

# W400 Electrosurgical Generator

## User Manual

**Model:** W400

**Device Type:** High Frequency Electrosurgical Generator

**Application:** Monopolar and Bipolar Electrosurgery

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## IMPORTANT SAFETY INFORMATION

### Read Before Use

This manual contains essential information for the safe installation, operation, maintenance, and servicing of the W400 Electrosurgical Generator. All operators, surgeons, nurses, biomedical engineers, and service personnel must read and understand this manual before using the equipment.

Improper use of electrosurgical equipment may result in:

- Patient burns
- Electrical shock
- Fire hazards
- Interference with implanted devices
- Tissue damage
- Equipment malfunction

Always follow the hospital safety protocol and electrosurgical safety standards.

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# 1. GENERAL INFORMATION

## 1.1 Introduction

The W400 Electrosurgical Generator is a modern solid-state high-frequency surgical unit designed to perform precise tissue cutting and coagulation during surgical procedures.

The system combines advanced microcontroller technology with multiple monopolar and bipolar operating modes to provide excellent surgical performance across various medical specialties.

The W400 offers:

- Pure cutting
- Blend cutting
- Spray coagulation
- Forced coagulation
- Fulguration
- Desiccation
- Bipolar coagulation
- Bipolar cutting
- Programmable memory modes

The generator is designed to provide smooth cutting performance, rapid hemostasis, reduced tissue trauma, and enhanced surgical precision.

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## 1.3 User Qualification

The equipment should only be operated by:

- Qualified surgeons
- Trained operating room staff
- Biomedical engineers

- Authorized service personnel

Users must understand:

- Electrosurgical principles
  - Patient safety procedures
  - Proper grounding techniques
  - Return electrode placement
  - Power setting adjustment
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## 2. CONTRAINDICATIONS & WARNINGS

### 2.1 General Warnings

WARNING: Risk of burns and electrical injury if used improperly.

WARNING: Do not use in the presence of flammable anesthetics or oxygen-rich environments.

WARNING: Do not operate the unit if the power cord or accessories are damaged.

WARNING: Do not open the generator cabinet. High voltage is present inside the equipment.

WARNING: Only qualified service personnel may service the unit.

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### 2.2 Pacemaker & Implantable Devices

Electrosurgery may interfere with:

- Cardiac pacemakers
- Implantable defibrillators
- Neurostimulators
- Other electronic implants

Precautions:

- Consult a cardiologist before surgery
  - Use bipolar mode whenever possible
  - Keep current path away from implanted devices
  - Place patient plate as far as possible from implant
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## 2.3 Fire Hazards

Electrosurgical sparks may ignite:

- Alcohol-based skin preparations
- Surgical drapes
- Flammable gases
- Oxygen-rich atmosphere

Always ensure:

- Skin prep is fully dry
  - Adequate ventilation is maintained
  - No pooling of flammable fluids exists
- 

## 3. TECHNICAL SPECIFICATIONS

Parameter	Specification
Model	W400
Input Voltage	230V AC $\pm$ 10%
Frequency	50 Hz
Technology	Solid State Microcontroller Based
Operating Modes	Monopolar & Bipolar
Display Type	Digital LED
Cooling System	Forced Air Cooling
Patient Plate Monitoring	Yes
Programmable Modes	99 Programs
Leakage Protection	HF Leakage Current Protection

### Output Modes

#### Monopolar Cut Modes

Mode	Maximum Output
Pure Cut	400 W
Blend 1	250 W
Blend 2	200 W
Endocut	99 W

## Monopolar Coagulation Modes

Mode	Maximum Output
Spray	120 W
Force	120 W
Fulgurate	150 W
Desiccate	150 W

## Bipolar Modes

Mode	Maximum Output
Micro	80 W
Macro	80 W
Bipolar Cut	100 W
Auto	100 W

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# 4. INSTALLATION & SETUP

## 4.1 Unpacking Instructions

Carefully unpack the equipment and inspect all components.

Check for:

- Physical damage
- Loose components
- Damaged connectors
- Missing accessories

If damage is observed:

- Do not use the equipment
  - Inform supplier immediately
  - Retain original packaging
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## 4.2 Standard Accessories

The W400 package includes:

1. Monopolar Footswitch
2. Bipolar Footswitch

3. Patient Return Plate
4. Patient Plate Cable
5. Monopolar Pencil Handle
6. Electrode Set
7. Power Cord

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## 4.3 Electrical Requirements

The operating room electrical system must comply with medical safety standards.

Requirements:

- 110~230V AC single-phase supply
- Proper protective grounding
- Dedicated medical-grade outlet
- Stable voltage supply
- Low earth-to-neutral voltage

Recommendations:

- Use voltage stabilizer
- Use isolation transformer if necessary
- Use hospital-grade grounding system

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## 4.4 Environmental Requirements

Recommended operating environment:

Parameter	Recommended Range
Temperature	10°C to 40°C
Relative Humidity	30% to 75%
Ventilation	Adequate Airflow
Dust Exposure	Minimal

Do not:

- Block cooling fan
- Place unit near heat source
- Expose to liquids
- Operate in wet environment

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## 5. UNDERSTANDING ELECTROSURGERY

### 5.1 Principle of Operation

Electrosurgery uses high-frequency radio waves to generate heat within tissue.

The heat is produced by tissue resistance to the radio-frequency current.

Effects include:

- Cutting
- Coagulation
- Desiccation
- Fulguration

The W400 operates at radio frequencies that minimize neuromuscular stimulation.

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### 5.2 Monopolar Electrosurgery

In monopolar electrosurgery:

- Current flows from active electrode
- Through patient tissue
- To patient return electrode
- Back to generator

Applications:

- General cutting
  - Tissue dissection
  - Hemostasis
- 

### 5.3 Bipolar Electrosurgery

In bipolar electrosurgery:

- Current flows between two tips of bipolar forceps
- Current path is limited to tissue grasped
- Patient plate is not required

Advantages:

- Reduced collateral tissue damage
  - Improved precision
  - Safer near delicate structures
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## 6. FRONT PANEL CONTROLS

### 6.1 Program Section

The programmable memory allows storage of frequently used settings.

Features:

- 99 programmable modes
  - Quick recall of settings
  - Improved workflow efficiency
- 

### 6.2 Cut Section

#### Pure Cut

Provides smooth tissue incision with minimal coagulation.

Recommended for:

- Skin incision
- Soft tissue cutting
- General dissection

#### Blend 1

Provides moderate hemostasis during cutting.

Recommended for:

- Vascular tissue
- Moderate bleeding control

#### Blend 2

Provides higher coagulation effect during cutting.

#### Endocut

Provides pulsed cutting for endoscopic applications.

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## 6.3 Coagulation Section

### Spray Coagulation

Non-contact coagulation with broad tissue effect.

### Force Coagulation

Provides rapid coagulation effect.

### Fulgurate

Produces spark coagulation without direct tissue contact.

### Desiccate

Direct-contact coagulation with controlled tissue drying.

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## 6.4 Bipolar Section

### Micro

Fine bipolar coagulation for delicate surgery.

### Macro

Higher bipolar coagulation effect.

### Bipolar Cut

Precise bipolar tissue cutting.

### Auto Mode

Automatically stops output after coagulation completion.

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## 7. REAR PANEL CONNECTIONS

### Rear Panel Components

- Main Power Switch
- Power Input Socket
- Fuse Holder

- Cooling Fan
  - Audio Volume Control
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## 8. OPERATING INSTRUCTIONS

### 8.1 Startup Procedure

1. Verify all accessories are properly connected.
  2. Connect power cable to grounded outlet.
  3. Switch ON mains power.
  4. Turn ON generator.
  5. Confirm self-test and indicators.
  6. Select desired mode.
  7. Adjust output power.
  8. Verify patient plate connection.
  9. Begin surgical procedure.
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### 8.2 Monopolar Setup

1. Connect patient plate.
  2. Place patient plate correctly.
  3. Connect monopolar pencil.
  4. Connect monopolar footswitch if required.
  5. Select cut or coag mode.
  6. Set desired power.
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### 8.3 Bipolar Setup

1. Connect bipolar forceps.
  2. Connect bipolar footswitch.
  3. Select bipolar mode.
  4. Set power level.
  5. Activate using footswitch.
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### 8.4 Shutdown Procedure

1. Reduce power settings.
2. Turn OFF generator.
3. Disconnect accessories.

4. Disconnect power cord.
  5. Clean equipment.
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## 9. RECOMMENDED OPERATING TECHNIQUES

### 9.1 Cutting Technique

Electrosurgical cutting is performed by delivering continuous high-frequency current that rapidly heats intracellular fluid, causing cellular vaporization and tissue division. Proper technique is essential to achieve smooth cutting with minimal tissue trauma and reduced bleeding.

#### General Guidelines for Effective Cutting

##### 1. Activate Before Tissue Contact

Always activate the CUT mode before the electrode touches the tissue.

This creates a controlled electrical arc between the electrode and tissue, allowing smooth vaporization of cells. If the electrode touches tissue before activation, tissue sticking, dragging, and thermal damage may occur.

##### Correct Technique:

- Press CUT footswitch or hand switch first
- Then gently approach tissue
- Maintain a fine spark during cutting

##### Incorrect Technique:

- Touch tissue first
- Then activate current

This may cause:

- Tissue tearing
  - Carbonization
  - Electrode sticking
  - Uneven incision
- 

##### 2. Maintain Smooth Electrode Movement

Move the electrode steadily and continuously during cutting.

A smooth movement ensures:

- Uniform tissue division
- Reduced thermal spread
- Cleaner surgical margins
- Better visibility

Avoid:

- Jerky movement
- Staying too long at one point
- Repeated scraping motion

If movement is too slow:

- Tissue overheating occurs
- Charring increases
- Smoke generation increases

If movement is too fast:

- Incomplete cutting occurs
- Excessive force becomes necessary

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### **3. Avoid Excessive Pressure**

The electrode should glide over tissue with minimal mechanical force.

Electrosurgery cuts by heat, not by physical pressure.

Excessive pressure may cause:

- Deep tissue burns
- Poor cutting efficiency
- Carbon buildup on electrode
- Tissue sticking

Proper technique:

- Allow RF energy to perform the cutting
- Use light hand control
- Maintain small distance for spark formation

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#### **4. Use Lowest Effective Power Setting**

Always begin with the lowest practical power setting and gradually increase only if necessary.

Benefits of lower power:

- Reduced collateral tissue damage
- Less smoke generation
- Lower risk of burns
- Better healing response

Excessively high power may cause:

- Deep necrosis
- Excessive sparking
- Poor cosmetic healing
- Uncontrolled thermal injury

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#### **Recommended Cutting Distance**

<b>Mode</b>	<b>Electrode Position</b>
Pure Cut	Slightly above tissue
Blend Modes	Light tissue contact
Endocut	Controlled intermittent contact

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#### **Electrode Maintenance During Cutting**

Clean electrode tips frequently during surgery.

Carbonized debris increases resistance and reduces cutting efficiency.

Use:

- Wet gauze
- Electrode cleaning pad

Do not:

- Scratch electrode aggressively
- Use damaged electrodes

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## Clinical Tips for Better Cutting Performance

- Use needle electrodes for precise incision
  - Use blade electrodes for long incisions
  - Keep surgical field dry
  - Minimize blood pooling
  - Maintain good patient plate contact
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## 9.2 Coagulation Technique

Electrosurgical coagulation controls bleeding by heating tissue slowly enough to denature proteins and seal blood vessels without complete tissue vaporization.

Different coagulation modes produce different tissue effects.

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## General Guidelines for Effective Coagulation

### 1. Use Intermittent Activation

Apply coagulation energy in short bursts rather than continuous prolonged activation.

Short intermittent activation:

- Provides controlled coagulation
- Reduces tissue carbonization
- Prevents deep thermal injury
- Improves visibility

Recommended technique:

- Activate for 1–2 seconds
  - Observe tissue response
  - Repeat if necessary
- 

### 2. Avoid Prolonged Activation

Continuous activation in one area may cause:

- Excessive tissue necrosis
- Deep burns
- Tissue sticking
- Delayed healing

Signs of excessive coagulation:

- Black carbonized tissue
- Excessive smoke
- Tissue popping
- Strong burning odor

When these signs appear:

- Reduce power
- Shorten activation time
- Reassess technique

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### **3. Observe Tissue Response Carefully**

The surgeon should continuously monitor tissue effect during coagulation.

Desired tissue appearance:

- Light blanching
- Mild shrinkage
- Controlled desiccation

Undesirable effects:

- Black charring
- Tissue vaporization
- Deep cavitation

The correct endpoint is vessel sealing, not tissue destruction.

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### **4. Adjust Power Gradually**

Start with lower coagulation settings and increase slowly.

Low settings:

- More controlled
- Less collateral damage

High settings:

- Faster coagulation
- Greater thermal spread
- Increased sparking

Always use the minimum power required to achieve hemostasis.

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# Coagulation Modes and Techniques

## Spray Coagulation

### Purpose

Rapid non-contact coagulation over broad tissue surfaces.

### Technique

- Hold electrode slightly away from tissue
- Activate before approaching tissue
- Maintain visible spark

Applications:

- Diffuse bleeding
  - Liver bed coagulation
  - Surface hemostasis
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## Fulguration

### Purpose

Superficial tissue coagulation using spark discharge.

### Technique

- Keep electrode above tissue surface
- Do not touch tissue directly
- Use brief activation bursts

Applications:

- Surface bleeding
  - Tumor coagulation
  - Superficial necrosis
- 

## **Desiccation**

### **Purpose**

Direct-contact coagulation for vessel sealing.

### **Technique**

- Touch tissue directly
- Activate briefly
- Observe tissue drying

Applications:

- Small vessel coagulation
  - Precise hemostasis
- 

## **9.3 Bipolar Technique**

Bipolar electrosurgery passes RF current only between the two tips of bipolar forceps, providing localized coagulation with minimal damage to surrounding tissue.

Bipolar mode is especially useful in:

- Neurosurgery
  - Microsurgery
  - Laparoscopy
  - Delicate vascular procedures
-

# General Guidelines for Bipolar Use

## 1. Use Clean Forceps Tips

Carbonized or contaminated tips increase resistance and reduce coagulation efficiency.

Dirty tips may cause:

- Poor current transfer
- Tissue sticking
- Uneven coagulation
- Increased thermal injury

Clean tips regularly using:

- Wet gauze
- Non-abrasive cleaning pad

Inspect forceps for:

- Bent tips
  - Damaged insulation
  - Corrosion
- 

## 2. Grasp Minimal Tissue

Only the target tissue should be held between bipolar tips.

Grasping excessive tissue may cause:

- Wide thermal spread
- Delayed coagulation
- Excessive necrosis

Proper technique:

- Use fine tissue grasp
  - Apply gentle pressure
  - Isolate bleeding vessel precisely
- 

## 3. Use Low Power Initially

Begin with the lowest bipolar power setting.

Advantages:

- Better precision
- Less sticking
- Reduced collateral injury

Increase power only if:

- Coagulation is insufficient
- Vessel sealing is incomplete

Excessive bipolar power may cause:

- Tissue carbonization
  - Electrode sticking
  - Adjacent tissue damage
- 

#### **4. Avoid Prolonged Activation**

Long activation times may overheat tissue and instruments.

Use short activation cycles:

- 1–2 second bursts
- Pause between activations
- Observe tissue effect

Desired endpoint:

- Tissue blanching
- Vessel collapse
- Hemostasis

Avoid:

- Black charring
  - Steam popping
  - Tissue adherence
-

# Bipolar Operating Tips

## For Microsurgery

- Use MICRO mode
  - Maintain very low power
  - Use fine bipolar forceps
  - Apply short bursts only
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## For Standard Vessel Coagulation

- Use MACRO mode
  - Grasp vessel securely
  - Activate briefly until vessel seals
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## For Bipolar Cutting

- Use bipolar cut mode only when precise tissue division is required
  - Maintain continuous motion
  - Avoid excessive pressure
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# Important Safety Notes

During all electrosurgical procedures:

- Never activate instrument in air for long periods
  - Avoid contact with metal instruments during activation
  - Keep cables untangled
  - Ensure proper grounding
  - Verify patient plate contact before monopolar use
  - Stop immediately if abnormal heating or sparking occurs
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## 10. RECOMMENDED POWER SETTINGS

NOTE: Settings may vary depending on tissue type, electrode size, surgical technique, and surgeon preference.

### General Surgery

Procedure	Mode	Power
Skin Incision	Pure Cut	60–90 W
Tissue Dissection	Blend 1	50–80 W
Hemostasis	Spray	30–50 W

### Neurosurgery

Procedure	Mode	Power
Bipolar Coagulation	Micro	10–20 W
Fine Dissection	Blend 1	20–40 W

### ENT Surgery

Procedure	Mode	Power
Tonsil Coagulation	Coag	20–35 W

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## 11. ACCESSORIES

### Compatible Accessories

- Monopolar pencils
- Hand-switch pencils
- Reusable electrodes
- Disposable electrodes
- Bipolar forceps
- Patient return electrodes
- Footswitches

Only use manufacturer-approved accessories.

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## 12. CLEANING & STERILIZATION

### 12.1 Generator Cleaning

- Switch OFF equipment
- Disconnect power cord
- Use soft damp cloth
- Use mild detergent only
- Do not spray liquids directly

Do not:

- Immerse generator
  - Use solvents
  - Use abrasive cleaners
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### 12.2 Accessory Sterilization

Reusable accessories should be:

- Cleaned immediately after use
  - Inspected for damage
- 

## 13. ELECTROSURGICAL SAFETY GUIDELINES

### Patient Plate Placement

Correct patient plate placement is critical.

Place on:

- Well-vascularized muscle area
- Clean dry skin
- Area close to surgical site

Avoid:

- Bony prominences
- Scar tissue
- Hairy areas
- Wet skin
- Metal implants

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## General Safety Precautions

- Use lowest effective power
  - Avoid metal-to-metal contact
  - Keep cables separated
  - Inspect accessories before use
  - Keep electrodes clean
  - Avoid cable coiling
- 

## Monitoring Equipment

To reduce interference:

- Keep ECG leads away from surgical site
  - Use isolated monitoring systems
  - Separate monitor cables from ESU cables
- 

# 14. PREVENTIVE MAINTENANCE

## Daily Inspection

Check:

- Power cord
  - Connectors
  - Patient plate cable
  - Footswitch operation
  - Fan operation
  - Accessories
- 

## Periodic Maintenance

Every 6 months:

- Calibration verification
- Leakage current testing
- Output power verification
- Safety inspection

- Grounding inspection

Maintenance should be performed only by qualified biomedical engineers.

## 15. TROUBLESHOOTING GUIDE

Problem	Possible Cause	Solution
Unit not powering ON	Loose power cable	Check cable connection
No output	Faulty accessory	Replace accessory
Poor cutting performance	Low power setting	Increase power gradually
Excessive sparking	Dirty electrode	Clean electrode
Patient plate alarm	Poor plate contact	Reapply plate
Monitor interference	Cable proximity	Separate cables
Footswitch not working	Loose connector	Reconnect footswitch

**WARNING:** If internal malfunction is suspected, discontinue use immediately and contact authorized service personnel.

## 16. STORAGE & TRANSPORTATION

### Storage Conditions

Parameter	Range
Temperature	-10°C to 55°C
Humidity	10% to 90%

Store equipment:

- In dry environment
- Away from direct sunlight
- In original packaging when possible

## 17. WARRANTY INFORMATION

The W400 Electrosurgical Generator is warranted against manufacturing defects under normal operating conditions.



Warranty does not cover:

- Physical damage
- Improper installation
- Unauthorized repair
- Liquid damage
- Electrical surges
- Use of non-approved accessories

Only authorized personnel may service the equipment.

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## 18. IMPORTANT SAFETY SYMBOLS

Symbol	Meaning
	Warning
	Protective Earth
ON/OFF	Power Switch
BF	Body Floating Applied Part

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## 19. CONTACT INFORMATION

For technical support, servicing, or spare parts:

ESC Medicams

Customer Support & Service Department via Email : [sales01@escmedicams.com](mailto:sales01@escmedicams.com)

Please keep the following information available:

- Model Number
  - Serial Number
  - Installation Date
  - Nature of Issue
- 

## FINAL SAFETY NOTICE

**DANGER:** Under no circumstances should the equipment cabinet be opened by unauthorized personnel.

High voltages are present inside the generator.

No user-serviceable parts are inside the unit.

Always disconnect the equipment from mains power before cleaning or inspection.