

# LectroPol-5

Polishing unit

Instruction Manual

**Original Instructions**



CE

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# 1 About this manual

**CAUTION**

Struers equipment must only be used in connection with and as described in the Instruction Manual supplied with the equipment.

**Note**

Read the Instruction Manual carefully before use.

**Note**

If you wish to view specific information in detail, see the online version of this manual.

## 1.1 Accessories and consumables

### Accessories

For information about the available range, see the LectroPol-5 brochure:

- [The Struers Website](http://www.struers.com) (<http://www.struers.com>)

### Consumables

The equipment is designed to be used only with Struers consumables specifically designed for this purpose and this type of machine.

Other products may contain aggressive solvents, which dissolve e.g. rubber seals. The warranty may not cover damaged machine parts (e.g. seals and tubes), where the damage can be directly related to the use of consumables not supplied by Struers.

For information about the available range, see:

- [The Struers Consumables Catalogue](https://www.struers.com) (via <https://www.struers.com>)

# 2 Safety

## 2.1 Intended use

The unit is intended to be used in combination with:

- LectroPol-5 Control unit

The machine is for use in a professional working environment (e.g. a materialographic laboratory).

LectroPol-5 is designed to perform automatic electrolytic sample preparation and etching of metallographic specimens.

The equipment is intended for use in quality control applications, where the surface can be prepared for further materialographic inspection with a transmitted electron microscope (TEM).

The equipment is designed for preparation of conductive materials suitable for electrolytic etching.

In order for the equipment to operate correctly and safety, it must be used with Struers accessories and consumables specially designed for this purpose and this type of device.

When in use, the machine equipment must not be touched, moved or tampered with.

The operator must be fully instructed in how to handle and use electrolytes with this machine.

The machine must be operated only by skilled/trained personnel.

The polishing unit must be placed on an even surface.

The polishing unit must be placed in a well ventilated area, preferably a fume cabinet.

### Control unit

See the Instruction Manual for this unit.

#### Do not use the machine for the following

Preparation of materials other than materials suitable for materialographic studies.

The machine must not be used for any type of explosive and/or flammable material, or materials which are not stable during machining, heating or pressure.

Do not use the machine without sufficient ventilation.

The machine must not be used with consumables or a combination of electrolytes and accessories which are not compatible for use with this equipment.

#### Model

LectroPol-5

## 2.2 LectroPol-5 safety precautions



### 2.2.1 Read carefully before use

1. Ignoring this information and mishandling of the equipment can lead to severe bodily injuries and material damage.
2. The machine must be installed in compliance with local safety regulations. All functions on the machine and any connected equipment must be in working order. The machine must be earthed (grounded).
3. The operator must read the safety precautions and Instruction Manual, as well as relevant sections of the manuals for any connected equipment and accessories.
4. The operator must be fully instructed in how to handle and use electrolytes with this machine.
5. Follow all safety requirements for handling, mixing, emptying and disposing of electrolytes.
6. The machine must be placed in a well-ventilated location. If needed, you can also place it in a fume cabinet.

7. The machine must be placed on a safe and stable table with an adequate working height.
8. The device is designed to be used with Struers consumables specially designed for this purpose and this type of device.
9. The machine is designed to be used with electrolytes recommended by Struers. Electrolytes that are not recommended by Struers can be dangerous to the operator or harm the machine.
10. Danger of chemical burns. Follow all safety requirements for handling, mixing, emptying and disposing of electrolytes.
11. Many electrolytes contain alcohol or other flammable solvents. Always follow all safety precautions when working with these types of electrolyte.
12. Never use the standard polishing unit for polishing or etching with electrolytes that have a temperature lower than 0°C/32°F. Use the special polishing unit for low temperatures instead.
13. The sample must be securely fixed to the polishing table.
14. Never try to open the polishing unit while it is running.
15. Do not touch the sample or the anode arm while polishing or etching.
16. Do not use the pump without having electrolyte or water in the electrolyte container.
17. Struers recommends that the main water supply is shut off or disconnected if the machine is to be left unattended.
18. Always use goggles, gloves and other recommended protective clothing.
19. Accessories: Only use accessories specifically developed for use with this type of machine.
20. If you observe malfunctions or hear unusual noises, switch off the machine and call technical service.
21. Always switch off the electrical power supply and remove the plug or power cable before dismantling the machine or installing additional components.
22. Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine.
23. The machine must be disconnected from the electrical power supply before any service. Wait 5 minutes until residual potential on the capacitors is discharged.
24. Struers equipment must only be used in connection with and as described in the Instruction Manual supplied with the equipment.
25. If the equipment is subjected to misuse, incorrect installation, alteration, neglect, accident or incorrect repair, Struers will accept no responsibility for damage to the user or the equipment.
26. Dismantling of any part of the equipment, during service or repair, should always be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).

## 2.3 Safety messages

Struers uses the following signs to indicate potential hazards.



**ELECTRICAL HAZARD**

This sign indicates an electrical hazard which, if not avoided, will result in death or serious injury.



**DANGER**

This sign indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.



**WARNING**

This sign indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



**CAUTION**

This sign indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



**CRUSHING HAZARD**

This sign indicates a crushing hazard which, if not avoided, could result in minor, moderate or serious injury.



**HEAT HAZARD**

This sign indicates a heat hazard which, if not avoided, can result in minor, moderate or serious injury.

**General messages**



**Note**

This sign indicates that there is a risk of damage to property, or a need to proceed with special care.



**Hint**

This sign indicates that additional information and hints are available.

## 2.4 Safety messages in this manual



**WARNING**

Follow all safety requirements for handling, mixing, emptying and disposing of electrolytes.



**WARNING**

Danger of chemical burns.  
Follow all safety requirements for handling, mixing, emptying and disposing of electrolytes.



**CAUTION**

Always request and read the Safety Data Sheet for each electrolyte before you start working with it.

**CAUTION**

Many electrolytes contain alcohol or other flammable solvents. Always follow all safety precautions when working with these types of electrolyte.

**CAUTION**

The operator must be fully instructed in how to handle and use electrolytes with this machine.

**CAUTION**

The machine is designed to be used with electrolytes recommended by Struers. Electrolytes that are not recommended by Struers can be dangerous to the operator or harm the machine.

**CAUTION****Fire and explosion hazards**

- 60% perchloric acid is a very corrosive and oxidizing product. Heating it can cause an explosion, and contact with combustible materials can cause fire.
- Fire fighting must be carried out from a protected location. Use extinguishing media as specified in the Safety Data Sheet.

**CAUTION**

All persons involved in mixing, using, storing, transporting and disposing of electrolytes must be trained in how to handle perchloric acid when carrying out these tasks.

- Do not inhale any vapor from the solution or its components.
- Avoid skin contact.

**WARNING**

Always wear a full-face shield or splash goggles, rubber gloves and a laboratory coat or coveralls when you are working with perchloric acid.

**WARNING**

Make sure that you are mixing the solvent in a chemical-fume hood designed for perchloric acid use.

**WARNING**

Do not use combustible or carbonaceous containers, reaction vessels, spill pans, storage shelves or similar materials when you work with perchloric acid.



**CAUTION**

Do not produce anhydrous perchloric acid, either from its salts or from aqueous solutions, e.g. by heating with high boiling acids or dehydrating agents such as sulfuric acid or phosphorous pentoxide. In addition to spontaneous explosion, the anhydrous acid explodes instantaneously on contact with oxidizable organic materials.



**CAUTION**

Limit the use or storage of perchloric acid to quantities less than 500 g per fume hood.



**WARNING**

Struers equipment must only be used in connection with and as described in the Instruction Manual supplied with the equipment.



**CRUSHING HAZARD**

Take care of your fingers when handling the machine.



**ELECTRICAL HAZARD**

The machine must be earthed (grounded).  
Switch off the electrical power supply before installing electrical equipment.  
Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine.  
Incorrect voltage can damage the electrical circuit.



**CAUTION**

Prolonged exposure to loud noises may cause permanent damage to a person's hearing.  
Use hearing protection if the exposure to noise exceeds the levels set by local regulations.



**CAUTION**

Do not use the machine with non-compatible accessories or consumables.



**CAUTION**

Always use goggles or a protective shield, and chemical-resistant gloves.



**WARNING**

Do not touch, move or tamper with the unit during use.



**WARNING**

Do not use the machine with defective safety devices.  
Contact Struers Service.

**WARNING**

Safety critical components must be replaced after a maximum lifetime of 20 years. Contact Struers Service.

**CRUSHING HAZARD**

Take care of your fingers when handling the machine. Wear safety shoes when handling heavy machinery.

## 2.5 Working with electrolytes

**WARNING**

Danger of chemical burns. Follow all safety requirements for handling, mixing, emptying and disposing of electrolytes.

**CAUTION**

Always request and read the Safety Data Sheet for each electrolyte before you start working with it.

**CAUTION**

Many electrolytes contain alcohol or other flammable solvents. Always follow all safety precautions when working with these types of electrolyte.

**CAUTION**

The operator must be fully instructed in how to handle and use electrolytes with this machine.

**CAUTION**

The machine is designed to be used with electrolytes recommended by Struers. Electrolytes that are not recommended by Struers can be dangerous to the operator or harm the machine.

### Working with perchloric acid

See [Perchloric acid](#) ► 12.

### Availability

Struers electrolytes are not marketed in the USA. If needed, the chemical compounds for the electrolyte must be purchased independently.

Contact your Struers representative for further information.

### After use

Do not let the electrolyte dry or crystallize inside the machine or on the polished material.

### Disposal

See [Disposal](#) ► 29.

### 2.5.1 Perchloric acid

If you are working with Struers electrolytes marked with the prefix A, you must mix a certain amount of perchloric acid into the electrolyte solution.

**CAUTION**

Always request and read the Safety Data Sheet for each electrolyte before you start working with it.

To find the Safety Data Sheet for the components in question, see: [www.struers.com](http://www.struers.com).

**CAUTION****Fire and explosion hazards**

- 60% perchloric acid is a very corrosive and oxidizing product. Heating it can cause an explosion, and contact with combustible materials can cause fire.
- Fire fighting must be carried out from a protected location. Use extinguishing media as specified in the Safety Data Sheet.

#### Training

**CAUTION**

All persons involved in mixing, using, storing, transporting and disposing of electrolytes must be trained in how to handle perchloric acid when carrying out these tasks.

- Do not inhale any vapor from the solution or its components.
- Avoid skin contact.

#### Mixing perchloric acid into the electrolyte solution

If you are working with Struers electrolytes marked with the prefix A, you must mix a certain amount of perchloric acid into the electrolyte solution.

**WARNING**

Always wear a full-face shield or splash goggles, rubber gloves and a laboratory coat or coveralls when you are working with perchloric acid.

**WARNING**

Make sure that you are mixing the solvent in a chemical-fume hood designed for perchloric acid use.

**WARNING**

Do not use combustible or carbonaceous containers, reaction vessels, spill pans, storage shelves or similar materials when you work with perchloric acid.

**WARNING**

For information about electrolytes, see the Safety Data Sheet for the specific product.


## Procedure

**CAUTION**

The components must be used in the correct quantity as specified below.

<b>Electrolyte A2</b>		
1. Mix ethanol, butoxyethanol and water. 2. Immediately before use, add A2 II - perchloric acid to the A2 I mixture.		
<b>Formula</b>	<b>A2 I</b>	<b>A2 II</b>
	90 ml distilled water	78 ml perchloric acid
	730 ml ethanol	
	100 ml butoxyethanol	
<b>Chemicals</b>	All chemicals are chemically pure, preferably analytical grade. Per cent is, where no other is stated, weight per cent.	
	Butoxyethanol	Ethylene glycol monobutyl ether, CH <sub>3</sub> -(CH <sub>2</sub> ) <sub>2</sub> -CH <sub>2</sub> -O-CH <sub>2</sub> -CH <sub>2</sub> OH
	Ethanol 96% vol	CH <sub>3</sub> -CH <sub>2</sub> OH
	Perchloric acid	60%, HClO <sub>4</sub>
	Distilled water	H <sub>2</sub> O
<b>Health and Safety</b>		
Before mixing, read the MSDS thoroughly for the specific components.  The user must follow the instructions for proper work procedure according to the instruction manual supplied with the equipment.		
<div style="border: 1px solid blue; padding: 5px;"> <div style="display: flex; align-items: center;"> <div> <p><b>Note</b> The product must be disposed of according to local regulations for dangerous goods.</p> </div> </div> </div>		

<b>Electrolyte A3</b>		
1. Mix ethanol and butoxyethanol. 2. Immediately before use, add A3 II - perchloric acid to the A3 I mixture.		
<b>Formula</b>	<b>A3 I</b>	<b>A3 II</b>
	600 ml methanol	60 ml perchloric acid
	360 ml butoxyethanol	

Electrolyte A3		
<b>Chemicals</b>	All chemicals are chemically pure, preferably analytical grade. Per cent is, where no other is stated, weight per cent.	
	Butoxyethanol	Ethylene glycol monobutyl ether, $\text{CH}_3\text{-(CH}_2\text{)}_2\text{-CH}_2\text{-O-CH}_2\text{-CH}_2\text{OH}$
	Methanol	100% vol., $\text{CH}_3\text{OH}$
	Perchloric acid	60%, $\text{HClO}_4$
<b>Health and Safety</b>		
Before mixing, read the MSDS thoroughly for the specific components.		
The user must follow the instructions for proper work procedure according to the instruction manual supplied with the equipment.		
<div style="border: 1px solid blue; border-radius: 10px; padding: 10px;">  <p><b>Note</b> The product must be disposed of according to local regulations for dangerous goods.</p> </div>		

Electrolyte D2		
1. Mix the phosphoric acid in the distilled water		
2. Add ethanol, propanol and urea.		
<b>Formula</b>	<b>D2</b>	
	500 ml distilled water	
	250 ml phosphoric acid	
	250 ml ethanol	
	50 ml propanol	
	5 g urea	
<b>Chemicals</b>	All chemicals are chemically pure, preferably analytical grade. Per cent is, where no other is stated, weight per cent.	
	Ethanol	96% vol., $\text{CH}_3\text{-CH}_2\text{OH}$
	Phosphoric acid	Ortho phosphoric acid 85%, $(\text{HO})_3\text{PO}$
	Propanol	2-propanol 100%, $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{OH}$
	Urea	$\text{CO}(\text{NH}_2)_2$
	Distilled water	$\text{H}_2\text{O}$

**Electrolyte D2****Health and Safety**

Before mixing, read the MSDS thoroughly for the specific components.

The user must follow the instructions for proper work procedure according to the instruction manual supplied with the equipment.

**Note**

The product must be disposed of according to local regulations for dangerous goods.

**Storing perchloric acid or solution****CAUTION**

Do not produce anhydrous perchloric acid, either from its salts or from aqueous solutions, e.g. by heating with high boiling acids or dehydrating agents such as sulfuric acid or phosphorous pentoxide. In addition to spontaneous explosion, the anhydrous acid explodes instantaneously on contact with oxidizable organic materials.

**CAUTION**

Limit the use or storage of perchloric acid to quantities less than 500 g per fume hood.

3. Never let perchloric acid crystallize on bottle necks, caps or anywhere else.
4. Store the chemical in a secure, cool, and well-ventilated area with a metal, glass or ceramic spill catch pan.
5. Store the chemical away from other chemicals or combustible or organic materials.
6. Never let solutions dry out.

For more information, see the Safety Data Sheet for the product.

## 3 Getting started

### 3.1 Device description

The equipment is used for materialographic preparation which enables further examination of materials for quality control purposes.

Electrolytic polishing and etching can be performed on most metallic material surfaces. The electrochemical process is possible on electrically conductive materials by the action of electrolyte and electricity. During the process, a high, local current, which is applied to the area of the specimen covered with electrolytes, will have an etching effect on the surface. This process makes the surface suitable for further materialographic analysis.

The equipment consists of a control unit and a polishing unit. The polishing unit is intended to be used in combination with a LectroPol-5 control unit.

The polishing unit must be placed in a well ventilated area, preferably a fume cabinet, to prevent inhalation of hazardous vapors. The polishing unit must not be used for sub-zero temperatures. A polishing unit for polishing at low temperatures is available for this purpose.

For the low temperature polishing unit a cooling unit is required and must be purchased separately. A pump circulates the cooling liquid through the cooling coils. The cooling unit is connected to the polishing unit.

The operator fills and empties the electrolyte cartridges (accessories).

Before starting the process, the operator places a specimen on the polishing table. The operator selects a suitable method, accessory, and electrolyte.

The operator makes sure that a suitable combination of electrolytes and polishing parameters is selected for the material. The operator inserts the electrolyte cartridge in the polishing unit.

The operator starts the process. A scanning function can automatically help to determine the settings by scanning in a pre-defined voltage range. Small layers of material are removed in the electrolytic polishing process, and the uneven material surface is reduced to a plane area for further analysis.

The voltage and current are monitored and adjusted automatically. In case of excess heat and/or excess power consumption the unit switches off automatically.

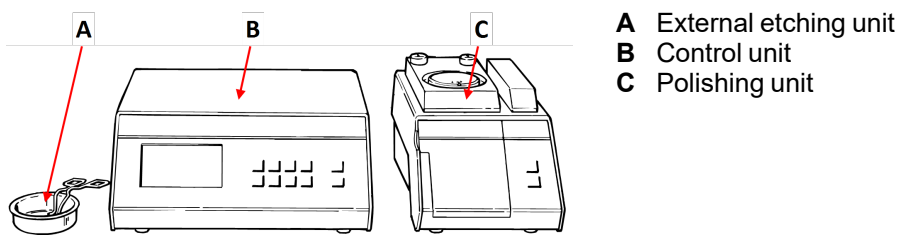
After use, the electrolyte cartridge must be removed and placed in a safe location.

Cleaning is carried out by using an electrolyte container filled with water.

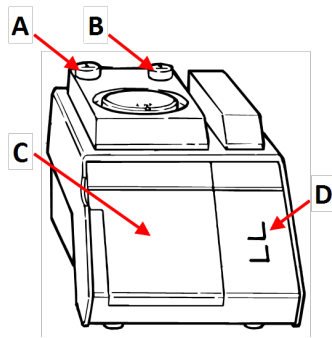
**Note**  
Proper maintenance is required to achieve the maximum up-time and operating lifetime of the machine.

**Note**  
The device is designed to be used with Struers consumables specially designed for this purpose and this type of device.

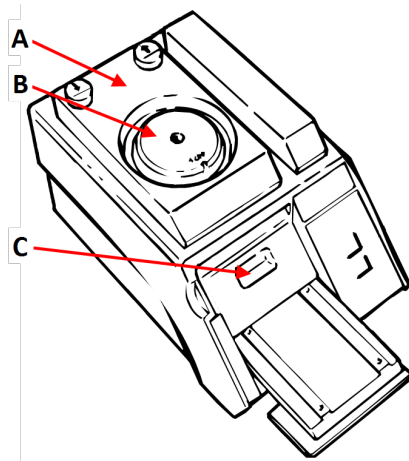
### 3.2 Overview - LectroPol-5



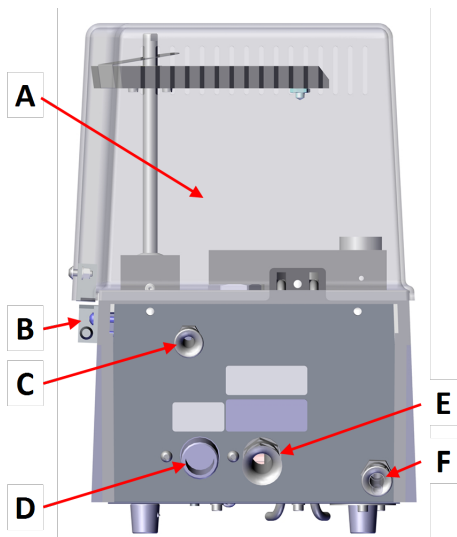


**Polishing unit****Front view - Polishing unit**

- A** Down button - Polishing table
- B** Up button - Polishing table
- C** Electrolyte compartment cover
- D** Control panel

**Top view - Polishing unit**

- A** Polishing table
- B** Mask
- C** Electrolyte container

**Rear view - Polishing unit - standard version**



- A** Protective cover
- B** Cover interlock
- C** Cover interlock connection
- D** Water inlet
- E** Communication cable to control unit
- F** Water outlet

**Control unit**

See the manual supplied with the specific equipment.

### 3.3 Control panel functions

#### Polishing unit

	<p><b>Start</b></p> <ul style="list-style-type: none"> <li>Starts the preparation process.</li> </ul>
	<p><b>Stop</b></p> <ul style="list-style-type: none"> <li>Stops the preparation process.</li> </ul>

#### Control unit

See the Instruction Manual for this unit.

## 4 Transport and storage

If, at any time after the installation, you have to move the unit or place it in storage, there is a number of guidelines we recommend that you follow.

- Package the unit securely before transportation. Insufficient packaging could cause damage to the unit and will void the warranty. Contact Struers Service.
- We recommend that you use the original packaging and fittings.

### 4.1 Transport

- Clean the polishing unit thoroughly. See [Cleaning ▶ 24](#).
- Disconnect the electrical power supply.
- Disconnect the polishing unit from the water supply or the cooling unit (option).
- Move the unit to its new position.

### 4.2 Storage



**Note**

We recommend that you keep all original packaging and fittings for future use.

- Disconnect the unit from the electrical power supply.
- Disconnect the unit from the water supply.
- Remove any accessories.
- Clean and dry the unit before storage. See [Daily ▶ 24](#).
- Place the machine and accessories in their original packaging.

- Place a bag of desiccant (silica gel) in the box.
- For details on storage temperature and humidity, see [Technical data - LectorPol-5](#) ► 30.

### Control unit

See the Instruction Manual for this unit.

## 5 Installation

### 5.1 Unpack the machine



#### Note

We recommend that you keep all original packaging and fittings for future use.

The equipment is delivered in two boxes.

- Control unit
- Polishing unit

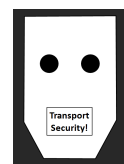
#### Polishing unit

1. Cut the packing tape on the top of the box.
2. Remove the loose parts.
3. Remove the unit from the box.

#### Pump protection

A piece of cardboard with foam protects the pump in the polishing unit during transport.

1. Press the **Up** button on the polishing unit to move the polishing table into its top position.
2. Open the electrolyte compartment cover.
3. Remove the cardboard.
4. Close the electrolyte compartment cover.
5. Press the **Down** button to carefully lower the polishing table until it is secured in lower position.



#### Moving the machine

See [Transport and storage](#) ► 18.

**Control unit**

See the Instruction Manual for this unit.

**5.2 Check the packing list**

The equipment is delivered in two boxes:

- Control unit
- Polishing unit

Optional accessories may be included in the packing box.

**Polishing unit**

The packing box contains the following items:

Pcs.	Description
1	Polishing unit
1	Supply and communications cable for connection to the control unit
1	Water hose
1	Set of masks: <ul style="list-style-type: none"> <li>• ½ cm<sup>2</sup></li> <li>• 1 cm<sup>2</sup></li> <li>• 2 cm<sup>2</sup></li> <li>• 5 cm<sup>2</sup></li> <li>• one mask without a hole</li> </ul>
1	Calibration tube. Packed in a cardboard tube
2	Electrolyte container
1	Protective cover
1	Instruction Manual set

**Control unit**

See the Instruction Manual for this unit.

**5.3 Location****CRUSHING HAZARD**

Take care of your fingers when handling the machine.  
Wear safety shoes when handling heavy machinery.

**WARNING**

The polishing unit must be placed in a well ventilated area, preferably a fume cabinet.  
Do not touch, move or tamper with the unit during use.

- The polishing unit must be placed in a well ventilated area, preferably a fume cabinet.
- Place the unit on a rigid, stable workbench with a horizontal surface and an adequate height. The workbench must be resistant to chemicals.
- Place the unit close to the water supply or to a separate cooling unit.
- The length of the supply and communications cable connecting the two units is 2 m (6.5 ft), so that the units can be placed in separate locations.

#### Control unit

See the Instruction Manual for this unit.

## 5.4 Power supply



#### **ELECTRICAL HAZARD**

The machine must be earthed (grounded).  
Switch off the electrical power supply before installing electrical equipment.  
Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine.  
Incorrect voltage can damage the electrical circuit.

#### Control unit

See the Instruction Manual for this unit.

## 5.5 Connecting the polishing unit

1. Connect the cable from the polishing unit to the back of the control unit.
2. Tighten the retaining ring to secure the plug.

#### Calibrating the pump

The first time the machine is switched on, it is recommended that you adjust the pump. See [Calibrating the pump ▶ 26](#).

## 5.6 Mounting an extension arm (option)

You can mount an extension arm for etching/polishing specimens of up to 100 mm.

#### Mounting the extension arm


1. Remove the gray plastic cap on the anode arm.
2. Screw in the metal rod and tighten it.
3. Slide the extension arm onto the rod.

#### Operate the device

Use the extension arm in the same way as the anode arm.

1. Lift the arm and place it on top of the specimen to ensure good electrical contact with the specimen.

## 5.7 Connecting cooling water



**Note**  
Cooling water must be supplied from the main cold water outlet.

You can connect an external cooling unit (option) to the system.

### Procedure

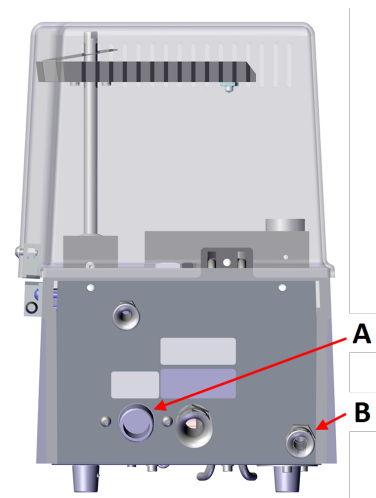
1. Mount the pressure hose on the water inlet on the back of the polishing unit.
2. Connect the other end of the pressure hose to the main cold water outlet or to the external cooling unit.
3. Lead the water outlet hose to the waste water drain or back to the external cooling unit.

### Controlling the cooling water flow

A built-in temperature sensor and a solenoid valve control the cooling water flow. The solenoid is closed and no cooling is active as long as the electrolyte temperature is below the preset value.

See [Calibrating the pump](#) ► 26.


If the temperature increases above the preset temperature, the solenoid valve opens to enable the flow of the cooling water.



**A** Water inlet  
**B** Water outlet

## 5.8 Noise

For information on the sound pressure level value, see this section: [Noise and vibration levels](#) ► 31.



**CAUTION**  
Prolonged exposure to loud noises may cause permanent damage to a person's hearing.  
Use hearing protection if the exposure to noise exceeds the levels set by local regulations.

## 5.9 Vibration

For information on the total vibration exposure to hand and arm, see this section: [Noise and vibration levels](#) ► 31.

## 6 Operate the device



### CAUTION

Do not use the machine with non-compatible accessories or consumables.

For instructions on how to operate the device, see the LectroPol-5 Control unit instruction manual.

### 6.1 Starting the machine the first time

See the LectroPol-5 Control unit instruction manual.

## 7 Maintenance and service

Proper maintenance is required to achieve the maximum up-time and operating lifetime of the machine. Maintenance is important in ensuring continued safe operation of your machine.

The maintenance procedures described in this section must be carried out by skilled or trained personnel.

### Safety Related Parts of the Control System (SRP/CS)

For specific safety related parts, see the section "Safety Related Parts of the Control System (SRP/CS)" in the section "Technical data" in this manual.

See [Safety Related Parts of the Control System \(SRP/CS\)](#) ► 31

### Technical questions and spare parts

If you have technical questions or when you order spare parts, state serial number and voltage/frequency. The serial number and the voltage are stated on the type plate of the machine.

### 7.1 General cleaning

To ensure a longer lifetime for your unit, Struers strongly recommends regular cleaning.



#### Hint

Do not use a dry cloth as the surfaces are not scratch resistant.



#### Hint

If needed, use ethanol or isopropanol to remove grease and oil.



#### Note

Do not use acetone, benzol or similar solvents.



**Note**  
Always remove the electrolyte when the machine is not in use.

**If the unit is not to be used for a longer period of time**

- Clean the unit thoroughly. See [Daily ▶ 24](#).

## 7.2 Daily

- Clean the unit at the end of each working day.



**Note**  
Avoid spilling electrolyte on the control unit.



**WARNING**  
Dried electrolyte can be hazardous.



**WARNING**  
It is important that no electrolyte is allowed to dry and/or crystallize inside the machine or on the polished material.



**Note**  
Do not use acetone, benzol or similar solvents.

1. Use the cleaning function. See LectroPol-5 Control unit Instruction Manual.
2. When the cleaning program has finished, use a damp cloth to wipe all surfaces of the polishing unit.
3. Wipe the inside of the polishing unit where the electrolyte container is stored.
4. Thoroughly clean all masks that have been used.

### 7.2.1 Cleaning

When you have finished using the machine, you must clean the system.



**CAUTION**  
Always use goggles or a protective shield, and chemical-resistant gloves.



**WARNING**  
Do not touch, move or tamper with the unit during use.

Carry out the cleaning procedure from the LectroPol-5 control unit.



1. From the **Main menu** screen, select the **Manual funct.** screen.
2. From the **Manual Functions** screen, select the **Cleaning** screen.
3. Press **Enter** to continue.
4. Follow the on-screen instructions. The on-screen instructions are listed below.
5. Press **Enter** to continue through the sequence of steps.



You can cancel the process at any time. To do so, press **Back**.



6. The following messages appear. Follow each step listed on the screen.

**[ Remove Electrolyte: ]**

1. **Lift the polishing table.**
2. **Please wait for 59 s**
3. **Remove the present elec.**

**[ Insert Water ]**

1. **Insert a container with water.**
2. **Lower the polishing table.**

**[ Cleaning... ]**

**The system is being cleaned now.**

**Please wait 57s**

**[ Cleaning done ]**

1. **Lift the polishing table.**
2. **Use alcohol to remove water.**
3. **Clean off the remaining alcohol.**

**[ Remove water ]**

**Remove the water.**

## 7.3 Monthly

### 7.3.1 Calibrating the pump

If the results are not correct, or if you cannot reproduce the results, adjust the pump.



**Note**

The pump must be adjusted before it is used for the first time.



**Note**




If an electrolyte with a significantly different viscosity than water is used or the equipment is operated at sub-zero temperatures, you may have to adjust the flow using the viscous electrolyte or at low temperature.










This function calibrates the pump of the polishing unit and ensures that the flow rate settings in the Struers methods are correct.

- Examine the state of the electrolyte before you adjust the pump.
- Use this function to check the pump regularly.
- Use this function to calibrate the pump only if the correct results are no longer achieved.

#### Procedure

Carry out this procedure from the control unit.

1. From the **Main menu** screen, select the **Configuration** screen.
2. Press **F4 - Adj. Pump**. 
3. Fill an electrolyte container to the max. mark with water.
4. Add one drop of detergent to release the surface tension of the water.
5. The following message is shown:  
**Insert container**  
**Please insert a container filled to the max. mark with water.**  
**Add a drop of detergent.**
6. Insert the container in the polishing unit.
7. Press **Enter** to continue. 
8. Remove the mask and insert the tube supplied with the machine into the outlet for the electrolyte.
9. Press **Enter** to continue. 
10. Select **Maximum pump flow**.

11. Press **Enter** to start the pump. 
12. Adjust the flow so that the water reaches the maximum mark on the tube.  
13. Press **Enter** to save the value. 
14. Select **Minimum pump flow**.
15. Press **Enter** to start the pump. 
16. Adjust the flow so that the water reaches the minimum mark on the tube.  
17. Press **Enter** to save the value. 
18. When you have completed the adjustment, press **Back**. 

## 7.4 Annually

### Replacing the protective cover

The protective cover must be replaced immediately if it has been corroded by electrolytes, or if there are visible signs of deterioration or damage.

### Test the safety devices

See [Test the safety devices](#) ► 27

#### 7.4.1 Test the safety devices

The safety devices must be tested at least once a year.



#### **WARNING**

Do not use the machine with defective safety devices.  
Contact Struers Service.



#### **Note**

Testing should always be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).

### Protective cover

The polishing unit has a protective cover with a mechanism which interrupts power to the polishing unit if the cover is opened during a process.

#### With the protective cover closed



1. Close the cover of the polishing unit.
2. Start a process: Press the **Start** button.

The machine starts operating.

3. Open the cover of the polishing unit.

The power to the polishing unit must be interrupted immediately. This means that the polishing current must drop to 0.



4. If operation does not stop, press the **Stop** button.
5. Contact Struers Service.

#### With the protective cover open



1. Start a process: Press the **Start** button.

The machine starts operating.

The pump begins to circulate electrolyte and the electrical connection is checked.

The power to the polishing unit must be interrupted immediately. This means that the polishing current must drop to 0. The **Current-time** graph must show that the polishing current is 0.



2. An error message appears: **No electrical connection. Check anode arm.**
3. If the polishing current is not 0 and electrolytic polishing begins, press the **Stop** button.
4. Contact Struers Service.

## 7.5 Spare parts

For specific safety related parts, see the section "Safety Related Parts of the Control System (SRP/CS)" in the section "Technical data" in this manual.

### Technical questions and spare parts

If you have technical questions or when you order spare parts, state serial number and voltage/frequency. The serial number and the voltage are stated on the type plate of the machine.

For further information, or to check the availability of spare parts, contact Struers Service. Contact information is available on [Struers.com](http://Struers.com).

## 7.6 Service and repair

We recommend that a regular service check be carried out yearly or after every 1500 hours of use.

**Note**

Service must only be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).  
Contact Struers Service.

**Service check**

We offer a range of comprehensive maintenance plans to suit the requirements of our customers. This range of services is called ServiceGuard.

The maintenance plans include equipment inspection, replacement of wear parts, adjustments/calibration for optimal operation, and a final functional test.

**7.7 Disposal**

Equipment marked with a WEEE symbol contains electrical and electronic components and must not be disposed of as general waste.

Contact your local authorities for information on the correct method of disposal in accordance with national legislation.



For disposal of consumables and recirculation fluid, follow local regulations.

**Electrolytes**

Contact your local authorities for information on the correct method of disposal in accordance with national legislation.

**8 Troubleshooting - LectroPol-5**

Error	Cause	Action
The supply voltage is too low.	The power supply voltage is too low compared to the voltage stated on the back of the control unit.	If needed, change the voltage setting.
No electrical connection. Check anode arm.	After pressing start, there is no electrical connection between anode and cathode.	Make sure that there is enough electrolyte in the container and that there is good electrical connection between the anode arm and the specimen.
	The protective cover is not mounted correctly.	Make sure that the protective cover of the polishing unit is mounted correctly.

<b>Error</b>	<b>Cause</b>	<b>Action</b>
No cell connection.	There is no connection to the polishing unit.	Make sure that the polishing unit is connected to the back of the control unit.
Temperature is above max. limit.	The electrolyte temperature is above the preset limit.	Connect the device to tap water or an external cooling unit and wait until the temperature is below the specified limit.
The device is switched on but the display is blank.	The backlight of the display has been turned off.	Press any button to reactivate the backlight.

See LectroPol-5 Control unit Instruction Manual.

## 9 Technical data

### 9.1 Technical data - LectroPol-5

<b>Subject</b>	<b>Specifications</b>	
<b>Power supply</b>	50/60 Hz - Max. load: 9.8 A	1 x 100-120 V
	50/60 Hz - Max. load: 4.9 A	1 x 220-240 V
<b>Output: Voltage/Current</b>	Polishing	0-100 V (1 V steps)/6 A
	Etching	0-25 V (0.5 V steps)/6 A
	External etching	0-15 V (0.5 V steps)/1.5 A
<b>Dimensions and weight</b>	Width	220 mm (8.7")
	Depth	350 mm (13.8")
	Height	160 mm (6.3")
	Weight	6.3 kg (14 lbs)
<b>Safety standards</b>	See the Declaration of Conformity	
<b>Operating environment</b>	Surrounding temperature	5-40°C (41-104°F)
	Humidity	0-95 % RH non-condensing
<b>Storage and transport conditions</b>	Surrounding temperature	5-40°C (41-104°F)
	Humidity	0-95 % RH non-condensing

## 9.2 Noise and vibration levels

<b>Noise level</b>	A-weighted sound emission pressure level at workstations	$L_{pA} = 55.4 \text{ dB(A)}$ (measured value) Uncertainty $K = 4 \text{ dB}$ Measurements made in accordance with EN ISO 11202
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<b>Vibration level</b>	N/A
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## 9.3 Safety Circuit Categories/Performance Level

Safety Circuit Categories/Performance Level	
Work zone interlock	EN 60204-1, Stop category 0 EN ISO 13849-1, Category 1 PL c

## 9.4 Safety Related Parts of the Control System (SRP/CS)



### WARNING

Safety critical components must be replaced after a maximum lifetime of 20 years. Contact Struers Service.



### Note

SRP/CS (safety-related parts of a control system) are parts that have an influence on safe operation of the machine.



### Note

Replacement of safety critical components must only be performed by a Struers engineer or a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).  
 Safety critical components must only be replaced by components with at least the same safety level.  
 Contact Struers Service.

Safety related part	Manufacturer/Manufacturer description	Manufacturer catalog no.	Electrical ref.	Struers catalog no.
Interlock switch circuit - Polishing unit	Schmersal Coded-magnet sensor	BNS33-11Z-2M	SS1	2SS00140
Interlock switch circuit - Polishing unit	Schmersal Coded-magnet (actuator) for sensor	BPS33	SS1	2SS00141
Interlock switch circuit - Polishing unit	Finder Power relay	62.32.9.024.4800	K1	2KL46680

## 9.5 Diagrams

If you wish to view specific information in detail, see the online version of this manual.

### 9.5.1 Diagrams - LectroPol-5

#### Control unit

See the Instruction Manual for this unit.

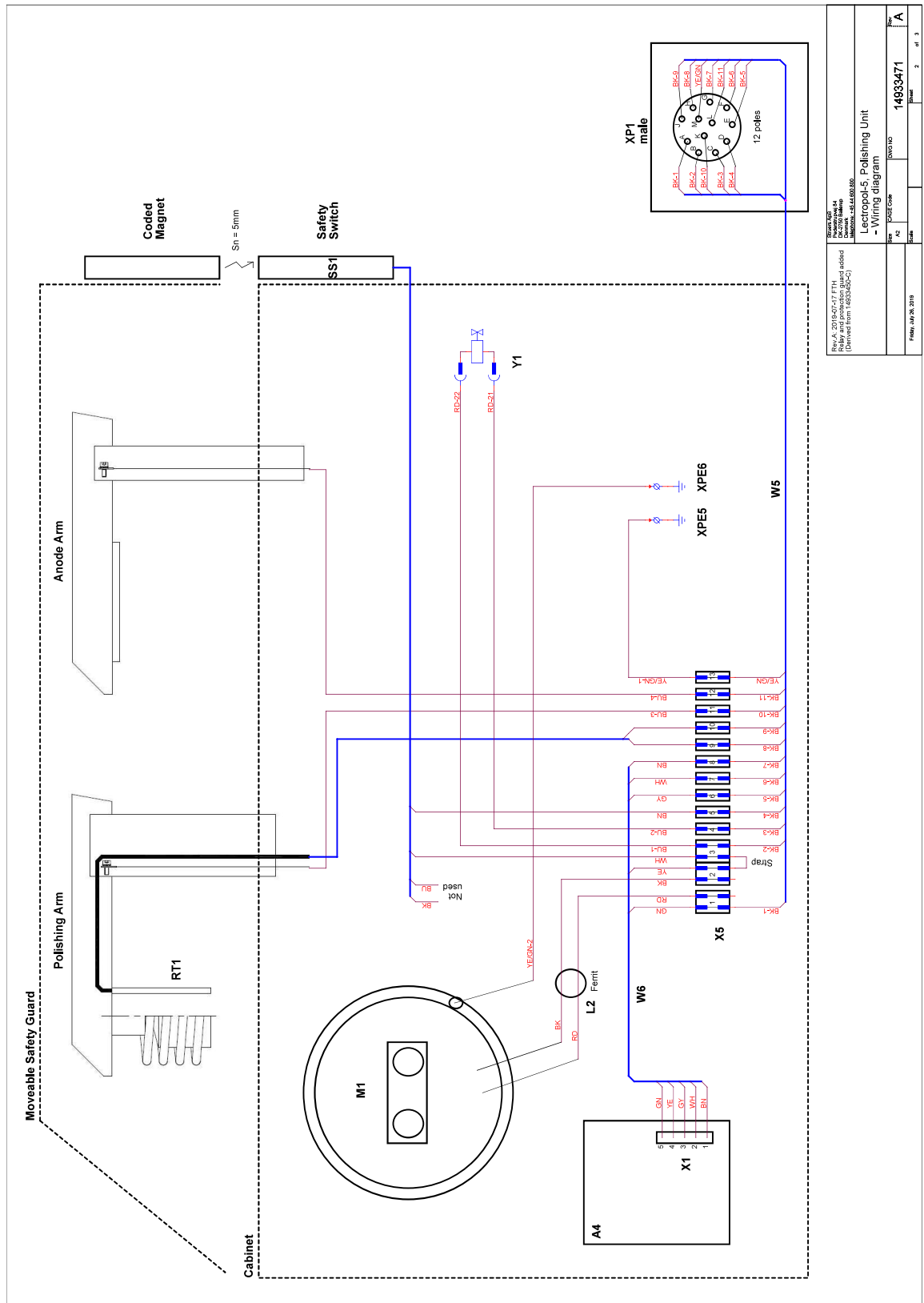
#### Polishing unit

Title	No.
LectroPol-5, Block diagram	<a href="#">15393051 A</a>
LectroPol-5, Wiring diagram	<a href="#">14933471 A</a>





14933471 A



## 9.6 Legal and regulatory information

### FCC notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

# 10 Manufacturer

Struers ApS  
Pederstrupvej 84  
DK-2750 Ballerup, Denmark  
Telephone: +45 44 600 800  
Fax: +45 44 600 801  
www.struers.com

### Responsibility of the manufacturer

The following restrictions should be observed, as violation of the restrictions may cause cancellation of Struers legal obligations.

The manufacturer assumes no responsibility for errors in the text and/or illustrations in this manual. The information in this manual is subject to change without notice. The manual may mention accessories or parts not included in the supplied version of the equipment.

The manufacturer is to be considered responsible for effects on safety, reliability, and performance of the equipment only if the equipment is used, serviced, and maintained in accordance with the instructions for use.



# Declaration of Conformity

Manufacturer	Struers ApS • Pederstrupvej 84 • DK-2750 Ballerup • Denmark
Name	LectroPol-5 Polishing unit
Model	N/A
Function	Chemical polishing/etching machine (electro chemical)
Type	493
Cat. no.	04936301, LectroPol-5 Polishing unit in combination with 04936333 LectroPol-5 Control Unit
Serial no.	



Module H, according to global approach



We declare that the product mentioned is in conformity with the following legislation, directives and standards:

<b>2006/42/EC</b>	EN ISO 12100:2010
<b>2011/65/EU</b>	EN IEC 63000:2018
<b>2014/30/EU</b>	EN 61000-3-2:2014, EN 61000-3-3:2013, EN 61000-6-1:2007, EN 61000-6-3:2007, EN 61000-6-3-A1:2011, EN 61000-6-3-A1-AC:2012
<b>Additional standards</b>	NFPA 70, NFPA 79, FCC 47 CFR Part 15 Subpart B

Authorized to compile technical file/  
Authorized signatory

Date: [Release date]

en For translations see  
bg За преводи вижте  
cs Překlady viz  
da Se oversættelser på  
de Übersetzungen finden Sie unter  
el Για μεταφράσεις, ανατρέξτε στη διεύθυνση  
es Para ver las traducciones consulte  
et Tõlked leiate aadressilt  
fi Katso käännökset osoitteesta  
fr Pour les traductions, voir  
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hu A fordítások itt érhetők el  
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lv Tulkojumus skatīt  
nl Voor vertalingen zie  
no For oversettelser se  
pl Aby znaleźć tłumaczenia, sprawdź  
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