

ERBE

VIO 300 S V 1.0.x
V 1.1.x
V 1.2.x

VIO 200 S V 1.2.x

Service Manual

02.08

SERVICE MANUAL

VIO 300 S

VIO 200 S

Service Manual Art.No. 80116-284

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CHAPTER 1

Safety information

Classification of the safety information

WARNING! || The WARNING! safety indication refers to a risk of personal injury.

CAUTION! || The CAUTION! safety indication refers to a risk of damage to property.

ATTENTION! || The ATTENTION! safety indication refers to a risk which can cause equipment to become unserviceable.

IMPORTANT! || The IMPORTANT! designation indicates application information and other particularly important information.

Knowledge of the User Manual

The User Manual for this unit constitutes an integral part of this Service Manual. For performing servicing activities it is assumed that the reader has knowledge of the User Manual, especially procedures for installation, putting into operation, and handling.

Protection from the risk of electric shock

WARNING! || The supply voltage must match the voltage specified on the rating plate. Connect the unit / the equipment cart to a properly installed grounded outlet. Only use the ERBE power cord or an equivalent power cord for this purpose. The power cord must bear the national test symbol.

|| For safety reasons, multiple outlets and extension cords should not be used. If their use is unavoidable, they also must be provided with proper grounding.

WARNING! || Unplug the power cord from the outlet before exchanging parts of the unit or cleaning it.

WARNING! || Do not plug a wet power cord into the unit or into an outlet.

WARNING! || Do not touch any unprotected wires or conductive surfaces while the unit is opened and under voltage.

WARNING! || Blown line fuses may only be replaced by a competent technician. Only replacement fuses of the rating specified on the unit's name plate may be used. Before resuming operation the unit must be subjected to a performance test by a competent technician.

Electrostatically sensitive components

CAUTION! || This unit contains electrostatically sensitive components. Work at an anti-static workplace while repairing the unit. Wear a grounding armband while working with electrostatically sensitive components. Hold the circuit boards by their non-conducting corners. Use an anti-static container for transporting electrostatically sensitive components and the circuit boards.

Liability and warranty

ATTENTION! || Adjustments, tests, modifications, maintenance and repair work may only be performed by ERBE or persons trained by ERBE. If the work is not performed by trained persons, ERBE accepts no liability and warranty rights become void.

|| It is recommended that the safety check also be performed by ERBE or persons trained by ERBE.

ATTENTION! || Only use original ERBE spare parts. The manufacturer accepts no liability and the warranty rights becomes void if original spare parts are not used.

CHAPTER 2

Modifications

As from VIO version 1.1.x

Hardware

| Component affected | Description of the modification |
|--------------------|---|
| IES 2 module | The IES 2 smoke evacuation system can be attached to the VIO HF surgical unit and operated via said unit. |
| EIP 2 module | The EIP 2 irrigation pump can be attached to the VIO HF surgical unit and operated via said unit. |

Software

| Component affected | Description of the modification |
|--------------------|---|
| Service settings | New Service settings: IES parameter EIP parameter |
| Test programs | New Test programs: TP user interface Set EEPROM default |

As from VIO version 1.2.x

Hardware

| Component affected | Description of the modification |
|--------------------|--|
| HF-Generator | Development of a new HF generator module which will be recognized and supported by VIO S devices from software version 1.2.x onward. |

Software

| Component affected | Description of the modification |
|--------------------|---|
| Setup settings | <p>DRY CUT ° can be switched on and off independently of SWIFT COAG ° (depending on the unit variant).</p> <p>SWIFT COAG ° can be switched on and off independently of DRY CUT ° (depending on the unit variant).</p> |

CHAPTER 3

Unit description

Unit variants

How do the unit variants differ from one another?

There are VIO S units in different unit variants. Each unit variant has modes assigned permanently to it.

In the VIO 300 S the unit variant 1 (= basic variant) contains all modes approved for this unit. These modes are described in the User Manual of the unit. All other units contain less modes than the basic variant. A list of all unit variants for the VIO 300 S can be requested from ERBE Tübingen.

Currently only unit variant 1 is available in the VIO 200 S. The modes of this variant are described in the User Manual of the unit.

How do I determine the unit variant?

When the VIO S is switched on, the following information about the unit software appears on the start screen:

- Software status (e.g. 1.2.x)
- Upgrades (e.g. EndoCut I)
- Unit variant (e.g. Variation 2)

The VIO 200 S is an exception. Since at the time of printing only unit variant 1 is available, no statement about the unit variant is made on the start screen.

Which service work does the unit variant affect?

The unit variant has an effect on the adjustment and some tests of the safety check.

Controls at the front

IMPORTANT! This chapter contains an overview of the controls of the unit(s). The relevant User Manual for the unit(s), knowledge of which is assumed for servicing work, provides detailed information about how to use the unit(s).

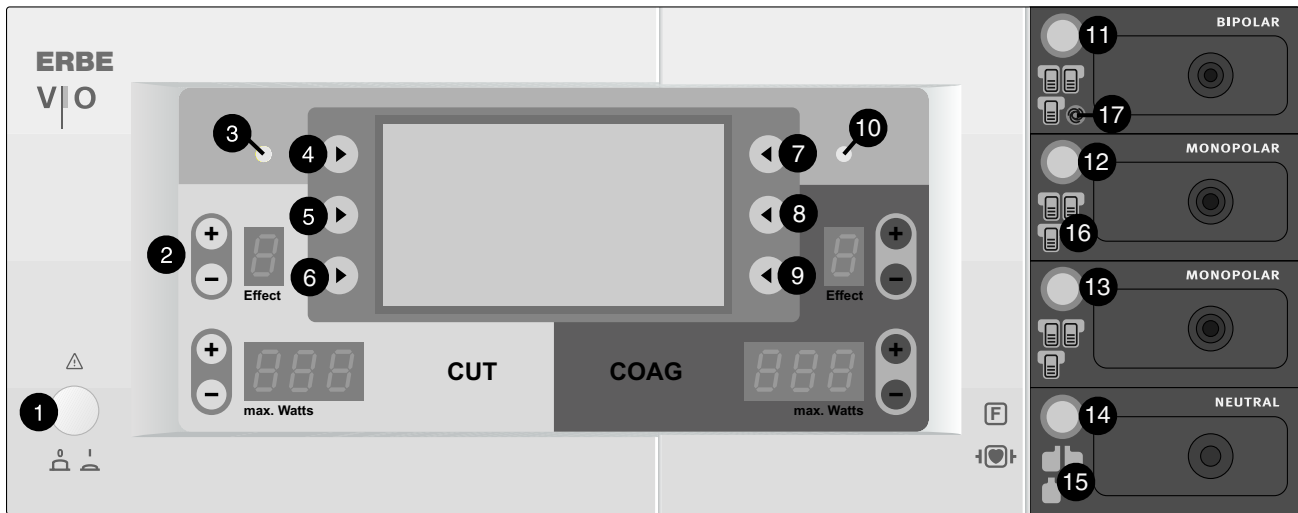


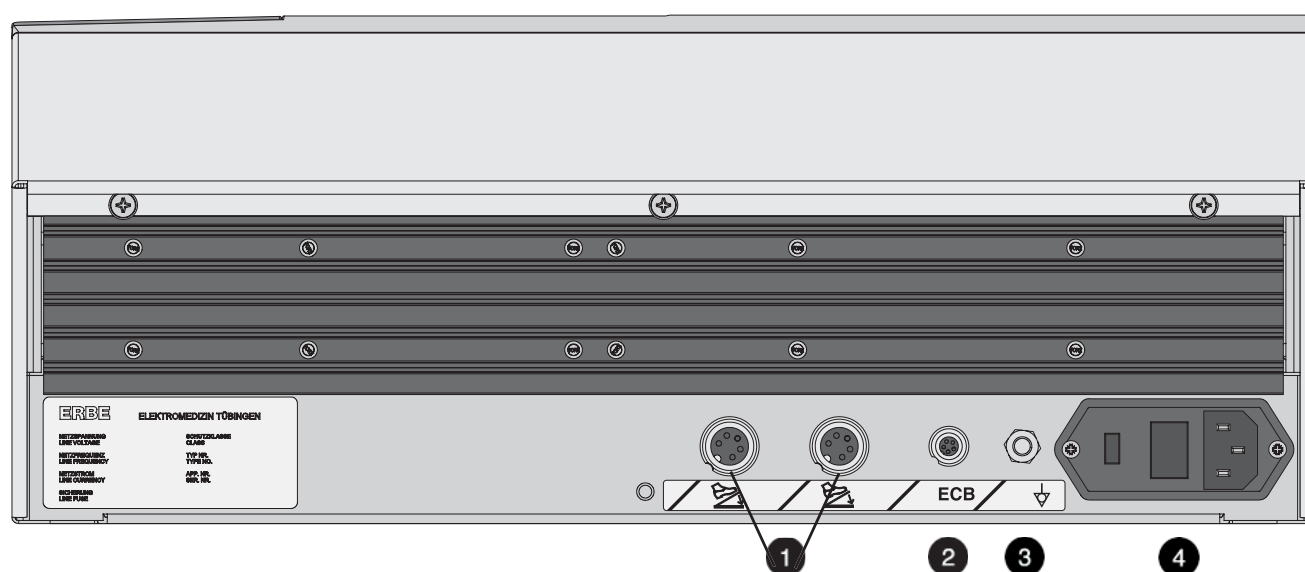
Fig. 3-1

- 1 Power Switch
- 2 +/- buttons
- 3 CUT LED
- 4 – 9 Selection buttons
- 10 COAG LED
- 11 – 14 Focus buttons
- 15 Pilot lamps for neutral electrodes
- 16 Pilot lamps for footswitches
- 17 Pilot lamp for AUTO START

Controls at the rear

IMPORTANT! || This unit comes with different power supply modules – plug-in or screw-in.

VIO S with screw-in power supply module



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Fig. 3-2

- 1 Footswitch sockets
- 2 ECB socket (ERBE Communication Bus)
- 3 Potential equalization terminal
- 4 Power supply module with fuses

VIO S with plug-in power supply module

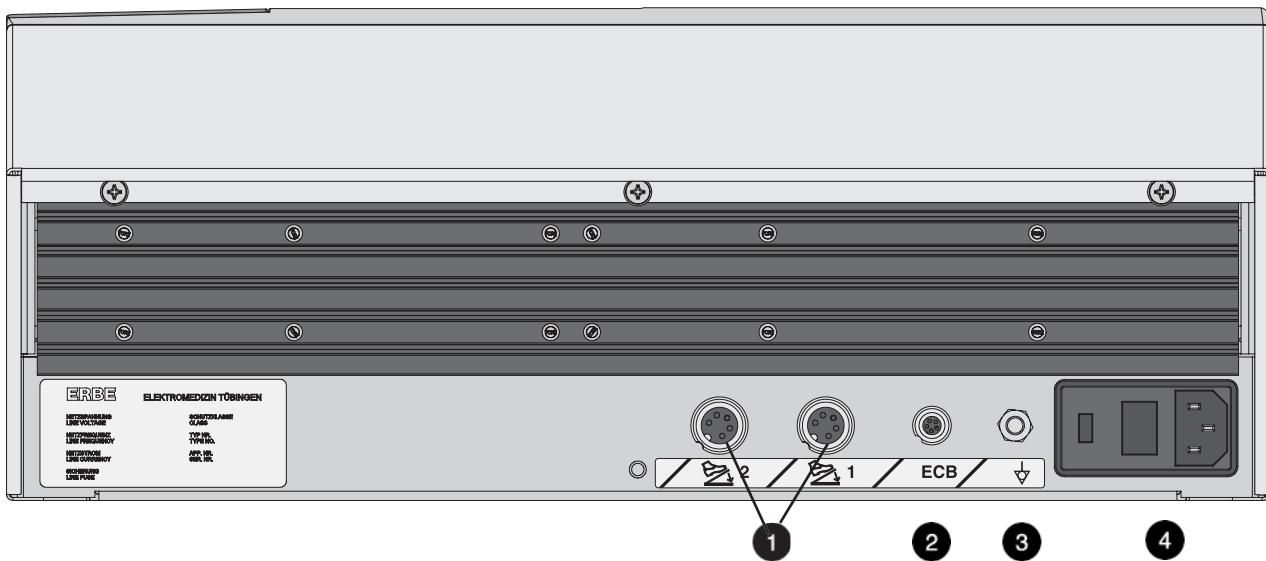


Fig. 3-3

- 1 Footswitch sockets
- 2 ECB socket (ERBE Communication Bus)
- 3 Potential equalization terminal
- 4 Power supply module with fuses

CHAPTER 4

Technical Data

| Power connection | |
|---|---|
| Rated supply voltage | 100 V – 120 V \pm 10% / 220 V – 240 V \pm 10% |
| Rated supply frequency | 50 / 60 Hz |
| Line current | 8 A / 4 A |
| Power input in standby mode | 40 watts |
| Power input with max. HF output | 500 watts / 920 VA |
| Terminal for grounding (potential equalization) | yes |
| Power fuses | T 8 A / T 4 A |

| Operating mode | |
|------------------------|--|
| Intermittent operation | ON time 25% (e.g. activated for 10 sec. / deactivated for 30 sec.) |

| Dimensions and weight | |
|------------------------|--------------------|
| Width x height x depth | 410 x 165 x 380 mm |
| Weight | 8.8 kg |

| Ambient conditions for transport and storage of unit | |
|--|-------------------|
| Temperature | -40 °C to + 70 °C |
| Relative humidity | 10% – 95% |

| Ambient conditions for operation of unit | |
|--|--------------------------|
| Temperature | +10 °C to + 40 °C |
| Relative humidity | 15% – 80%, noncondensing |

Acclimatizing

If the unit has been stored or transported at temperatures below +10 °C or above +40 °C, the unit will require approx. 3 hours to acclimatize at room temperature.

| Standards | |
|--|------|
| Classification according to EC Directive 93/42/EEC | II b |
| Protection class as per EN 60 601-1 | I |
| Type as per EN 60 601-1 | CF |

CHAPTER 5

Setup and Service settings

General information

This unit features two levels for changing settings:

- Setup level
- Service level

Overview of Setup settings

Accessible to users and service personnel.

| Setting | Available from | Description |
|--------------------|----------------|---|
| Contrast | V 1.0.x | Setting display contrast. |
| System volume | V 1.0.x | Setting the volume of activation tones. The activation tones must be easy to hear! |
| Key volume | V 1.0.x | Setting key volume. |
| AUTO START | V 1.0.x | Input of start delay for the AUTO START function. |
| Brightness LED | V 1.0.x | Setting the brightness of the LEDs. |
| Brightness Display | V 1.0.x | Setting display brightness. |

Overview of Service settings

Only accessible to service personnel.

| Setting | Available from | Description |
|-------------------|----------------|--|
| Date | V 1.0.x | Self-explanatory. |
| Time | V 1.0.x | Self-explanatory. |
| Neutral electrode | V 1.0.x | Single surface Dual surface Either way Dynamic Factory setting up to V 1.1.x: Either way Factory setting as from V 1.2.x: Dynamic |
| Time limit | V 1.0.x | Setting the time after which activation terminates automatically. |
| Automatic time | V 1.0.x | Setting the time for which an input box is shown on the display. |
| Error list | V 1.0.x | Saves all the errors that are detected and reported. |
| Version list | V 1.0.x | Indicates the software versions of all the connected components. "Safe config." option ¹ |
| APC parameter | V 1.0.x | Setting the following parameters: APC supply: self-explanatory. APC Auto Purge: the instrument is automatically purged with gas when it is plugged into the APC receptacle or if the instrument is plugged into the APC receptacle already it is automatically purged with gas when the unit starts up. APC purge duration: selection of period for which the instrument is purged with gas automatically. 1 to 10 s. APC purge flow: selection of purge flow (in %) at which the instrument is purged with gas automatically. Purge flow relates to the default COAG Flow setting stored in the instrument. |
| Language | V 1.0.x | Self-explanatory. |
| Start screen | V 1.0.x | Start screen type selection. |

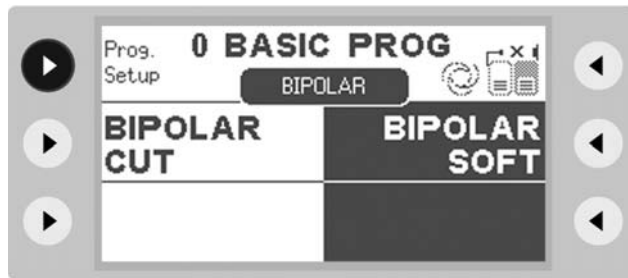
| Setting | Available from | Description |
|----------------------------|--------------------|--|
| DRY ° / SWIFT ° 2 | V 1.0.x to V 1.1.x | ON: Modes DRY CUT ° / SWIFT COAG ° are used. OFF: Modes DRY CUT / SWIFT COAG are used. |
| DRY CUT ° / SWIFT COAG ° 2 | V 1.2.x | DRY CUT ° activated: Mode DRY CUT ° is used. DRY CUT ° deactivated: Mode DRY CUT is used. SWIFT COAG ° activated: Mode SWIFT COAG ° is used. SWIFT COAG ° deactivated: Mode SWIFT COAG is used. |
| AUTO START | V 1.0.x | Setting to specify whether AUTO START is permitted as an activation mode. |
| Test programs | V 1.0.x | Selection of hardware test programs. |
| IES parameter | V 1.1.x | Setting the parameters for operation of the IES 2 smoke evacuation system. |
| EIP parameter | V 1.1.x | Setting the parameters for operation of the EIP 2 irrigation pump. |

1. "Safe config." saves the unit receptacle configuration recognized by the system. The receptacle configuration must be saved by the service technician after every software update and after every unit upgrade and conversion. For this purpose compare the receptacle configurations indicated on the "Version list" with the physical configurations on the unit. If the two agree, save the receptacle configurations with "Safe config."

2. depending on the unit variant.

Call up Setup and Service settings

Call up Setup level

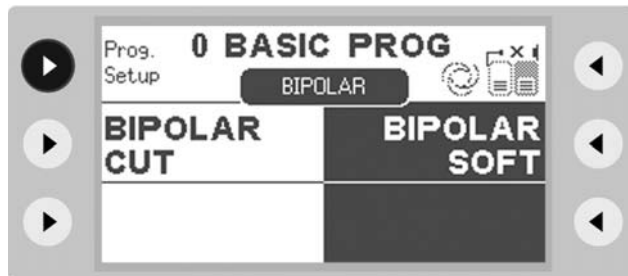


1. Call up "CUT-COAG" box and select menu item "Prog.Setup".



2. Select menu item "Setup". The unit switches to the Setup level. For the settings that can be changed there see table page 17.

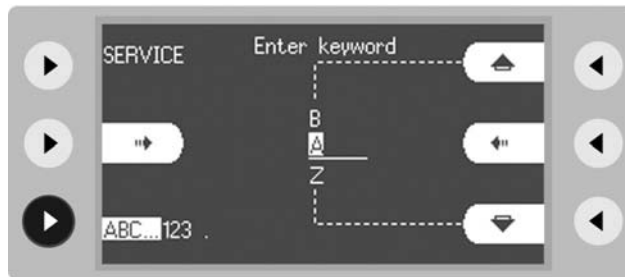
Call up Service level



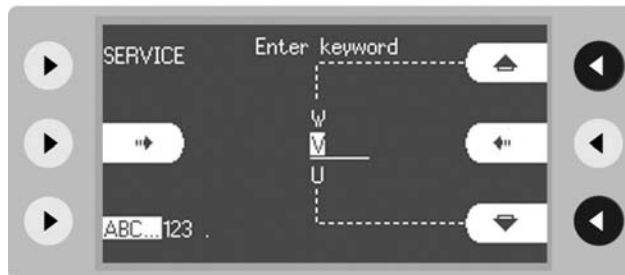
1. Call up "CUT-COAG" box and select menu item "Prog.Setup".



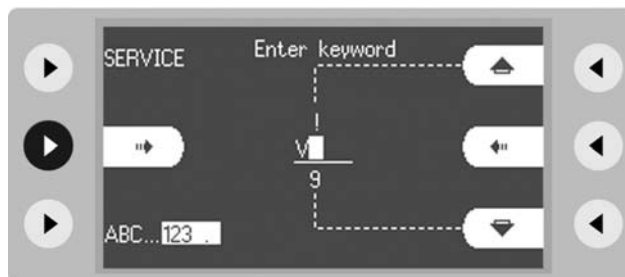
2. Select menu item "Service". The unit switches to the "Password input" box.



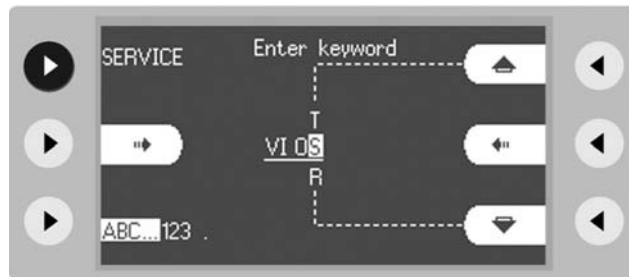
3. In the menu item "Case" select upper case.



4. Enter password **V**IOS. When doing so use the Up and Down keys to set the initial letter.



5. Confirm the correct letter with the selection button.
6. Repeat steps 3 to 5 letter by letter.



7. Confirm password with menu item "SERVICE". The unit switches to the Service level. For the settings that can be changed there see table page 18.

IMPORTANT! || Once the keyword has been entered and provided the unit remains switched on, the Service level can be called up direct, i.e. without having to repeat keyword entry. By switching off the unit the Service level is protected by the keyword against unauthorized access again.

Change settings

IMPORTANT! || A setting change does not have to be confirmed. The unit executes it immediately. After restarting the unit the changed setting remains intact.

1. Mark the setting that is to be changed using the selection buttons.
2. Press the selection button next to the mark. A new box opens. In that box the setting can be changed with the nearest selection button.

CHAPTER 6

Remediating malfunctions

Safety information

ATTENTION! || Adjustments, technical tests, modifications, maintenance and repair work may only be performed by ERBE or persons trained by ERBE. If the work is not performed by trained persons, ERBE accepts no liability and warranty rights become void.

ERROR list

Abbreviations of Error displays

| | |
|----------|---|
| A: | APC 2-Errors |
| B: | Control panel-Errors |
| C: | CPU + Sensors-Errors |
| D: | IES 2-Errors (=Smoke evacuation system) |
| E: | VEM 2-Errors |
| Err: | Error display on the seven-segment displays of the VIO |
| F: | Footswitch-Errors |
| 2,3,5,6: | IIF-Errors (=Instrument Interface) of corresponding receptacle slot |
| 4 (NE): | Nessy2-Errors |
| 9: | EIP 2-Errors (=ERBE Irrigation Pump) |

Status of ERROR list: 02.08

A/E-Errors

| Recognizing module: A = APC 2, E = Extension module VEM 2 | | | | |
|---|------------|------------------------|--|--|
| Recognizing module | Error code | Additional information | Description | Action |
| A | 01 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| A/E | 02 – 04 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| A/E | 05 | | Button error receptacle 1. | Check the keyboard. |
| A/E | 06 | | Button error receptacle 2. | Check the keyboard. |
| A | 07 – 09 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| A | 0A | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| A/E | 0B | | | Information in test mode (adjustment). |
| A/E | 0C – 0D | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| A | 10 | | Underpressure at selected gas input. | Check the gas supply (tank, pressure regulator). If the error persists, notify ERBE Service. |
| A | 11 | | Overpressure at selected gas input. | Check the gas supply (tank, pressure regulator). If the error persists, notify ERBE Service. |
| A | 12 | | Caloric and differential pressure sensor do not agree (wrong gas). | Check the gas supply (type of gas). If the error persists, notify ERBE Service. |
| A | 13 | | | Restart the unit. If the error occurs again, notify ERBE Service. |

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| Recognizing module: A = APC 2, E = Extension module VEM 2 | | | | |
|---|------------|------------------------|--|---|
| Recognizing module | Error code | Additional information | Description | Action |
| A/E | 21 – 23 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| A | 30 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| A/E | 38 | | Type detection of receptacle 1 fails to agree with the stored value. | Check and save the receptacle configuration in the "Version List" test program. If the error occurs again, notify ERBE Service. |
| A/E | 39 | | Type detection of receptacle 2 fails to agree with the stored value. | Check and save the receptacle configuration in the "Version List" test program. If the error occurs again, notify ERBE Service. |
| A | 40 | | Flow specification not attained. | Check the accessories. If the error persists, notify ERBE Service. |
| A | 41 | | Flow specification exceeded. | Restart the unit. If the error occurs again, notify ERBE Service. |
| A/E | 7D + 7E | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| A/E | 7F | | Operating system error. | Information, no fault condition. |
| A/E | 80 | | Internal state incorrect. | Information, no fault condition. |
| A/E | 81 – 83 | | Protocol violation CAN. | Restart the unit. If the error occurs again, notify ERBE Service. |
| A/E | 85 | | Invalid resistance instrument number. | Check the accessories. If the error persists, notify ERBE Service. |
| A | 86 | | Gas underdose, e.g. hose blocked. | Check the accessories. If the error persists, notify ERBE Service. |

| Recognizing module: A = APC 2, E = Extension module VEM 2 | | | | |
|---|------------|------------------------|-----------------------------|--|
| Recognizing module | Error code | Additional information | Description | Action |
| A | 90 | | Low pressure at cylinder 1. | Check the gas supply (tank, pressure regulator). If the error persists, notify ERBE Service. |
| A | 91 | | Low pressure at cylinder 2. | Check the gas supply (tank, pressure regulator). If the error persists, notify ERBE Service. |
| A | A0 | | | Restart the unit. If the error occurs again, notify ERBE Service. |

B-Errors

| Recognizing module: B = Control panel | | | | |
|---------------------------------------|--------------------|------------------------|---|--|
| Recognizing module | Error code | Additional information | Description | Action |
| B | 02 + 03 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| B | 05 (as to 1.1.x) | | NESSY message; NE is not correctly applied: Occurs if measurement of the NE contact resistance is outside the valid range on activation. | Check the NE accessories and NE setting in setup. |
| B | 0B (as from 1.2.x) | | NESSY message; NE is not correctly applied: Occurs if measurement of the NE contact resistance is outside the valid range on activation. | Check the NE accessories and NE setting in setup. |
| B | 10 | | Please terminate activation: Occurs if activation has been automatically terminated (e.g. by AutoStop) and the activation signal remains (longer than 5 s) (e.g. footswitch). | Check the accessories. If the error persists, notify ERBE Service. |
| B | 14 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| B | 17 | | Double activation: Occurs if two activation signals (e.g. both pedals of a footswitch) are present simultaneously (within 100 ms). | Check the accessories. If the error persists, notify ERBE Service. |
| B | 19 | | PowerFail: Occurs if a PowerFail signal is received but the PowerFail does not actually happen within 2 s. | Check the supply input voltage. |

| Recognizing module: B = Control panel | | | | |
|---------------------------------------|------------|------------------------|--|--|
| Recognizing module | Error code | Additional information | Description | Action |
| B | 1C | | The maximum ON time has been exceeded: Occurs if activation lasts longer than the ON time selected in Setup. | Check the accessories. If the error persists, notify ERBE Service. |
| B | 1E | | Keyboard error: Occurs if a button pressed is recognized during initialization. | Check the keyboard. |
| B | 1F | | NESSY symmetry monitoring: Occurs if an error is signaled by the Nessy symmetry monitoring during activation. | Check the NE accessories. |
| B | 2A–2C | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| B | 50 – 59 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| B | 5A | | Error in the version check: Occurs if the VEM module attempts to log with an invalid version. | Remove the module concerned from the unit and notify ERBE Service. |
| B | 5B | | Error in the version check: Occurs if the IES module attempts to log with an invalid version. | Remove the module concerned from the unit and notify ERBE Service. |
| B | 5C | | Error in the version check: Occurs if the EIP module attempts to log with an invalid version. | Remove the module concerned from the unit and notify ERBE Service. |
| B | 5D | | Error in the version check: Occurs if a dual-pedal footswitch attempts to log with an invalid version. | Remove the module concerned from the unit and notify ERBE Service. |
| B | 5E | | Error in the version check: Occurs if a single-pedal footswitch attempts to log with an invalid version. | Remove the module concerned from the unit and notify ERBE Service. |

| Recognizing module: B = Control panel | | | | |
|---------------------------------------|------------|------------------------|---|--|
| Recognizing module | Error code | Additional information | Description | Action |
| B | 5F | | Error in the version check: Occurs if a ReMode footswitch attempts to log with an invalid version. | Remove the module concerned from the unit and notify ERBE Service. |
| B | 60 | | Error in the version check: Occurs if an IES footswitch attempts to log with an invalid version. | Remove the module concerned from the unit and notify ERBE Service. |
| B | 81 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| B | 84 | | Footswitch was recognized by the system: Occurs if a footswitch is connected. | Information, no fault condition. |
| B | 85 | | Footswitch was disconnected from the system: Occurs if a footswitch is disconnected from the system. | Information, no fault condition. |
| B | 87 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| B | 8B | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| B | 8D | | No status message from APC module: Occurs if an APC module is disconnected from the system. | Check connectors. Check APC. |
| B | 8E + 8F | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| B | 90 | | | Restart the unit. If the error occurs again, notify ERBE Service. |

| Recognizing module: B = Control panel | | | | |
|---------------------------------------|------------|------------------------|--|--|
| Recognizing module | Error code | Additional information | Description | Action |
| B | 91 | | No status message from IES module: Occurs if the IES module is disconnected from the system. | Check connectors. Check IES 2. |
| B | 95 | | New instrument recognized by system: Occurs if an instrument with instrument recognition is connected. | Information, no fault condition. |
| B | 9F | | Instrument has been disconnected from the system: Occurs if an instrument with instrument recognition is disconnected from the system. | Information, no fault condition. |
| B | A0 | | No other mode can be set for this instrument: Occurs if the user wants to assign a different mode to an instrument with a fixed mode. | Information, no fault condition. |
| B | A3 | | Footswitch not assigned: Occurs if a footswitch which has not been assigned to an output receptacle is pressed. | Assign the footswitch activation. |
| B | A4 | | Two footswitches are connected: Occurs if two footswitches of the same type are connected. | Remove the duplicate footswitch from the unit. |
| B | AA | | No valid mode is assigned: Occurs if an output channel is activated without a mode being assigned to it. | Information, no fault condition. |
| B | AB | | Activation is only possible with a valid instrument: Occurs if a MF receptacle is activated at which no instrument is recognized. | Check the accessories. If the error persists, notify ERBE Service. |

| Recognizing module: B = Control panel | | | | |
|---------------------------------------|------------|------------------------|---|--|
| Recognizing module | Error code | Additional information | Description | Action |
| B | B0 | | NESSY symmetry warning: Occurs if the Nessy symmetry monitoring signals a value between 20 % and 50 %. | Check the NE accessories. |
| B | B1 | | NESSY current density warning: Occurs if the Nessy current density monitoring signals a value above the limit curve. | Check the NE accessories. |
| B | C4 | | Purge function not assigned: Occurs if the purge button on the APC is pressed and no APC receptacle was selected. | Information, no fault condition. |
| B | C5 | | Purge function not assigned: Occurs if the Purge button on the APC is pressed and no instrument is connected. | Information, no fault condition. |
| B | D2 | | No status message from VEM module: Occurs if the VEM module is disconnected from the system. | Information, no fault condition. |
| B | D3 | | No status message from EIP module: Occurs if the EIP module is disconnected from the system. | Information, no fault condition. |
| B | D4 – D6 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| B | DA | | Occurs if a module responds that is not supported by the system. | Remove the module concerned from the unit and notify ERBE Service. |
| B | DB | | Occurs if a button that is not selectable is pressed (after a timeout). | Remove the module concerned from the unit and notify ERBE Service. |

| Recognizing module: B = Control panel | | | | |
|---------------------------------------|------------|------------------------|---|---|
| Recognizing module | Error code | Additional information | Description | Action |
| B | DC | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| B | EA | | Module was recognized: Occurs if a module is recognized. | Information, no fault condition. |
| B | EB | | Receptacle was recognized: Occurs if a receptacle is recognized. | Check and save the receptacle configuration in the "Version List" test program. If the error occurs again, notify ERBE Service. |

C-Errors

| Recognizing module: C = CPU + Sensors | | | | |
|---------------------------------------|------------|------------------------|-------------|---|
| Recognizing module | Error code | Additional information | Description | Action |
| C | 01 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | 04 – 06 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | 0D | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | 21 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | 26 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | 30 – 38 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | 41 – 48 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | 51 – 58 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | 5A + 5B | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | 61 – 64 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | 70 – 72 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | 75 | | | Restart the unit. If the error occurs again, notify ERBE Service. |

| Recognizing module: C = CPU + Sensors | | | | |
|---------------------------------------|------------|------------------------|-------------|---|
| Recognizing module | Error code | Additional information | Description | Action |
| C | 7D – 7F | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | 81 – 84 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | 91 + 92 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | A0 + A1 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | C0 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| C | F0 | | | Restart the unit. If the error occurs again, notify ERBE Service. |

D-Errors

| Recognizing module: D = Smoke evacuation system IES 2 | | | | |
|---|------------|------------------------|--------------------------------------|---|
| Recognizing module | Error code | Additional information | Description | Action |
| D | 80 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| D | 81 | | Excess temperature (> 60 °C). | Overtemperature IES2: Let the unit cool down. |
| D | 82 | | Insufficient temperature (< 0 °C). | Undertemperature IES2: Leave unit on for several minutes without operating. |
| D | 83 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| D | 86 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| D | 87 | | Obstruction. | Remove the suction tube from the tissue. |
| D | 88 | | The filter is missing or obstructed. | Insert or replace the filter. |

Err-Errors

| Err = Error display on the seven-segment displays | | |
|---|-------------|---|
| Display | Description | Action |
| ErrdIS | | Restart the unit. If the error occurs again, notify ERBE Service. |
| ErrtAS | | Restart the unit. If the error occurs again, notify ERBE Service. |

F-Errors

| Recognizing module: F = Footswitch | | | | |
|------------------------------------|------------|------------------------|--|------------------------------|
| Recognizing module | Error code | Additional information | Description | Action |
| F | 01 | | CRC error: Occurs if an error is detected during CRC monitoring of the footswitch at start-up (e.g. bit failure in the Flash memory or error when downloading software). | Replace the ECBS footswitch. |

2,3,5,6-Errors

| Recognizing module: 2,3,5,6 = IIF (Instrument Interface) of corresponding receptacle slot | | | | |
|---|------------|------------------------|--|--|
| Recognizing module | Error code | Additional information | Description | Action |
| 2,3,5,6 (Buchse) | 01 – 07 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 08 | | Overcurrent activation recognition: The measurement current for analysis of the activation recognition is too high. | Check the accessories. If the error persists, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 09 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 0A | | Overcurrent instrument recognition: The measurement current for analysis of the instrument recognition is too high. | Check the accessories. If the error persists, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 0C – 0E | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 0F | | U Coag error: +12 V voltage during Coag activation too low. | Check the accessories. If the error persists, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 70 – 72 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 81 | | Short circuit instrument recognition R: The resistor value determined for the instrument recognition corresponds to a short circuit. | Check the accessories. If the error persists, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 82 | | Short circuit activation recognition R_NEU: The resistor value determined for the activation recognition corresponds to a short circuit. | Check the accessories. If the error persists, notify ERBE Service. |

| Recognizing module: 2,3,5,6 = IIF (Instrument Interface) of corresponding receptacle slot | | | | |
|---|------------|------------------------|---|--|
| Recognizing module | Error code | Additional information | Description | Action |
| 2,3,5,6 (Buchse) | 83 | | No-load activation recognition R_NEU: The resistor value determined for the activation recognition corresponds to no-load. | Check the accessories. If the error persists, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 84 | | Instrument recognition R-window violated: The resistor value determined for the instrument recognition cannot be reliably assigned to a setpoint. | Check the accessories. If the error persists, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 85 | | Short circuit activation recognition R_ALT: The resistor value determined for the activation recognition corresponds to a short circuit. | Check the accessories. If the error persists, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 86 | | Activation error: Activation not consistent with instrument type. | Check the accessories. If the error persists, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 87 – 89 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 8A – 8F | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| 2,3,5,6 (Buchse) | 90 | | | Restart the unit. If the error occurs again, notify ERBE Service. |

4 (NE)-Errors

| Recognizing module: 4 (NE) = Nussy2 | | | | |
|-------------------------------------|------------|------------------------|-------------|---|
| Recognizing module | Error code | Additional information | Description | Action |
| 4 (NE) | 01 – 08 | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| 4 (NE) | 0C – 0E | | | Restart the unit. If the error occurs again, notify ERBE Service. |
| 4 (NE) | 10 + 11 | | | Restart the unit. If the error occurs again, notify ERBE Service. |

9-Errors

| Recognizing module: 9 = ERBE Irrigation Pump EIP 2 | | | | |
|--|------------|--|--|--|
| Recognizing module | Error code | Additional information | Description | Action |
| 9 | 80 | CRC Error. | | Restart the unit. If the error occurs again, notify ERBE Service. |
| 9 | 82 | Pump lid open at ON. | User error: The pump lid of the EIP 2 is not closed at the start of activation or is opened during activation. | Close the pump lid before activation or do not open it during activation. |
| | | | Unit error. | Restart the unit. If the error occurs again, notify ERBE Service. |
| 9 | 84 | Time Out Error. | User error: Activation of the EIP 2 was maintained for more than 20 seconds. Maximum activation time for the EIP 2 is 20 seconds. | End the activation. It is then possible to activate the EIP 2 new. If the error occurs again, check the accessories. |
| 9 | 88 | UeWS Error | | Restart the unit. If the error occurs again, notify ERBE Service. |
| 9 | 90 | No current or no load. | | Restart the unit. If the error occurs again, notify ERBE Service. |
| 9 | A0 | Current too high at ON. | | Restart the unit. If the error occurs again, notify ERBE Service. |
| 9 | C0 | Motor control faulty (voltage too high at ON). | | Restart the unit. If the error occurs again, notify ERBE Service. |

CHAPTER 7

Maintenance and servicing

Who is allowed to perform servicing and maintenance work?

ATTENTION! Adjustments, tests, modifications, maintenance and repair work may only be performed by ERBE or persons trained by ERBE. If the work is not performed by trained persons, ERBE accepts no liability and warranty rights become void.

It is recommended that the safety check also be performed by ERBE or persons trained by ERBE.

What is a safety check?

IMPORTANT! The safety check is a preventive measure to examine whether the device is safe and ready for operation. In order to perform the various tests the current specifications and regulations of the particular country and the instructions in this service manual must be observed.

How often does a safety check have to be performed?

IMPORTANT! ERBE recommends performing a safety check after every repair, but at least once a year.

Safety check – step by step

For simplification the device to be tested is referred to below as the "test specimen".

Safety information

WARNING! || For safety reasons (personnel protection) the test specimen should generally be operated by a suitable isolating transformer. An exceptional case is the tests for grounded conductor resistance, ground leakage current, and patient leakage current, in which the test specimen is supplied with current via the safety tester.

ATTENTION! || In the event of a fault occurring in the test specimen or individual components during the safety check the test steps taken so far no longer apply. Remedy the defect and repeat the safety check from the beginning.

ATTENTION! || The specifications made in this chapter for test programs / test program settings allow the service technician to perform the safety check. In addition, the test program mode provides a number of diagnostic and inspection options for the service technician. They are described in the repair manual. ERBE Elektromedizin expressly states that the full functional range of the test program mode may not be used without precise knowledge of the individual test programs.

IMPORTANT! || It is assumed that the user knows how to operate the test specimen, the test equipment, the measuring equipment, and auxiliary test equipment. The test instructions only apply in conjunction with the relevant test steps.

IMPORTANT! || Test equipment, measuring equipment, and auxiliary test equipment (cables, test boxes, etc.) are listed separately at the beginning of each test unit. Where ERBE article numbers are specified, only original ERBE test equipment, measuring equipment, and auxiliary test equipment may be used.

IMPORTANT! || The test report for the safety check can be requested from ERBE Technical Service Tübingen. For the address see address sheet on last page.

Testing and measuring equipment

IMPORTANT! The following list contains the testing and measuring equipment recommended by ERBE for servicing. Where ERBE article numbers are specified, only original ERBE testing and measuring equipment should be used.

| ERBE Art. No. | Description |
|---------------|---|
| – | Safety tester (with insulation testing >500 V DC) |
| – | HF power meter (recommended: Metron QA-ES) |
| – | Oscilloscope, 100 MHz or higher (recommended: Tektronix TDS 1012) |
| – | High Voltage Differential Probe (recommended: TESTTEC TT-SI 9010, Tektronix P5210 or Sapphire SI-9010) |
| 20188-100 | Single-pedal footswitch |
| 20189-100 | Dual-pedal footswitch |
| 20190-045 | Electrode handle ICC/ACC |
| 20192-127 | Patient cable AE |
| 20192-110 | Patient cable AE, international |
| 20196-045 | Bipolar cable |
| 20196-053 | Bipolar cable, international |
| 20100-034 | Adapter cable bipolar |
| 20194-070 | Patient cable NE |
| 20194-075 | Patient cable NE, international |
| 20100-033 | Adapter cable NE |
| 20100-035 | Cable LF – leakage current |
| 20100-038 | Cable LF – leakage current, international |
| 20100-101 | VIO Testbox Symmetry/Resistance (NE asymmetry/critical resistance) |
| 20100-102 | VIO Testbox Auto Start/Auto Stop (bipolar start/stop) |
| 20100-019 | Testbox spark monitor, 230 V |

User manual and visual inspections

- Test specimen and accessories (where enclosed) undamaged externally.
- User manual present.
- All labels on the test specimen (conformity declaration mark, rating plate, and all wording) present and readily legible.

Tests to be conducted in accordance with the national specifications and regulations

Grounded conductor test

- Ground terminal to chassis.
- Ground terminal to potential equalization pin.

Ground leakage current measurement

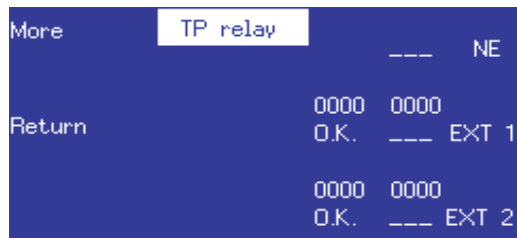
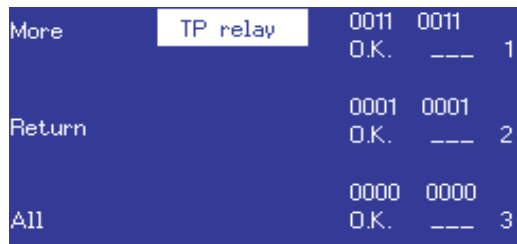
- Ground leakage current, normal condition (N.C.).
- Ground leakage current, single-fault condition (S.F.C.).

Patient leakage current measurement

- Patient leakage current, normal condition (N.C.).
- Patient leakage current, single-fault condition (S.F.C.).

IMPORTANT! Close the output relay of the unit in the "TP relay" test program for testing the patient leakage current. On the test specimen:

1. Call up service level (see page 20).
2. Select the "Test programs" setting and press the adjacent button to call it up. The test specimen switches to the test program mode.
3. Select the "TP relay" test program and press the adjacent button to call it up.



4. Close all relays in the test program via "All":
 - ----- Relays closed
 - --/-- Relays open
5. Perform the measurement.
6. Switch the test specimen off.

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DC resistance

Testing and measuring equipment

| ERBE Art. No. | Description |
|---------------|---|
| 20192-127 | Patient cable AE |
| | or |
| 20192-110 | Patient cable AE, international |
| 20190-045 | Electrode handle ICC/ACC |
| 20194-070 | Patient cable NE |
| | or |
| 20194-075 | Patient cable NE, international |
| 20100-033 | Adapter cable NE |
| – | Safety tester (with insulation testing >500 V DC) |

Test setup

WARNING! Across the measuring lines there is the DC voltage of 500 V! In order to avoid injuries, only switch on the test specimen and safety tester when all the electrical connections have been made.

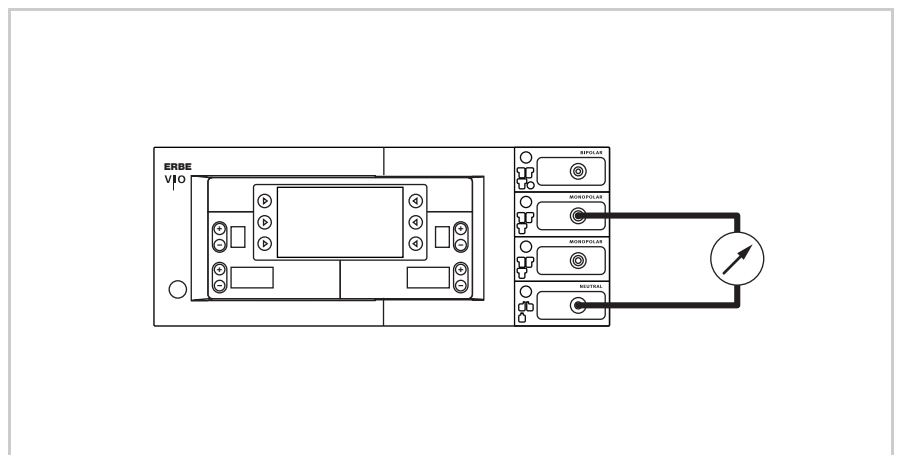


Fig. 7-1

- The test specimen is connected to the power supply via the power cord.
- The NE receptacle of the test specimen is connected to the safety tester via the patient cable with NE with the adapter cord.
- The AE receptacle of the test specimen is connected to the safety tester via the patient cable with AE and electrode handle with the laboratory cable.

Test procedure

1. Start safety tester in the "Insulation resistance" function. The measured value displayed should be >200 MOhm.
2. Start test specimen and select the test program "TP relay".
3. In the test program "TP relay" use "All" to switch through all the output relays on the test specimen. When doing so the measured value displayed on the safety tester must drop significantly from >200 MOhm.
4. Determine insulation resistance using the safety tester. The measured value must be >2 MOhm.
5. Document the measured value.

Performance tests**Testing and measuring equipment**

| ERBE Art. No. | Description |
|------------------|---------------------------------|
| 20189-100 | Dual-pedal footswitch |
| 20194-070 | Patient cable NE or |
| 20194-075 | Patient cable NE, international |
| 20100-033 | Adapter cable NE |

Art-Nr.: 80116-284
02.08**Test setup**

- The test specimen is connected to the power supply via the power cord.
- The dual-pedal footswitch is connected.
- The NE patient cable with the shorted adapter cable is connected to the NE receptacle on the test specimen.

Test procedure**Power switch**

1. Check power switch for smooth operation. The power switch must be easy to operate and must neither stick nor scrape.
2. Press power switch. The power switch must snap into the "ON" position and the test specimen must perform a system start.

**Start routine /
acknowledgement tone**

1. The test specimen must perform the system start without error message(s).
2. The test specimen must emit an acoustic signal (acknowledgement tone) during the self-test.

- Pushbuttons / acknowledgement tone when pressed**
1. Check all the pushbuttons (focus buttons, selection buttons, +/- buttons) on the test specimen to make sure they are working properly. Press each button at least twice. When pressing the buttons there must be an acoustic signal every time (= acknowledgement tone).
- Software download**
1. Document whether a software update was performed.
- Neutral electrode setting**
1. Call up service level (see page 20).
 2. Then call up the neutral electrode setting and document the existing setting.
- Date and time**
1. Remain in the Service level.
 2. Then call up the date and time settings one after the other, check the existing settings, and correct them if required.
- Display / LEDs**
- Display:
1. Check the backlighting of the display to make sure it is operating properly. If backlighting is faulty, no image will be visible.
- LEDs:
1. Upon system start all the LEDs and seven-segment displays must light up briefly with equal brightness. In the case of the neutral electrode receptacle red and green must light up briefly one after the other.
- Activation tones**
1. Press CUT pedal on the dual-pedal footswitch at least twice. When pressing the pedal there must be an acoustic signal every time (= acknowledgement tone).
 2. Press COAG pedal on the dual-pedal footswitch at least twice. When pressing the pedal there must be an acoustic signal every time (= acknowledgement tone).

Footswitch activation

Testing and measuring equipment

| ERBE Art. No. | Description |
|------------------|---------------------------------|
| 20188-100 | Single-pedal footswitch |
| 20189-100 | Dual-pedal footswitch |
| 20194-070 | Patient cable NE or |
| 20194-075 | Patient cable NE, international |
| 20100-033 | Adapter cable NE |

Test setup

- The test specimen is connected to the power supply via the power cord.
- On the test specimen the basic program is selected.
- The single-pedal footswitch is connected.
- The dual-pedal footswitch is connected.
- The NE patient cable with the shorted adapter cable is connected to the NE receptacle on the test specimen.

Test procedure

Single-pedal footswitch activation COAG

1. Assign the single-pedal footswitch to any receptacle.
2. Press COAG pedal on the single-pedal footswitch. On the test specimen COAG must be activated.

Dual-pedal footswitch activation CUT / COAG

1. Assign the dual-pedal footswitch to any receptacle.
2. Press CUT pedal on the dual-pedal footswitch. On the test specimen CUT must be activated.
3. Press COAG pedal on the dual-pedal footswitch. On the test specimen COAG must be activated.

Fingerswitch activation

Testing and measuring equipment

| ERBE Art. No. | Description |
|------------------|---------------------------------|
| 20192-127 | Patient cable AE |
| | or |
| 20192-110 | Patient cable AE, international |
| 20190-045 | Electrode handle ICC/ACC |
| 20194-070 | Patient cable NE |
| | or |
| 20194-075 | Patient cable NE, international |
| 20100-033 | Adapter cable NE |

Test setup

- The test specimen is connected to the power supply via the power cord.
- On the test specimen the basic program is selected.
- The NE patient cable with the shorted adapter cable is connected to the NE receptacle on the test specimen.

Test procedure

20190-045 Activation CUT / COAG

1. Connect the electrode handle with the AE patient cable to the 1st Monopolar receptacle on the test specimen.
2. Press CUT button on the electrode handle. On the test specimen CUT must be activated.
3. Press COAG button on the electrode handle. On the test specimen COAG must be activated.
4. Connect the electrode handle with the AE patient cable to the 2nd Monopolar receptacle (if present) on the test specimen.
5. Repeat test steps 2 and 3.

Automatic start mode

Testing and measuring equipment

| ERBE Art. No. | Description |
|---------------|---|
| 20196-045 | Bipolar cable or |
| 20196-053 | Bipolar cable, international |
| 20100-034 | Adapter cable bipolar |
| 20100-102 | VIO Testbox Auto Start/Auto Stop (bipolar start/stop) |

Test setup

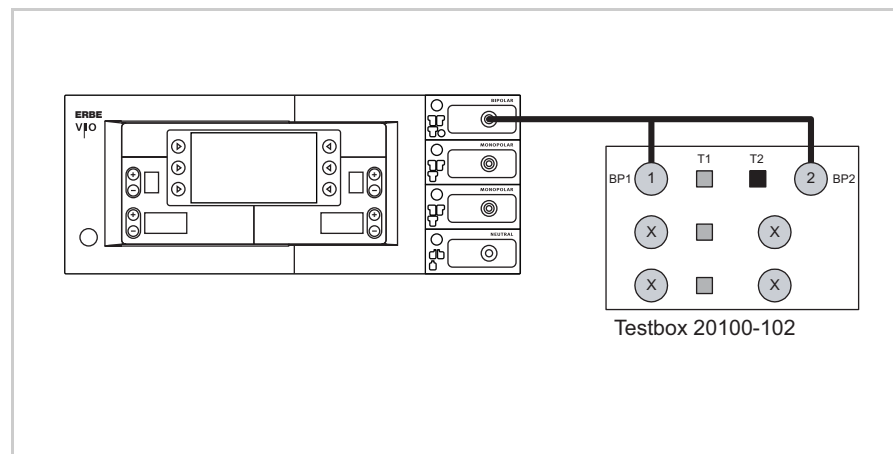


Fig. 7-2

- The test specimen is connected to the power supply via the power cord.
- The Bipolar receptacle of the test specimen is connected to the VIO Testbox via the bipolar cable with the adapter cable.

Test procedure

1st test step

1. In the Setup of the test specimen establish the set start delay for the AUTO START setting. Make a note of the value.
2. Set test specimen to:
BIPOLAR SOFT, Effect 1, 50 W
AUTO START
3. On the VIO Testbox press button T1. The test specimen must start activation after the set start delay.
4. Press button T2. The test specimen must terminate activation.

- 2nd test step**
1. Set test specimen to:
BIPOLAR SOFT, Effect 8, 50 W
AUTO START
 2. On the VIO Testbox press button T1. The test specimen must start activation after the set start delay.
 3. Press button T2. The test specimen must terminate activation.

Automatic stop mode

Testing and measuring equipment

| ERBE Art. No. | Description |
|---------------|---|
| 20196-045 | Bipolar cable or |
| 20196-053 | Bipolar cable, international |
| 20100-034 | Adapter cable bipolar |
| 20100-102 | VIO Testbox Auto Start/Auto Stop (bipolar start/stop) |
| 20188-100 | Single-pedal footswitch |

Test setup

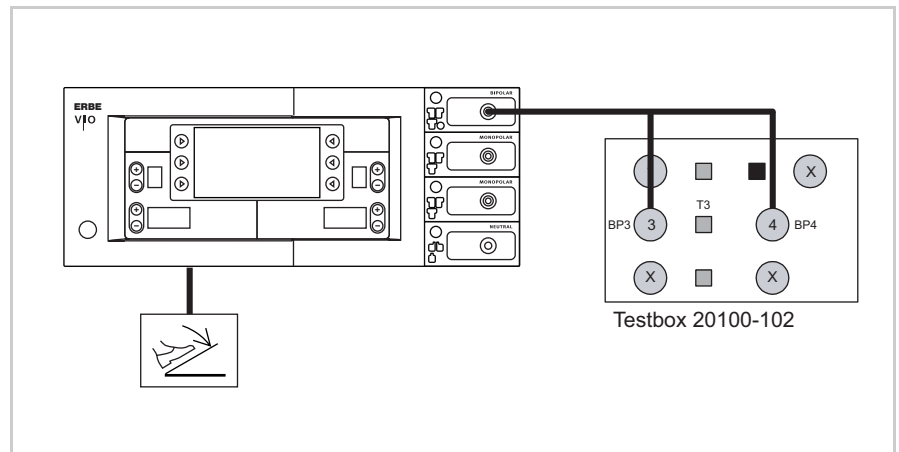


Fig. 7-3

- The test specimen is connected to the power supply via the power cord.
- The Bipolar receptacle of the test specimen is connected to the VIO Testbox via the bipolar cable with the adapter cable.
- The single-pedal footswitch is connected.

Test procedure

1. Set test specimen to:
BIPOLAR SOFT with AutoStop, Effect 4, 50 watts
2. On the VIO Testbox hold down button T3.
3. Activate BIPOLAR SOFT with the footswitch, keeping the pedal pressed.
4. Hold down button T3 for approx. 5 s, then let go. Within another 9 s at the latest the test specimen must terminate activation and emit two brief signal tones.

Spark monitor

Testing and measuring equipment

| ERBE Art. No. | Description |
|---------------|---------------------------------------|
| 20192-127 | Patient cable AE |
| 20192-110 | or Patient cable AE, international |
| 20190-045 | Electrode handle ICC/ACC |
| 20194-070 | Patient cable NE |
| 20194-075 | or Patient cable NE, international |
| 20100-033 | Adapter cable NE |
| 20100-019 | Testbox spark monitor, 230 V |

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Test setup

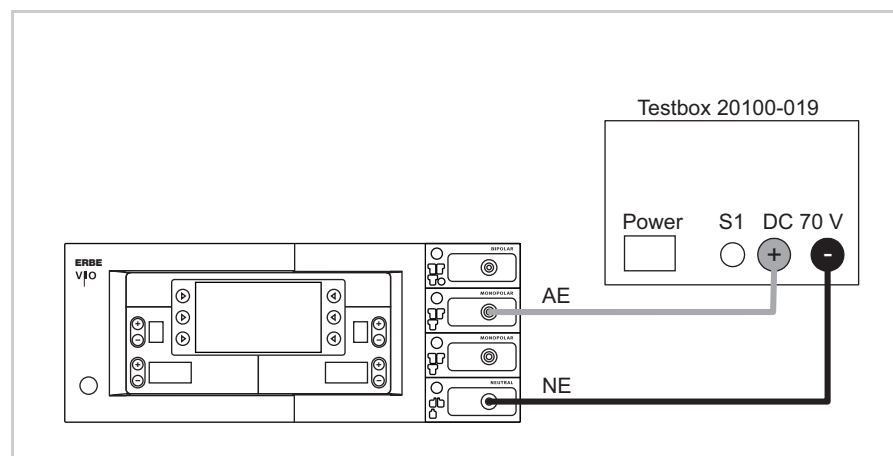


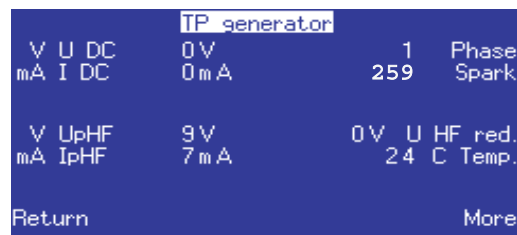
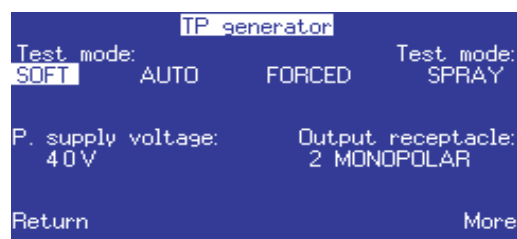
Fig. 7-4

- The test specimen is connected to the power supply via the power cord.
- The test specimen is connected to the testbox.

Test procedure

Call up Test program mode

1. Call up service level (see page 20).
2. Select the "Test programs" setting and press the adjacent button to call it up. The test specimen switches to the test program mode.
3. Select the "TP generator" test program and press the adjacent button to call it up.



4. Select the receptacle on which to measure in the test program under "Output receptacle" (select here: 2 = receptacle slot, MONOPOLAR = arrangement with monopolar receptacle).

Measurement

1. On the Testbox press button S1.
2. In the test program read off the measured value for "Spark". The tolerance range is 245 to 285 ERBE.

HF power output CUT

Testing and measuring equipment

| ERBE Art. No. | Description |
|---------------|---------------------------------|
| 20192-127 | Patient cable AE or |
| 20192-110 | Patient cable AE, international |
| 20190-045 | Electrode handle ICC/ACC |
| 20194-070 | Patient cable NE or |
| 20194-075 | Patient cable NE, international |
| 20100-033 | Adapter cable NE |
| 20196-045 | Bipolar cable or |
| 20196-053 | Bipolar cable, international |
| 20100-034 | Adapter cable bipolar |
| – | HF power meter |
| 20189-100 | Dual-pedal footswitch |

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AUTO CUT DRY CUT

Test setup

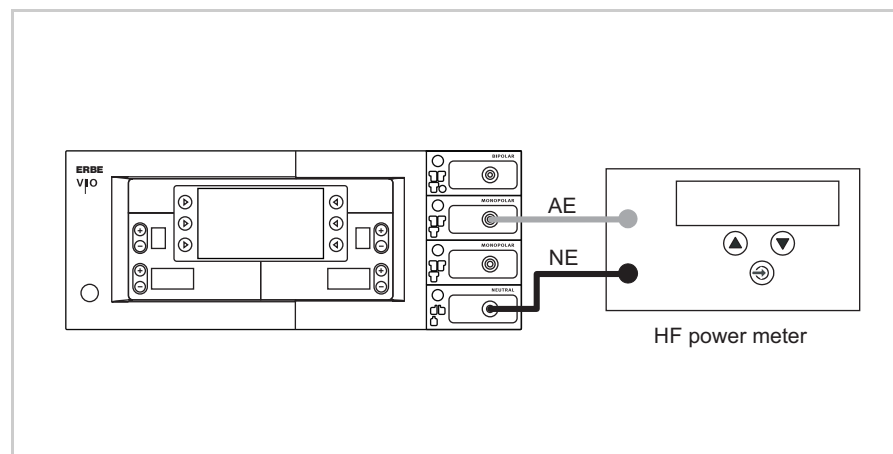


Fig. 7-5

- The test specimen is connected to the power supply via the power cord.
- The levels of power are determined with the HF power meter. The measuring cables are plugged into the HF power meter direct.

Test procedure VIO 200 S

1. Set test specimen to:
AUTO CUT, Effect 8, 200 watts
2. Set HF power meter to:
RL = 500 ohms
3. Activate test specimen via CUT button on the electrode handle.
4. Determine and document measured value. The tolerance range is 160 to 240 watts.

Test procedure VIO 300 S

1. Set test specimen to:
AUTO CUT, Effect 8, 300 watts
2. Set HF power meter to:
RL = 500 ohms
3. Activate test specimen via CUT button on the electrode handle.
4. Determine and document measured value. The tolerance range is 240 to 360 watts.

1. Set test specimen to:
DRY CUT, Effect 8, 200 watts
2. Set HF power meter to:
RL = 500 ohms
3. Activate test specimen via CUT button on the electrode handle.
4. Determine and document measured value. The tolerance range is 160 to 240 watts.

BIPOLAR CUT
(depending on the
unit variant)

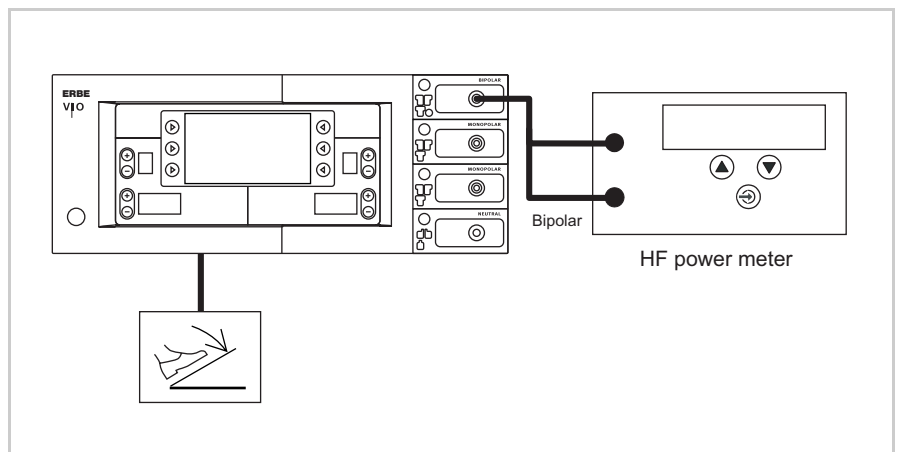
Test setup

Fig. 7-6

- The test specimen is connected to the power supply via the power cord.
- The levels of power are determined with the HF power meter. The measuring cables are plugged into the HF power meter direct.
- The dual-pedal footswitch is connected.

Test procedure

1. Set test specimen to:
BIPOLAR CUT, Effect 8, 100 watts
2. Set HF power meter to:
RL = 500 ohms
3. Activate test specimen via CUT pedal on the footswitch.
4. Determine and document measured value. The tolerance range is 80 to 120 watts.

HF power output COAGULATE**Testing and measuring equipment**

| ERBE Art. No. | Description |
|------------------|---------------------------------|
| 20192-127 | Patient cable AE or |
| 20192-110 | Patient cable AE, international |
| 20190-045 | Electrode handle ICC/ACC |
| 20194-070 | Patient cable NE or |
| 20194-075 | Patient cable NE, international |
| 20100-033 | Adapter cable NE |
| 20196-045 | Bipolar cable or |
| 20196-053 | Bipolar cable, international |
| 20100-034 | Adapter cable bipolar |
| – | HF power meter |
| 20189-100 | Dual-pedal footswitch |

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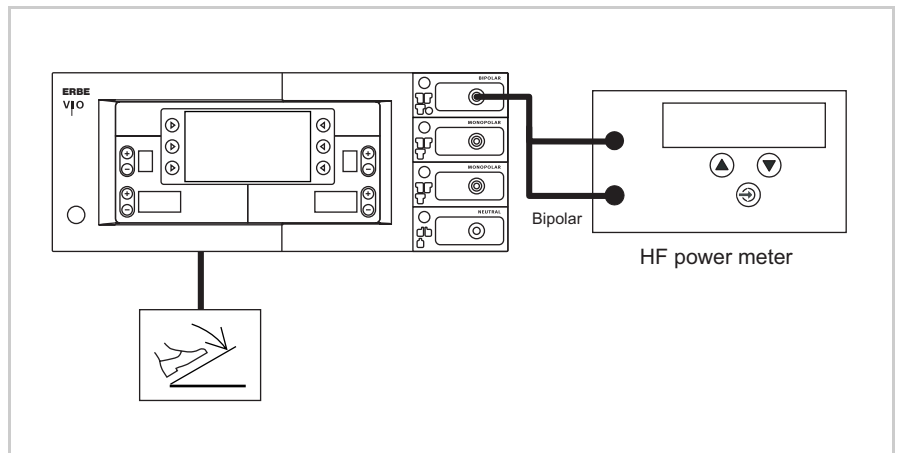
BIPOLAR SOFT COAG Test setup

Fig. 7-7

- The test specimen is connected to the power supply via the power cord.
- The levels of power are determined with the HF power meter. The measuring cables are plugged into the HF power meter direct.
- The dual-pedal footswitch is connected.

Test procedure

1. Set test specimen to:
BIPOLAR SOFT, Effect 8, 120 watts
2. Set HF power meter to:
RL = 75 ohms
3. Activate test specimen via COAG pedal on the footswitch.
4. Determine and document measured value. The tolerance range is 96 to 144 watts.

**SOFT COAG
FORCED COAG
SPRAY COAG (depending on
the unit variant)**

Test setup

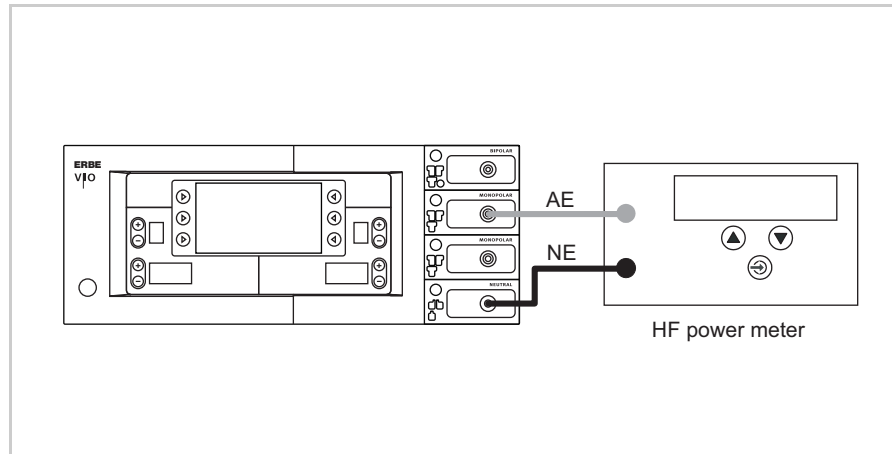


Fig. 7-8

- The test specimen is connected to the power supply via the power cord.
- The levels of power are determined with the HF power meter. The measuring cables are plugged into the HF power meter direct.

Test procedure VIO 200 S

1. Set test specimen to:
SOFT COAG, Effect 8, 120 watts
2. Set HF power meter to:
RL = 50 ohms
3. Activate test specimen via COAG button on the electrode handle.
4. Determine and document measured value. The tolerance range is 96 to 144 watts.

1. Set test specimen to:
FORCED COAG, Effect 4, 120 watts
2. Set HF power meter to:
RL = 500 ohms
3. Activate test specimen via COAG button on the electrode handle.
4. Determine and document measured value. The tolerance range is 96 to 144 watts.

Test procedure VIO 300 S

1. Set test specimen to:
SOFT COAG, Effect 8, 200 watts
2. Set HF power meter to:
RL = 50 ohms
3. Activate test specimen via COAG button on the electrode handle.
4. Determine and document measured value. The tolerance range is 160 to 240 watts.

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1. Set test specimen to:
FORCED COAG, Effect 4, 120 watts
 2. Set HF power meter to:
RL = 500 ohms
 3. Activate test specimen via COAG button on the electrode handle.
 4. Determine and document measured value. The tolerance range is 96 to 144 watts.
1. Set test specimen to:
SPRAY COAG, Effect 2, 120 watts
 2. Set HF power meter to:
RL = 500 ohms
 3. Activate test specimen via COAG button on the electrode handle.
 4. Determine and document measured value. The tolerance range is 96 to 144 watts.

Performance test upgrades

Testing and measuring equipment

| ERBE Art. No. | Description |
|------------------|---------------------------------|
| 20192-127 | Patient cable AE |
| | or |
| 20192-110 | Patient cable AE, international |
| 20190-045 | Electrode handle ICC/ACC |
| 20194-070 | Patient cable NE |
| | or |
| 20194-075 | Patient cable NE, international |
| 20100-033 | Adapter cable NE |
| – | HF power meter |
| – | Oscilloscope |
| – | Probe 100:1 |

ENDO CUT I and Q Test setup

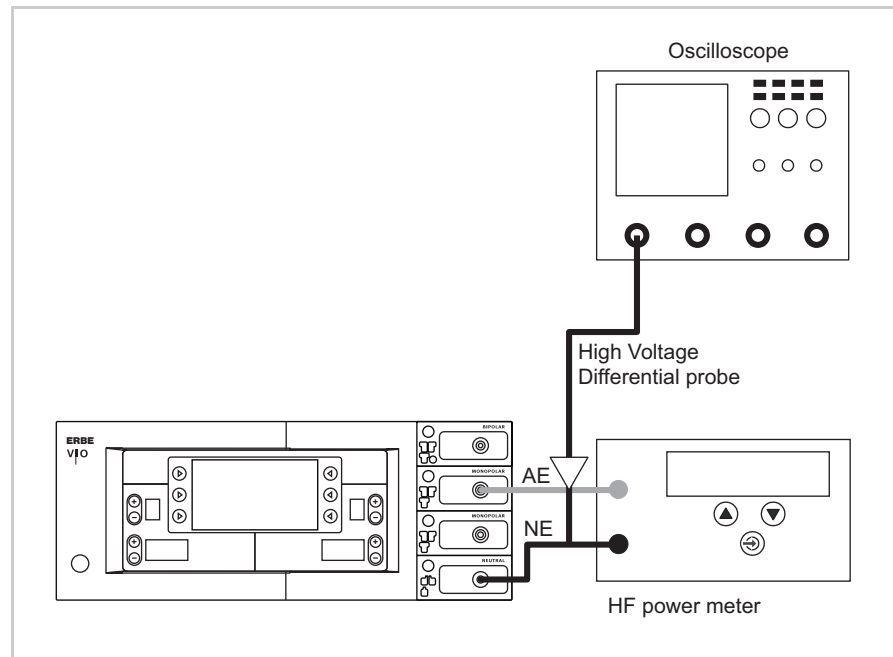


Fig. 7-9

- The test setup is designed as shown in the illustration above.
- The test specimen is connected to the power supply via the power cord.
- The levels of power are determined with the HF power meter. The measuring cables are plugged into the HF power meter direct.

Test procedure

1. Set test specimen to:
EndoCut I, Effect 1, Cutting duration 1, Cutting interval 1
2. Set HF power meter to:
RL = 1000 ohms
3. Connect the probe of an oscilloscope to AE and NE.
4. Set oscilloscope to:
200 V / Div, 20 ms
5. Activate test specimen via the CUT button on the electrode handle.
6. Determine the duration of the cutting pulse. The tolerance range is 90 to 110 ms.

1. Set test specimen to:
EndoCut Q, Effect 1, Cutting duration 1, Cutting interval 2
2. Set HF power meter to:
RL = 1000 ohms
3. Connect the probe of an oscilloscope to AE and NE.
4. Set oscilloscope to:
200 V/Div, 100 ms
5. Activate test specimen via the CUT button on the electrode handle.
6. Determine the duration of the cutting pulse. The tolerance range is 320 to 380 ms.

Monitor circuits

NE monitoring of critical resistance for single surfaced neutral electrodes

Testing and measuring equipment

| ERBE Art. No. | Description |
|---------------|--|
| 20194-070 | Patient cable NE or |
| 20194-075 | Patient cable NE, international |
| 20100-033 | Adapter cable NE |
| 20100-101 | VIO Testbox Symmetry/Resistance (NE asymmetry/critical resistance) |
| 20189-100 | Dual-pedal footswitch |

Presets on the test specimen

- AUTO CUT, Effect 1, 10 watts.
- Neutral electrode "single surface".

Test set-up and test procedure

1st test step

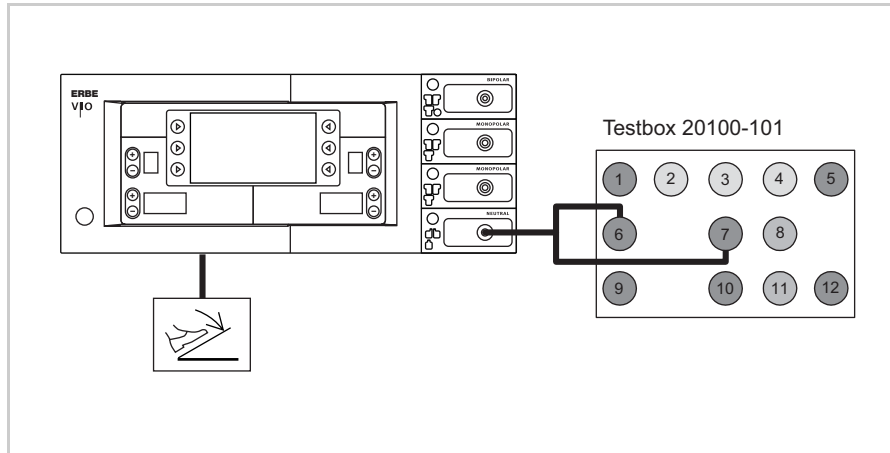


Fig. 7-10

- The test specimen is connected to the power supply via the power cord.
 - The test is performed without a load.
 - The NE receptacle of the test specimen is connected to the VIO Testbox via the patient cable NE with the adapter cable.
 - The dual-pedal footswitch is connected.
1. On the test specimen the (single surfaced) neutral electrode lamp must light up red.
 2. Activate AUTO CUT via the footswitch. The test specimen must inhibit activation and emit or display an optical and acoustic warning.

2nd test step

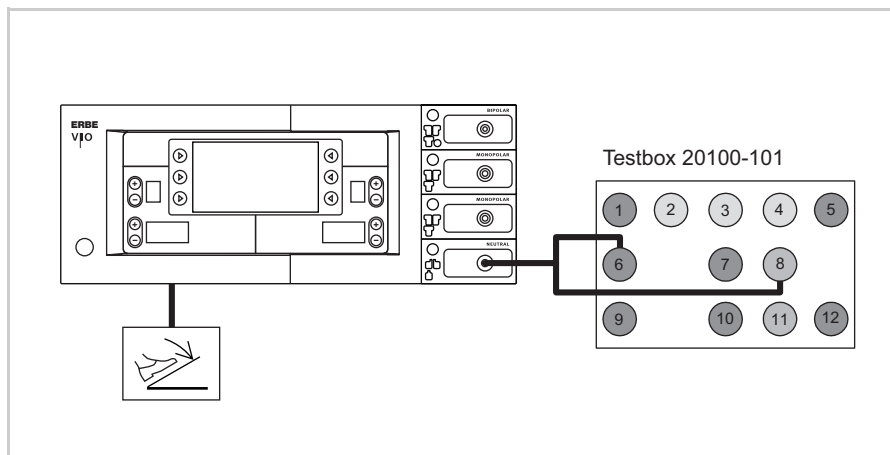


Fig. 7-11

- The test specimen is connected to the power supply via the power cord.
- The test is performed without a load.
- The NE receptacle of the test specimen is connected to the VIO Testbox via the patient cable NE with the adapter cable.
- The dual-pedal footswitch is connected.

1. On the test specimen the (single surfaced) neutral electrode lamp must light up green.
2. Activate AUTO CUT via the footswitch. It must be possible to activate the test specimen without error or warning signals.

NE monitoring of critical resistance for dual surfaced neutral electrodes

Testing and measuring equipment

| ERBE Art. No. | Description |
|---------------|--|
| 20194-070 | Patient cable NE or |
| 20194-075 | Patient cable NE, international |
| 20100-033 | Adapter cable NE |
| 20100-101 | VIO Testbox Symmetry/Resistance (NE asymmetry/critical resistance) |
| 20189-100 | Dual-pedal footswitch |

Presets on the test specimen

- AUTO CUT, Effect 1, 10 watts.
- Neutral electrode "dual surface".

Test set-up and test procedure

1st test step

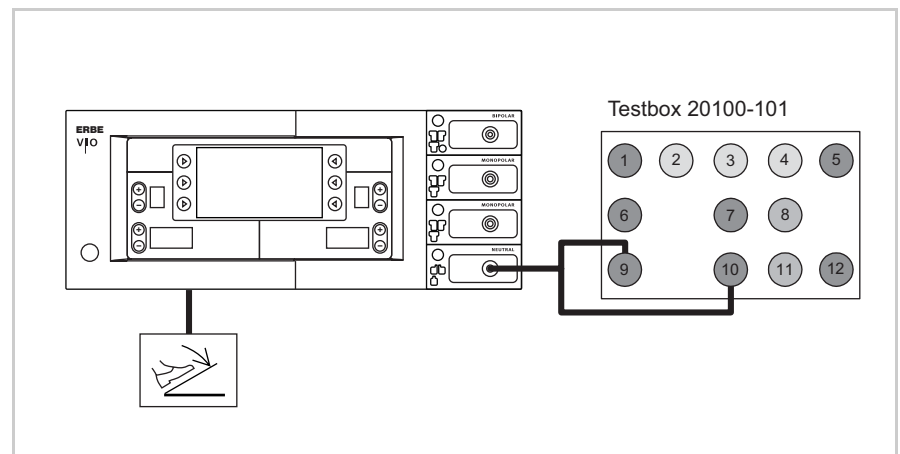


Fig. 7-12

- The test specimen is connected to the power supply via the power cord.
- The test is performed without a load.
- The NE receptacle of the test specimen is connected to the VIO Testbox via the patient cable NE with the adapter cable.
- The dual-pedal footswitch is connected.

1. On the test specimen the (dual surfaced) neutral electrode lamp must light up red.
2. Activate AUTO CUT via the footswitch. The test specimen must inhibit activation and emit or display an optical and acoustic warning.

2nd test step

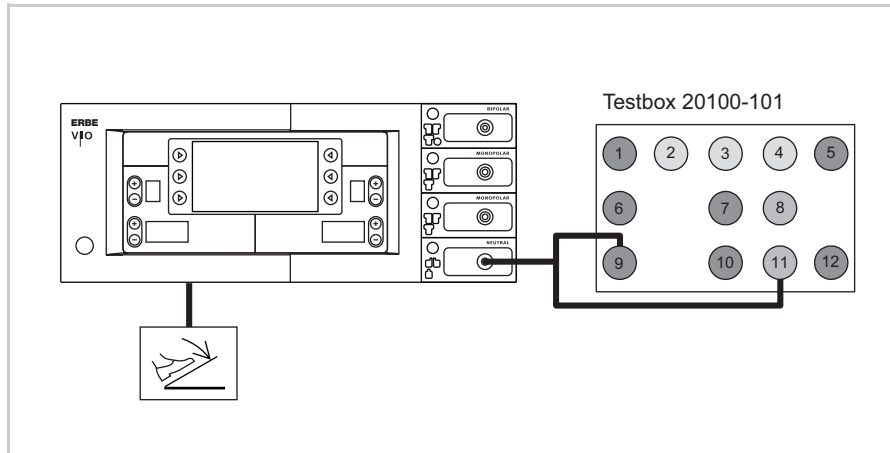


Fig. 7-13

- The test specimen is connected to the power supply via the power cord.
 - The test is performed without a load.
 - The NE receptacle of the test specimen is connected to the VIO Testbox via the patient cable NE with the adapter cable.
 - The dual-pedal footswitch is connected.
1. On the test specimen the (dual surfaced) neutral electrode lamp must light up green.
 2. Activate AUTO CUT via the footswitch. It must be possible to activate the test specimen without error or warning signals.

3rd test step

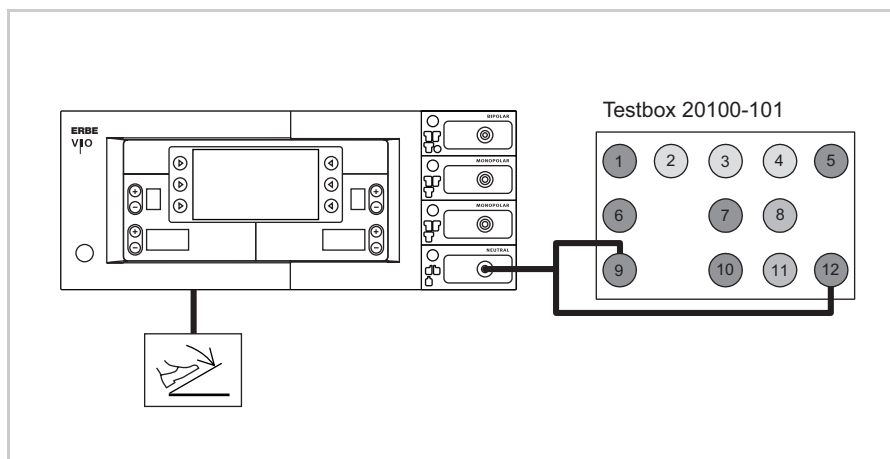


Fig. 7-14

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- The test specimen is connected to the power supply via the power cord.
 - The test is performed without a load.
 - The NE receptacle of the test specimen is connected to the VIO Testbox via the patient cable NE with the adapter cable.
 - The dual-pedal footswitch is connected.
1. On the test specimen the (dual surfaced) neutral electrode lamp must light up red.
 2. Activate AUTO CUT via the footswitch. The test specimen must inhibit activation and emit or display an optical and acoustic warning.

NE monitoring of asymmetry **Testing and measuring equipment**

| ERBE Art. No. | Description |
|------------------|--|
| 20192-127 | Patient cable AE |
| | or |
| 20192-110 | Patient cable AE, international |
| 20190-045 | Electrode handle ICC/ACC |
| 20194-070 | Patient cable NE |
| | or |
| 20194-075 | Patient cable NE, international |
| 20100-033 | Adapter cable NE |
| 20100-101 | VIO Testbox Symmetry/Resistance (NE asymmetry/critical resistance) |

Presets on the test specimen

- SOFT COAG, Effect 1, 10 watts.
- Neutral electrode "dual surface".

Test set-up and test procedure

1st test step

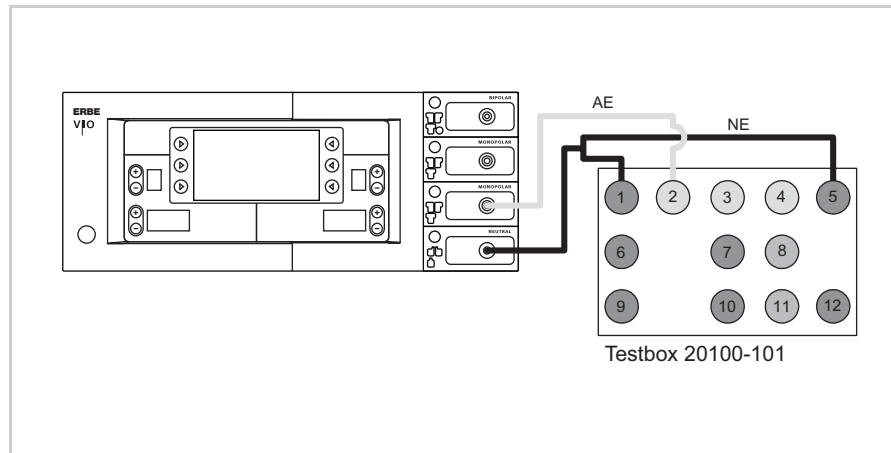


Fig. 7-15

- The test specimen is connected to the power supply via the power cord.
 - The NE receptacle of the test specimen is connected to the VIO Testbox via the patient cable NE with the adapter cable.
 - The AE receptacle of the test specimen is connected to the VIO Testbox (AE receptacle) via the patient cable AE and the electrode handle with the laboratory cable.
1. Activate test specimen via COAG button on the electrode handle for approx. 10 seconds. During the entire activation time there must be no warning signal.

2nd test step

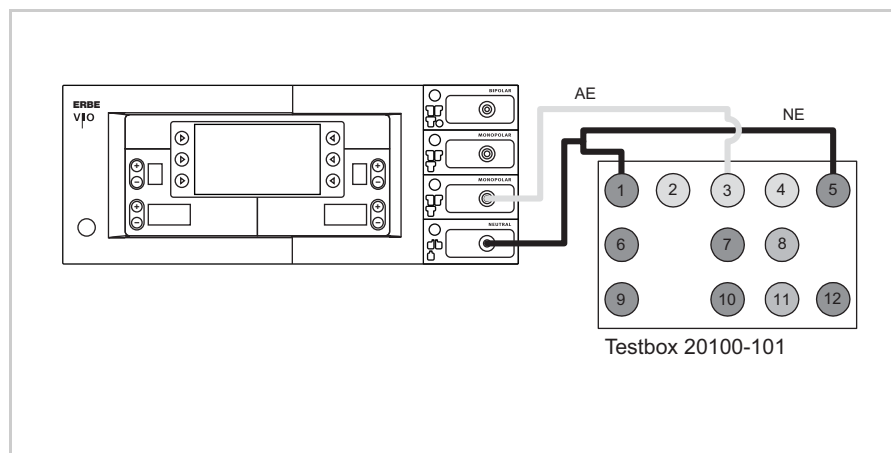


Fig. 7-16

- The test specimen is connected to the power supply via the power cord.
- The NE receptacle of the test specimen is connected to the VIO Testbox via the patient cable NE with the adapter cable.
- The AE receptacle of the test specimen is connected to the VIO Testbox (AE receptacle) via the patient cable AE and the electrode handle with the laboratory cable.

1. Activate test specimen via COAG button on the electrode handle for approx. 10 seconds. There must be an optical warning signal 2 seconds after activation at the latest. The test specimen must not interrupt activation.

3rd test step

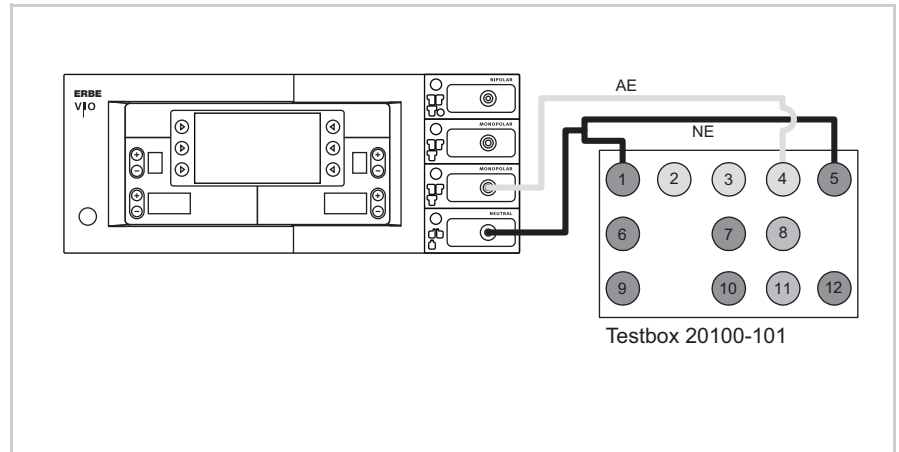


Fig. 7-17

- The test specimen is connected to the power supply via the power cord.
 - The NE receptacle of the test specimen is connected to the VIO Testbox via the patient cable NE with the adapter cable.
 - The AE receptacle of the test specimen is connected to the VIO Testbox (AE receptacle) via the patient cable AE and the electrode handle with the laboratory cable.
1. Activate the test specimen with the COAG button on the electrode handle for approx. 10 seconds. Within 2 seconds after activation at the latest an optical warning must be emitted and within another 2 seconds an acoustic warning must be emitted. The test specimen must interrupt activation.

