 2	Transmit
Pin 3	Receive
Pin 5	Ground
Other pins	Not connected

The Ettan IPGphor 3 requires these settings in the device receiving data	
Baud rate	9600
Data bits	8
Stop bit	1
Start bit	1
Parity	None
Flow control	None

## Set the baud rate

Follow the instructions below to set the baud rate on the LCD screen.

Step	Action
------	--------

- |   |   |
|---|---|
| 1 | Press the <b>Up</b> and <b>Down arrows</b> together to access the <b>Baud</b> menu. |
| 2 | Use the <b>Up</b> or <b>Down arrows</b> to set the baud rate.                       |
| 3 | Use the <b>Right arrow</b> to exit to the main menu.                                |

Serial Port Setup Baud Rate: 9600 Set Up or Dn      Exit>
---

## 4 Installation

### 4.3 Setup

## Assembly

The following parts must be added to Ettan IPGphor 3 instrument before it can be used:

- Strip holder or manifold
  - Strips
  - Buffer and sample liquids
- 

## Spare parts and accessories

For correct up to date information on spare parts and accessories visit:

[www.gelifesciences.com](http://www.gelifesciences.com)

---

## 4.4 Software installation for isoelectric focusing process

### Introduction

Refer to *Ettan IPGphor 3 Control Software User Manual* to install the Ettan IPGphor 3 Control Software.

---

# 5 Operation

## Introduction

This chapter provides instructions for the use of Ettan IPGphor 3 Isoelectric Focusing System.

Before starting the Ettan IPGphor 3 Isoelectric Focusing System, rehydrate the samples according to the method selected, either fixed-length Ettan IPGphor 3 strip holders or use the Ettan IPGphor Cup Loading Manifold.

---

## In this chapter

This chapter contains the following sections:

Section	See page
5.1 Preparations before start	47
5.2 Start up the instrument	66
5.3 Perform a run from the control panel	68
5.4 Run a pre-programmed protocol from the PC	90

---

## 5.1 Preparations before start

### Introduction

This section provides instructions on how to prepare the strip holders or the manifolds before starting the system.

---

### Precautions



#### NOTICE

Solutions containing urea may be warmed briefly. Do not heat any solutions containing urea above 30°C to 40°C as isocyanate, a urea degradation product, will carbamylate the proteins in the sample, thus changing their isoelectric points.



#### NOTICE

All chemicals should be of the highest purity. Double distilled water should be used.

## 5.1.1 Use the strip holders

### Introduction

Ettan IPGphor 3 Isoelectric Focusing System fixed-length strip holders allow IPG strips to be rehydrated and samples loaded in one step before proceeding automatically to perform the separation. The IPG strips are 3 mm wide and 0.5 mm thick after rehydration.

### Precautions



**WARNING**

Check that the high voltage is turned off before opening the safety lid. The **HV ON** indicator on the front panel should not light.

### Prepare the strip holder(s).



**NOTICE**

Handle the ceramic holders with care, as they are brittle and fragile.

Step	Action
1	Select the strip holder(s) corresponding to the IPG strip length chosen for the experiment (7, 11, 13, 18, or 24 cm).
2	Wash each holder with the strip holder cleaning solution supplied to remove residual protein.
3	Rinse thoroughly with double distilled water.
4	Use a cotton swab or a lint-free tissue to dry the holder or allow it to air-dry. The holder must be completely dry before use.



## Rehydrate the Immobiline DryStrip

Follow the instructions below to rehydrate the Immobiline DryStrip.

Step	Action
1	Prepare the rehydration solution and rehydrate the Immobiline DryStrip in the strip holder or in the rehydration tray when using the manifold.
2	Follow the recommended procedures found in the Instructions attached to each Immobiline DryStrip package.

**Note:** See also the *2-D Electrophoresis, Principles and Methods* guide containing commonly used recipes.

## Pipet the rehydration solution



### WARNING

Avoid spilling liquids on the body of the instrument. If large volumes of liquid have penetrated the casing of the instrument and come into contact with the electrical components, immediately switch off the instrument and contact an authorized service technician.



### CAUTION

Always wear gloves when handling IPG strips and the equipment that comes in contact with them. This will help minimize protein contamination which can result in artifactual spots in stained 2-D gel patterns.



### NOTICE

Use the appropriate rehydration volume for the IPG strip length.

Follow the instructions below to pipet the appropriate volume of rehydration solution into each holder. The correct volume to each strip length is found in the instructions attached to each Immobiline DryStrip package.

5 Operation

5.1 Preparations before start

5.1.1 Use the strip holders

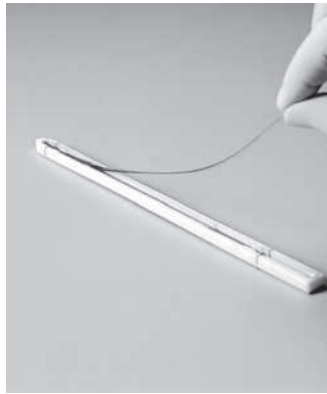
Step	Action
1	Pipette the solution slowly at a central point in the strip holder channel away from the sample application wells.
2	Remove any larger air bubbles.



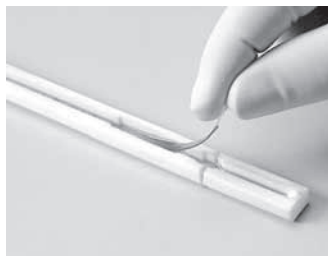
## Position the IPG strip

Follow the instructions below to position the IPG strip.

Step	Action
1	Remove the protective cover from the IPG strip.
2	Position it with the gel side down and the pointed (anodic) end of the strip directed toward the pointed end of the strip holder.
3	With the pointed end first, lower the strip onto the solution. To help coat the entire strip, gently lift and lower the strip and slide it back and forth along the surface of the solution, tilting the strip holder slightly as needed to assure complete and even wetting.



- 4 Lower the cathodic (square) end of the strip into the channel, making sure that the IPG gel is in contact with the strip holder electrodes at each end. The gel can be visually identified once the rehydration solution begins to dye the gel. Be careful not to trap bubbles under the strip.



## 5 Operation

### 5.1 Preparations before start

#### 5.1.1 Use the strip holders

## Apply Immobiline DryStrip cover fluid

Follow the instructions below to apply Immobiline DryStrip Cover Fluid to minimize evaporation and urea crystallization.

Step	Action
1	Pipet the cover fluid dropwise into one end of the strip holder until one half of the strip is covered.
2	Later, pipet the cover fluid dropwise into the other end of the strip holder, adding fluid until the entire IPG strip is covered.

## Place the strip holder cover

Position the cover on the holder. Pressure blocks on the underside of the cover ensure that the strip maintains good contact with the electrodes as the gel rehydrates.

## Rehydration proceeding

Rehydration can proceed on the bench top or on the Ettan IPGphor 3 platform. Ensure that the holder is on a level surface. A minimum of 10 h is required for rehydration, overnight is recommended.

Alternatively, the rehydration period can be programmed as the first step of an Ettan IPGphor 3 protocol. This is especially convenient if temperature control during rehydration is a concern, or if a low voltage is applied during rehydration.

## Sample rehydration under voltage (optional)

Follow the instructions below to perform rehydration under voltage. If desired, the sample can be absorbed by the IPG strip under low voltage. This may improve the uptake of high molecular weight proteins.

Step	Action
1	Set the rehydration time to 0:00 and program <b>Step 1</b> of the protocol for low voltage (30 to 100 V) for 10 to 12 h, see <i>Edit step or gradient</i> , on page 79
2	Program additional steps as desired to achieve complete focusing.

## Apply electrode pads prior to IEF (optional)

Under certain conditions, such as prolonged focusing, water may migrate toward one end of the strip, causing the other end to begin drying out. This effect can be minimized by placing paper electrode pads between the IPG strip and each strip holder electrode just before IEF. Electrode pads may also absorb ions that would otherwise accumulate at the ends of the IPG strip and possibly interfere with the separation.

Follow the instructions below to apply electrode pads prior to IEF.

Step	Action
1	Cut two 3 mm wide electrode pads from a paper IEF electrode strip (18-1004-40).
2	Position on a clean, flat surface such as a glass plate and soak with deionized water. Remove excess water by blotting with tissue paper.  <b>Note:</b> <i>Electrode pads must be damp, not saturated or dripping.</i>
3	Lift one end of the rehydrated IPG strip using forceps or tweezers. Position an electrode pad over the electrode, then lower the strip back in place.
4	Repeat at the other end.

Apply sample after rehydration  
(optional)

If the sample was not applied by inclusion in the rehydration solution, it can be applied immediately prior to IEF.

Follow the instructions below to apply electrode pads prior to IEF.

**Note:**     *The IPG strip backing is impermeable; do not apply the sample to the back of the strip.*

Step	Action
1	Prepare the sample in a solution similar in composition to the rehydration solution used.
2	<p>Pipet the sample into either or both of the lateral wells at either end of the strip holder. Introduce the sample below the cover fluid.</p> <p>Up to 7.5 µl of sample solution can be added to each side (i.e. 15 µl per well or maximum 30 µl if both sides of both wells are used).</p>

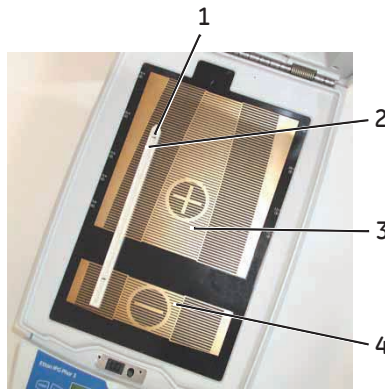


## Position the strip holders

Ettan IPGphor 3 platform has two electrode areas:

- The larger area (3) is the positive electrode (anode)
- The smaller area (4) is the negative electrode (cathode).

Position the strip holder on the platform as shown below: Electrode contacts underneath, one in each electrode area (1). The pointed end of the strip holder (2) is over the anode (pointing to the back of the unit) and the blunt end is over the cathode. Guidemarks along the sides of the platform show approximate positioning for each strip holder size (7, 11, 13, 18, and 24 cm).



## 5 Operation

### 5.1 Preparations before start

#### 5.1.1 Use the strip holders

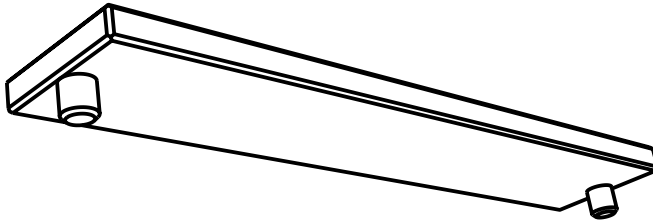
### Using safety lid



#### NOTICE

During isoelectric focusing, do not lean on the safety lid, do not apply excess pressure or uneven weight to the lid, and do not place any items on the lid. Such pressure could cause arcing between the strip holder electrodes and the electrode areas, damaging the instrument.

When using the Ettan IPGphor standard strip holders, lid adapters must be used to apply the correct amount of pressure to the lids of the IPGphor strip holders. The pressure keeps the IPG strip in contact with the IPG strip holder electrodes.





## Close the safety lid



### CAUTION

The safety lid must be properly closed before power is applied.



### NOTICE

Exceeding the recommended current limit of 50  $\mu$ A per IPG strip can cause the strip to burn and may damage the instrument.

Follow the instructions below to ensure good electrical contact when using the fixed length strip holder:

- | Step | Action  |
|------|---|
| 1    | Apply two lid adapters (2) right across the lids of the strip holders, one over the anodic area and the other over the cathodic area. |



- |   |  |
|---|--|
| 2 | Use two or more strip holders (3) and place them wide apart to ensure that the lid adapters are only hanging on one strip holder and not pressing down on the other. |
| 3 | Carefully close the safety lid (1) by applying light downwards pressure, ensure the mechanism locks the lid.   |

## 5 Operation

### 5.1 Preparations before start

#### 5.1.1 Use the strip holders

Step	Action
4	To inspect the run the light protective cover can be lifted without stopping the run.



5	To open the safety lid press down the lid and the lock is released and the run is stopped. Close the lid and the run continues.
---	---

## 5.1.2 Use the Ettan IPGphor Cup Loading Manifold

### Precautions



#### CAUTION

Always wear protective gloves when working with rehydration solution.

### Introduction

For more detailed information, please refer to *Ettan IPGphor Cup Loading Manifold User Manual*.

---

### Rehydrate Immobiline DryStrip in the IPGbox

Rehydrate the IPG strips with the gel side down in the appropriate volume of rehydration solution, with or without sample, using the IPGbox.




Rehydration in the Cup Loading Manifold is not recommended, the channel is too wide to ensure proper rehydration.

Also, follow the instructions included with the Immobiline DryStrips or the IPGbox. Close the lid of the IPGbox and allow the strips to rehydrate overnight (10 to 20 hours).

---

Position the manifold on  
Ettan IPGphor 3

Follow the instructions below to position the manifold on Ettan IPGphor 3.

Step	Action
1	Clean and dry the Ettan IPGphor 3 platform before placing the manifold on the system.
2	Position the manifold on the Ettan IPGphor 3 platform. The small T-shaped protrusion fits into a cutout section of the Ettan IPGphor 3 platform near the lid hinge.
	
3	Ensure that the manifold is level by placing the round spirit level on the center of the manifold tray after it is placed on the Ettan IPGphor 3.
4	Measure out 108 ml of Immobiline DryStrip Cover Fluid (even if fewer than 12 strips will be loaded into the manifold). Add the cover fluid evenly in the 12 manifold channels.

## Position the IPG strips in the manifold

Follow the instructions below to position the IPG strips in the manifold.

Step	Action
------	--------


- |   |  |
|---|--|
| 1 | Transfer the strips to the Ettan IPGphor Cup Loading Manifold. |
|---|--|



- |   |   |
|---|---|
| 2 | Position the strips under the cover fluid face up in the tray with the anodic (+, pointed) end of the IPG strip pointing at the anode of Ettan IPGphor 3.   |
| 3 | Center the strip down the length of the manifold channel. Protrusions along the sides guide the strip approximately straight, although some manual adjustment of the strip may be necessary. See also the <i>Ettan IPGphor Cup Loading Manifold User Manual</i> . |

Place sample cups

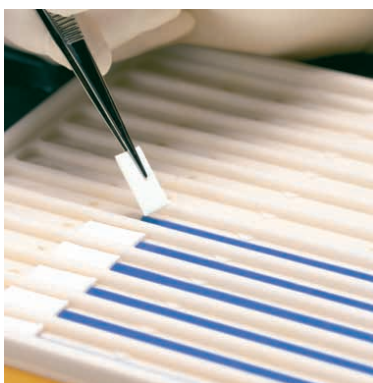
Follow the instructions below to place the sample cups.

Step	Action
1	Position a strip of sample cups in the appropriate position, for example ~1 cm from the end of the gel portion of the IPG strip. Do NOT place the cup with the feet over a center protrusion.
2	Ensure that the feet of the cups are properly seated at the bottom of the channel. Use the insertion tool, wiggle the tool gently while pushing it down.
	
3	Fill the cups with cover fluid to test for proper seating of the cups.
4	Replace the cover fluid after 10 minutes.

## Place electrode paper wicks

Follow the instructions below to place the electrode paper wicks.

Step	Action
1	Add 150 µl distilled water to each paper wick.
2	Position the wicks on each end of the IPG strips so that one end of the wick overlaps the end of the gel on the IPG strip.



Position the electrodes

Follow the instructions below to position the electrodes.

Step	Action
1	With the electrode cams in the open position, position the electrode assembly on top of all the wicks. The electrode must be in contact with the wick.
2	Swivel the cams into the closed position under the external lip of the tray. The electrodes should not be moved while the cams are in the closed position.





## Load samples into the sample cups

Follow the instructions below to load the samples into the sample cups.

Step	Action
------	--------

- |   |  |
|---|--|
| 1 | A maximum of 150 µl of sample may be placed in these cups. |
|---|--|



- |   |   |
|---|---|
| 2 | Check to make sure that there is cover fluid over the samples. When the sample is introduced into the cups, it will sink through the oil to the bottom of the cup and come into contact with the IPG strip.   |
| 3 | Close the Ettan IPGphor 3 lid.  |
| 4 | <ul style="list-style-type: none"><li>• Program and run the Ettan IPGphor 3 from its own control panel display. See <i>Section 5.3 Perform a run from the control panel</i>, on page 68 for more details, or</li><li>• Start the Ettan IPGphor 3 from the Ettan IPGphor 3 Control Software. See <i>Section 5.4.1 Setting up a run</i>, on page 91 for more details.</li></ul> |

## 5.2 Start up the instrument

### Precautions



**WARNING**

Check that the high voltage is turned off before opening the safety lid. The **HV ON** indicator on the front panel should not light.



**WARNING**

In a situation where there is a risk of injury, turn off the instrument by switching the mains power switch (located on the rear panel) to position **0**. Malfunctions must be rectified before Ettan IPGphor 3 Isoelectric Focusing System is restarted.

### Turn on power and run diagnostic program

Step	Action
1	Turn on the mains <b>Power switch</b> located on the rear panel.
2	<p>This activates a self diagnostic program that runs for approximately 10 seconds. A series of screens indicate progress. If any component fails, the diagnostic program will stop and a message will indicate the source of the fault.</p> <p>Note the fault, if any.</p>
3	Press <b>START</b> to skip to the next test.
4	Call GE service if any failure is detected,

Step	Action
5	Once the diagnostic program is successfully completed, the LCD screen indicates that the instrument is ready, as shown in the figure.



## 5.3 Perform a run from the control panel

### In this section

This section covers how you run ISO electric focusing from the control panel.

Section	See page
5.3.1 Ettan IPGphor 3 control panel functionality	69
5.3.2 Protocol parameters	73
5.3.3 Set protocol parameters	75
5.3.4 Isoelectric focusing from the control panel	83
5.3.5 Pause or stop a protocol	89

## 5.3.1 Ettan IPGphor 3 control panel functionality




### Introduction






IEF runs are programmed from the Ettan IPGphor 3 Isoelectric Focusing System control panel with up to ten user-defined IEF protocols, each with up to 9 steps per protocol.

Programmable functions including: rehydration time, platform temperature, current limit, voltage limit for each step, voltage gradient or step and step duration.

### Control unit keys

The following keys on the control panel are used to program Ettan IPGphor 3.

COMMAND keys	Function
<b>EDIT</b> 	<p>Pressing the <b>EDIT</b> key in the edit mode toggles between the protocol identification screen with general settings for all steps and the settings in the three first protocol steps.</p> <p>The <b>EDIT</b> key switches the display to edit mode, in which protocol steps can be programmed. (Refer to <i>Section 5.3.3 Set protocol parameters</i>, on page 75.</p> <p>The <b>EDIT</b> key also allows the estimated run time remaining to be viewed while the unit is operating.</p>
<b>Left arrow</b> 	<p>The <b>Left arrow</b> key moves the cursor to the left. Moving the cursor off the screen to the left repositions the cursor at the left side of the next row. From the bottom row the cursor is repositioned on the left side of the top row.</p>
<b>Right arrow</b> 	<p>The <b>Right arrow</b> key moves the cursor to the right. Moving the cursor off the screen to the right repositions the cursor at the left of the next row. From the bottom row the cursor is repositioned on the left side of the top row.</p>

COMMAND keys	Function
<b>Up arrow</b> 	<p>The <b>Up arrow</b> key increases the value of the selected field or digit.</p> <p><b>Note:</b> <i>Exception is when the cursor is positioned to the left under the Step number S1-S9, the <b>Up arrow</b> key changes the display to the previous group of three protocol steps.</i></p> <p><b>Note:</b> <i>During electrophoresis, the <b>Up/dDown arrow</b> keys are used to toggle between VhS, VhT, and Hrs.</i></p>
<b>Down arrow</b> 	<p>The <b>Down arrow</b> arrow key decreases the value of the selected field or digit.</p> <p><b>Note:</b> <i>Exception is when the cursor is positioned to the left under the Step number S1-S9, the <b>Down arrow</b> key changes the display to the next group of three protocol steps..</i></p> <p><b>Note:</b> <i>During electrophoresis, the <b>Up/Down arrow</b> keys are used to toggle between VhS, VhT, and Hrs.</i></p>
<b>START</b> 	<p>The <b>START</b> button begins the selected protocol.</p>
<b>STOP</b> 	<p>The <b>STOP</b> button pauses the protocol. Pressing the <b>STOP</b> key a second time cancels the protocol in progress.</p> <p>Press the <b>STOP</b> button a third time to reset the instrument to start another protocol.</p>
<b>HV ON</b> indicator lamp 	<p>The <b>HV ON</b> lamp indicates that the high voltage power supply is on and isoelectric focusing is in progress. This lamp is not illuminated during the rehydration phase of a protocol.</p>

## Protocol identification screen

The **protocol identification screen** is the first screen that appears after the diagnostic program is completed. The first row starts with **Protocol #1, Name**. The default location of the cursor is always under the protocol number "1".

A protocol can be selected by pressing the **Up** and **Down arrow** keys to display the number of a protocol. Once the selected protocol is started, the LCD screen indicates the parameters of the step currently being carried out.

The **protocol identification screen** comprises the following programmable items:

- Protocol number and name
- Rehydration time, temperature
- IEF run conditions (temperature and maximum current/strip)
- Number of strips and number of steps in the selected protocol.

Prot# 1 File 1  
Rehydrate 0:00Hr @ 20°C  
IEF @ 20°C 50µA/Strip  
1 Strips 0 Steps

---

## 5 Operation

### 5.3 Perform a run from the control panel

#### 5.3.1 Ettan IPGphor 3 control panel functionality

### IEF steps screen

The second screen in edit mode is the first in a series of nine programmable IEF steps in which the voltage change pattern, voltage, and step duration are set. The steps are displayed in groups of 3 steps per screen. The number of steps which have been programmed is displayed next to the protocol number.

The two options for the **voltage change pattern** are:

- **Step**, which sets the voltage at the selected value for the new step and then holds the voltage constant for the step duration.
- **Gradient**, which increases the voltage limit (linearly with respect to time) from the value set for the previous step to the value set for this step. If this is the first step, the value increases from 0.

The original factory programmed voltage for each step is 0. Program each step with the protocol voltage values. If fewer than nine steps are required, end the program by assigning a value of 0 V after the final step. The step duration (0 to 99:59 hours) or volt-hours (0 to 300.000 Vhr) are programmable for each step.

```
Prot# 1 3 Steps
S1 Step 500V 1:00 Hrs
S2 Step 1000V 4:00 Hrs
S3 Step 8000V 80000 Vhr
```

---



## 5.3.2 Protocol parameters

### Programmable parameters

Ettan IPGphor 3 can store up to ten protocols. Programmable protocol parameters include:

- Duration and temperature of the rehydration phase.
- Duration, temperature, and power parameters for up to nine IEF steps for each protocol.
- Power parameters including maximum current, voltage, and voltage change pattern.

Please refer to the *2-D Electrophoresis, principles and methods guide* for sample handling recommendations and protocol guidelines. The permitted range of values for each programmable parameter is listed below.

Permitted range of values for each programmable parameter		
Parameter	Operational Range	Recommended values
Steps	1 to 9	
Step duration	Rehydration: 0 to 99:59 hrs Focusing: 0 to 99:59 hrs	10:00 to 14:00 hrs 2:00 to 10:00 hrs
Volts	0 to 10000 V	100 to 10000 V
Max. current	1500 $\mu$ A total for 12 strips max.	50–75 $\mu$ A per strip
Platform temperature	Rehydration: 15°C to 30°C Focusing: 15°C to 30°C	20 20

## 5 Operation

### 5.3 Perform a run from the control panel

#### 5.3.2 Protocol parameters

### Navigating parameter “fields” and “digits”

- Each screen consists of information as well as one or more fields that can be edited. The active fields contain individually adjustable digits or characters.
- Certain digits are also linked to their neighbouring digits. For example, three of the four digits in the voltage field can each be adjusted individually, but when adjusting the value from 1000 to 990, for instance, even though only the ten’s place is adjusted manually, three digits are affected.
- Whether individual or linked, digits “wrap around,” so increasing from 9 produces 0 and decreasing from 0 produces 9—until a parameter limit is reached.

Ettan IPGphor 3 can be programmed in volt-hours (Vhr) or hours and minutes in step-n-hold or in gradient mode. Any values within the operating limits listed above can be used.

---

## 5.3.3 Set protocol parameters

### Introduction

This section covers the programming, editing, or verifying of all parameter values.

All protocol parameters are set in the edit mode. Press the **EDIT** key to toggle between the first editable screen and the protocol identification screen.

**Note:** *The cursor stops only in the fields that can be edited. Once the cursor is in position, press the **Up** or **Down** arrow keys to adjust the value.*

### Create or edit protocols

Follow the instructions below to edit the rehydration parameters, time and temperature, and the IEF parameters, temperature,  $\mu\text{A}/\text{Strip}$  and number of strips as necessary on the main screen.

Step	Action
1	Select the protocol to be created or edited from the <b>protocol identification screen</b> .
2	Position the cursor under the protocol number field using the <b>Right</b> and <b>Left arrow</b> keys and move to the desired protocol number using the <b>Up</b> and <b>Down arrow</b> keys.

Prot# 1 File 1  
Rehydrate 10:00Hr @ 20°C  
IEF @ 20°C 50 $\mu\text{A}$ /Strip  
1 Strips 0 Steps

## 5 Operation

### 5.3 Perform a run from the control panel

#### 5.3.3 Set protocol parameters

Step	Action
------	--------

- |   |   |
|---|---|
| 3 | <p>Edit the file name by using the <b>Right arrow</b> key to move into the file name, and <b>Up</b> and <b>Down arrows</b> to adjust the characters as desired. To skip editing the name use the <b>Left arrow</b> to proceed to the next line.</p> |
|---|---|

To change any letter, move the cursor to that location using the **Right** and **Left arrow** keys and then scroll through the 37 available options using the **Up** and **Down arrow** keys. Once the desired letter appears, move the cursor to the next character to be set.

The original label "File #" occupies 6 of the 16 available characters. To change the label to a more descriptive name, such as "11 CM 3 to 10L," requires scrolling through the alphanumeric options for each of the 11 digits in the name.

```
Prot# 1 File 1
Rehydrate 10:00Hr @ 20°C
IEF @ 20°C 50µA/Strip
1 Strips 0 Steps
```

- |   |   |
|---|---|
| 4 | <p>Edit time range by using the <b>Left</b> and <b>Right arrow</b> keys to position the cursor, and use the <b>Up</b> and <b>Down arrow</b> keys to set the time range.</p> |
|---|---|

The available time range is 0–99:59 h, with 10 min resolution. (Hence, only the first three digits are editable). A minimum of 10 hrs is required for the rehydration of IPG strip gels, but overnight is recommended. This protocol step can also be used as a simple timer to start the protocol at a convenient time. If the IPG strips are already rehydrated and ready for immediate focusing, set the rehydration duration to 00:00 Hrs.

```
Prot# 1 File 1
Rehydrate 10:00Hr @ 20°C
IEF @ 20°C 50µA/Strip
1 Strips 0 Steps
```

- | Step | Action  |
|------|---|
| 5    | <p>Adjust the rehydration temperature by using the <b>Left</b> and <b>Right arrow</b> keys to position the cursor. Use the <b>Up</b> and <b>Down arrow</b> keys to select the value within the range of 15°C to 30°C.</p> <p>The original factory programmed value is 20°C.</p> |

```

Prot# 1 File 1
Rehydrate 10:00Hr @ 20°C
IEF @ 20°C 50µA/Strip
1 Strips 0 Steps

```

**Note:**

*Maintaining the actual platform temperature at <18 °C or >25 °C may require placement of the Ettan IPGphor 3 instrument in a location of lower or higher than ambient temperature (e.g. a cold room).*

*It may be necessary to operate the instrument in an air conditioned room to prevent condensation from collecting on the platform in humid environments when the platform is run below 7°C ambient temperature.*

- |   |  |
|---|--|
| 6 | <p>The third line contains fields to set the platform temperature and current limit for all isoelectric focusing steps.</p> <p>Adjust the rehydration temperature by using the <b>Left</b> and <b>Right arrow</b> keys to position the cursor. Use the <b>Up</b> and <b>Down arrow</b> keys to select the value within the range of 15°C to 30°C.</p> <p>To set the <b>platform temperature</b> use the <b>Left</b> and <b>Right arrow</b> keys to position the cursor in the active °C field and use the <b>Up</b> and <b>Down arrow</b> keys to select the value within the range of .</p> <p>The original factory programmed IEF temperature is 20°C.</p> |
|---|--|

```

Prot# 1 File 1
Rehydrate 10:00Hr @ 20°C
IEF @ 20°C 50µA/Strip
1 Strips 0 Steps

```

## 5 Operation

### 5.3 Perform a run from the control panel

#### 5.3.3 Set protocol parameters

Step	Action
------	--------

- |   |  |
|---|--|
| 7 | Adjust the current limit for all isoelectric focusing steps by using the <b>Left</b> and <b>Right arrow</b> keys to position the cursor under one of the three active $\mu\text{A}$ digits, and use the <b>Up</b> and <b>Down arrow</b> keys to select the value within the range of 0 to 200 $\mu\text{A}$ per strip. |
|---|--|

The original factory programmed value is 50  $\mu\text{A}$  per IPG strip.

Prot# 1 File 1  
Rehydrate 10:00Hr @ 20°C  
IEF @ 20°C 50 $\mu\text{A}$ /Strip  
1 Strips 0 Steps

**Note:**

*The total deliverable amperage is 1500  $\mu\text{A}$ .*

- |   |   |
|---|---|
| 8 | Use the arrow keys to adjust the <b>numbers of strips</b> to run. |
|---|---|

Prot# 1 File 1  
Rehydrate 10:00Hr @ 20°C  
IEF @ 20°C 50 $\mu\text{A}$ /Strip  
1 Strips 0 Steps

- |   |  |
|---|--|
| 9 | Press <b>EDIT</b> on the control panel to move to next screen. |
|---|--|

## Edit step or gradient

- 1 Press the **EDIT** key to display the programmable parameters on the display. Position the cursor in the field to be edited using the **Right** and **Left arrow** keys and adjust the value by pressing the **Up** and **Down arrow** keys.
- 2 Access a **Step** by placing the cursor under the step number and use the **Right** and **Left arrow** keys.  
Each step is identified by "S" and the step number. The original programmed option is **Step** for each step.

```
Prot# 1 3 Steps
S1 Step 500V 1:00 Hrs
S2 Step 1000V 4:00 Hrs
S3 Step 8000V 80000 Vhr
```

- 3 To advance to the next step group press the **Down arrow** key and to return to a previous step group press the **Up arrow** key.
- 4 To toggle to **Gradient**, move the cursor to the **Step** field using the **Right** and **Left arrow** keys and toggle with the **Up** or **Down arrow** key.

```
Prot# 1 3 Steps
S1 Grad 500V 1:00 Hrs
S2 Grad 1000V 4:00 Hrs
S3 Step 8000V 80000 Vhr
```

- 5 **IEF voltage** is programmable from 0–8000 V in increments of 10 V. Each of the first three digits in the voltage field can be set independently.  
First move the cursor to the desired digit location using the **Right** and **Left arrow** keys and then change the value using the **Up** and **Down arrow** keys.

```
Prot# 1 3 Steps
S1 Grad 500V 1:00 Hrs
S2 Grad 2000V 1:00 Hrs
S3 Step 8000V 2:00 Hrs
```

## 5 Operation

### 5.3 Perform a run from the control panel

#### 5.3.3 Set protocol parameters

- 6 To select, set the cursor under the currently selected field and use the **Up** or **Down arrow** key to toggle between Hrs and Vhrs. Move the cursor to the desired digit location using the **Right** and **Left arrow** keys, and change the value using the **Up** and **Down arrow** keys.

The original factory programmed time for each step is 0:00, and should be set to 0:00 for all unused steps. The Vhrs value is calculated according to the explanatory note at the left, but these values can be set in the same manner as the Hrs values.

**Note:**

*When toggling from Hrs to Vhr, the value in the Vhrs field is automatically calculated according to the selected voltage change pattern:*

*For Step-n-hold, Vhr is the product of hours and voltage.*

*For Gradient, Vhr is the product of hours and the mean of the voltage limit set for the current step and the previous step.*

*Absolute Vhr limits can be set to any value from 1 to 30000 Vhr.*

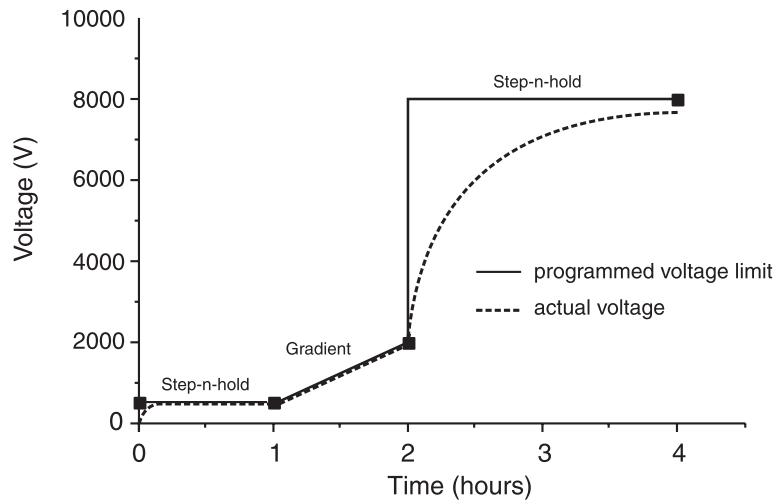
Prot# 1 3 Steps
S1 Grad 500V 1:00 Hrs ·
S2 Grad 1000V 4:00 Hrs
S3 Step 8000V 80000 Vhr ·



## Simplified 4-step protocol and resulting voltage profile (example)

To illustrate the two voltage change patterns, a simplified example shows program steps and the resulting voltage profile. Note that step 4 ends the protocol.

For recommended IEF protocols, see the *2-D Electrophoresis Principles and Methods guide*.



**Note:** The set voltage is the voltage limit. Under conditions of limiting current, it may take some time for the maximum voltage to be reached, and under certain power conditions, it may not be reached at all.

A lower voltage step may be entered at the end of the Ettan IPGphor 3 protocol. Band sharpness will decrease however.

## Verify the protocol

Step	Action
1	Scroll through each step: position the cursor in the step number field using the <b>Right</b> and <b>Left arrow</b> keys.
2	Advance through the steps using the <b>Up</b> and <b>Down arrow</b> keys.
3	Edit as required by placing the cursor with the <b>Right</b> and <b>Left arrow</b> keys and adjusting the value with the <b>Up</b> and <b>Down arrow</b> keys.

5 Operation

5.3 Perform a run from the control panel

5.3.3 Set protocol parameters

Step	Action
4	Make sure that the voltage field in all unused steps displays a value of 0, or that the value in the Hrs field is 00:00.

Exit edit mode

Press **EDIT** to save any changes and exit the step edit mode. The *protocol identification* screen will appear.

## 5.3.4 Isoelectric focusing from the control panel

### Precautions



#### WARNING

Ettan IPGphor 3 is a high voltage instrument that can cause fatal electrical shock if the safety features are disabled. The safety lid must be securely closed before starting a protocol.

### Protocol steps

Once the protocol begins, each step is carried out automatically, and instrument status for each step is indicated on the screen. Platform temperature and time remaining can be changed while the protocol is in progress, and each such possibility is discussed in turn below.

### Select protocol number

Step	Action
1	Place the cursor in the protocol number field using the <b>Right</b> and <b>Left arrow</b> keys and select the protocol number using the <b>Up</b> and <b>Down arrow</b> keys.

```
Prot# 1 MY PROTOCOL
Rehydrate 10:00Hr @ 20°C
IEF @ 20°C 200µA/Strip
12 Strips 3 Steps
```

2	Use the <b>Right</b> and <b>Left arrow</b> keys to position the cursor to set the number of strips to run, and the up and <b>Down arrow</b> keys to select the number(1–12)
---	---

```
Prot# 1 MY PROTOCOL
Rehydrate 10:00Hr @ 20°C
IEF @ 20°C 200µA/Strip
12 Strips 3 Steps
```

5 Operation

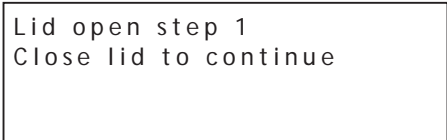
5.3 Perform a run from the control panel


5.3.4 Isoelectric focusing from the control panel

Step	Action
3	Press <b>START</b> . A screen is displayed to confirm the number of strips to run. Adjust the number of strips if necessary.



4	Press <b>START</b> to continue.
5	If the safety lid is not properly closed the following message will indicate the required action:





**CAUTION**

During IEF:

- Do not lean on the safety lid.
- Do not apply excess pressure or uneven weight to the lid.
- Do not place any items on the lid.

6	Press <b>START</b> again after securing the safety lid.
---	---

Step	Action
7	<p>The first screen will indicate the protocol, number of steps, and total hours (excluding rehydration time):</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p>Starting protocol # 1            3 steps 4:00 Hr</p> </div> <p>If a rehydration period was programmed, the rehydration status screen will indicate the number of hours elapsed and the actual platform temperature:</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p>Running Prot# 1            Rehydration for 10:00 Hr            0:01 Hr Elapsed            Rehydrate at 20°C</p> </div>

## Change rehydration duration or other parameters

To change rehydration duration or other parameters:

Step	Action
1	Press <b>EDIT</b> to display the set screen. Pressing <b>EDIT</b> again will access the step setting screen. Pressing <b>EDIT</b> again will return to the running screen.
2	<p>The first line indicates that the protocol is running.</p> <p>Any changes made while a protocol is running are applied to the current run only, the stored protocol is not affected. Move the cursor under the digit you wish to set and change it using the <b>Up</b> and <b>Down arrow</b> keys. To end this step, set all digits to 0. This screen is automatically replaced by the regular status screen after a few seconds.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p>Running Prot# 1            Rehydrate 10:00Hr @ 20°C            IEF @ 20°C 200 µA/Strip            12 Strips 3 Steps</p> </div>

## 5 Operation

### 5.3 Perform a run from the control panel

#### 5.3.4 Isoelectric focusing from the control panel

Step	Action
------	--------

- |   |   |
|---|---|
| 3 | <p>The temperature field can be changed directly (without pressing <b>EDIT</b>)</p> <p>Use the <b>Right</b> and <b>Left arrow</b> keys to position the cursor in the temperature field and use the <b>Up</b> and <b>Down arrow</b> keys to adjust the value.</p> <p>It may take up to 30 minutes to reach the set temperature, depending on ambient conditions.</p> <p>Isoelectric focusing will begin after the rehydration step is complete. The <b>HV ON</b> lamp will light and the status screen showing the step currently in progress as well as all parameters will appear.</p> |
|---|---|

```
Running Prot# 1 @ 20°C
Step 1 of 3 Vhrs
Step Vhrs Elapsed
500V 40µA/Strip 0.0W
```

**Note:**

*The indicated wattage is the total power delivered to all strips, and will often read 0W because any value less than 0.5 is rounded down to 0. If the delivered power exceeds 0.4 W per strip, stop the run and reduce the V or µA settings.*

The current platform temperature is indicated.

The average current per IPG strip (µA), the total instantaneous power delivered (W), and actual voltage (V) are indicated. If the current is the limiting parameter, the "A" in "µA" will flash.

- |   |  |
|---|--|
| 4 | <p>To toggle between VhT, VhS and Hrs:</p> <ul style="list-style-type: none"><li>• Move the cursor to the <b>Hrs/Vhrs</b> field of the display using the <b>Right</b> or <b>Left arrow</b> key.</li><li>• Change the display to reflect VhT, VhS and Hrs using the up and down keys.</li></ul> |
|---|--|

```
Running Prot# 1 @ 20°C
Step 1 of 3 Vhrs
Step Vhrs Elapsed
500V 40µA/Strip 0.0W
```

The Ettan IPGphor 3 will display the volt-hours during the run as:

- VhS, which indicates the total volt hours for that step, or
- VhT, the total volt-hours accumulated during the entire run at the current time.

Hours elapsed for the current step will be indicated by Hrs.

Step	Action
------	--------

- |   |  |
|---|--|
| 5 | <p>To change the display to show remaining Hrs, VhS or VhT:</p> <p>Move the cursor under the <b>Elapsed</b> or ~ <b>Remain</b> field and use the <b>Up</b> or <b>Down arrow</b> keys.</p> <p>The temperature, voltage and current limits for the current step may be adjusted directly on this screen as well.</p> |
|---|--|

```
Running Prot# 1 @ 20°C
Step 1 of 3 Vhrs
Step Vhrs Elapsed
500V 40µA/Strip 0.0W
```

- |   |  |
|---|--|
| 6 | <p>Pressing <b>EDIT</b> will access the step parameter screen. Pressing <b>EDIT</b> again will return to the running screen. Use the <b>Up arrow</b> in the <b>S1</b> to <b>S3</b> fields to access the <b>Rehydration/IEF</b> screen.</p> |
|---|--|

```
Running Prot#
S1 Grad 500V 1:00 Hrs
S2 Grad 2000V 1:00 Hrs
S3 Step 8000V 2:00 Hrs
```

**Note:**

*If you adjust the voltage during a gradient step the step will be converted to Step for the remainder of the step.*

- |   |  |
|---|--|
| 7 | <p>As isoelectric focusing proceeds, the bromophenol blue tracking dye will migrate toward the anode and leave the IPG strip. This generally occurs well before focusing is complete</p> |
|---|--|

**Note:**

*A colorless strip is no indication that IEF is complete.*

If the tracking dye does not move, then no current is flowing across the strip. Check that the strip holder electrodes are in contact with the electrode areas. See the Troubleshooting section for additional suggestions.

5 Operation

5.3 Perform a run from the control panel

5.3.4 Isoelectric focusing from the control panel

Step	Action
8	<div>When the protocol ends, audible beeps will sound and the following screen is displayed:<div><div>Run ended at 8000V 12000 Vhrs Total 50µA 8:00 Hr Total Press <b>Stop</b> to reset</div></div><div>The final instrument values are displayed. Press <b>STOP</b>, as indicated, to reset the instrument.</div></div>



## 5.3.5 Pause or stop a protocol

### Start and stop keys

To pause or stop a protocol in progress, press the **STOP** key:



Paused in step 1  
Press **START** to continue

To continue the protocol, press the **START** key. To cancel the protocol, press the **STOP** key again. This will cause the instrument to respond as though the end of an uninterrupted protocol had been reached as described above.

---

## 5.4 Run a pre-programmed protocol from the PC

### In this section

This section covers how you run ISO electric focusing from a PC.

Section	See page
5.4.1 Setting up a run	91
5.4.2 Perform a run	97

### 5.4.1 Setting up a run

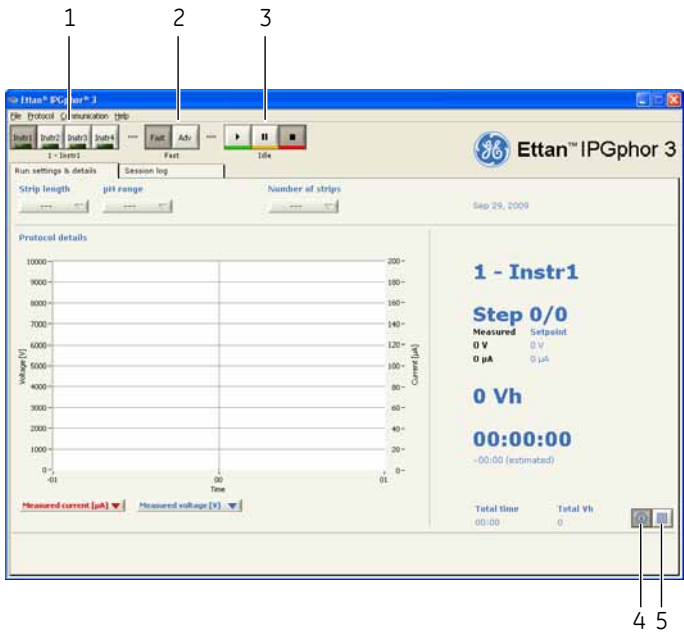
#### Precautions



**WARNING**

Check that the high voltage is turned off before opening the safety lid. The **HV ON** indicator on the front panel should not light.

#### Main screen and buttons



Part	Function
1	Instrument selection buttons
2	Protocol mode buttons
3	Instrument control buttons
4	Info button

Part	Function
5	Protocol view button

Connect instrument

Step	Action
1	Start the computer, log on to Windows and start Ettan IPGphor 3 Control Software.
2	Select the desired Ettan IPGphor 3 by clicking one of the four instrument selection buttons ( <i>Instr1 - Instr4</i> ).

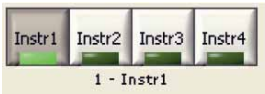


The identity of the instrument should now be shown below the buttons. Up to four instruments can be run simultaneously with the software.

3	Select menu <b>Communication/Instrument (1-4)</b> to open the instrument communication settings.
---	--



- |   |   |
|---|---|
| 4 | Check <b>Active</b> .                                   |
| 5 | Select <b>COM</b> port in the <b>COM port</b> list box. |
| 6 | Enter instrument name in the <b>Name</b> field.         |
| 7 | Click <b>Done</b> .                                     |
- A green lamp is lit in the corresponding instrument selection button.



## Select protocol mode options

For setting the protocol for the run there are two main options:

- Fast mode
- Advanced mode

The selection is made by the **protocol mode buttons** and the selected mode is indicated below the buttons.

In the fast mode option the software selects an optimized protocol based on the tray type, strip length and pH range to be used. Further, by switching to advanced mode, this protocol can be edited and saved to a file.

## Use the fast mode protocol

Step	Action
------	--------

- |   |   |
|---|---|
| 1 | In Ettan IPGphor main window, click on the appropriate instrument selection button ( <b>Instr1 - Instr4</b> ) to select the desired instrument. |
|---|---|



- |   |  |
|---|--|
| 2 | Select <b>Fast</b> . Fast should be shown below the buttons. |
|---|--|



- |   |   |
|---|---|
| 3 | Select the <b>Run settings &amp; details</b> tab by clicking the tab. |
|---|---|



- |   |  |
|---|--|
| 4 | Set experimental conditions, that is <b>Strip length</b> , <b>pH range</b> and <b>Number of strips</b> , by clicking the corresponding button. |
|---|--|

Step	Action
5	The software now selects an optimized GE protocol for the specified experimental parameters.

Edit the selected protocol

Select the **Protocol view** in the **Run settings & details** tab by clicking the right of the two buttons at the bottom right hand corner of the tab window.



The protocol selected by the software is now shown in detail. It is now possible to edit any values in the protocol by clicking an editable field and enter desired changes.

Protocol name

AT\_18\_5.0-6.0

Rehydr. time

00:00

Temp

20

°C

IEF:

I/strip

75

µA

Temp

20

°C

Step		U [V]		Time or Vh	
1	Step ▾	500	.....	500	Vh ▾
2	Grad ▾	1000	.....	800	Vh ▾
3	Grad ▾	10000	.....	16500	Vh ▾
4	Step ▾	10000	.....	39200	Vh ▾
5	Step ▾	0	.....	00:00	HH:mm ▾
6	Step ▾	0	.....	00:00	HH:mm ▾
7	Step ▾	0	.....	00:00	HH:mm ▾
8	Step ▾	0	.....	00:00	HH:mm ▾
9	Step ▾	0	.....	00:00	HH:mm ▾

Total time

08:59

Total Vh

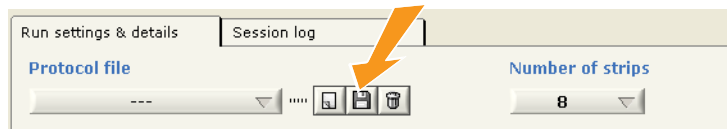
57000

i

Grid

## Save protocol

Step	Action
1	Check that the desired protocol name is entered in the <b>Protocol name</b> box.  <b>Tip:</b> <i>Name the protocol according to user name_strip length_pH range (upper limit 16 characters).</i>
2	Click the middle of the three buttons in order to save the protocol. A <b>Save as</b> dialog is opened. Change protocol file name and protocol directory folder, if desired.



### Note:

*If the name of an edited protocol will be overwritten it will be lost.*

## Download protocols to a specific position

Ettan IPGphor 3 can store up to ten protocols.

Step	Action
1	To download a protocol to the Ettan IPGphor 3 at another position than position 1, select menu <b>Protocol:Transfer protocol</b> . and select desired <b>Instrument position (1-10)</b> .



2	Click <b>OK</b> .  The current protocol is now downloaded to the selected position in Ettan IPGphor 3. Any existing protocol at that position is overwritten.
---	---

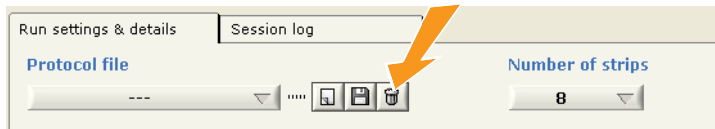
## 5 Operation

### 5.4 Run a pre-programmed protocol from the PC

#### 5.4.1 Setting up a run

## Delete protocols

Click on the right button of the three buttons in the top of the **Protocol** view.



The current protocol is now deleted.



## 5.4.2 Perform a run

### Start a run

Follow the instructions below to start the run after transferring the protocol.

Step	Action
1	Select instrument by clicking the desired Instrument selection button ( <b><i>Instr1-Instr4</i></b> ).



- |   |                                     |
|---|-------------------------------------|
| 2 | Select a protocol to run.           |
| 3 | Select the number of strips to run. |
| 4 | Click <b>Start</b> button.          |



The current protocol is now downloaded to position 1 in the selected instrument.

The run is now started which is indicated by the word **Running** below the instrument control buttons.

- |   |   |
|---|---|
| 5 | To start a second run, select the desired instrument, protocol, and number of strips to run, and click <b>Start</b> button. It is possible to start up to four different runs using four different protocols on four different instruments in parallel. |
|---|---|

## 5 Operation

### 5.4 Run a pre-programmed protocol from the PC

#### 5.4.2 Perform a run

## Pause a run

Follow the instructions below to pause a run.

Step	Action
------	--------

- |   |  |
|---|--|
| 1 | Click <b>Pause</b> button to pause an ongoing run. |
|---|--|



The run is now paused which is indicated by the word **Paused** below the instrument control buttons.

- |   |   |
|---|---|
| 2 | Click <b>Start</b> button to proceed the run. The run is started from the same position in the protocol from where it was paused. |
|---|---|

## Stop a run

Follow the instructions below to stop an ongoing run.

Step	Action
------	--------

- |   |  |
|---|--|
| 1 | Press <b>Stop</b> . The run is now stopped. To indicate that the run has stopped, <b>Idle</b> is displayed below the instrument control buttons. |
|---|--|



- |   |  |
|---|--|
| 2 | The run is now stopped which is indicated by the word Idle below the instrument control buttons. |
|---|--|

**Note:** While using **Stop** it is not possible to start the protocol again except from the beginning of the protocol.

## Display graphics and data

Ettan IPGphor 3 Control Software provides graphics of the data (Voltage, Volt-hours and Current) as it is retrieved from Ettan IPGphor 3.

The user can monitor and display the progress of any individual run from any one of four different instruments being run in parallel.

## Monitor a run

Follow the instructions below to monitor the run.

Step	Action
1	Select the correct instrument selection button ( <i>Instr1 - Instr4</i> ) to select the desired instrument. It is possible to monitor and display the progress of any individual run from any one of four different instruments being run in parallel. The identity of the selected instrument is shown below the instrument control buttons.
2	Open the <i>Run settings &amp; details</i> tab by clicking the tab heading.
3	In the <i>Protocol details</i> graph two of three possible parameters (setpoint voltage, measured voltage and measured current) are displayed to give an overview of the protocol and the run.



- 4 Open any of the combo boxes below the graph and then click on the desired parameter to be displayed in the *Protocol details* graph.

**Note:**

*If measured voltage and measured current are selected, the time scale changes and only the elapsed time is shown.*

5 Operation

5.4 Run a pre-programmed protocol from the PC

5.4.2 Perform a run

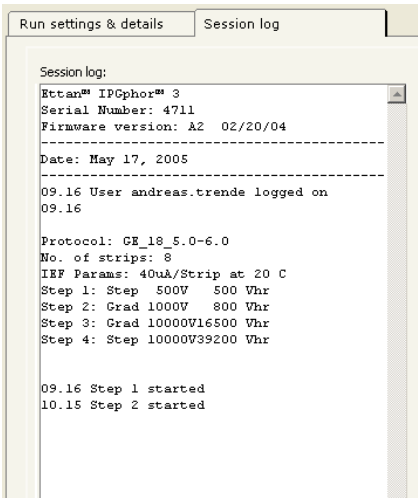
- | Step | Action  |
|------|---|
| 5    | Click the left of the two buttons at the lower right corner of the tab window to select the Info and data view. |



The main running parameters are now displayed. **Vh** or **Time** is indicated depending on what is selected to define the length of the current step.



- 6 Open the **Session log** tab by clicking the tab heading to view the running data collected in the log file.



The session log file stores instrument identity, User ID, current protocol, start time and many other parameters, please refer to *Ettan IPGphor 3 Control Software User Manual* for details.

Step	Action
7	Click another instrument selection button for monitoring runs on other instruments controlled from the software. This way it is possible to monitor up to four parallel runs.

## Capture run data

Run data is acquired from the Ettan IPGphor 3 Isoelectric Focusing Unit automatically every minute during a run, and the data is presented in a graph and in numerical displays.

## Store data

All run data and the session log can be exported to a Microsoft Excel file. It is also possible to save the current application window as an image file.

Follow the instructions below to export data.

Step	Action
1	Select <b>Export:File</b> .
2	Select file. The default file name is the date and time (e.g. Apr 11, 2013 10.56.45).
3	Select location. The default location for the saved file is C:\IPGphor3\RunData.

# 6 Maintenance

## Precautions



### WARNING

The customer must make sure that all installation, maintenance, operation and inspection is carried out by qualified personnel who are adequately trained, understand and adhere to local regulations and the operating instructions, and have a thorough knowledge of the product and the entire process.



### WARNING

Ettan IPGphor 3 covers must not be opened by the user. It contains electrical circuits which can give a lethal electric shock. Service and planned maintenance should be performed by personnel authorized by GE.



### WARNING

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



### WARNING

Do not remove the main cover. There are no userserviceable components inside, and you can be exposed to high voltage.



### NOTICE

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

## 6.1 Cleaning Ettan IPGphor 3

### Precautions



#### WARNING

If large volumes of liquid have penetrated the casing of the instrument and come into contact with the electrical components, immediately switch off the instrument and contact an authorized service technician.



#### NOTICE

Do not use strong acids, bases, ketones, alcohols, or other reagents to clean the covers, sample cups, or electrodes or the parts may be damaged.

Cups may be briefly rinsed with ethanol if desired.



#### NOTICE

Clean strip holders and manifold with the strip holder cleaning solution provided. Clean all other components that come in contact with the IPG strip or the sample with a detergent designed for glassware. Rinse well with distilled water.

### Clean Ettan IPGphor 3

The parts of the instrument that come in contact with liquid reagents are resistant to chemicals typically used for IEF. Before introducing any other chemicals into the system, first test the affected parts.

### Cleaning procedures

IPGphor Strip Holder Cleaning Solution has been specifically formulated for removing protein deposits. It will not damage the strip holder or manifold. IPGphor Strip Holder Cleaning Solution (29-0119-27) can be ordered in 1 liters bottles from GE.

Clean ceramic strip holders/manifold



NOTICE

The ceramic strip holders and manifold are very brittle and fragile. Take care in handling and do not subject to impacts.

The Ettan IPGphor 3 strip holders and manifold are made from a thermally conductive aluminum oxide ceramic. They have been surface-treated to minimize adsorption and interaction with proteins. The surface coating is mechanically robust and can withstand temperatures of up to 300°C, however it can be damaged by prolonged exposure to extremes of pH.

Clean strip holders/manifold after each first-dimension IEF run. Do not let solutions dry in the strip holder/manifold. Cleaning may be more effective if the strip holder/manifold is first soaked a few hours or overnight in a solution of 2% to 5% IPGphor Strip Holder Cleaning Solution in water. Strip holders and manifold may also be immersed in boiling 1% SDS.



NOTICE

You must use a neutral pH detergent, such as the IPGphor Strip Holder Cleaning Solution, to remove residual protein from the strip holders/manifold.



NOTICE

Fixed length strip holders and manifold may be baked, boiled or autoclaved. DO NOT EXPOSE THEM TO STRONG ACIDS OR BASES, INCLUDING ALKALINE DETERGENTS.

Instruction

Step	Action
1	First rinse off the strip holder/manifold. Use a mild liquid soap to remove any residual IPG cover fluid.
2	Squeeze a few drops of IPGphor Strip Holder Cleaning Solution into the strip holder/manifold slot. Use a toothbrush and vigorous agitation to clean the strip holder/manifold.



Step	Action
3	Rinse well with distilled or deionized water.
4	Thoroughly air dry the strip holders/manifold or dry well with a lint-free tissue prior to use.
5	Wipe the platform and plate electrodes with a lab tissue or paper towel after each use. Other exterior surfaces can be cleaned with a damp cloth. Never use abrasive cleanser or solvents.

## Clean Manifold Light

Clean Ettan IPGphor Manifold Light with water, no warmer than 40°C, and with IPGphor Strip Holder Cleaning Solution.



### CAUTION

Do not use any organic solvents during cleaning.

## Clean electrodes



### NOTICE

Avoid scratching the electrode surfaces.

Wash the electrode assemblies with the IPGphor Strip Holder Cleaning Solution. Rinse thoroughly with water then deionized water and allow to air dry.

## 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.

## 6 Maintenance

### 6.1 Cleaning Ettan IPGphor 3

Copy the form you need from *Section 8.1 Health and Safety Declaration Form, on page 112* or print it from the PDF file available on the User Documentation CD.

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## 6.2 Replace fuses

### Precautions



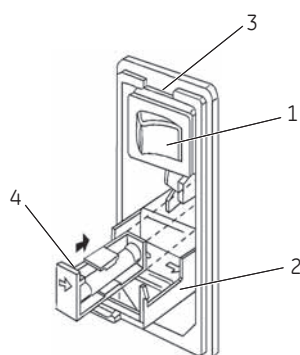
#### WARNING

Always disconnect power from the instrument and detach the power cord before replacing fuses.

### Fuses

Fuses protect equipment by disconnecting loads too large for the instrument's circuit design, so it is imperative that fuses are replaced only with fuses of identical rating. The mains power module, located at the back of the instrument, contains two input mains fuses which are the same for all models: T2.5 AL 250V, 5 × 20 mm.

### Fuse compartment



Part	Function
1	Mains power switch
2	Hinged cover
3	Slot
4	Cassette end

Instruction for replacing fuses

Step	Action
1	Open the fuse compartment by inserting a small flat-blade screwdriver into the slot at the top of the power module. Twist the screwdriver 1/8 – turn to release the cover, then pull out the hinged compartment, which opens out.
2	Insert the screwdriver above the arrow on one fuse cassette, catch the cassette end, and slowly slide it completely out of the module.
3	Pull the fuse out of its cassette and inspect. If the fuse element is burned or broken, replace the fuse with an identical type. If the fuse appears to be intact, check it with a multi-meter. (A reading of 1 ohm or less indicates the fuse is still usable.)
4	After placing a new fuse into the cassette, slide it into the power module, making sure the arrow on the cassette points to the right (in the same direction as the guide arrows on the inside of the compartment door).
5	Repeat steps 2 to 4 for the second cassette.
6	Close the fuse compartment cover and gently press it into the power module until it snaps shut.
7	Plug the power cord into the unit and turn the mains power switch on.
8	If the instrument does not start when power is switched on after replacement of mains fuse(s), call GE service.

# 7 Troubleshooting

## Troubleshooting guide

The following table specifies the troubleshooting situations that you might encounter while using Ettan IPGphor 3.

Symptom	Possible solution
<b>Problems indicated by LCD messages</b>	
Lid open step 1, close to continue	The safety lid is not properly closed. When the safety lid is open, the system has an automatic voltage cutoff safety feature. In order for the protocol to proceed, the safety lid must be closed.
Locked screen in edit mode	Turn off the mains power switch to reset the instrument.
Blank display	If no electrical components are functioning (e.g. <b>HV ON</b> lamp does not light and the cooling fans are motionless), check the fuses in the mains power module.
Diagnostic program indicates component failure	Note the component that failed and press the <b>START</b> key to continue through the diagnostic program. Call your local GE service for further information on how to remedy the failure.
Arc	An electric arc has been detected. The instrument will reduce the voltage setting 500 V automatically. The run continues, and there is no need for further action.

Symptom	Possible solution
<b>Power delivery</b>	
Current too low or zero	At least two of three pressure pads under the safety lid should press gently against the strip holders to ensure electrical continuity between the strip holder electrodes and the electrode areas on the platform.
	The gel must be evenly and completely rehydrated to conduct current. Make sure the proper amount of rehydration solution is applied to the IPG strip holder and allow a minimum of 10 hours for rehydration.
	Check that both connecting points of the strip holder or the connecting pins of the manifold electrodes are in contact with the gold surface.
Voltage limit not reached	The ionic strength of the rehydration solution is too high. The instrument has reached the current limit; reduce the IPG buffer concentration; use a mixed-bed ion-exchange resin to remove ionic breakdown products of urea or other additives.
	Desalt the sample or prepare the sample so that the salt concentration is less than 10 mM.
Sparks or burning in strips	Reduce the current limit. Do not exceed 50 $\mu$ A per strip.
	Prevent the IPG strip from drying out by always applying Immobiline DryStrip Cover Fluid during rehydration.
	Ensure that the IPG strip is fully rehydrated along the entire length of the strip. The IPG strip should be in complete contact with the correct volume of rehydration solution. Remove any air bubbles trapped under the IPG strip.
	Desalt the sample or prepare the sample so that the salt concentration is less than 10 mM. De-ionize additives to the rehydration solution. Excessive charged material in the sample or rehydration buffer lead to electro-endosmosis which will dry out the middle of the strip, possibly leading to arcing and burning at these points.

## 8 Reference information

### Technical service and repair

GE offers complete technical support for all our products. If you have any questions about how to use this product, or would like to arrange to repair it, please call or fax your local GE representative.

---

8.1 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.	
		<b>Instrument has been cleaned of hazardous substances.</b> Please rinse tubing or piping, wipe down scanner surfaces, or otherwise ensure removal of any dangerous residue. Ensure the area around the instrument is clean. If radioactivity has been used, please perform a wipe test or other suitable survey.	
		Adequate space and clearance is provided to allow safe access for instrument service, repair or installation. In some cases this may require customer to move equipment from normal operating location prior to GE arrival.	
		Consumables, such as columns or gels, have been removed or isolated from the instrument and from any area that may impede access to the instrument.	
		All buffer / waste vessels are labeled. Excess containers have been removed from the area to provide access.	
Provide explanation for any "No" answers here:			
Equipment type / Product No:		Serial No:	
I hereby confirm that the equipment specified above has been cleaned to remove any hazardous substances and that the area has been made safe and accessible.			
Name:		Company or institution:	
Position or job title:		Date (YYYY/MM/DD):	
Signed:			

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## Product return or servicing



### Health & Safety Declaration Form for Product Return or Servicing

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

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

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

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

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

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

Equipment type / Product No:		Serial No:	
------------------------------	--	------------	--

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

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

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

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## 8.2 Technical specifications

### Power specifications

Parameter	Specification
Mains supply voltage	100-240 V AC $\pm$ 10%
Frequency	50/60 Hz
Power consumption	230 VA
Transient overvoltages	Overvoltage category II

### Electrophoresis

Parameter	Specification
High voltage	Up to 10 kV
Current	Up to 1.5 mA

### Working surface

Parameter	Specification
Electrode areas	Gold-plated copper.
Capacity	Up to 12 fixed-length strip holders or one manifold.
Platform temperature	15°C to 30°C $\pm$ 2°C.

### User interface

Item/Parameter	Specification
Control panel	7-key membrane keypad.
Liquid crystal display (LCD)	4 lines, 24 characters per line.

Item/Parameter	Specification
Programmable parameters	Rehydration time, platform temperature, maximum current limit per strip, voltage limit in each step, voltage step or gradient, and step duration.
Protocol capacity	10 protocols, with up to 9 steps each.
Serial port	RS232, 1200 or 9600 baud, 8 data bits 1 stop bit, no parity, no flow control. 9600 baud is mandatory for connection with Ettan IPGphor 3 Control Software.

## 8.3 Ordering information

The following table provides you with ordering information.

### Replacements

Replacement part	Code number
Ettan IPGphor Cup Load- ing Manifold, ceramic	80-6498-57
Ettan IPGphor Cup Load- ing Manifold Light	11-0025-80
Sample cups, pack of 20 (6x)	80-6498-95
Paper electrode wicks, pack of 40 (6x)	80-6499-14
Paper bridge pads, pack of 20 (6x)	80-6499-33
Electrode set	80-6498-76
Cleaning brush	80-6505-98
Spirit level	80-6194-19
Forceps SS	80-6506-17

### Accessories

Accessory part	Quantity	Code number
Immobiline DryStrip Reswelling Tray, 7–18 cm	1	80-6371-84
Immobiline DryStrip Reswelling Tray, 7–24 cm	1	80-6465-32
Immobiline DryStrip Cover Fluid	1 liter	17-1335-01
IPGphor Strip Holder Cleaning Solu- tion	1 liter	29-0119-27

## More information

For more details on ordering information and for information about spare parts and accessories, visit [www.gelifesciences.com/2DE](http://www.gelifesciences.com/2DE) or contact your local GE representative.

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