

LectroPol-5

Control unit

Instruction Manual

Original Instructions



CE

Doc. no.: 14937025-01_A_en-us
Date of release: 2023.03.31

Copyright

The contents of this manual are the property of Struers ApS. Reproduction of any part of this manual without the written permission of Struers ApS is not allowed.

All rights reserved. © Struers ApS 2023.03.31.

Table of Contents

1 About this manual	6
1.1 Accessories and consumables	6
2 Safety	6
2.1 Intended use	6
2.2 LectroPol-5 safety precautions	7
2.2.1 Read carefully before use	7
2.3 Safety messages	8
2.4 Safety messages in this manual	9
2.5 Working with electrolytes	12
2.5.1 Perchloric acid	13
3 Getting started	17
3.1 Device description	17
3.2 Overview	18
3.3 Control panel functions	18
3.4 The display	19
3.4.1 Main menu	21
3.4.2 The process screen	21
3.4.3 The configuration screen	22
3.5 Electrolytic polishing and etching - main steps	24
3.6 Working with electrolytes	27
3.6.1 Perchloric acid	27
4 Transport and storage	31
4.1 Transport	31
4.2 Storage	31
5 Installation	32
5.1 Unpack the machine	32
5.2 Check the packing list	32
5.3 Location	33
5.4 Power supply	33
5.4.1 Power cables	34
5.4.2 Voltage	35
5.5 Connecting the polishing unit	35
5.5.1 Mounting an extension arm (option)	35
5.6 Connecting the external etching unit	36

5.7	Noise	36
5.8	Vibration	36
6	Operate the device	36
6.1	Starting the machine the first time	37
6.2	Methods	37
6.2.1	Selecting a method	37
6.2.2	Struers methods	38
6.2.3	Creating a method	41
6.2.4	Creating a method not based on Struers methods	42
6.2.5	Renaming a method	48
6.2.6	Changing text	48
6.2.7	Change the settings	49
6.2.8	Resetting a method	52
6.3	Optimizing the results	52
6.3.1	Troubleshooting	52
6.3.2	Electrolytes	54
6.3.3	Polishing thin plates	54
6.3.4	Etching stainless steel	54
6.3.5	Polishing copper with D2 electrolyte	54
6.3.6	Changing to masks with different hole sizes	55
6.4	Manual functions	55
6.4.1	Changing electrolyte	56
6.4.2	Cleaning	58
6.4.3	Operating the pump manually	59
6.4.4	External etching	60
7	Maintenance and service	61
7.1	General cleaning	62
7.2	Daily	62
7.3	Monthly	62
7.3.1	Calibrating the pump	62
7.4	Annually	64
7.4.1	Test the safety devices	64
7.5	Spare parts	65
7.6	Service and repair	65
7.7	Disposal	66
8	Troubleshooting - LectroPol-5	66
9	Technical data	67
9.1	Technical data - LectroPol-5	67
9.2	Noise and vibration levels	68

9.3	Safety Circuit Categories/Performance Level	68
9.4	Safety Related Parts of the Control System (SRP/CS)	68
9.5	Diagrams	68
9.5.1	Diagrams - LectroPol-5	69
9.6	Legal and regulatory information	72
10	Manufacturer	72
	Declaration of Conformity	73

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 Polishing 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 safely, 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.

Polishing unit

See the Instruction Manual for this unit.

Do not use the device 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**

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

**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.

**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.

**ELECTRICAL HAZARD****For electrical installations with Residual Current Circuit Breakers**

For this machine a residual current circuit breaker Type B, 30 mA (or better) is recommended is required (EN 50178/5.2.11.1).

For electrical installations without Residual Current Circuit Breakers

The equipment must be protected by an insulation transformer (double-wound transformer).

Contact a qualified electrician to verify the solution.

Always follow local regulations.

**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](#) ► 27.

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.

Cleaning cloths used to wipe any drips or spills must be rinsed with water to prevent electrolyte from drying out.

Disposal

See [Disposal](#) ► 66.

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.

**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.

Electrolyte A2		
1. Mix ethanol, butoxyethanol and water. 2. Immediately before use, add A2 II - perchloric acid to the A2 I mixture.		
Formula	A2 I	A2 II
	90 ml distilled water 730 ml ethanol 100 ml butoxyethanol	78 ml perchloric acid
Chemicals	All chemicals are chemically pure, preferably analytical grade. Per cent is, where no other is stated, weight per cent.	
	Butoxyethanol	Ethylene glycol monobutyl ether, $\text{CH}_3\text{-(CH}_2\text{)}_2\text{-CH}_2\text{-O-CH}_2\text{-CH}_2\text{OH}$
	Ethanol 96% vol	$\text{CH}_3\text{-CH}_2\text{OH}$
	Perchloric acid	60%, HClO_4
	Distilled water	H_2O
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.		

Electrolyte A3		
<ol style="list-style-type: none"> Mix ethanol and butoxyethanol. Immediately before use, add A3 II - perchloric acid to the A3 I mixture. 		
Formula	A3 I	A3 II
	600 ml methanol	60 ml perchloric acid
	360 ml butoxyethanol	
Chemicals	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., CH_3OH
	Perchloric acid	60%, HClO_4
Health and Safety		
<p>Before mixing, read the MSDS thoroughly for the specific components.</p> <p>The user must follow the instructions for proper work procedure according to the instruction manual supplied with the equipment.</p>		
<div style="border: 1px solid blue; border-radius: 10px; padding: 10px;">  <p>Note The product must be disposed of according to local regulations for dangerous goods.</p> </div>		

Electrolyte D2		
<ol style="list-style-type: none"> Mix the phosphoric acid in the distilled water Add ethanol, propanol and urea. 		
Formula	D2	
	500 ml distilled water	
	250 ml phosphoric acid	
	250 ml ethanol	
	50 ml propanol	
	5 g urea	

Electrolyte D2		
Chemicals	All chemicals are chemically pure, preferably analytical grade. Per cent is, where no other is stated, weight per cent.	
	Ethanol	96% vol., CH ₃ -CH ₂ OH
	Phosphoric acid	Ortho phosphoric acid 85%, (HO) ₃ PO
	Propanol	2-propanol 100%, CH ₃ -CH ₂ -CH ₂ OH
	Urea	CO(NH ₂) ₂
	Distilled water	H ₂ O
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.		
<div style="border: 1px solid blue; border-radius: 10px; padding: 10px;">  <p>Note The product must be disposed of according to local regulations for dangerous goods.</p> </div>		

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.

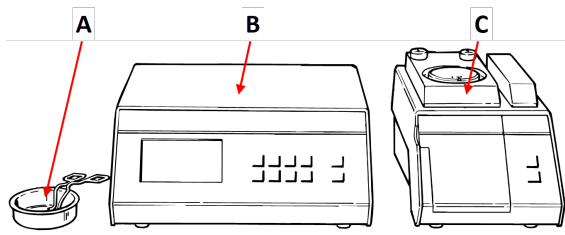
**Note**

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

**Note**

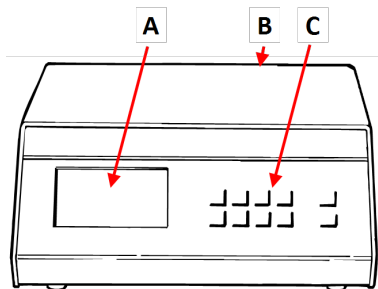
The device is designed to be used with Struers consumables specially designed for this purpose and this type of device.

3.2 Overview



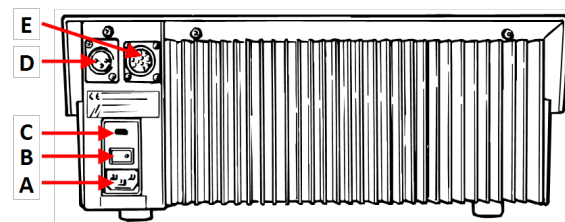
- A External etching unit
- B Control unit
- C Polishing unit

Control unit



Front view - Control unit

- A Display
- B Main switch (on the rear side)
- C Control panel



Rear view - Control unit

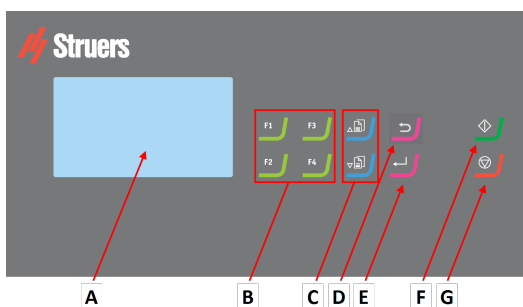
- A Socket - Power supply
- B Main switch
- C Fuse compartment
- D Socket - Polishing unit
- E Socket - External etching

Polishing unit









See the manual supplied with the specific equipment.

3.3 Control panel functions

Control unit



- A Display
- B Function keys - F1 to F4
- C Scroll up/Scroll down
- D Back
- E Select/Enter
- F Start
- G Stop

Button	Function
 	Function key <ul style="list-style-type: none"> Press this button to activate controls for various purposes. See the bottom line of the individual screens.
	Scroll up <ul style="list-style-type: none"> Press this button to scroll up in a screen and to increase the value of a setting.
	Scroll down <ul style="list-style-type: none"> Press this button to scroll down in a screen and to decrease the value of a setting.
	Back <p>Use this button on the control panel to return to previous functions or values.</p> <ul style="list-style-type: none"> Press the button to return to the main menu. Press the button to return to the last function or value. Press the button to cancel changes.
	Select/Enter <ul style="list-style-type: none"> Press this button to enter a field, for instance a setting, to select a value, and to confirm a selection.
	Start <ul style="list-style-type: none"> Starts the preparation process.
	Stop <ul style="list-style-type: none"> Stops the preparation process.

Polishing unit

See the Instruction Manual for this unit.

3.4 The display



Note

The screens shown in this manual may differ from the actual screens in the software.

When you switch on the machine, the display shows the configuration and the version of the installed software.

After start-up, the display changes to the screen last shown when the machine was switched off.

The display is divided into some main areas. See this example.

A Title bar

The title bar shows the function you have selected.

B Information fields

These fields show information about the selected function. In some fields you can select and change the value.

C Function key options

The functions shown depend on the screen that is displayed.



The display shows information such as menus, preparation settings, or the preparation process as it progresses.

Navigating in the display

Use the buttons on the control panel to navigate in the display.

See [Control panel functions](#) ► 18.

Sound

Short beep

A short beep, when you press a key, indicates that the selection is confirmed.

You can enable or disable the beep: select **Configuration**.

Long beep

A long beep, when you press a button, indicates that the key cannot be activated at the moment.

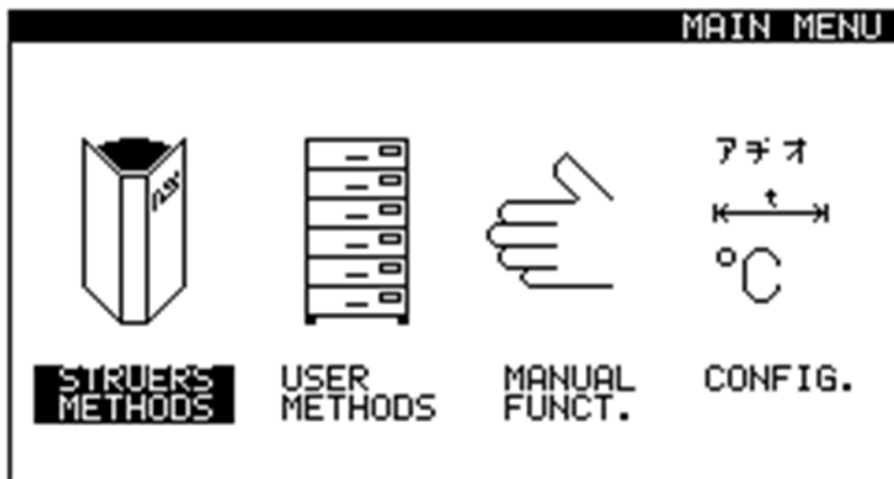
You cannot disable this beep.

Standby mode



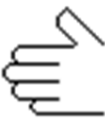
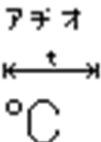
To increase the lifetime of the display, the back-light is dimmed automatically if the machine has not been used for a while. (30 min)

- Press any key to re-activate the display.

3.4.1 Main menu



From the **Main menu** screen you can choose between the following options:

- 
 - **Struers Methods**
- 
 - **User Methods**
- 
 - **Manual funct.**
- 
 - **Config.**

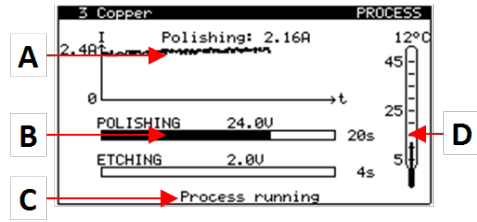
See

- [Methods ▶ 37](#)
- [Manual functions ▶ 55](#)
- [The configuration screen ▶ 22](#)

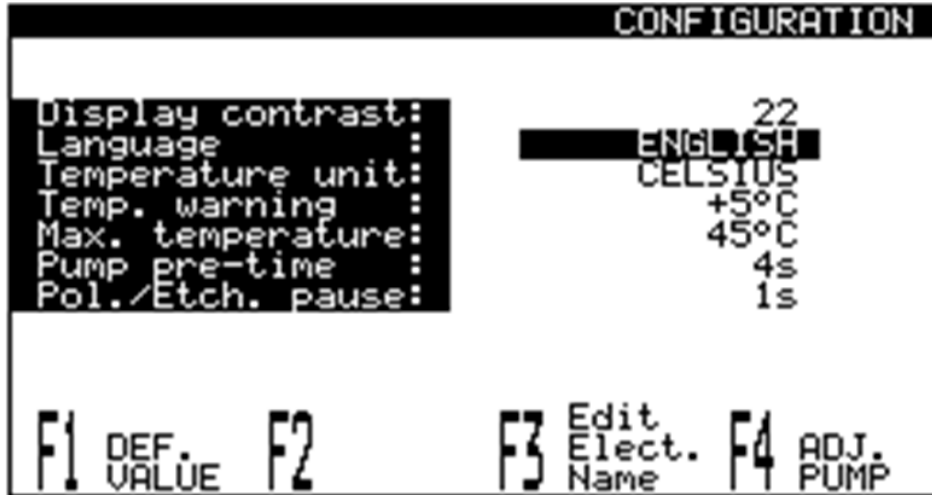
3.4.2 The process screen

This is an example showing the process screen.

- A Current-time graph
- B Bar graph of expired time. Example: **Polishing**
- C Process status. Example: **Process running**
- D Electrolyte temperature

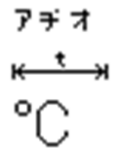


3.4.3 The configuration screen




You can change general settings in the **Configuration** menu.

1. From the **Main menu** screen, select **Config..**
2. From the **Configuration** screen, select:



- **Display contrast**
- **Language**
- **Temperature unit**
- **Temp. warning**
- **Max. Temperature**
- **Pump pre-time**
- **Pol./etch. pause**

Menu item	Description
Display contrast	<ul style="list-style-type: none"> • If needed, adjust the contrast settings of the display.
Language	<ul style="list-style-type: none"> • Select the language you wish to use. If needed, you can change the language at a later date.

Menu item	Description
Temperature unit	<ul style="list-style-type: none"> Set the temperature unit to be used: Celsius or Fahrenheit.
Temp. warning	<ul style="list-style-type: none"> Set the temperature level for each method, if needed. When the pre-set temperature is reached, cooling of the electrolyte starts. A temperature warning indicates that the electrolyte temperature has exceeded the temperature set in the method. <ul style="list-style-type: none"> 0 - 10°C (32 - 50°F) or <ul style="list-style-type: none"> No Warning
Max. Temperature	<ul style="list-style-type: none"> Set the maximum temperature of the electrolyte, if needed. If this value is reached during the process, the machine stops automatically. <ul style="list-style-type: none"> 30 - 50°C (86 - 122°F)
Pump pre-time	<ul style="list-style-type: none"> Set the time when the pump must start running before the current is applied. This is used to achieve an even flow of electrolyte from the very start of the process. <ul style="list-style-type: none"> 4 - 15 s
Pol./etch. pause	<ul style="list-style-type: none"> If needed, define a short pause between polishing and etching where no current is applied. During that pause the flow rate, if set, is changed, and the viscous layer that is created during polishing is destroyed so that the specimen can be etched. <ul style="list-style-type: none"> 0 - 5 seconds.
F1 - Def. value	<ul style="list-style-type: none"> If needed, reset values to the default factory setting: <ul style="list-style-type: none"> Select the relevant value. Press F1.
F2	N/A.
F3 - Edit Elect. Name	<p>If you are using your own electrolytes, you can change the names to names of your own choice.</p> <div style="border: 1px solid blue; border-radius: 10px; padding: 10px; margin: 10px 0;"> <p>Note  When you change the name of a user defined electrolyte, the name changes automatically in all the methods where this electrolyte is used.</p> </div> <ol style="list-style-type: none"> Select the electrolyte. Press F3 to start the editing function. Select the name. Enter the new name. <p>See Changing text ▶ 48.</p>

Menu item	Description
F4 - Adj. Pump	<ul style="list-style-type: none"> The pump must be adjusted before it is used for the first time. Use this function to check the pump regularly. <p>See Calibrating the pump ▶62</p>

3.5 Electrolytic polishing and etching - main steps

Preparing the specimen

Before you carry out electrolytic polishing and etching on a specimen, the specimen must be ground. The finer the finish of the ground surface is, the shorter the polishing time will be, and usually with a better final result.

Inserting the electrolyte container

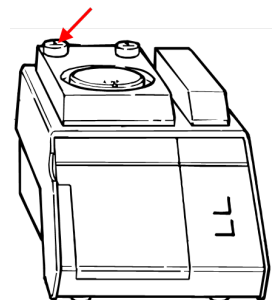
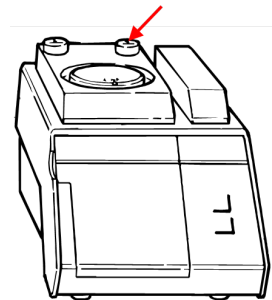


WARNING

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

See [Working with electrolytes](#) ▶ 27.

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. Insert a container filled with the correct electrolyte.
4. Close the electrolyte compartment cover.
5. Press the **Down** button and carefully lower the polishing table to its bottom position.



Selecting the mask

All Struers methods are developed and tested with 1 cm² masks. You can prepare specimens with a different mask size. See [Change the settings](#) ▶49.

Positioning the specimen

1. Place the specimen on the mask.

2. Make sure that the opening is covered completely. If it is not, electrolyte will flow over and around the edge of the specimen.

Placing the anode arm

**Note**

The backside of the specimen to be prepared must be electrically conductive.

1. Lift the anode arm and place it on top of the specimen.
The anode makes an electrical contact with the specimen.

Starting the process

1. Select the method you wish to use. See [Selecting a method ▶ 37](#).
2. Press the **Start** button.
The process is carried out automatically.



After the specimen has been processed

As soon as the process finishes you must wash and clean the specimen to avoid any further attack of the surface.

1. Lift the anode arm back into the default position.
2. Remove and wash the specimen.
3. Flush the specimen with alcohol and dry it immediately.

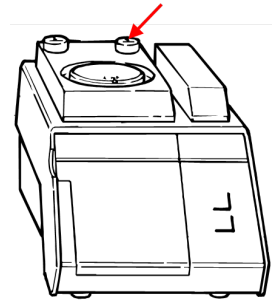
Removing the electrolyte container

**WARNING**

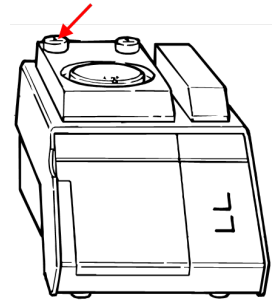
Follow all safety requirements for handling, mixing, emptying and disposing of electrolytes.

See [Working with electrolytes ▶ 27](#).

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. Carefully remove the electrolyte container.
4. Close the electrolyte compartment cover.



5. Press the **Down** button and carefully lower the polishing table to its bottom position.



External etching



WARNING

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

See [Working with electrolytes](#) ► 27.

If you wish to use external etching, follow these guidelines.

1. Connect the plug of the external etching unit to the back of the control unit.
2. Fill the bowl with the required electrolyte.
3. Use a pair of pliers to take hold of the specimen.
4. Lower the specimen face down into the electrolyte.



Note

Make sure that there is no contact between the etching bowl and the specimen or the pair of pliers. If there is contact, this will result in a short-circuit and the specimen will not be etched correctly.

5. As soon as the specimen is immersed in the electrolyte, the countdown of the pre-set time starts.

When the time has expired, the voltage switches off and the etching process stops.

3.6 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](#) ► 27.

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.

Cleaning cloths used to wipe any drips or spills must be rinsed with water to prevent electrolyte from drying out.

Disposal

See [Disposal](#) ► 66.

3.6.1 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.



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.

Electrolyte A2		
1. Mix ethanol, butoxyethanol and water. 2. Immediately before use, add A2 II - perchloric acid to the A2 I mixture.		
Formula	A2 I	A2 II
	90 ml distilled water 730 ml ethanol 100 ml butoxyethanol	78 ml perchloric acid
Chemicals	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 ₃ -(CH ₂) ₂ -CH ₂ -O-CH ₂ -CH ₂ OH
	Ethanol 96% vol	CH ₃ -CH ₂ OH
	Perchloric acid	60%, HClO ₄
	Distilled water	H ₂ O
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.		
<div style="border: 1px solid blue; border-radius: 10px; padding: 10px;"> <div style="display: flex; align-items: center;">  <div> <p>Note The product must be disposed of according to local regulations for dangerous goods.</p> </div> </div> </div>		

Electrolyte A3		
1. Mix ethanol and butoxyethanol. 2. Immediately before use, add A3 II - perchloric acid to the A3 I mixture.		
Formula	A3 I	A3 II
	600 ml methanol 360 ml butoxyethanol	60 ml perchloric acid
Chemicals	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 ₃ -(CH ₂) ₂ -CH ₂ -O-CH ₂ -CH ₂ OH
	Methanol	100% vol., CH ₃ OH
	Perchloric acid	60%, HClO ₄

Electrolyte A3**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.

Electrolyte D2

1. Mix the phosphoric acid **in** the distilled water
2. Add ethanol, propanol and urea.

Formula	D2	
	500 ml distilled water	
	250 ml phosphoric acid	
	250 ml ethanol	
	50 ml propanol	
	5 g urea	
Chemicals	All chemicals are chemically pure, preferably analytical grade. Per cent is, where no other is stated, weight per cent.	
	Ethanol	96% vol., CH ₃ -CH ₂ OH
	Phosphoric acid	Ortho phosphoric acid 85%, (HO) ₃ PO
	Propanol	2-propanol 100%, CH ₃ -CH ₂ -CH ₂ OH
	Urea	CO(NH ₂) ₂
	Distilled water	H ₂ O

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.

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

1. Clean the control unit with a soft, damp cloth.
2. Clean the polishing unit thoroughly. See the Instruction Manual for this unit.
3. Disconnect the electrical power supply.
4. Disconnect the polishing unit from the water supply or the cooling unit (option).
5. Move the units to their new positions.

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.

- Remove any accessories.
- Clean and dry the unit before storage. See [Daily ▶ 62](#).
- 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 - LectroPol-5 ▶ 67](#)

Polishing 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

Control unit

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

Polishing unit

See the Instruction Manual for this unit.

Moving the machine

See [Transport ▶ 31](#).

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.

Control unit

The packing box contains the following items:

Pcs.	Description
1	Control unit
2	Electrical power supply cables
1	External etching unit
1	Instruction Manual set

Polishing 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.

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

- Place the unit on a rigid, stable workbench with a horizontal surface and an adequate height.
- Place the unit close to the fume cabinet where the polishing unit is placed.

**Note**

Do not place the control unit in a fume cabinet as the sensitive electronics can be damaged by chemical fumes from the electrolytes.

Polishing 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.

Power socket

The electrical power supply socket must be easy to access.

The electrical power supply socket must be located at a height ranging from 0.6 m to 1.9 m (2½” to 6’) above floor level. Not higher than 1.7 m (5’ 6”) is recommended.

5.4.1 Power cables



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.



Note

The equipment is shipped with 2 types of electrical power cables. If the plug supplied on these cables is not approved in your country, the plug must be replaced with an approved plug.

Single-phase supply

The 2-pin plug (European Schuko) is for use on single-phase electrical power connections.



The leads must be connected as follows:

Yellow/Green	Earth (ground)
Brown	Line (live)
Blue	Neutral

2-phase supply

The 3-pin plug (North American NEMA) is for use on 2-phase electrical power connections.



The leads must be connected as follows:

Green	Earth (ground)
Black	Neutral
White	Line (live)

Connection to the machine

- Connect the electrical power cable to the socket at the back of the control unit.
- Connect the cable to the electrical power supply.



5.4.2 Voltage



CAUTION

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.



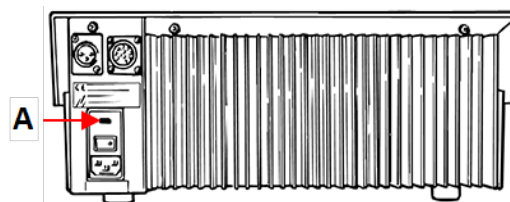
Note

In countries with a 100 - 120 V electrical power supply, you must change the setting of the equipment.

- 115 V: 100-120 V/50/60 Hz
- 230 V: 200-240 V/50/60 Hz Factory setting

How to change the voltage

1. Use a small, flat-tip screwdriver to open the cover of the fuse compartment at the back of the control unit.
2. Take the fuse out of the fuse compartment.
3. Turn the fuse into the required position.
4. Push it back into the fuse compartment.
5. Close the cover of the fuse compartment.



A Fuse compartment

5.5 Connecting the polishing unit



WARNING

Place the unit in a fume cabinet.
Do not touch, move or tamper with the unit during use.

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 ▶ 62](#).

5.5.1 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.

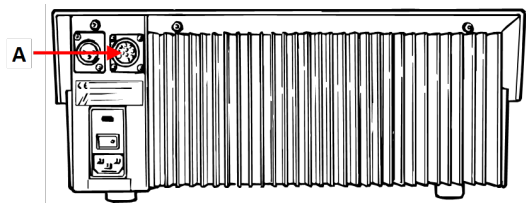
Operate the device

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.

5.6 Connecting the external etching unit

1. Connect the cable from the external etching unit to the back of the control unit.



A Socket - External etching

5.7 Noise

For information on the sound pressure level value, see this section: [Noise and vibration levels ▶ 68](#).



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.

5.8 Vibration

For information on the total vibration exposure to hand and arm, see this section: [Noise and vibration levels ▶ 68](#).

6 Operate the device



CAUTION

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

6.1 Starting the machine the first time

- Switch on the machine on the main switch at the back of the control unit.

Start-up - the first time

The first time the machine is switched on, the **Main menu** screen is shown.

For instructions on how to navigate in the display, see:

- [Control panel functions ▶ 18](#)
- [The display ▶ 19](#)

Language

Select the language you wish to use. If needed, you can change the language at a later date.

1. From the **Main menu** screen, select **Config. > Language**.
2. Scroll up or down in the list to select the language of your choice.

Calibrating the pump

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

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

See [Calibrating the pump ▶ 62](#).

Start-up - daily operation

When you switch on the machine, the screen that was shown when the machine was switched off is shown just after the start-up screen.

6.2 Methods

You can work with the following types of methods:

- **Struers Methods.**
These methods are predefined. You cannot change the settings. If needed, copy them into the **User Methods** folder, and change the settings.
- **User Methods**
These methods you can copy and change as needed.

6.2.1 Selecting a method

1. From the **Main menu** screen, select the **Struers Methods** screen.
The methods contain all the settings needed for the process.
2. Select the method you wish to use.



6.2.2 Struers methods

Polishing/etching

Methods

Steel		
Mode	Polishing/Etching	
Area	1 cm ²	
Temp.	22°C (71.6°F)	
	Polishing	Etching
Electrolyte	A2	A2
Voltage	40 V	5.0 V
Flow rate	14	9
Time	12 s	5 s

Low carbon steel		
Mode	Polishing/Ext. Etching	
Area	1 cm ²	
Temp.	22°C (71.6°F)	
	Polishing	External etching
Electrolyte	AC2	A2
Voltage	53 V	2.5 V
Flow rate	7	
Time	20 s	6 s

Medium carbon steel		
Mode	Polishing/Ext. Etching	
Area	1 cm ²	
Temp.	22°C (71.6°F)	
	Polishing	External etching
Electrolyte	AC2	A2
Voltage	60 V	2.5 V
Flow rate	12	
Time	18 s	6 s

Hardened steel	
Mode	Polishing only
Area	1 cm ²
Temp.	22°C (71.6°F)
	Polishing
Electrolyte	A3
Voltage	63 V
Flow rate	13
Time	18 s

Stainless steel		
Mode	Polishing/Ext. Etching	
Area	1 cm ²	
Temp.	22°C (71.6°F)	
	Polishing	External etching
Electrolyte	A3	10% oxalic
Voltage	35 V	15.0 V
Flow rate	13	
Time	25 s	60 s

Aluminum	
Mode	Polishing only
Area	1 cm ²
Temp.	22°C (71.6°F)
	Polishing
Electrolyte	A2
Voltage	48 V
Flow rate	9
Time	35 s

Aluminum alloys	
Mode	Polishing only
Area	1 cm ²
Temp.	22°C (71.6°F)
	Polishing

6 Operate the device

Aluminum alloys	
Electrolyte	A2
Voltage	39 V
Flow rate	9
Time	15 s

Copper		
Mode	Polishing/Etching	
Area	1 cm ²	
Temp.	22°C (71.6°F)	
	Polishing	Etching
Electrolyte	D2	D2
Voltage	24 V	2.0 V
Flow rate	13	10
Time	20 s	4 s

Brass and bronze		
Mode	Polishing/Ext. Etching	
Area	1 cm ²	
Temp.	22°C (71.6°F)	
	Polishing	External etching
Electrolyte	E5	D2
Voltage	56 V	3.0 V
Flow rate	18	
Time	18 s	7 s

Titanium	
Mode	Polishing only
Area	1 cm ²
Temp.	22°C (71.6°F)
	Polishing
Electrolyte	A3
Voltage	35 V
Flow rate	16
Time	15 s

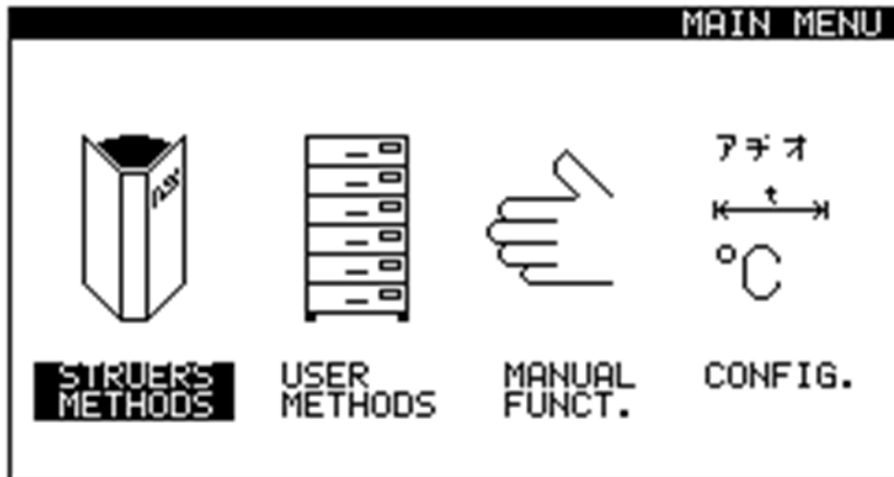
6.2.3 Creating a method

To create a method:

- Copy a Struers method from the **Struers Methods** folder, and save it in the **User Methods** folder.

or

- Select an empty method or copy an existing method in the **User Methods** folder.



- Save the method in the **User Methods** folder.
- Rename the method. See [Renaming a method ▶48](#).
- Edit the method and save the changes. See [Change the settings ▶49](#).

Copying a method

1. From the **Main menu** screen, select one of the following screens:

– **Struers Methods**

or

– **User Methods**



2. Select the method you wish to use.
3. Copy the method: Press **F1 - Copy**.
4. Press **Enter** to confirm your selection.
5. If you are copying a method from the **Struers Methods** screen:



- Press **Back** to return to the **Main menu** screen.



- Select the **User Methods** screen.



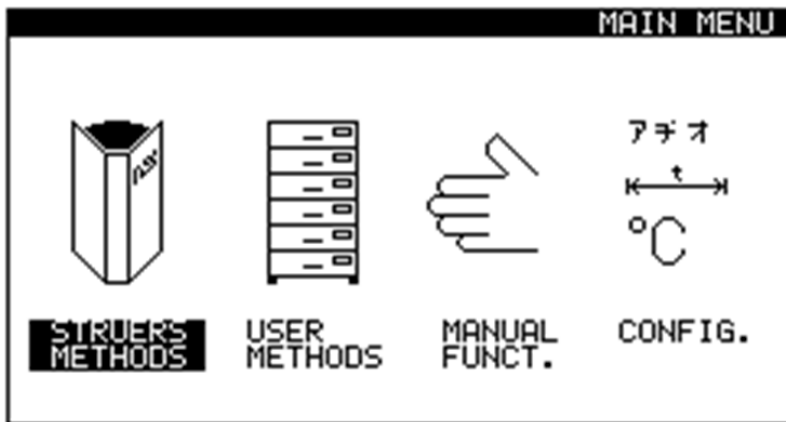
6. In the **User Methods** screen, select the field where you want to insert the new method.
7. Insert the method. Press **F2 - Insert**.
8. If you are using an empty method, the name automatically changes from **Empty method** to **Unnamed method**.
9. Press **Enter** to confirm your selection.



10. Rename the method. See [Renaming a method](#) ▶48.

6.2.4 Creating a method not based on Struers methods

If you are working with materials which are not covered by the methods in the **Struers Methods** database, you can create a new method. To do so, you must perform a scan.



Procedure

1. From the **Main menu** screen, select the **User Methods** screen.
2. Select a method you wish to use for the new material, for instance an empty method or copy a method from the Struers screen.



3. Press **Enter** to view the settings in the selected method.
4. If needed, change the **Electrolyte** setting to the correct electrolyte for your new material.
5. Press **F1** to select the **Scan** function.
6. Select the **Set max. volt.** setting, and set maximum voltage that will be applied during the scan:
10 - 100 V
7. Select and set the **Set flow rate** setting.
8. Start the scan: Press Start.



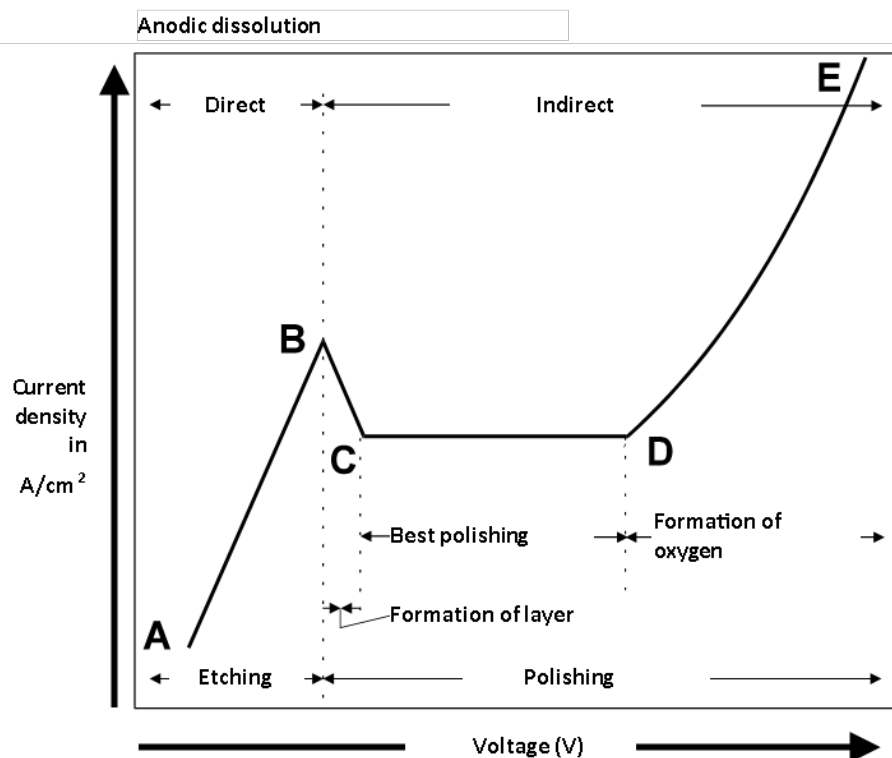
The scanning result

1. When the scan is completed, view the current density curve: Press **Enter**.



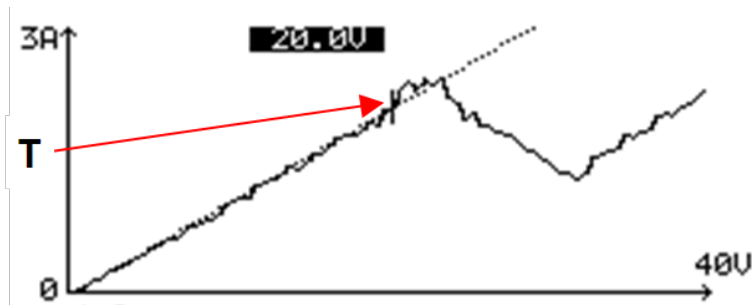
Example - the ideal current density curve

In this example the different areas for polishing and etching are shown.



Example - the scanning result

In this example the graph shows the current density curve. You can use this result to define an approximate value for the polishing and the etching voltage. A tangent, **T**, is shown.



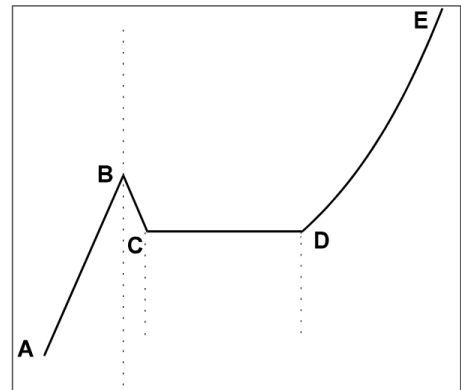
Defining the polishing voltage

The formation of a viscous layer is necessary to achieve the best electrolytic polishing results.

- The formation starts in the area **B – C**.
- The area **C – D** is best for polishing.
- The thickest viscous layer is found in the area **C – D** where the highest voltage/current ratio is found.

Struers tests show that the thickest possible viscous layer give the most uniform polishing results.

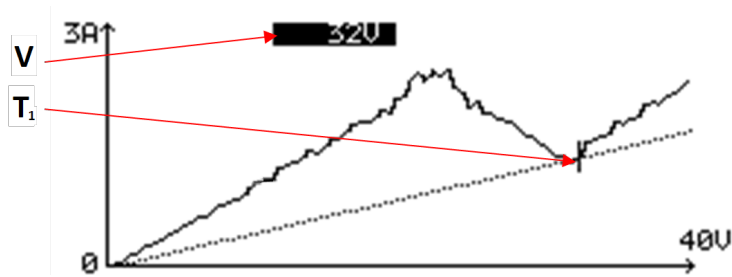
- In the area **D – E** the formation of oxygen occurs. This will produce pittings and is not suited for polishing or etching.



You can use the tangent to define the point with the thickest viscous area.

1. Move the tangent along the current density curve in the area **C – D** until the tangent shows the smallest angle relative to the X-axis (point **T₁**).





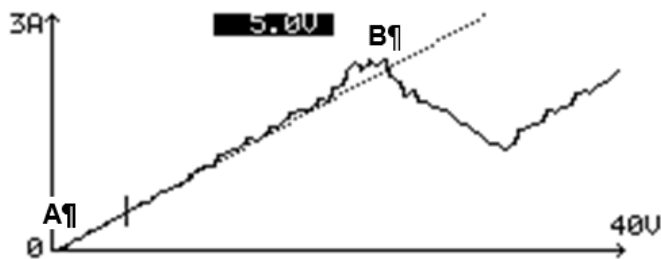
2. Press **F2** to enter the polishing voltage in the method.

The voltage where the tangent is touching the current density curve is shown on the screen, **V**.

Defining the etching voltage

The area of direct anodic dissolution is suited for electrolytic etching. The best etching results are achieved in the lower range of the area **A – B**.

- This means that the etching voltage must be adjusted in the area **A – B**.



Press **F3** to set the voltage for etching in the method.

1. Press **Back** to return to the method.

The voltage values for both polishing and etching have been inserted in the method.



2. Save the new settings for the voltage: Press **F4 - SaveSave**.

Repeating the scan

1. If you wish to repeat the scan, while the screen shows the current density curve press **F1 - Scan**.



The Voltage setting

If needed, adjust the **Voltage** setting for **Polishing** and/or **Etching**.

The polishing voltage

1. Set **Time** for **Polishing** to 10 seconds.
2. Set **Mode** to **Polishing only**.



Note

Before continuing the process, carry out a quick session of mechanical grinding, or change to a part of the specimen which has not been polished or etched before. If needed, use a new specimen.

3. Place the specimen, and position the anode arm.
4. Close the protective cover.
5. Start polishing the specimen: Press Start.
6. When the process is finished, remove the protective cover.



7. Clean the specimen and check the result.

If the result is not satisfactory, increase/decrease the polishing voltage in steps of 2 V until the best result is reached.

The etching voltage

Set the polishing voltage and repeat the sequence to find the correct etching voltage.

1. Set **Voltage** for **Polishing**.
2. Set **Mode** to **Polishing/Etching**.
3. Set **Time** for **Etching** to 5 seconds.



Note

Before continuing the process, carry out a quick session of mechanical grinding, or change to a part of the specimen which has not been polished or etched before. If needed, use a new specimen.

4. Place the specimen, and position the anode arm.
5. Close the protective cover.
6. Start polishing and etching the specimen: Press Start.
7. When the process is finished, remove the protective cover.



8. Clean the specimen and check the result.
If the result is not satisfactory, increase/decrease the etching voltage in steps of 1 V until the best result is reached.

The Time setting

If needed, adjust the **Time** setting for **Polishing** and **Etching**.

The polishing time

1. Make sure the voltage is correct.
2. Set **Mode** to **Polishing only**.



Note

Before continuing the process, carry out a quick session of mechanical grinding, or change to a part of the specimen which has not been polished or etched before. If needed, use a new specimen.

3. Place the specimen, and position the anode arm.
4. Close the protective cover.
5. Start polishing the specimen: Press Start.
6. When the process is finished, remove the protective cover.



7. Clean the specimen and check the result.
If the result is not satisfactory, increase/decrease the polishing time in steps of 5 seconds until the best result is reached.

The etching time

1. Make sure the voltage is correct.
2. Set **Mode** to **Polishing/Etching**



Note

Before continuing the process, carry out a quick session of mechanical grinding, or change to a part of the specimen which has not been polished or etched before. If needed, use a new specimen.

3. Place the specimen, and position the anode arm.
4. Close the protective cover.
5. Start polishing the specimen: Press Start.
6. When the process is finished, remove the protective cover.



7. Clean the specimen and check the result.
If the result is not satisfactory, increase/decrease the etching time in steps of 2 seconds until the best result is reached.

Changing the mask

If you wish to polish larger areas, change the mask to one with a larger hole. This can affect the following settings:

Voltage

The voltage settings of the method apply to different mask sizes.

If you are polishing a larger area, a higher current will flow.

The maximum current of the machine is limited to 6 A, and this value can be exceeded because of the larger area. The voltage will then automatically be reduced to a lower value, so that the current does not exceed 6 A. A message is shown on the screen.


Flow rate

If you change the mask to one with a larger hole, decrease the flow rate by approx. 1 - 2.

If you change the mask to one with a smaller hole, increase the flow rate by approx.. 1-2.

6.2.5 Renaming a method

You can rename a method to a name of your choice.



Note
You cannot edit or change the names of the methods in the **Struers Methods** database.

1. From the **Main menu** screen, select the **User Methods** screen.
2. Select the method you wish to rename.
3. Press **F4 - Rename**.
4. You will be prompted to accept the text shown or to press **Down** to select the editing function.

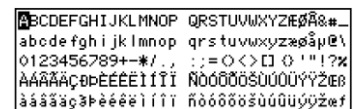


See [Changing text ▶ 48](#).

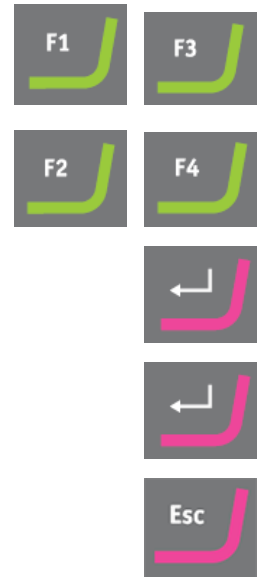
6.2.6 Changing text

To change a text value, select the field for entering the text.

1. Place the cursor on the character you wish to change.
F1: Move the cursor to the left.
F3: Move the cursor to the right.
2. Go to the character set.



3. Move the cursor and select the characters you wish to enter.
 - **F1**: Move the cursor to the left.
 - **F2**: Delete one character in the text.
 - **F3**: Move the cursor to the right.
 - **F4**: Insert a space in the text.
4. Place the new character in the text and move the cursor.
5. Repeat the procedure for each character.
6. Save the changes.
7. Exit the text editor.



6.2.7 Change the settings



Note

You cannot change the names of the methods in the **Struers Methods** database.

You can change settings in a method to suit your requirements.

- When you change a setting in a method, **F4 Save** is shown on the bottom line of the screen.
- If you are making changes in an existing method, the original method will be overwritten when you save changes.
- If you want to keep both the original method and the new version, make a copy of the method with a new name, and make the changes in the copy.

Procedure

To change a setting, select the field for changing the setting.

1. Select the setting you wish to change.
 - If it is a numeric value, two square brackets [] appear around the value.
 - If it is an alphanumeric value, a pop-up menu appears.
2. Select the desired value.
 - If there are two values, toggle between the values.
3. Save the changes.
4. Confirm your changes.



Settings

Mode
Select the mode you wish to use: <ul style="list-style-type: none">• Polishing/Etching• Polishing/Ext. Etching• Polishing only• Etching only• Ext. etching only

Area
Select from the standard sizes of masks delivered with the machine. <ul style="list-style-type: none">• $\frac{1}{2} \text{ cm}^2$• 1 cm^2• 2 cm^2• 5 cm^2• User: This is a mask without any hole. If needed, make a customized hole in the mask to suit your requirements.

Temp.

Recommended temperature: -50°C to $+40^{\circ}\text{C}$ (-58°F to $+104^{\circ}\text{F}$).

The actual temperature of the electrolyte is shown in parentheses next to the recommended temperature.

The setting depends on the type of polishing unit being used.

- **Standard polishing unit**

The temperature is monitored continuously.

Select a value within the range $0-40^{\circ}\text{C}/32-104^{\circ}\text{F}$.

**Note**

If tap water is used, the set temperature must not be lower than the temperature of the water.

**Note**

Do not apply temperatures below 0°C (32°F). The tubing in the polishing unit is not designed for temperatures lower than this.

- **Low-temperature polishing unit**

If you are using a polishing unit for low temperatures, the machine must be connected to an external cooling unit (option).

When you select a value below $0^{\circ}\text{C}/32^{\circ}\text{F}$, the machine temperature control is suspended, and external cooling is used.

The temperatures shown on the screen are for monitoring purposes only, the actual electrolyte temperature cannot be controlled from the machine.

Electrolyte


The standard Struers electrolytes are included. You can add 5 user-defined electrolytes.

Voltage

You can adjust the voltage for polishing and etching.


Select the value you wish to use.

- Polishing voltage:
0 - 100 V in steps of 1 V
- Etching voltage:
0 - 25 V in steps of 0.5 V
- External etching:
0 - 15 V in steps of 0.5 V

Flow rate			
You can set the flow rate independently for polishing and etching:			
0 - 20			
<div style="border: 1px solid blue; padding: 5px;">  Note The flow rate can vary depending on the temperature, age and usage of the electrolyte. </div>			
Time			
The setting after 90 minutes/300 seconds is No Limit , a setting for manual operation.			
Settings for Time			
	1 s steps	5 s steps	10 s steps
Polishing	0-30 s	30-60 s	60 s-90 min
Etching	0-30 s	30-60 s	60-300 s

6.2.8 Resetting a method

You can reset a method to its default values.


Note
 You cannot edit or change the names of the methods in the **Struers Methods** database.

1. From the **Main menu** screen, select the **User Methods** screen.
2. Select the method you wish to reset.
3. Reset the method: Press **F3 - Reset**.
4. Press **Enter** to confirm your selection.



6.3 Optimizing the results

6.3.1 Troubleshooting

Before you start optimizing the results, check the electrolyte being used. See [Electrolytes ▶ 54](#).

Error	Cause	Action
The surface is not polished or is only partly polished.	The current density is insufficient.	<ul style="list-style-type: none"> • Increase the voltage to reach a higher current.
	The electrolyte is worn out.	<ul style="list-style-type: none"> • Replace the electrolyte.
	An insufficient quantity of electrolyte.	<ul style="list-style-type: none"> • Add electrolyte.
Areas that have not been polished.	Gas bubbles: the voltage is too high.	<ul style="list-style-type: none"> • Decrease the voltage.
	Gas bubbles: the flow rate is too high.	<ul style="list-style-type: none"> • Adjust the flow rate.
	The electrolyte temperature is too high.	<ul style="list-style-type: none"> • Check the electrolyte temperature.
The polished surface is etched.	There has been a chemical attack of the grain boundaries after the current was switched off.	<ul style="list-style-type: none"> • Remove and clean the specimen immediately after the current is switched off.
	The voltage is too low.	<ul style="list-style-type: none"> • Increase the voltage.
Pittings	The preparation time was too long.	<ul style="list-style-type: none"> • Improve the preparation phase before polishing. • Decrease the time.
	The voltage is too high.	<ul style="list-style-type: none"> • Decrease the voltage.
	The anodic layer is insufficient.	<ul style="list-style-type: none"> • Decrease the flow rate.
<p>There are deposits on the surface.</p> <p>Materials such as titanium produce deposits on the surface.</p> <p>Cleaning the specimen under running water.</p>	Products with insoluble reaction.	<ul style="list-style-type: none"> • Replace the electrolyte. Use a different electrolyte or a fresh mix.
		<ul style="list-style-type: none"> • Increase the voltage.

Error	Cause	Action
The surface is wavy.	The preparation time is too short.	<ul style="list-style-type: none"> Increase the time.
	The flow rate is not correct.	<ul style="list-style-type: none"> Increase or decrease the flow rate.
	The electrolyte is worn out.	<ul style="list-style-type: none"> Replace the electrolyte.
	Polishing is uneven because of incorrect preparation phases.	<ul style="list-style-type: none"> Improve the preparation phase before polishing.
	The type of electrolyte is not correct.	<ul style="list-style-type: none"> Use a different electrolyte with other polishing data.
	The preparation phase is not correct.	<ul style="list-style-type: none"> Improve the preparation phase before polishing.

6.3.2 Electrolytes

Before you start optimizing the results, check the following:

- The electrolyte container is filled to the maximum mark.
- The minimum and maximum flow of the pump is adjusted correctly.
- The temperature of the electrolyte is approx. 20-22°C (68-72°F).

Electrolytes

- Check the age of the mixed electrolyte. The mixture should not be more than 3 months old.
- Check the number of polishings made with the electrolyte. The electrolyte can be worn out by too many polishings.
- Make sure that the correct combination of material and electrolyte is used.
- Make sure that the electrolyte is cooled sufficiently during operation.

6.3.3 Polishing thin plates

When you polish thin plates at high voltages, you can lead high temperature away from the specimen.

- Place a block of metal on top of the plates. Make sure that there is a good electrical contact between the plate and the block of metal.

6.3.4 Etching stainless steel

- Before you perform external etching of stainless steel in oxalic acid, wash the specimen in lukewarm water.

6.3.5 Polishing copper with D2 electrolyte

If you use the D2 electrolyte, you can only polish copper up to a hole size of 2 cm².

- If you wish to polish larger areas, use E5 electrolyte.

6.3.6 Changing to masks with different hole sizes

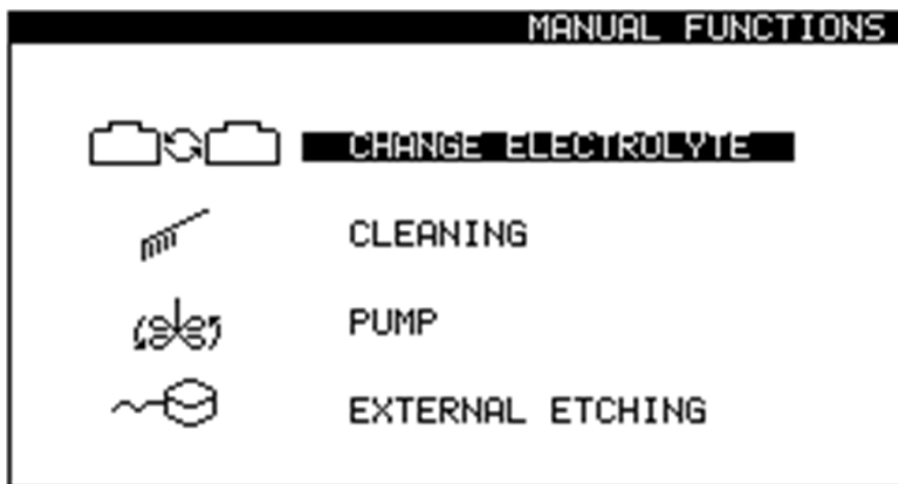
When you change to a mask with a different hole size, you may have to change the flow rate during polishing to suit the different size of hole. All Struers methods are developed for 1 cm² holes.

- When you use masks with 1/2 and 2 cm² holes, do not change the flow rate.
- When you use the mask with the 5 cm² hole, decrease the flow rate by approx. 2 - 4 numbers.

For etching the flow rate remains unchanged.

6.4 Manual functions





A number of manual functions are available in the software.



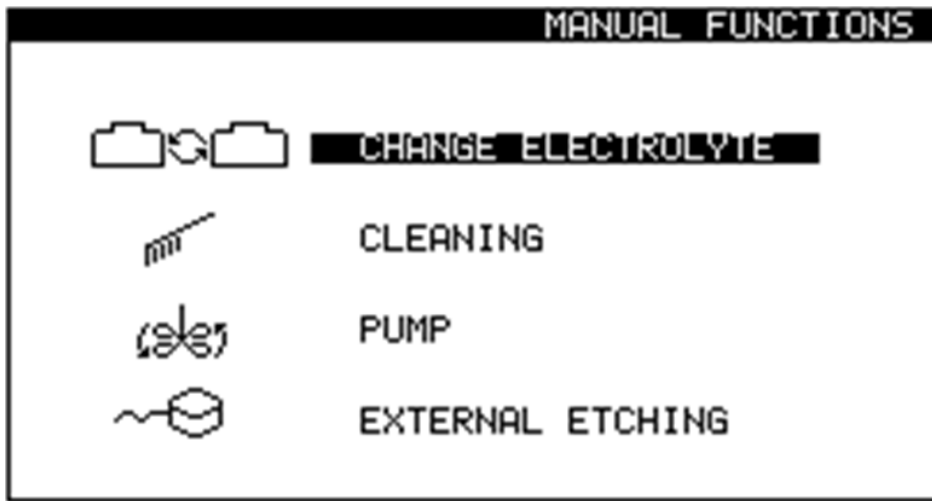
1. From the **Main menu** screen, select the **Manual funct.** screen.



From the **Manual Functions** screen you can choose between the following options:

-  **Change electrolyte.** See [Changing electrolyte](#) ► 56.
-  **Cleaning.** See [Cleaning](#) ► 58.
-  **Pump.** See [Operating the pump manually](#) ► 59.
-  **External etching.** See [External etching](#) ► 60.

6.4.1 Changing electrolyte



When you change from a method that uses one type of electrolyte to a method that uses a different type of electrolyte, you must change the electrolyte. You will be prompted to change the electrolyte and clean the system. If needed, you can start this function manually.



CAUTION

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



WARNING

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

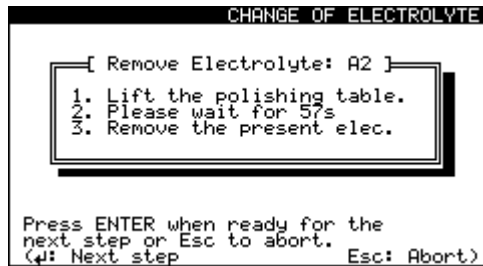
1. From the **Main menu** screen, select the **Manual funct.** screen.
2. From the **Manual Functions** screen, select the **Change electrolyte** screen.
3. Press **Enter** to continue.
4. Follow the on-screen instructions. The on-screen instructions are listed below.
5. Press **Enter** to continue through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



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

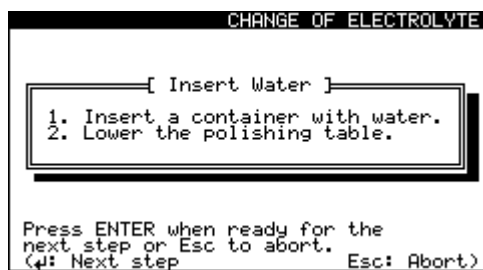


6. The following messages appear. Follow each step listed on the screen.



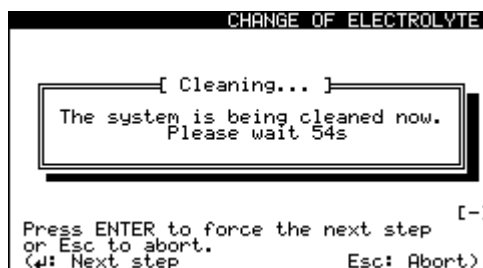
[Remove Electrolyte: A2]

1. Lift the polishing table.
2. Please wait for 57 s
3. Remove the present elec.



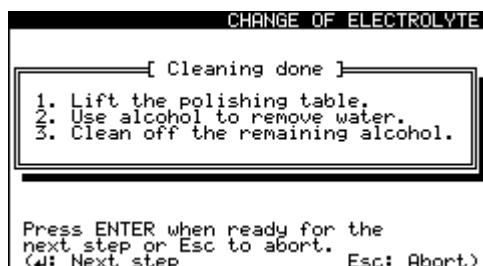
[Insert Water]

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



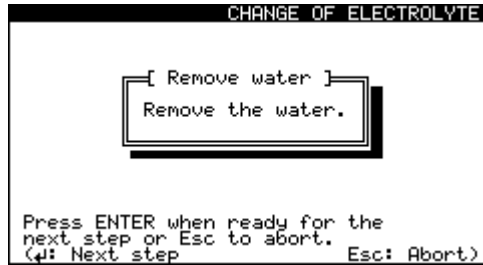
[Cleaning...]

- The system is being cleaned now.
Please wait 54s



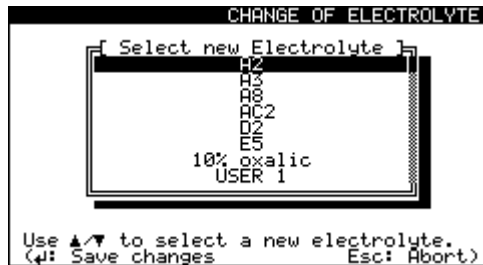
[Cleaning done]

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



[Remove water]

Remove the water.



[Select new Electrolyte]

- A2
- A3
- A8
- ...
- 10% oxalic
- USER 1

6.4.2 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.

6.4.3 Operating the pump manually

You can activate the pump and adjust the flow rate manually.

1. From the **Main menu** screen, select the **Manual funct.** screen.



2. From the **Manual Functions** screen, select the **Pump** screen.



3. Press **Enter**.



4. Adjust the flow rate.

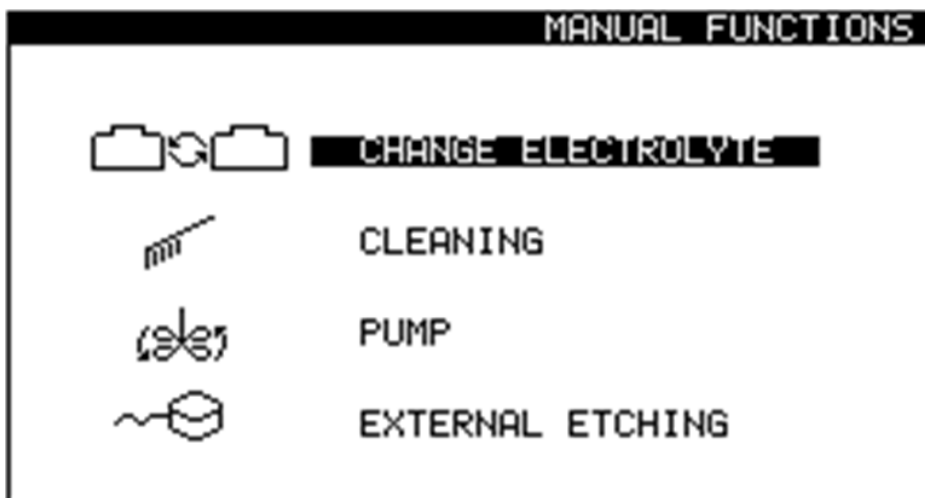


5. Press **Enter** or **Back** to stop the pump.



6.4.4 External etching

You can control the external etching process.



1. From the **Main menu** screen, select the **Manual funct.** screen.



2. From the **Manual Functions** screen, select **External etching**.



3. Press **Enter**.



The timer starts counting immediately.

**Note**

To obtain the best etching results, immerse the specimen facing downwards into the electrolyte.

Current

When you immerse a specimen in the electrolyte, the current is shown on the screen.

**Note***Current limit*

When you perform external etching, the maximum current is limited to 1.5 A.

If this value is reached, the voltage decreases automatically to prevent the system from exceeding the current limit. A message is shown on the screen.

Voltage

The voltage is shown on the screen. The setting that was used the last time, is used as the default value.

4. If needed, adjust the voltage.
0.5 - 15 V, in steps of 0.5 V.
5. If needed, press **Back** to cancel the process.

**Etching more specimens**

1. If you wish to etch more specimens, press **F1** to reset the timer.
2. Repeat the process.



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 \(SRP/CS\) ▶ 68](#)

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 machine, we strongly recommends regular cleaning.



Note

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



Note

Do not use acetone, benzol or similar solvents.

- Clean the front plate with a damp cloth after use.

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

- Clean the machine and all accessories thoroughly.

Polishing unit

See the Instruction Manual for this unit.

7.2 Daily

Control unit

- Clean all accessible surfaces with a soft, damp cloth.

Accessories

See the manual supplied with the specific equipment.

7.3 Monthly

See the instruction manual for LectroPol-5 Polishing unit.

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

The safety devices must be tested at least once a year. See [Test the safety devices](#) ► 64.

Polishing unit

To inspect the protective cover, see the LectroPol-5 Polishing unit instruction manual.

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.

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, 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.
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.

Error	Cause	Action
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 also [Optimizing the results](#) ► 52

9 Technical data

9.1 Technical data - LectroPol-5

Subject	Specifications	
Software and electronics	Display	128 x 240 dots (16 x 40 characters)
	Controls	Touch pad
	Database	10 Struers methods + 20 user definable methods
Power supply	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
Output: Voltage/Current	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
Safety standards	See the Declaration of Conformity	
Dimensions and weight	Width	385 mm (15.2")
	Depth	350 mm (13.8")
	Height	160 mm (6.3")
	Weight	18 kg (40 lbs)
Operating environment	Surrounding temperature	5-40°C (41-104°F)
	Humidity	0-95% RH non-condensing
Storage and transport conditions	Surrounding temperature	-25 > +55°C (-13 > +131°F)
	Humidity	0-95% RH non-condensing

9.2 Noise and vibration levels

Noise level	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
--------------------	----------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------

Vibration level	N/A
------------------------	-----

9.3 Safety Circuit Categories/Performance Level

See the instruction manual for LectroPol-5 Polishing unit

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.

Control unit

Safety Related Parts of the Control System (SRP/CS): N/A.

Polishing unit

See the instruction manual for LectroPol-5 Polishing unit

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

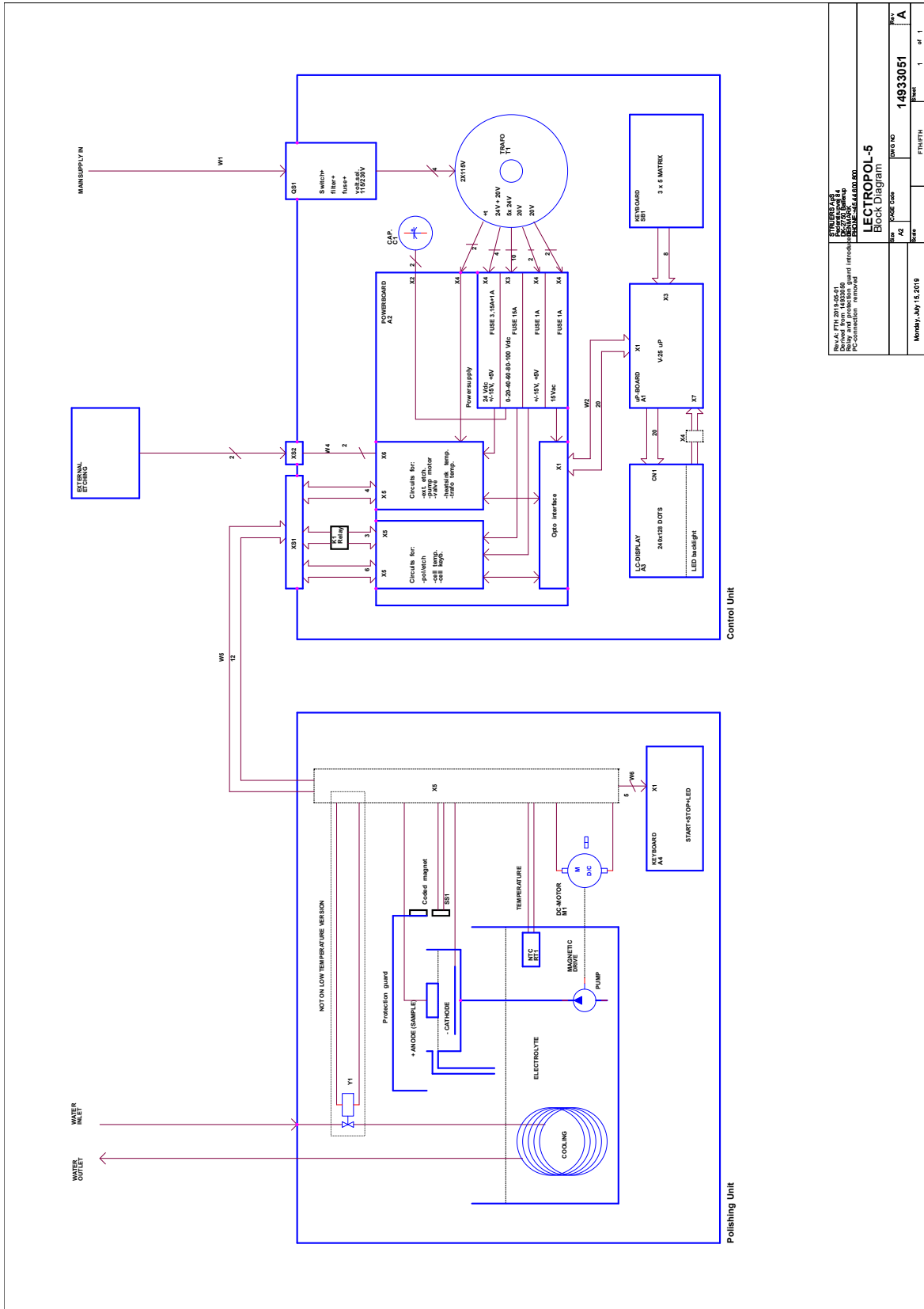
Control unit

Title	No.
LectroPol-5, Block diagram	14933051 A
LectroPol-5, Wiring diagram	14933470 A

Polishing unit

See the Instruction Manual for this unit.

14933051 A



BUNNENGAAS Breda, P.O. Box 14933051 3720 BR Breda T: +31 (0)30 652 2000 F: +31 (0)30 652 2001 E: info@bunnen-gaas.nl PC-connection: www.bunnen-gaas.nl	
LECTROPOL-5 Block Diagram	
Date: Monday, July 13, 2015	Page: 1 of 1
Part No: 14933051	Rev: 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 Control unit
Model	N/A
Function	Chemical polishing/etching (electro chemical)
Type	493
Cat. no.	04936333 LectroPol-5 Control unit in combination with 04936301 LectroPol-5 Polishing unit/ 04936302 LectroPol-5 Low-temperature polishing unit
Serial no.	



Module H, according to global approach

EU

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

2006/42/EC	EN ISO 12100:2010
2011/65/EU	EN 63000:2018
2014/30/EU	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
Additional standards	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
hr Za prijevode idite na
hu A fordítások itt érhetők el
it Per le traduzioni consultare
ja 翻訳については、
lt Vertimai patalpinti
lv Tulkojumus skatīt
nl Voor vertalingen zie
no For oversettelser se
pl Aby znaleźć tłumaczenia, sprawdź
pt Consulte as traduções disponíveis em
ro Pentru traduceri, consultați
se För översättningar besök
sk Preklady sú dostupné na stránke
sl Za prevode si oglejte
tr Çeviriler için bkz
zh 翻译见

www.struers.com/Library