ERBE

VIO 300 D V 2.1.x

VIO 200 D V 2.1.x

Service Manual

10.07

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Service manual Art. No. 80116-287

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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 manuals relating to the units form part of this service manual. Familiarity with the user manuals, in particular the procedures for setting up, commissioning and handling described in the manuals, is a prerequisite for the performance of servicing work.

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.

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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 ERBE spare parts. The manufacturer accepts no liability and the warranty claim becomes void if original spare parts are not used.

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CHAPTER 2

Controls

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).

Controls at the front

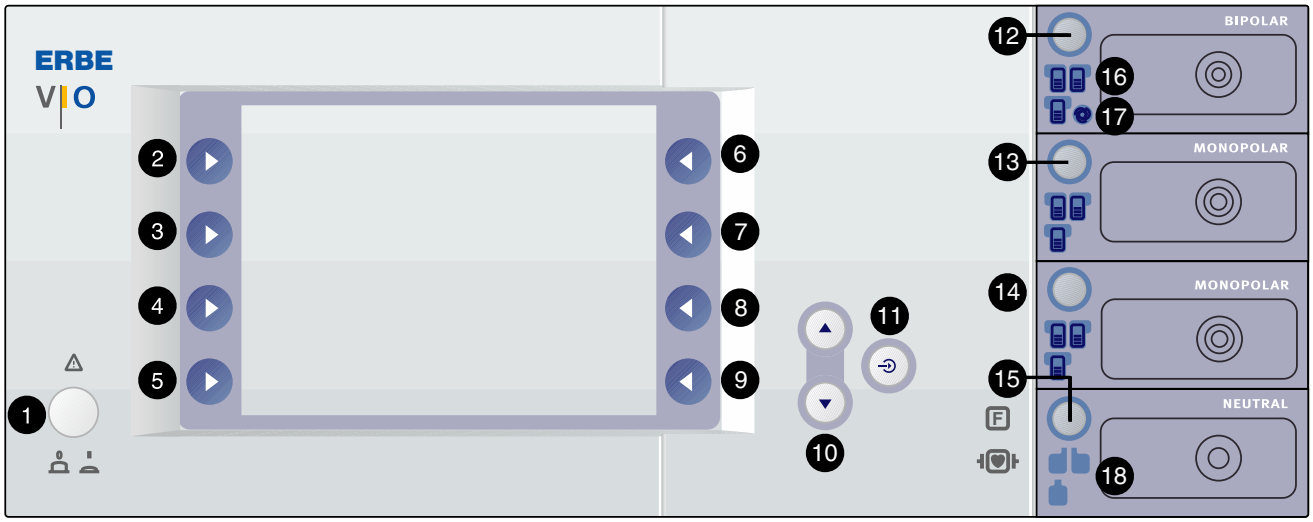

Fig. 2-1

1	Power Switch
2 – 9	Selection buttons
10	Up/Down buttons
11	Enter button
12 – 15	Focus buttons
16	Pilot lamps for footswitches
17	Pilot lamp for AUTO START
18	Pilot lamps for neutral electrodes

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Controls at the rear

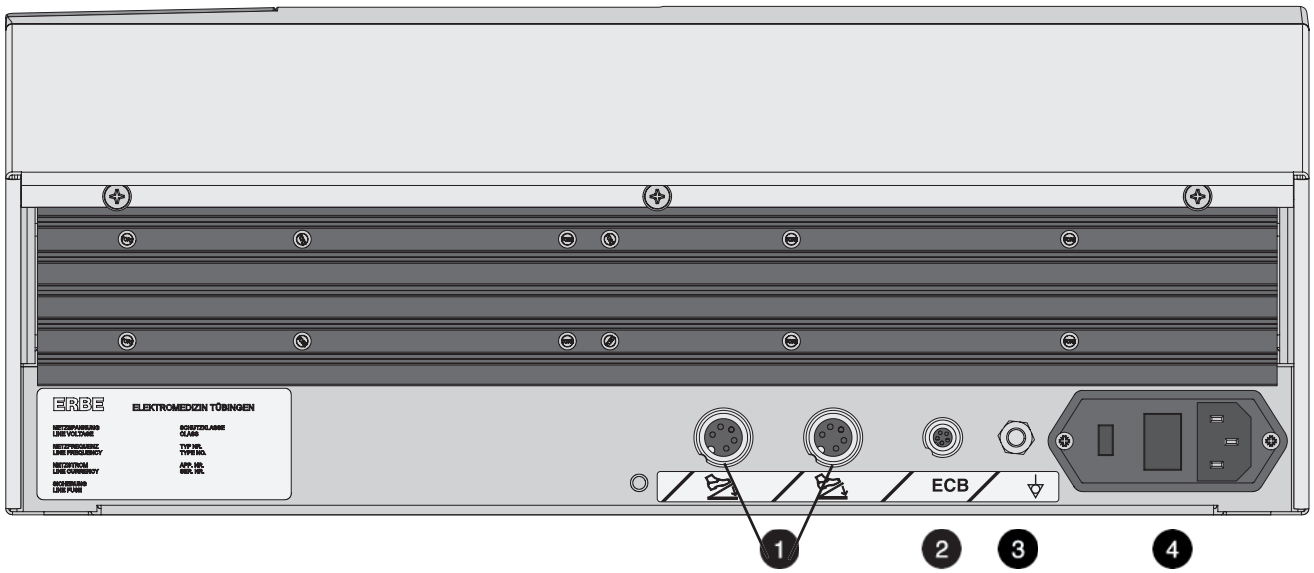

Fig. 2-2

1 Footswitch sockets

2 ECB socket (ERBE Communication Bus)

3 Potential equalization terminal

4 Power supply module with fuses

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CHAPTER 3

Technical Data

Power connection	
Rated supply voltage	100 V – 120 V ± 10% / 220 V – 240 V ± 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 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	9.5 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

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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

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CHAPTER 4

Setup

General information

This unit has two Setup levels. The first level is accessible to users and service staff. The second level is only for use by the service staff.

Overview of settings for Setup level 1

Setting	Available from	Description
Brightness	V 2.1.x	Setting the display brightness in 16 levels.
System volume	V 2.1.x	Setting the volume of activation tones in 16 levels. The activation tones must be clearly audible!
Key volume	V 2.1.x	Setting the button volume in 16 levels.
Viewing angle	V 2.1.x	Rough graduation of display brightness in 3 levels.
Power display	V 2.1.x	A bar diagram is shown on the display on activation of the output indicator. The bar diagram provides a dynamic display of the delivered output during activation. At the end of activation, Pmax shows the maximum delivered output, and Pavg the mean value of the delivered output over the activation period. The green line in the bar diagram represents the power limitation selected.
Display UpMax	V 2.1.x	Display of maximum HF voltage [V_p] on activation of the unit. In the user manual for the instrument or on the instrument itself the maximum electrical capacity is given in [V_p]. If the HF voltage exceeds the capacity of the instrument, the instrument may be damaged. Select a reduced effect to avoid this.

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Setting	Available from	Description
AUTO START 1	V 2.1.x	Input of start delay for the AUTO START function. The start delay value for AUTO START 1 depends on the value entered for AUTO START 2 but is always *below* the start delay value of AUTO START 2. A start delay between 0.0 and 9.5 s is possible.
AUTO START 2	V 2.1.x	Input of start delay for the AUTO START function. The start delay value for AUTO START 2 depends on the value entered for AUTO START 1 but is always *above* the start delay value of AUTO START 1. A start delay between 0.1 and 10 s is possible.
Service program	V 2.1.x	This menu item leads to the second SET-UP level.

Overview of settings for Setup level 2

IMPORTANT! This setup menu is only available in English depending on the language setting selected on the unit.

Setting	Available from	Description
Date	V 2.1.x	Self-explanatory.
Time	V 2.1.x	Self-explanatory.
Identifier	V 2.1.x	Enter an label/identifier for the unit. The specified identifier is displayed on the input screen.
Neutral electrode	V 2.1.x	single surface, dual surface, either way, dynamic. On delivery, the unit is set to neutral electrode “dual surface”.
AUTO START	V 2.1.x	Setting for whether AUTO START is permitted as an activation type.
Time limit	V 2.1.x	Setting the time period after which activation is automatically ended: 1 to 99 s or OFF
Display time	V 2.1.x	Setting the length of time for which indicator window and error messages appear on the display: 1 to 15 s or OFF.
Automatic time	V 2.1.x	Setting the length of time for which an input window appears on the display: 3 to 29 s or Not automatic.
Start screen	V 2.1.x	Selection of start screen: Guide or List of Programs.

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Setting	Available from	Description
Expert mode	V 2.1.x	If the expert mode is activated, the following settings are also available: – Temperature monitoring for neutral electrodes – Advanced setting options for ENDO CUT I and Q – Advanced setting options for BiClamp – Advanced setting options for PRECISE APC
Language	V 2.1.x	Self-explanatory.
APC supply	V 2.1.x	Self-explanatory.
APC AutoPurge	V 2.1.x	The instrument is purged with gas automatically when it is plugged into the APC receptacle and an instrument that is already plugged into the APC receptacle is purged with gas automatically when the unit is started up.
APC Purge Duration	V 2.1.x	Selection of time for which the instrument is purged with gas automatically: 0 to 10 s.
APC PurgeFlow	V 2.1.x	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.
max. APC cyl.pressure	V 2.1.x	Setting of maximum cylinder pressure in the argon cylinder used. Correct reporting on the cylinder level display on the HF surgical device depends upon the maximum cylinder pressure setting of the actual argon gas bottle used: 100 to 240 bar.
Sound sample	V 2.1.x	Selection of type of warning signals.
Decoupling C (C = capacitor)	V 2.1.x	Setting on the decoupling capacitor. MAX: Decoupling capacitor with maximum capacity. MIN: Decoupling capacitor with minimized capacity. At this setting, neuromuscular stimuli are reduced in the PULSED APC mode.

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Setting	Available from	Description
Next safety check	V 2.1.x	Self-explanatory.
Test programs[1]	V 2.1.x	Error list: Stores all errors detected and signaled by the control panel.
	V 2.1.x	Event list: Stores all events (=information and activations) in a looped memory.
	V 2.1.x	Version list: Shows the software versions of all connected components. Option “safe config.” is available.[2]
	V 2.1.x	EEPROM: Shows memory usage by the application program on EEPROM.
	V 2.1.x	HF-CPU error list: Stores all errors detected and signaled by the “CPU + Sensors”; up to 16 entries.
	V 2.1.x	No. HF errors: Records the frequency of errors detected and signaled by the “CPU + Sensors”.
	V 2.1.x	APC error list: Stores all errors detected and signaled by the APC.
	V 2.1.x	No. APC errors: Records the frequency of errors detected and signaled by the APC.
	V 2.1.x	Operating time: Runtime meter or ON counter for add-on modules, if these modules have a corresponding counter.
	V 2.1.x	Loudsp. test: Unit checks the loudspeaker function. Three different tones must be heard.
	V 2.1.x	CAN looped mem.: Displays the CAN messages before the last error occurred. The test program was integrated for product development for debugging.
	V 2.1.x	Error list IIF/NE: Stores all errors detected and signaled by the IIF (instrument interface) and the NE (Nessy2).
	V 2.1.x	Hardware TP: Branching to the hardware test programs.
	V 2.1.x	Upgrade list: Indicates which upgrades have been installed.

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Setting	Available from	Description
	V 2.1.x	Reset Passwords: Deletes **all** passwords assigned for user programs. It is not possible to delete only one password for a specific user program. This function is protected with its own password. Obtain the password from the Service Hotline (see the last page of these instructions).
	V 2.1.x	Enable Kali (only relevant for VIO 200 D): Makes it possible to increase the HF power limitation for SWIFT COAG to 150 W. When switching off, the unit resets the increase back to the standard power limitation of 120 W automatically.

1. Test programs not explained here are not relevant for the service technicians.
2. "safe config." saves the receptacle configuration of the unit detected by the system. The receptacle configuration must be saved by the service technician after each software update and each time the unit is upgraded or converted. For this purpose compare the receptacle configuration indicated on the "Version list" with the physical configuration on the unit. If they agree, save the receptacle configuration with "safe config."

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Call up Setup

IMPORTANT!

There are various methods of scrolling forwards within a menu:
(a) with the Down button
or
(b) with the selection button next to the menu item “More”.
In the service manual, the variant (a) is used.

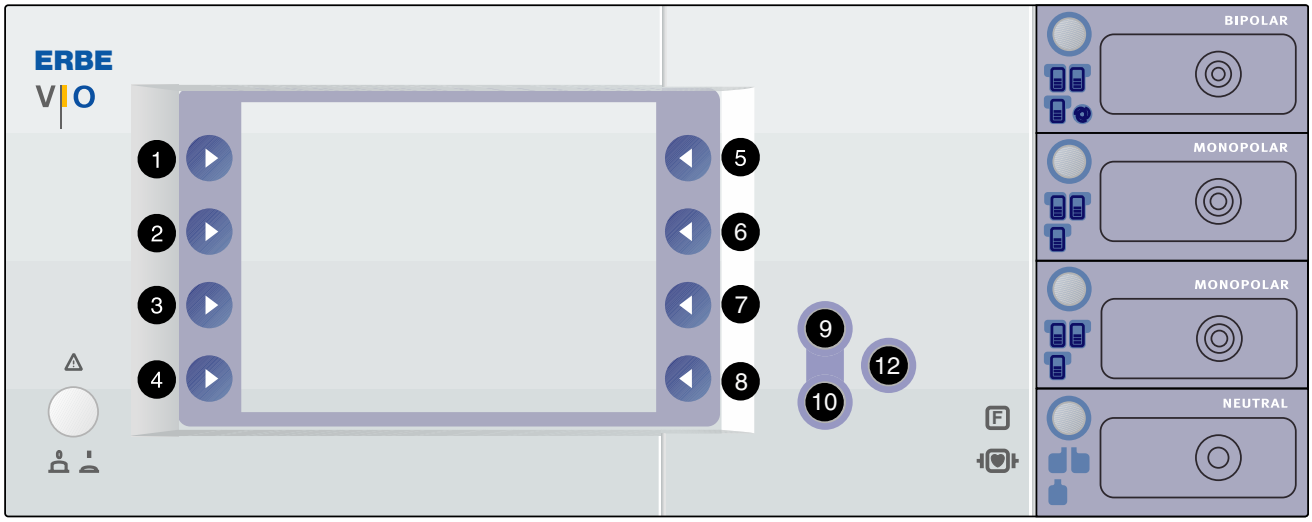

Fig. 4-1

Setup level 1

1. Call up "Guide" window.
2. Select menu item "Other functions".
3. Select menu item "Setup". The unit switches to Setup level 1. See above table for settings that can be changed here.

Setup level 2

1. Call up Setup level 1 as described above.
2. Use the Down button (10) to scroll to the setting "Service program".
3. Select setting "Service program".
4. Enter **VIOD** as the password:
   Use the Up/Down buttons (9/10) to select the letters, confirming each of the four letters with the adjacent selection button and then jumping forward to enter the next letter. Repeat this procedure until all four letters have been entered.
5. Confirm the complete password using the Enter button (12). The unit switches to Setup level 2. See above table for settings that can be changed here.

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Change settings

1. Select the setting to be changed using the adjacent selection button (1...8). The setting is highlighted.
2. Change the setting with the Up/Down buttons (9/10).
3. Confirm the changed setting with the Enter button (12).

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CHAPTER 5

Remedying malfunctions

ERROR list for VIO system

Abbreviations used for identifying modules:

A:	APC 2
B:	Control panel
C:	CPU + Sensors
D:	Smoke evacuation system IES 2
E:	Extension module VEM 2
F:	Footswitch
2,3,5,6:	IIF (Instrument Interface) of corresponding receptacle slot
4 (NE):	Nessy2
9:	ERBE Irrigation Pump EIP 2

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Status of ERROR list: 10.07

A/E-Errors

Recognizing module: A = APC 2, E = Extension module VEM 2				
Recog-nizing module	**Error code**	**Additional infor-mation**	**Description**	**Action**
A	1			Restart the unit. If the error occurs again, notify ERBE Service.
A/E	2 – 4			Restart the unit. If the error occurs again, notify ERBE Service.
A/E	5		Button error receptacle 1.	Check the keyboard.
A/E	6		Button error receptacle 2.	Check the keyboard.
A	7 – 9			Restart the unit. If the error occurs again, notify ERBE Service.
A	A			Restart the unit. If the error occurs again, notify ERBE Service.
A/E	B		Error in test mode.	Information in test mode (adjustment).
A/E	C + D			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			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			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.

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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.

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B-Errors

Recognizing module: B = Control panel				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
B	1 + 2			Restart the unit. If the error occurs again, notify ERBE Service.
B	5 + 6			Restart the unit. If the error occurs again, notify ERBE Service.
B	9			Restart the unit. If the error occurs again, notify ERBE Service.
B	A			Restart the unit. If the error occurs again, notify ERBE Service.
B	B	Value of measured resistance in ohms.	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	C	CAN ID of status message of corresponding module.	Function is not available: Occurs if a module is unable to implement the required function.	Remove the module concerned from the unit and notify ERBE Service.
B	D	Incorrect EEPROM address.	I^2C bus error: Occurs if a write or read function cannot be performed properly on the serial EEPROM of the control panel CPU.	Restart the unit. If the error occurs again, notify ERBE Service.
B	E		ECB bus error: Occurs if the control panel CPU detects an error at the CAN bus (e.g. CAN connection interrupted).	Remove the footswitch or add-on modules from the unit. Notify ERBE Service.
B	F			Restart the unit. If the error occurs again, notify ERBE Service.

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Recognizing module: B = Control panel				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
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	11			Restart the unit. If the error occurs again, notify ERBE Service.
B	12	CAN ID of activation signal (e.g. 100 with dual-pedal footswitch).	Activation signal during switch-on: Occurs if an activation signal is present during initialization of the unit (e.g. footswitch pedal pressed).	Check the accessories. If the error persists, notify ERBE Service.
B	13	1 => Error file 1 2 => Error file 2 10 => Event file 1 20 => Event file 2	Errors in list management: Occurs if an error is identified in the corresponding flash file when managing the event or error list.	Delete the error lists. If the error persists, notify ERBE Service.
B	14 + 15			Restart the unit. If the error occurs again, notify ERBE Service.
B	16		Insufficient EEPROM memory: Occurs if the memory for user programs is full.	Delete unnecessary programs.
B	17	CAN ID of second activation signal.	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.

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Recognizing module: B = Control panel				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
B	18	Bit comination of HF module and APC module: 1000 or 100 HF module (Coag) 2000 or 200 HF module (Cut) 4000 or 400 APC module	No deactivation signal: Occurs if a module involved in activation (HF module or APC module) fails to react to a deactivation request for longer than 110 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.
B	1A			Restart the unit. If the error occurs again, notify ERBE Service.
B	1B		CRC check not yet completed: Occurs if the user wants to operate the unit after downloading software before there has been at least one successful CRC check.	Wait until the CRC check is complete.
B	1C		The maximum ON time has been exceeded: Occurs if activation lasts longer than the ON time selected in SET-UP.	Check the accessories. If the error persists, notify ERBE Service.
B	1D	Number of the incorrect parameter (Hex): 101 Cut mode 102 Coag mode 201 Cut effect 202 Coag effect 301 Cut power 302 Coag power 501 Cut APC flow 502 Coag APC flow	Incorrect instrument parameters: Occurs if an instrument is detected via instrument recognition and the parameter is outside the permissible tolerances.	Check the accessories. If the error persists, notify ERBE Service.

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Recognizing module: B = Control panel				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
B	1E	Button code: 0x001 => button Up 0x002 => button Down 0x004 => button Enter 0x008 => buttonReceptacle 1 0x010 => buttonReceptacle 2 0x020 => buttonReceptacle 3 0x040 => buttonNE 0x080 => buttonAPC1 0x100 => buttonAPC2	Keyboard error: Occurs if a button pressed is recognized during initialization.	Check the keyboard.
B	1F	NESSY symmetry value in %.	NESSY symmetry monitoring: Occurs if an error is signaled by the Nessy symmetry monitoring during activation.	Check the NE accessories.
B	21			Restart the unit. If the error occurs again, notify ERBE Service.
B	22		Occurs if activation was terminated automatically (e.g. by AutoStop) and tissue is still touched.	Check the accessories. If the error persists, notify ERBE Service.
B	23			Restart the unit. If the error occurs again, notify ERBE Service.
B	24		Occurs if an incorrect status message is received from the IES 2.	Remove IES 2 from the unit and notify ERBE Service.

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Recognizing module: B = Control panel				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
B	25		Occurs if a modified receptacle configuration was found (e.g. by replacement or retrofitting of a receptacle).	Check and save the receptacle configuration in the "Version List" test program. If the error occurs again, notify ERBE Service.
B	81 + 82			Restart the unit. If the error occurs again, notify ERBE Service.
B	84		Dual-pedal footswitch recognized: Occurs if a dual-pedal footswitch is connected.	Information, no fault condition.
B	85		Dual-pedal footswitch has been disconnected from the system: Occurs if a dual-pedal footswitch is disconnected from the system.	Information, no fault condition.
B	86		APC receptacle 1 recognized: Occurs if an APC receptacle 1 is recognized.	Information, no fault condition.
B	87			Restart the unit. If the error occurs again, notify ERBE Service.
B	88		Single-pedal footswitch recognized: Occurs if a single-pedal footswitch is connected.	Information, no fault condition.
B	89		Single-pedal footswitch has been disconnected from the system: Occurs if a single-pedal footswitch is disconnected from the system.	Information, no fault condition.
B	8A		APC receptacle 2 recognized: Occurs if an APC receptacle 2 is detected.	Information, no fault condition.

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Recognizing module: B = Control panel				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
B	8B			Restart the unit. If the error occurs again, notify ERBE Service.
B	8C		APC module recognized: Occurs if an APC module is detected.	Information, no fault condition.
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		No status message from HF receptacle 1: Occurs if an HF receptacle 1 is disconnected from the system.	Restart the unit. If the error occurs again, notify ERBE Service.
B	90			Restart the unit. If the error occurs again, notify ERBE Service.
B	91		No status message from IES module: Occurs if the IES module is disconnected from the system.	Check connectors. Check IES 2.
B	92		IES module recognized: Occurs if an IES module is detected.	Information, no fault condition.
B	93		Multifunctional footswitch recognized: Occurs if a multifunctional footswitch is connected.	Information, no fault condition.
B	94		Multifunctional footswitch has been disconnected from the system: Occurs if a multifunctional footswitch is disconnected from the system.	Information, no fault condition.

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Recognizing module: B = Control panel				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
B	95	Number of output receptacle *0X10000 + instrument number.	New instrument recognized by system: Occurs if an instrument with instrument recognition is connected.	Information, no fault condition.
B	97 + 98			Restart the unit. If the error occurs again, notify ERBE Service.
B	99	Activation type: 1 => Dual-pedal footswitch both pedals 2 => Dual-pedal footswitch only Coag 3 => Dual-pedal footswitch only Cut 4 => Single-pedal footswitch 5 => AutoStart 1 6 => AutoStart 2	This activation type is not available: Occurs if the user assigns an activation signal that is not currently available. (e.g. unconnected footswitch).	Assign the correct activation type to the instrument.
B	9A		Please check the clock: Occurs if the VIO was switched off for such a long time that the supply current to the built-in real-time clock was no longer sufficient.	Set time.
B	9B		Master remote control recognized: Occurs if a master remote control is recognized by the VIO.	Information, no fault condition.
B	9C		Master remote control has been disconnected from the system: Occurs if the master remote control is disconnected from the system.	Information, no fault condition.

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Recognizing module: B = Control panel				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
B	9D		Remote control recognized: Occurs if a remote control is recognized by the VIO.	Information, no fault condition.
B	9E		Remote control has been disconnected from the system: Occurs if the remote control is disconnected from the system.	Information, no fault condition.
B	9F	Number of output receptacle.	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	Number of output receptacle.	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	A1			Restart the unit. If the error occurs again, notify ERBE Service.
B	A3	Error number of footswitch (see error description for footswitch): + 0x100 (with single-pedal footswitch) + 0x200 (with dual-pedal footswitch) + 0x400 (with multifunctional footswitch)	Footswitch not assigned: Occurs if a footswitch which has not been assigned to an output socket is pressed.	Assign the footswitch activation.

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Recognizing module: B = Control panel				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
B	A4	CAN ID of second footswitch or 2 if it cannot be assigned to any CAN ID.	Two footswitches are connected: Occurs if two footswitches of the same type are connected.	Remove the duplicate footswitch from the unit.
B	A6		EEPROM is updated: Occurs if the unit is programmed using a connected PC.	Information, no fault condition.
B	A8			Restart the unit. If the error occurs again, notify ERBE Service.
B	A9		Activation not possible until settings are confirmed: Occurs if the user wants to perform activation after switching on the unit without confirming the settings beforehand.	Information, no fault condition.
B	AA	CAN ID of activation request.	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	CAN ID of activation request.	Activation is only possible with a valid instrument: Occurs if an MF receptacle is activated at which no instrument is recognized.	Check the accessories. If the error persists, notify ERBE Service.
B	AC	0x140 (CAN ID of AutoStart monitor).	AutoStart is not possible if contact is made during assignment: Occurs if the AutoStart function is assigned while contact has already been recognized.	Check the accessories. If the error persists, notify ERBE Service.
B	AD–AF			Restart the unit. If the error occurs again, notify ERBE Service.

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Recognizing module: B = Control panel				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
B	B0	NESSY symmetry value in %.	NESSY symmetry warning: Occurs if the Nessy symmetry monitoring signals a value between 20 % and 50 %.	Check the NE accessories.
B	B1	NESSY current value.	NESSY current density warning: Occurs if the Nessy current density monitoring signals a value above the limit curve.	Check the NE accessories.
B	B2		IES footswitch detected: Occurs if an IES footswitch is connected.	Information, no fault condition.
B	B3			Restart the unit. If the error occurs again, notify ERBE Service.
B	B4		Rinsing of an APC instrument: Occurs if rinsing of an APC instrument is initiated.	Information, no fault condition.
B	B5 + B6			Restart the unit. If the error occurs again, notify ERBE Service.
B	B7		Permissible limit value of AUTO START activation has been exceeded: Occurs if an attempt is made to assign AUTO START activation a non-permissible power limitation value.	Information, no fault condition.
B	B8		New interface module recognized: Occurs if an interface module (e.g. VIO PORTAL) logs on to the system.	Information, no fault condition.

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Recognizing module: B = Control panel				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
B	B9		Interface module has been disconnected from the system: Occurs if an interface module (e.g. VIO PORTAL) is disconnected from the system.	Information, no fault condition.
B	BA		Warning from interface module: Occurs if an interface module (e.g. VIO PORTAL) signals an error.	Check interface module.
B	BB		Reminder that a safety check is due: Occurs when a safety check is due.	Information, no fault condition.
B	BC		VEM 2 module recognized: Occurs if receptacle extension module VEM 2 logs into the system.	Information, no fault condition.
B	BD		VEM 2 module disconnected: Occurs if receptacle extension module VEM 2 is disconnected from the system.	Information, no fault condition.
B	BE		VEM 2 module receptacle 1 no longer ready for operation: Occur if the 1st receptacle of receptacle extension module VEM 2 no longer responds.	Information, no fault condition.
B	BF		VEM 2 module receptacle 2 no longer ready for operation: Occur as if the 2nd receptacle of receptacle extension module VEM 2 no longer responds.	Information, no fault condition.

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Recognizing module: B = Control panel				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
B	C0		Neither footswitch nor AUTO START assigned: Occurs if an instrument without a fingerswitch is recognized and neither a footswitch nor AUTO START is assigned.	Information, no fault condition.
B	C1		EIP 2 was recognized by the system: Occurs if the EIP 2 is connected to the system.	Information, no fault condition.
B	C2		EIP 2 was disconnected from the system: Occurs if EIP 2 is disconnected from the system.	Information, no fault condition.
B	C3		IES 2 footswitch was disconnected from the system: Occurs if the IES 2 footswitch is disconnected from the system.	Information, no fault condition.
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	Can only occur in conjunction with the STORZ OR1 system (from VIO version 1.7.4).	Configuration download from STORZ OR-1 system has failed.	Create a new configuration on the Storz OR-1 system.
B	C6		Temperature monitoring for neutral electrodes: NESSY current > 300 mA	Information, no fault condition.
B	FC		Power Down: Occurs if the unit is switched off.	Information, no fault condition.
B	FD		System Reset: Occurs if a system reset is performed (e.g. when switching on unit).	Information, no fault condition.

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Recognizing module: B = Control panel				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
B	FE		PowerFail: Occurs if a PowerFail is signaled (e.g. when switching off unit).	Information, no fault condition.
B	FF	ID of CAN message with associated data bytes.	CAN MESSAGE: Occurs as soon as a CAN message, which is to be logged in a protocol, is transmitted by the control panel.	Information, no fault condition.

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C-Errors

Recognizing module: C = CPU + Sensors				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
C	1			Restart the unit. If the error occurs again, notify ERBE Service.
C	4 – 6			Restart the unit. If the error occurs again, notify ERBE Service.
C	D			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 – 65			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.

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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	D0			Restart the unit. If the error occurs again, notify ERBE Service.
C	F0		Trial activation with Pmax==0 (USA) -> no HF.	Information, no fault condition.

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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.

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F-Errors

Recognizing module: F = Footswitch				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
F	1		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.

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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)	1 – 7			Restart the unit. If the error occurs again, notify ERBE Service.
2,3,5,6 (Buchse)	8		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)	9			Restart the unit. If the error occurs again, notify ERBE Service.
2,3,5,6 (Buchse)	A		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)	C – E			Restart the unit. If the error occurs again, notify ERBE Service.
2,3,5,6 (Buchse)	F		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.

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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.

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4 (NE)-Errors

Recognizing module: 4 (NE) = Nessy2				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
4 (NE)	1 – 8			Restart the unit. If the error occurs again, notify ERBE Service.
4 (NE)	C – E			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.
4 (NE)	13 – 16			Restart the unit. If the error occurs again, notify ERBE Service.

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9-Errors

Recognizing module: 9 = ERBE Irrigation Pump EIP 2				
Recognizing module	**Error code**	**Additional information**	**Description**	**Action**
9	80	CRC Error.	CRC error: Occurs if the EIP 2 CRC monitoring procedure performed at unit startup discovers an error (e.g. turnover of a bit in the flash memory or error during software download).	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: The Hall sensor circuit board is not connected to the main board or the Hall sensor circuit board is faulty.	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 active the EIP 2 new. If the error occurs again, check the accessories.
9	88	UeWS Error	The motor control monitoring circuit is faulty.	Restart the unit. If the error occurs again, notify ERBE Service.
9	90	No current or no load.	During activation there is no measurable current input to the motor.	Restart the unit. If the error occurs again, notify ERBE Service.
9	A0	Current too high at ON.	The current input to the motor is too high. The motor or pump head is jammed or faulty.	Restart the unit. If the error occurs again, notify ERBE Service.
9	C0	Motor control faulty (voltage too high at ON).	The measured voltage is too high. The motor control is faulty.	Restart the unit. If the error occurs again, notify ERBE Service.

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CHAPTER 6

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.

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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.

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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
20189-101	Dual-pedal footswitch with ReMode
20190-115	VIO ReMode Electrode handle (only if there is a MF receptacle)
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
20100-152	BiClamp measuring cable (only if there is a MF receptacle)
20100-174	Test cable for bipolar resection (only if there is a MF receptacle)
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

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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

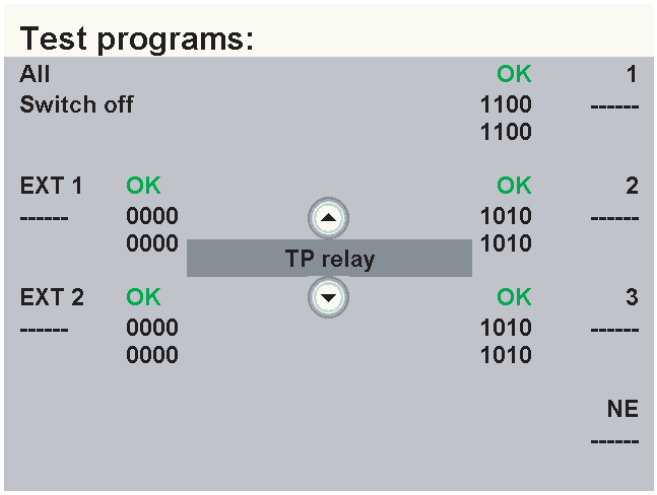
- Ground leakage current, normal condition (N.C.).
- Ground leakage current, single-fault condition (S.F.C.).

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 Setup level 2 (see page 18).
2. Select the "Test programs" setting.
3. Use the Up button to select "Hardware TP" and press Enter to confirm. The test specimen switches to the test program mode.
4. Use the Up/Down buttons to select the "TP relay" test program and press Enter to call it up.



5. Close all relays in the test program via "All switch off":
   – ------ Relays closed
   – --/-- Relays open
6. Remain in the Test program.

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DC resistance

Testing and measuring equipment

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

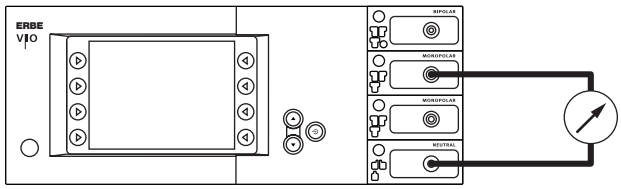

Fig. 6-1

- 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.

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Test procedure

1. Start safety tester in the "Insulation resistance" function The measured value displayed should be >200 MOhm.
2. In the test program "TP relay" use "All switch on" 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.
3. Determine insulation resistance using the safety tester. The measured value must be >2 MOhm.
4. Document the measured value.

Performance tests

Testing and measuring equipment

ERBE Art. No.	Description
20189-101	Dual-pedal footswitch with ReMode
20194-070 or 20194-075	Patient cable NE Patient cable NE, international
20100-033	Adapter cable NE

Test setup

- The test specimen is connected to the power supply via the power cord.
- The dual-pedal footswitch with ReMode 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.

Control buttons / acknowledgement tone when pressed

1. Check all selection buttons on the control panel for functionality. Press each button at least twice. An acoustic signal (=acknowledgement tone) must be emitted each time the buttons are pressed.

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Pushbuttons / acknowledgement tone when pressed

1. Check all the pushbuttons (focus buttons, up and down buttons, enter button) on the test specimen to make sure they are operating properly. Press each button at least twice. There must be an acoustic signal (acknowledgement tone) every time a button is pressed.

Software download

1. Document whether a software update was performed.

Neutral electrode setting

1. In Setup level 2 obtain and document the current setting of the neutral electrode.

Date and time

1. In Setup level 2 check date and time and correct if necessary.

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. When starting the system, all LEDs must briefly light up at the same intensity.

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
20189-101	Dual-pedal footswitch with ReMode

Test setup

- The test specimen is connected to the power supply via the power cord.
- The single-pedal footswitch is connected.
- The dual-pedal footswitch with ReMode is connected.

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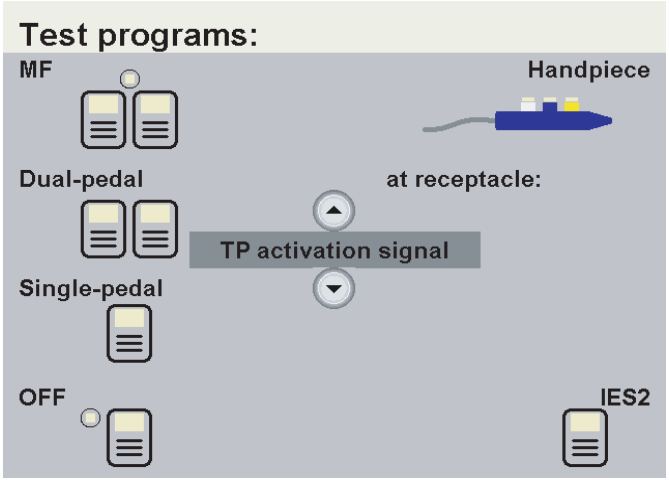
Test procedure

Call up Test program mode

1. Call up Setup level 2 (see page 18).
2. Select the "Test programs" setting.
3. Use the Up button to select "Hardware TP" and press Enter to confirm. The test specimen switches to the test program mode.



4. Use the Up/Down buttons to select the "TP activation signal" test program and press Enter to call it up.

Single-pedal footswitch activation COAG

1. Press COAG pedal on the single-pedal footswitch. The test program must confirm activation by lighting up the "Single-pedal" icon in color.

Dual-pedal footswitch activation CUT / COAG

1. Press CUT pedal on the dual-pedal footswitch. The test program must confirm activation lighting up the relevant field in color (yellow) in the "MF" icon.
2. Press COAG pedal on the dual-pedal footswitch. The test program must confirm activation lighting up the relevant field in color (blue) in the "MF" icon.

Dual-pedal footswitch ReMode

1. Press ReMode button on the dual-pedal footswitch. The test program must confirm switchover by lighting up the relevant field in color in the "MF" icon.
2. Remain in the Test program.

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Fingerswitch activation

Testing and measuring equipment

ERBE Art. No.	Description
20192-127 20192-110	Patient cable AE or Patient cable AE, international
20190-045	Electrode handle ICC/ACC
20190-115	VIO ReMode Electrode handle (only if there is a MF receptacle)

Test setup

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

Test procedure

20190-045 Activation CUT / COAG

1. Connect the electrode handle with patient cable AE to the Monopolar receptacle of the test specimen.
2. Press CUT button on the electrode handle. The test program must confirm activation by lighting up the relevant field in color in the "Handpiece" icon.
3. Press COAG button on the electrode handle. The test program must confirm activation by lighting up the relevant field in color in the "Handpiece" icon.
4. Remove the electrode handle.

20190-115 Activation CUT / COAG (only if there is an MF receptacle)

1. Connect the VIO ReMode electrode handle to the MF receptacle of the test specimen.
2. Press CUT button on the VIO ReMode electrode handle. The test program must confirm activation by lighting up the relevant field in color in the "Handpiece" icon.
3. Press COAG button on the VIO ReMode electrode handle. The test program must confirm activation by lighting up the relevant field in color in the "Handpiece" icon.

20190-115 ReMode (only if there is an MF receptacle)

1. Press ReMode button on the electrode handle. The test program must confirm switchover by lighting up the relevant field in color in the "Handpiece" icon.
2. Remove the VIO ReMode electrode handle.

Exit Test program mode

1. Press the Up button until "Restart" appears.
2. Press Enter to confirm the setting. The test specimen exits the test program mode.

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Instrument recognition MF receptacle

Testing and measuring equipment

ERBE Art. No.	Description
20100-152	BiClamp measuring cable

Instrument recognition via resistance

Currently not available.

Instrument recognition via EEPROM

Test setup

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

Test procedure

1. Connect BiClamp measuring cable to the MF receptacle of the test specimen. The test specimen must indicate instrument recognition with a message. The setting for COAG mode must change to BiClamp.

Automatic start mode

Testing and measuring equipment

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

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Test setup

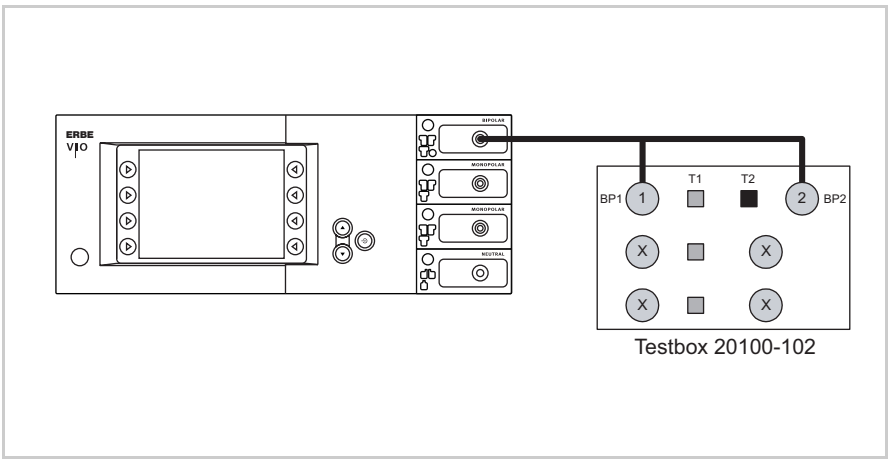

Fig. 6-2

- 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 setting AUTO START 1. Record the value.
2. Set test specimen to:
   BIPOLAR SOFT, Effect 1, 50 watts
   AUTO START 1
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 watts
   AUTO START 1
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.

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Automatic stop mode

Testing and measuring equipment

ERBE Art. No.	Description
20196-045 or 20196-053	Bipolar cable or 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

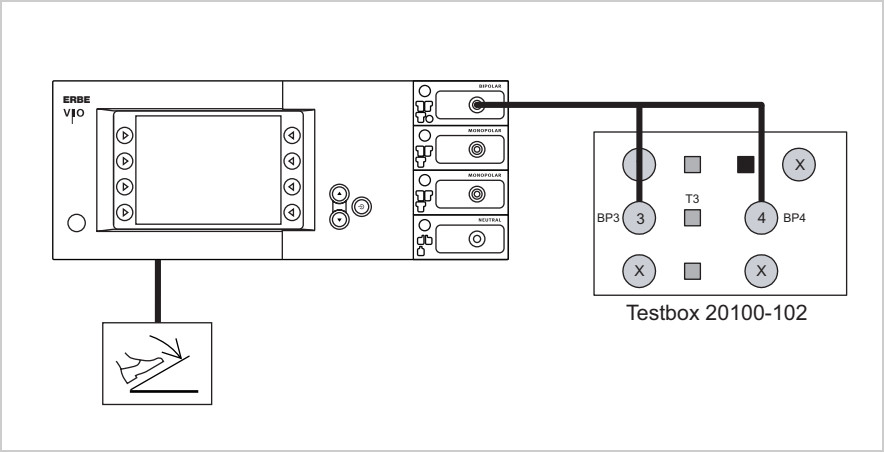

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Fig. 6-3

- 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.

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Spark monitor

Testing and measuring equipment

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

Test setup

The test set-up depends on the respective receptacle configuration of the test specimen so it may vary. This test set-up assumes a receptacle configuration of Bipolar receptacle, Monopolar receptacle, Monopolar receptacle, NE receptacle. Measurement is conducted at the 2nd Monopolar receptacle.

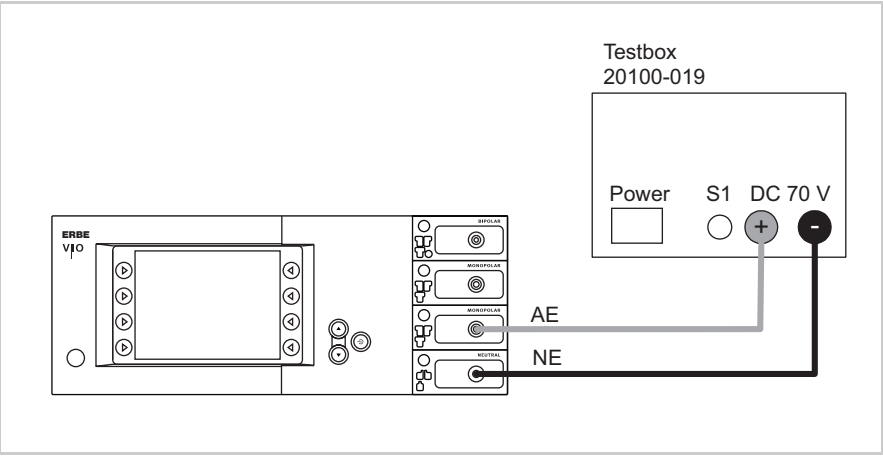

Fig. 6-4

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

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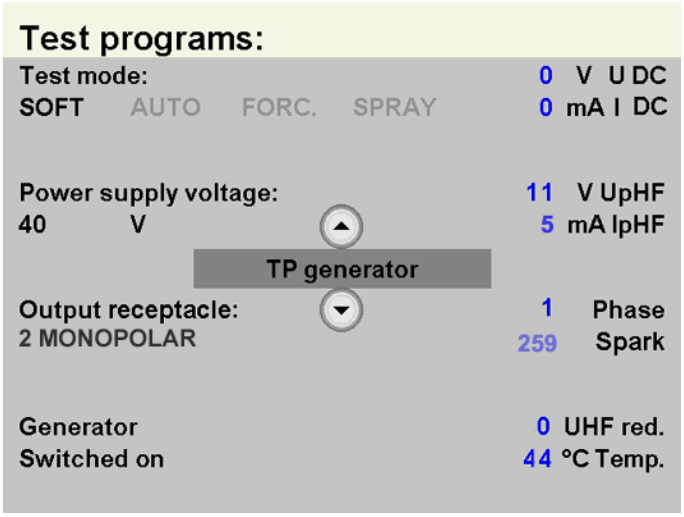
Test procedure

Call up Test program mode

1. Call up Setup level 2 (see page 18).
2. Select the "Test programs" setting.
3. Use the Up button to select "Hardware TP" and press Enter to confirm. The test specimen switches to the test program mode.
4. Use the Up/Down buttons to select the "TP generator" test program and press Enter to call it up.



5. Select the receptacle on which to measure in the test program under "Output receptacle" (the second monopolar receptacle is selected here).

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.

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HF power output CUT

Testing and measuring equipment

ERBE Art. No.	Description
20192-127 or 20192-110	Patient cable AE or Patient cable AE, international
20190-045	Electrode handle ICC/ACC
20194-070 or 20194-075	Patient cable NE or Patient cable NE, international
20100-033	Adapter cable NE
20196-045 or 20196-053	Bipolar cable or Bipolar cable, international
20100-034	Adapter cable bipolar
20100-174	Test cable for bipolar resection (only if there is a MF receptacle)
–	HF power meter
20189-101	Dual-pedal footswitch with ReMode

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AUTO CUT
DRY CUT

Test setup

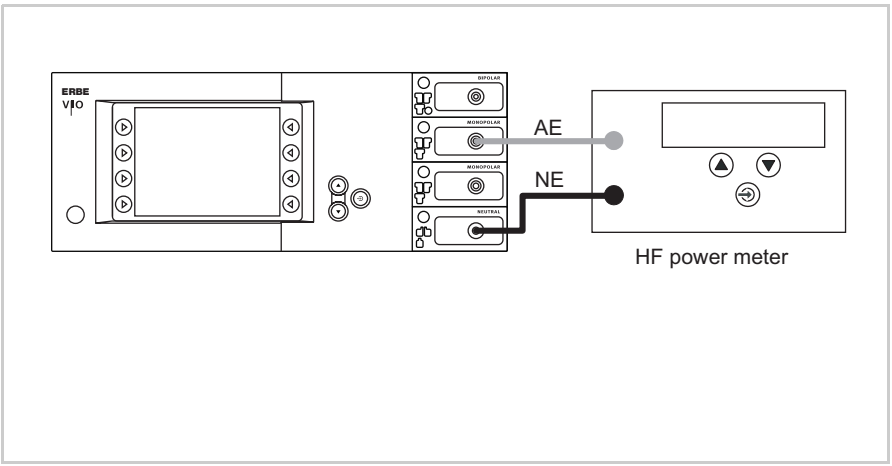

Fig. 6-5

- 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

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.

Only relevant with VIO 300 D

1. Set test specimen to:
   DRY CUT[1], 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.

1. The DRY CUT is only standard scope of supply with VIO 300 D electrosurgical units. With VIO 200 D electrosurgical units it can be purchased and installed as an upgrade. For details of how to test DRY CUT with VIO 200 D electrosurgical units see chapter "Performance test upgrades".

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BIPOLAR CUT Test set-up of the bipolar receptacle

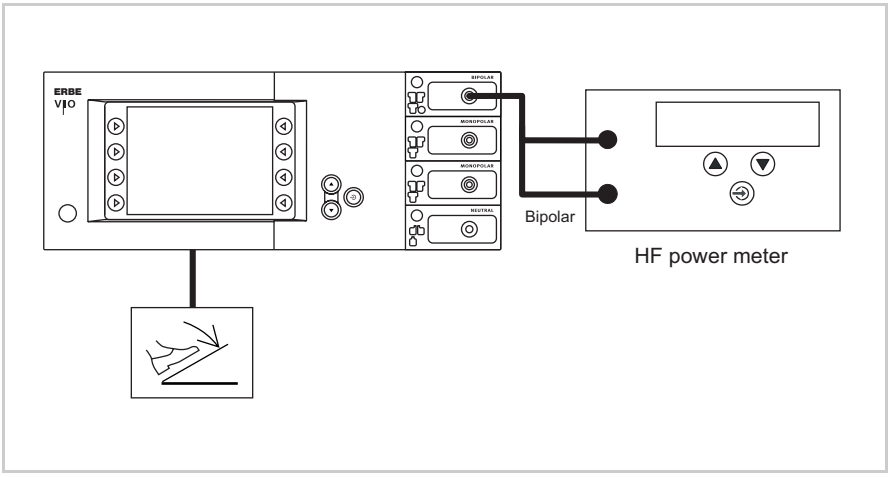

Fig. 6-6

- 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 with ReMode 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.

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BIPOLAR CUT+ (only if there is an MF receptacle)

Test set-up of the multifunctional receptacle

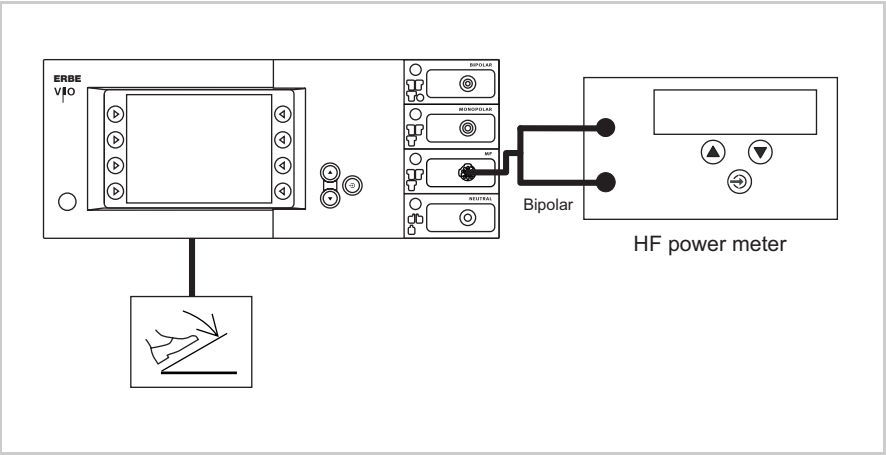

Fig. 6-7

- 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 with ReMode is connected.

Test procedure

1. Set test specimen to:
   BIPOLAR CUT+, Effect 8
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 296 to 400 watts.

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HF power output COAGULATE

Testing and measuring equipment

ERBE Art. No.	Description
20192-127 or 20192-110	Patient cable AE or Patient cable AE, international
20190-045	Electrode handle ICC/ACC
20194-070 or 20194-075	Patient cable NE or Patient cable NE, international
20100-033	Adapter cable NE
20196-045 or 20196-053	Bipolar cable or Bipolar cable, international
20100-034	Adapter cable bipolar
–	HF power meter
20189-101	Dual-pedal footswitch with ReMode

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BIPOLAR FORCED COAG

Test setup

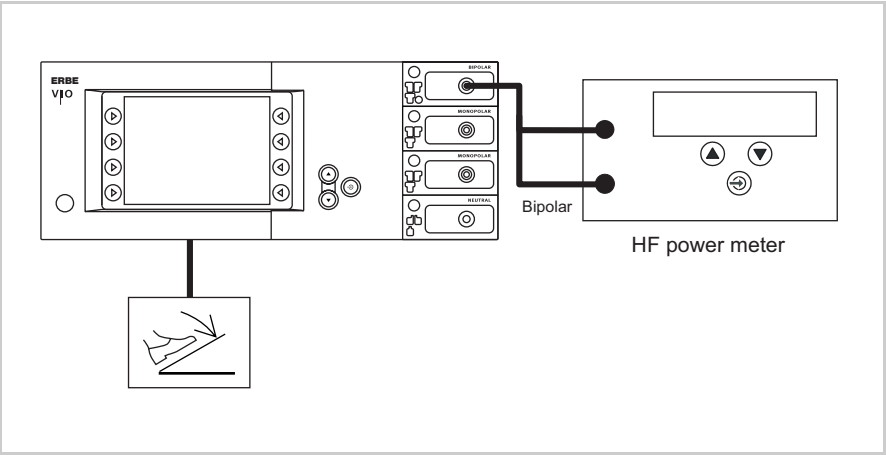

Fig. 6-8

- 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.
- The dual-pedal footswitch with ReMode is connected.

Test procedure

1. Set test specimen to:
   BIPOLAR FORCED COAG, Effect 2, 90 watts
2. Set HF power meter to:
   RL = 200 ohms
3. Activate test specimen via COAG pedal on the footswitch.
4. Determine and document measured value. The tolerance range is 72 to 108 watts.

SOFT COAG
FORCED COAG
SPRAY COAG

Test setup

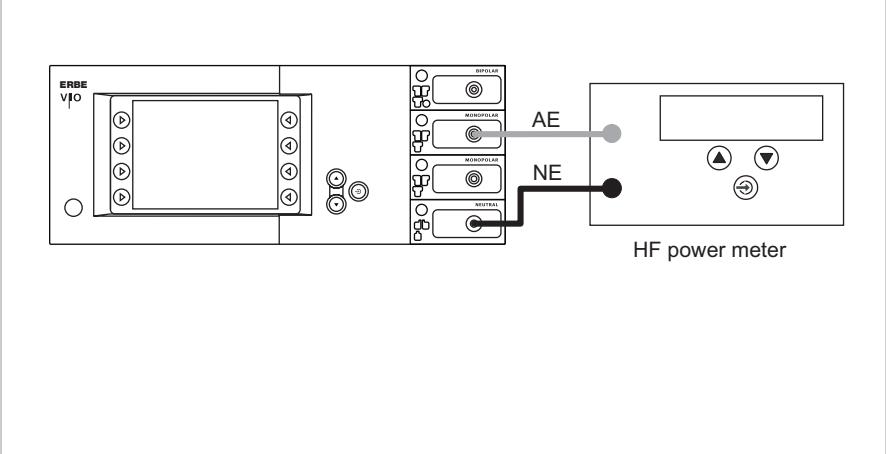

Fig. 6-9

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- 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:
   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.

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.

Only relevant with VIO 300 D

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.

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Performance test upgrades

Testing and measuring equipment

ERBE Art. No.	Description
20192-127 or 20192-110	Patient cable AE or Patient cable AE, international
20190-045	Electrode handle ICC/ACC
20100-152	BiClamp measuring cable (only if there is a MF receptacle)
20194-070 or 20194-075	Patient cable NE or Patient cable NE, international
20100-033	Adapter cable NE
–	HF power meter
–	Oscilloscope
–	Probe 100:1
20189-101	Dual-pedal footswitch with ReMode

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DRY CUT
(only to be tested as an upgrade with VIO 200 D)

Test setup

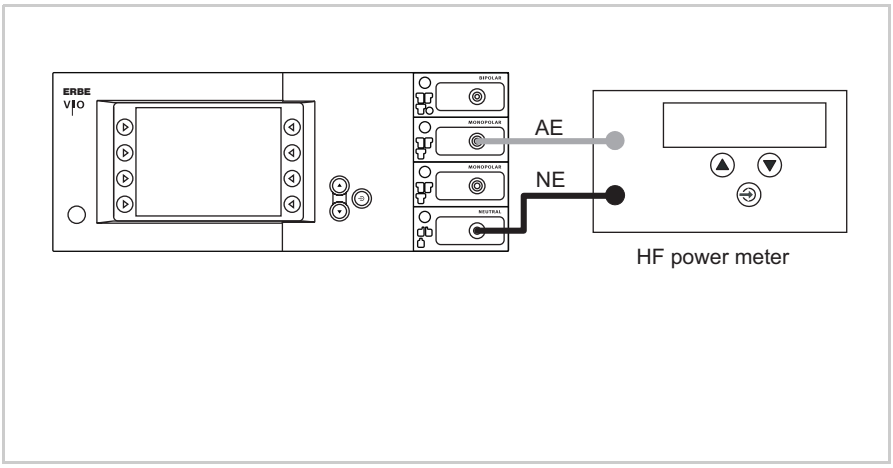

Fig. 6-10

- 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:
   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.

BiClamp
Short-circuit detection
(only if there is an MF receptacle)

Test setup

- The test specimen is connected to the power supply via the power cord.
- The BiClamp measuring cable is connected to the MF receptacle of the test specimen, the cable end is shorted.
- The dual-pedal footswitch with ReMode is connected.

Test procedure

1. Activate the BiClamp function with the footswitch. After approx. 8 seconds the test specimen must interrupt activation and emit a warning message "C-84-2 short circuit".

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ENDO CUT I and Q **Test setup**

ATTENTION! || When connecting the probe to the input of the HF power meter, make absolutely sure that minus is connected to the patient plate.

IMPORTANT! || For these tests in SET-UP level 2 set the Expert mode to "ON".

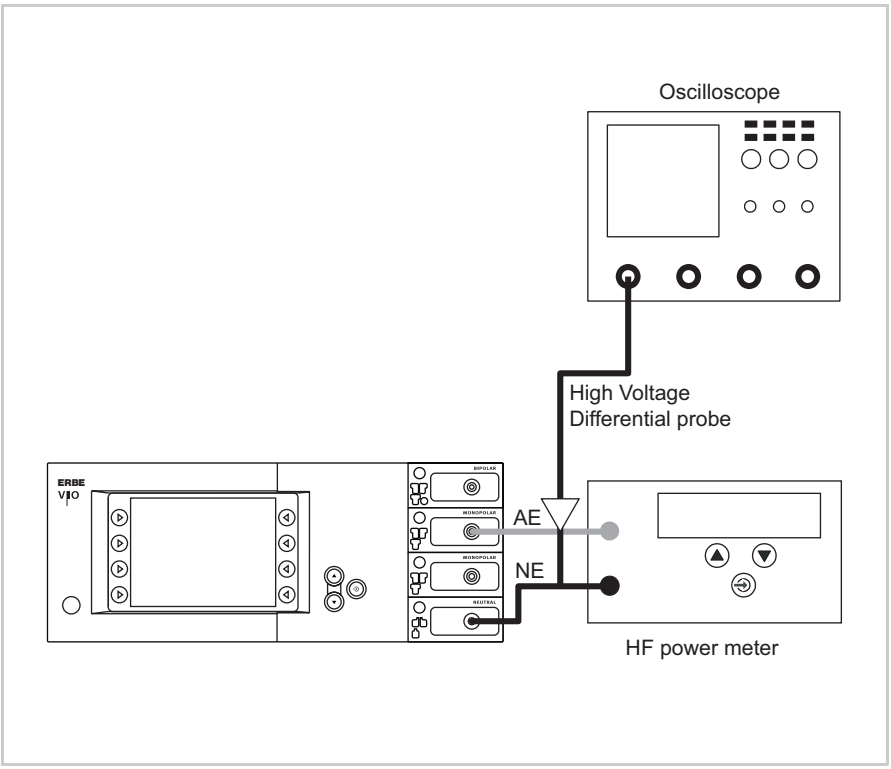

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Fig. 6-11

- 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.

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1. Set test specimen to:
   EndoCut Q, Effect 1, Cutting duration 4, 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.

BI PRECISE COAG

Test setup

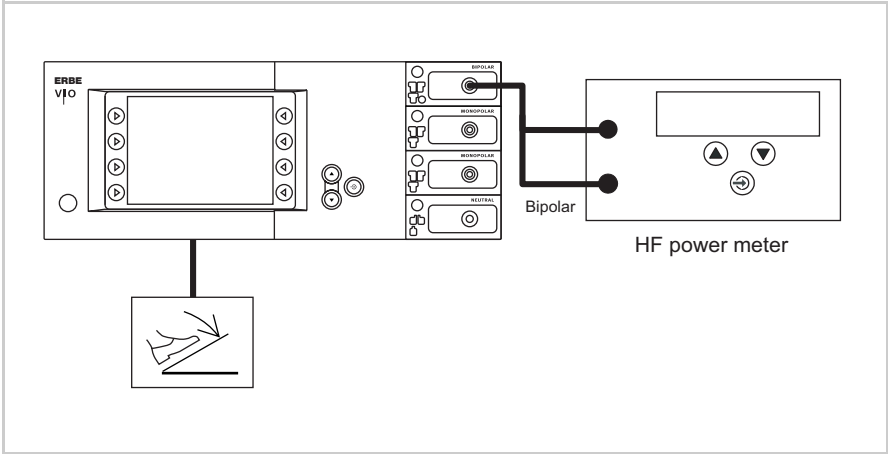

Fig. 6-12

- 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 with ReMode is connected.

Test procedure

1. Set test specimen to:
   BI PRECISE COAG, Effect 8, 50 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 40 to 60 watts.

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Monitor circuits

NE monitoring of critical resistance for single surfaced neutral electrodes

Testing and measuring equipment

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

Presets on the test specimen

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

Test set-up and test procedure

1st test step

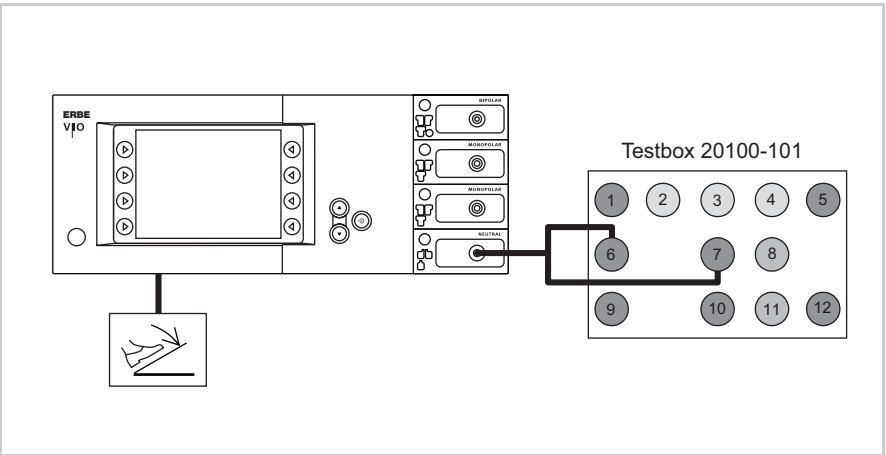

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Fig. 6-13

- 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 with ReMode 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.

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2nd test step

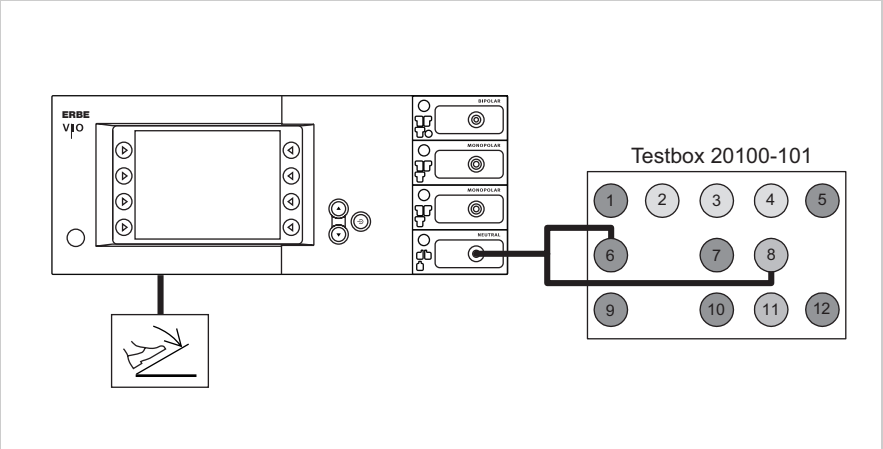

Fig. 6-14

- 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 with ReMode 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 or 20194-075	Patient cable NE or Patient cable NE, international
20100-033	Adapter cable NE
20100-101	VIO Testbox Symmetry/Resistance (NE asymmetry/critical resistance)
20189-101	Dual-pedal footswitch with ReMode

Presets on the test specimen

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

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Test set-up and test procedure

1st test step

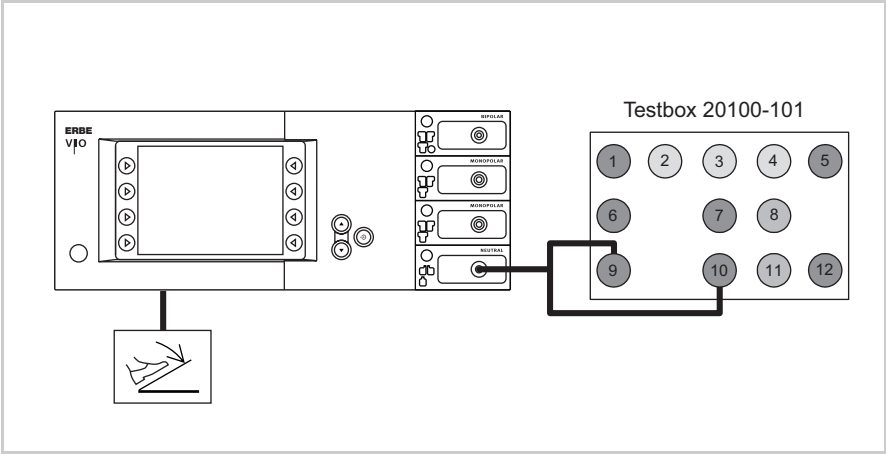

Fig. 6-15

- 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 with ReMode 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

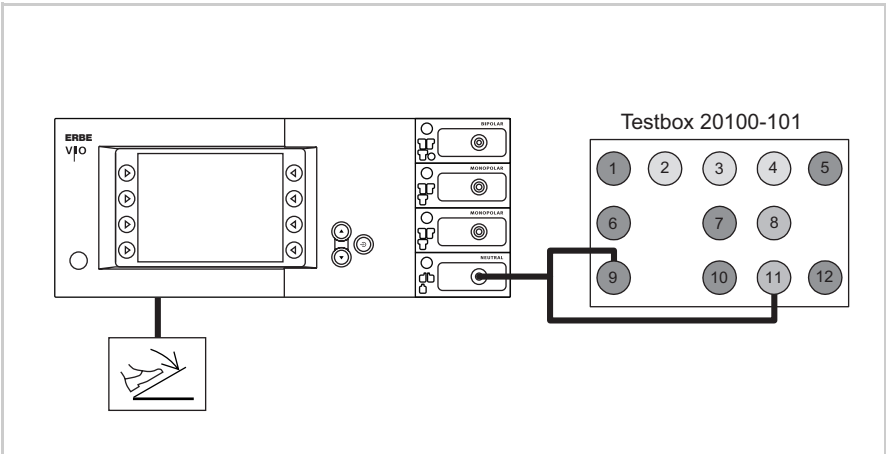

Fig. 6-16

- 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 with ReMode is connected.

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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

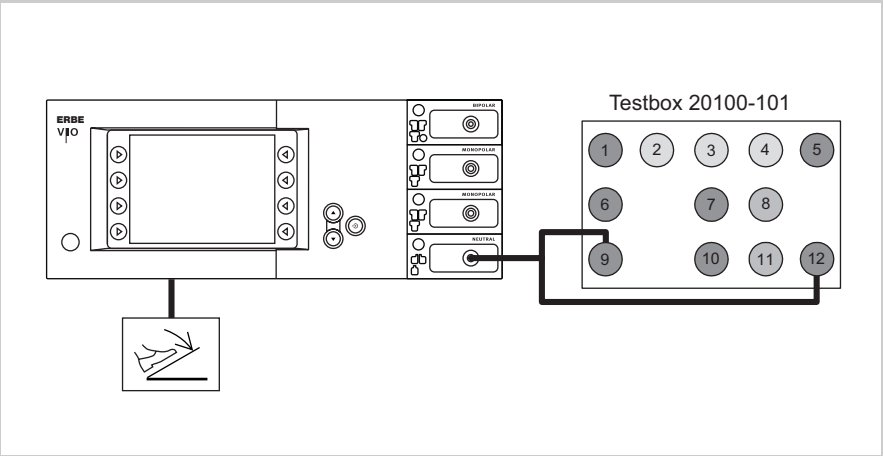

Fig. 6-17

- 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 with ReMode 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.

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NE monitoring of asymmetry

Testing and measuring equipment

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

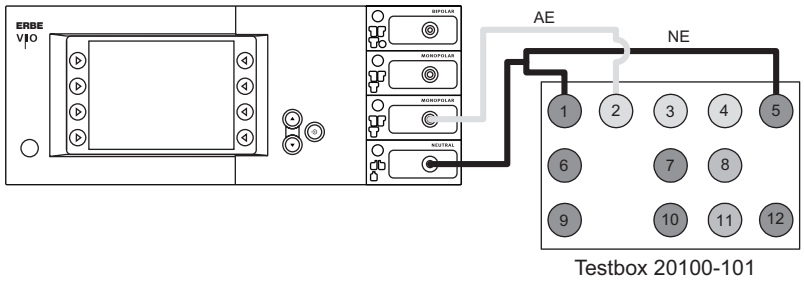

Fig. 6-18

- 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.

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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

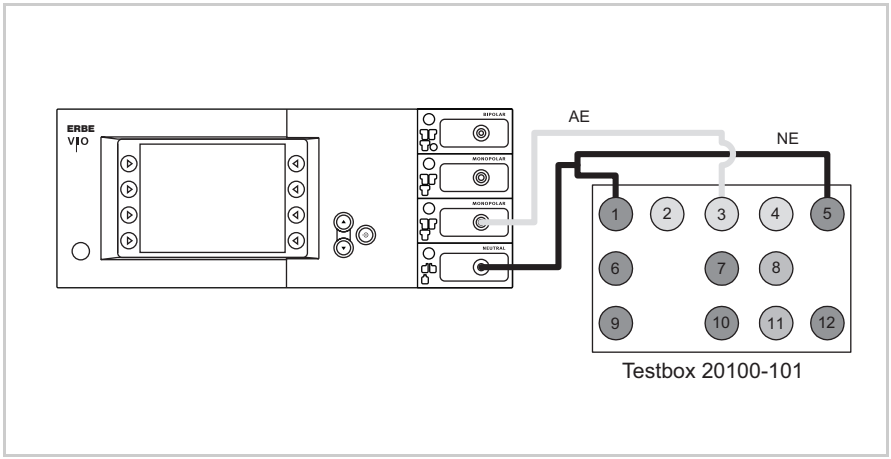

Fig. 6-19

- 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.

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3rd test step

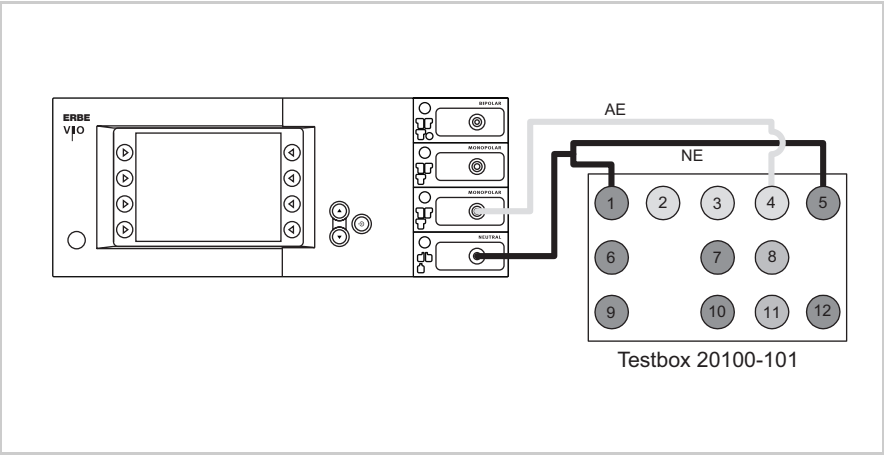

Fig. 6-20

- 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.

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