

## SERVICE MANUAL ARGON COAGULATION UNIT





**REF 900-001** 









## Key

Front ARC PLUS			
Pos.	Symbol	Description	
1	-	LuerLock gas connector Only for use with argon instruments!	
2	-	Display of operational status Orange $\rightarrow$ Sleep mode Green $\rightarrow$ device active	
3	$\textcircled{\textbf{b}}$	Purge function / Purge key	
4	-	Active status display	
5	G	Error indicator (Error message is fully displayed on the ARC 400's screen)	
Poor			
Pos	Symbol	Description	
6	<del>O</del>	Optical communication interface for BOWA electrosurgical devices Signal output	
7	Ð	Optical communication interface for BOWA electrosurgical devices Signal input	
8	-	Connection for potential equalisation	
9	Ŷ	Ventilation bolt for argon tube pressure regulator	
10	-	Mains connection for IEC connector	
11	$\odot$	Bottle pressure sensor connector from pressure regulator 1	
12		Gas canister connector 1	
13	$\odot$	Bottle pressure sensor connector from pressure regulator 2	
14	2	Gas canister connector 2	
15	10101	UART communication interface (for service use only!)	
16	-	Mains switch	
17	-	Mains fuse (2x 250V/1A T)	
18	-	Rating plate	



## Possible operating states of the ARC PLUS user interface

### Ready for operation

•	

#### CUT active

BOWA A R C PLUS	
•	

### COAG active

BOWA A R C PLUS	
•	

## Purge function active

•	

## Purge function active and purge button activated





## 

## No gas canister connected or canister pressure too low (only at system startup)

#### Internal error

		<u>`</u>
• &	G	

#### Self-test

BOWA ARC PLUS		
•	G G	

#### Service mode

BOWA A R C PLUS	
•	

### Sleep mode

BOWA A R C PLUS	
•	
<b>*</b>	



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## 1. Using this Service Manual

This Service Manual is an integral part of the product.

BOWA electronic GmbH & Co KG will neither accept any liability nor provide any warranty in the event of direct or consequential damage arising as a result of non-compliance with the Service Manual.

- Carefully read through the Service Manual before using the unit.
- Keep the Service Manual in a safe place throughout the lifetime of the product.
- Make sure the Service Manual is also available to service technicians.
- Pass on the Service Manual to all subsequent owners/users of the product.
- Update the Service Manual by adding supplementary information provided by the manufacturer.

## 1.1. Index of revisions

ARC PLUS unit version	Revision status
Valid from Version 1.0	2013 / 01

The revision index is as follows:



## 1.2. Validity

This Service Manual applies only to the product indicated on the title page.

## **1.3.** Other applicable documents

• Observe the other applicable documents in the appendix or in the other information.

Other applicable documents are:

- Appendix (optional)
- User Manual



## 1.4. Symbols and markings

1.4.1. Structure of warnings



## \rm **SIGNAL WORD**

Type, source and consequences of danger (physical injury)!Measure for avoiding the danger.



## NOTE

Type, source and consequences of danger (damage to property)!Measure for avoiding the danger.

#### 1.4.2. Risk levels in warnings

Symbol	Risk level	Probability of occurrence	Consequences of non-compliance
	DANGER	Immediate danger	Death, serious physical injury
	WARNING	Possible risk	Death, serious physical injury
	CAUTION	Possible risk	Minor physical injury
0	NOTE	Possible risk	Damage to property

#### 1.4.3. Information

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Additional information provided to facilitate working with the argon coagulation unit.



Symbol / Marking	Meaning
$\checkmark$	Prerequisite for an action
•	Action with one step
1. 2. 3.	Action comprising several steps that must be carried out in a certain order
Ŕ	Result of preceding action
•	List (first level)
•	List (second level)
Highlighting	Highlighting
(see Section xxx, p. xxx)	Cross reference
Socket 11	Numbers in bold type (here: <b>11</b> ) refer to the photos of the unit and the corresponding key

## 1.4.4. Other symbols and markings



Symbol	Symbol name	Symbol	Symbol name
	Argon	and a second sec	Argon open
			Argon Flex
		Pulsed	Argon Flex Pulsed

## 1.4.5. Symbols for monopolar argon CUT / COAG Modes

## 1.4.6. Argon group icons

Symbol	Symbol name	Symbol	Symbol name
Functions	Argon modes		

## 1.4.7. Argon Icons

Symbol	Symbol name	Symbol	Symbol name
Full Empty	Main canister empty	Full Empty	Spare canister empty
Full Full Empty	Main canister full	Full Empty	Spare canister full



## 2. Safety information for service technicians

BOWA-electronic places great emphasis on safety when working with electrosurgical equipment. This section contains information on:

- Safety instructions
- Warnings

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) ]| The safety instructions in the User Manual contain information relevant to correct handling of the argon coagulation unit.

## 2.1. Safety information

Argon coagulation units are subject to rigorous inspections by specially trained personnel.

Only experienced and trained personnel may work with the argon coagulation unit.

BOWA assumes that the argon coagulation unit will be maintained by qualified or authorised personnel. Service technicians must be trained and familiar with the basic principles, rules of maintenance and risks posed by the argon coagulation unit in order to ensure that patients, personnel and equipment are never put in danger.

## 2.2. Warnings and safety instructions

#### 2.2.1. General instructions

- Only use the argon coagulation unit after correctly performing the self-test (see User Manual).
- Position the argon coagulation unit safely; do not place it on top of electrical equipment.
- Do not place any objects (e.g. tools) on the argon coagulation unit.
- Avoid harmful interference effects by placing the argon coagulation unit as far away as possible from other electrical equipment.
- Take suitable safety precautions before working on the argon coagulation unit, use isolating transformers, insulated tools and materials.
- Connect the accessories only to the sockets provided.



## 2.2.2. Special instructions

- Replace sub-assemblies only with sub-assemblies of the same type and quality.
- Use antistatic containers to transport components that could be damaged by static electricity.

#### 2.2.3. Working with the unit switched on

## \rm **DANGER**



Since the unit's components are not insulated against contact with foreign objects, there is high risk of electric shock with potentially fatal consequences!

- Work must only be carried out by qualified or authorised personnel.
- Connect the argon coagulation unit directly to an earthed socket.
- Do not use mains extension cables, adapters or multi-way sockets.
- Use a 1000 VA isolating transformer if you are working on the unit when it is open.
- Ensure that the argon coagulation unit and all of its accessory parts are operated in dry conditions.
- Do not touch any unprotected cables or PCBs.
- Do not use any earthing straps when working on a live argon coagulation unit.

Overheated or unsuitable components and inflammable materials pose the risk of fire or explosion.

- Ensure that the argon coagulation unit has sufficient cooling.
- Do not use any inflammable materials, such as anaesthetics, gases or fluids, around the argon coagulation unit.
- If accessories are overheated, remove them from the argon coagulation unit and keep them away from the unit and personnel.



### 2.2.4. Working with the unit switched off

The components are not insulated against contact with foreign objects. There is a risk of electric shock from electrically charged components even after the unit is switched off.

- Switch off the argon coagulation unit and pull out the plug at least 5 minutes before commencing any service work.
- Use an electrostatic discharge wrist strap and ESD mats, in order to prevent damage to the electronic components.

The argon coagulation unit can be damaged by incorrect use of tools and associated materials.

- Do not clean the argon coagulation unit with cleaning agents which could cause damage or scratching.
- Follow the cleaning instructions in the User Manual.
- When carrying out maintenance work, also observe the warnings and safety instructions in the User Manual.

## 3. Deploying the argon coagulation unit

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Electromagnetic interference fields are produced when the argon and electrosurgical units are used in accordance with the instructions.

Make sure that no electronic devices are used in the environment of the argon unit that can be adversely affected by electromagnetic interference fields.

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Argon coagulation units and electrosurgical units may only be operated in rooms for medical use which fulfil the requirements of DIN VDE 0100-710.

If the argon coagulation unit has been stored or transported at temperatures below +10°C, it requires at least 3 hours to acclimatise.

When used for the first time, it must be ensured that the argon coagulation unit is subjected to a functional check in combination with the electrosurgical unit and that the person responsible for operation has been instructed by the manufacturer or supplier.

Electrosurgical unit, argon coagulation unit and argon canisters are normally installed on the ARC CART equipment trolley with gas canister mounting:



Figure 3-1: ARC CART

![](_page_17_Picture_1.jpeg)

- Secure the Argon tank by fixing it with the synthetic band provided for the purpose.
- The argon coagulation unit must always be placed under the electrosurgical unit.
- The equipment trolley must be positioned outside the zone of the operating theatre that is at risk of explosion. Free circulation of air around the units must be guaranteed. Maintain room temperatures between +10 °C and + 40 °C and a relative humidity between 30 and 75 %.
- ► To achieve full proportioning precision of the argon coagulation unit, it should be switched on approx. 10 minutes before use.
- The argon coagulation unit can also be connected to the central argon supply as long as the degree of purity for argon gas and the requirements for maximum supply pressure are complied with. In this case, the responsibility for making the proper connection lies with the hospital.
- Use separate power cords and potential equalisation cords respectively for the electrosurgical unit and the argon coagulation unit.
- Use either the included power cord or one that is of the same quality and has the required national safety certificate

![](_page_17_Picture_9.jpeg)

## 

Check that the mains voltage concurs with the mains voltage specified on the argon coagulation unit.

Connect both optical links to the corresponding sockets 6 and 7 on the argon coagulation unit and the electrosurgical device.

ARC PLUS optical	ARC 350/400 opti-
socket	cal socket
Э	Ð
Ð	Э

When using the Argon Flex mode, a foot switch is required. It has to be connected to the corresponding socket on the rear of the electrosurgical unit.

- Up to two gas canisters can be connected via pressure regulators.
- Connect argon canisters with built-in pressure regulators (e.g. 900-906) either at socket 12 or 14 of the argon coagulation unit.
- The electronic pressure sensor of socket 12 must be connected to socket 11, and socket 14 corresponding to socket 13.

![](_page_18_Picture_5.jpeg)

Fogure 3-2: Example of two connected argon canisters

![](_page_19_Picture_1.jpeg)

## 4. Gas supply

#### Use of argon gas canisters

Following points must be observed when using argon gas canisters:

- Observe the gas supplier's security notes. Only staff trained for handling pressurised gas containers may handle them.
- Only transport gas canisters with valve protectors and do not use force on the canister or pressure reducer.
- Only argon with a purity of 4.8 or better may be used.
- Damaged canisters must not be used.
- In the appropriate concentration, Argon gas, which escapes uncontrolled into the atmosphere, can lead to shortage of oxygen and the associated consequences for the system. Therefore, always pay attention to audible leaks with extended hissing noises when connecting.
- Use only the pressure reducers and pressure lines provided by BOWA, see following table:

ltem no.	ltem		Interface for detecting canister fill level
900-901	Pressure reducer, DIN 477 Nr. 6		No
900-902	Pressure reducer, DIN 477 Nr. 10		No
900-903	Pressure reducer, CGA 580 No		No
900-904	Pressure reducer, BS 341 Nr. 3		No
900-906	Pressure reducer, DIN 477 Nr. 6	(only combined with ARC 400)	Yes
900-907	Pressure reducer, DIN 477 Nr. 10	(only combined with ARC 400)	Yes
900-908	Pressure reducer, CGA 580	(only combined with ARC 400)	Yes
900-909	Pressure reducer, BS 341 Nr. 3	(only combined with ARC 400)	Yes

- The input pressure for the ARC plus unit must not exceed 4.5 bar.
- Observe the operating instructions of the pressure reducer.
- Leaking canisters, pressure reducers and pressure lines must not be used.
- Do not use any lubricants with the pressure reducer and do not use tools for fitting.

![](_page_20_Picture_1.jpeg)

Up to two gas canisters can be connected via pressure reducers. Only use one variety of pressure reducers, i.e. two pressure reducers without electronic fill level sensors OR two pressure reducers with electronic fill level sensors.

Connecting one pressure reducer with and one without electronic fill level sensor is not intended.

![](_page_20_Figure_4.jpeg)

Figure 4-1: Pressure reducer with fill level sensor interface

- 1 Quick coupling gas connector to argon coagulation unit
- 2 Electronic fill level sensor plug
- 3 Gas canister connector
- 4 Manometer for checking the gas canister's pressure / filling level

#### Centralised gas supply

The maximum applicable gas input pressure to gas connectors **12** and **14** is 4.5bar and may not be exceeded.

Because the working pressure of a centralised gas supply is higher than the allowed pressure (approx. 5bar), the argon coagulation unit must be fitted with an internal pressure reducer. These may only be fitted by authorised BOWA service dealers.

![](_page_21_Picture_1.jpeg)

# 5. Design and operating principle of ARC PLUS

The argon coagulation unit consists of several sub-assemblies connected together as blocks or modules:

- Front panel unit, complete (70319)
- Control board (70304)
- Sensor board (70097)
- Gas block (70097)
- Low voltage power supply unit (10971)
- Optical connector board (70329)

The block diagram in chapter 13 gives an overview of the components and their functions.

![](_page_22_Picture_1.jpeg)

## 5.1. Front panel unit, complete (70319)

The complete front panel unit comprises the following components:

- Glass touch interface
- RGB LED display
- Plastic front frame

It is not possible to separate these components.

The connection between front panel and control board is created by the connectors JP1, JP2 and JP3.

![](_page_22_Figure_9.jpeg)

Figure 5-1: Front panel unit, front view

![](_page_22_Figure_11.jpeg)

Figure 5-2: Front panel unit, rear view

#### Following connectors are present:

Front panel connector nr.	Function	Objective
JP1	Data bus (SPI) and glass front power supply	Socket JP20 control board
JP2	Glass front status LED control	Socket JP1 control board
JP3	RESET line to control board JP1	Socket JP20 control board

![](_page_23_Picture_1.jpeg)

## 5.2. Control board (70304)

The control board is the main control centre of the argon coagulation unit. Here, all sensor signals are processed and the set output parameters are controlled

On this board, the front panel unit is connected to the micro processing unit via JP20. Measurement readings are sent via the ribbon cable connected to JP6 to the processing unit. The valves V1 - V6are operated directly from the control board. Additionally, the optical links, gas canister pressure sensors and the communication interface are connected to the control board.

![](_page_23_Picture_5.jpeg)

Figure 5-3: Control board

![](_page_24_Picture_1.jpeg)

![](_page_24_Figure_2.jpeg)

Figure 5-4: Overview of the connectors on the control board

#### The following interfaces are provided:

Plug nr.	Function
JP1	Glass front status LED control
JP2	24VDC power supply from the low voltage power supply unit [10971]
JP4	Gas outlet connector illumination
JP6	Input for analog pressure sensor signals from the control board [70097]
JP8	UART interface
JP10	Valve control V1 – V6
JP12	Gas canister pressure sensor, canister 2
JP13	Gas canister pressure sensor, canister 1
JP14	Optical interface connector
JP20	Data bus (SPI) and glass front power supply

#### Meaning of active LED indicators:

LED RED	Meaning
D10	+5,0V → OK
D103	+3,3V → OK
D104	+3,0V → OK
D106	-12V → OK
D107	+12V → OK

LED GREEN	Meaning
D19	Valve V1 open
D15	Valve V5 open
D16	Valve V6 open
D18	Valve V2 open
D17	Valve V3 open

![](_page_25_Picture_1.jpeg)

## 5.3. Sensor board (70097)

The sensor board is equipped with 3 pressure sensors and a pressure differential sensor for gas flow measurement.

Each gas canister connector requires a pressure sensor to monitor the gas input pressure. Output pressure to the instrument is monitored by a separate sensor.

![](_page_25_Picture_5.jpeg)

Figure 5-5: Sensor board (70097)

![](_page_25_Figure_7.jpeg)

Figure 5-6: Sensor board, component side

The following	interfaces are	provided:

Plug nr.	Function
JP2	Output for analog pressure sensor values to control board [70304]

![](_page_26_Picture_1.jpeg)

## 5.4. Pneumatic block (70096)

The pneumatic block is composed of 6 magnetic valves and an aluminium routing block. The sensor board, magnetic valves and the gas canister inlets are linked via the routing block. The gas output is controlled by the valves according to the settings made in the user interface of electrosurgical unit.

![](_page_26_Picture_4.jpeg)

Figure 5-7: Pneumatic block (70096)

![](_page_26_Figure_6.jpeg)

Figure 5-8: Pneumatic block drawing

![](_page_27_Picture_1.jpeg)

![](_page_27_Figure_2.jpeg)

#### Pneumatic block flow diagram:

Figure 5-9: Pneumatic block flow diagram

## The function of each valve on the pressure block is as follows:

Valve	Function	Connecting line colour
V1	Input valve gas canister 1	purple
V2	Input valve gas canister 2	grey
V3	Bypass valve	brown
V4	Proportional valve	red
V5	Output valve	white
V6	Self-check valve	yellow

![](_page_28_Picture_1.jpeg)

## 5.5. Low voltage power supply (10971)

The low voltage power supply provides the required low voltage for the control board.

From its wide range mains input of 100 V - 240 V AC it produces a DC voltage of +24 V.

![](_page_28_Picture_5.jpeg)

Figure 5-10: low voltage power supply

- Mains input 100-240 V AC (2-pin)
- 2 Low voltage DC output 24 V DC (4-pin)
- 3 PE connector (6.3mm)
- 4 Potentiometer for adjusting the output voltage +/-10%

![](_page_28_Figure_11.jpeg)

Figure 5-11: Low voltage power supply component side

#### Layout of low voltage connector 2:

Pin	Voltage
1+2	+24 V
3+4	GND

#### Output values of the low voltage power supply

Voltage	Max. current	Max. power
+24 V +/-5%	4.2 A	100 W

![](_page_29_Picture_1.jpeg)

## 5.6. Optical link board (70305)

The optical link board serves as communication interface the argon coagulation unit to BOWA electrosurgical units

![](_page_29_Picture_4.jpeg)

Figure 5-12: Optical link board

#### The following interfaces are provided:

Label	Symbol	Function
	Э	Signal output of the optical link interface to BOWA electrosurgical units
	Ð	Signal input of the optical link interface from BOWA electrosurgical units
JP1		Connection between optical link board and control board

![](_page_29_Figure_8.jpeg)

Figure 5-13: Optical link board, component side

- 1 Signal output (sending), glowing red
- 2 Signal input (receiving)

![](_page_30_Picture_1.jpeg)

## 6. Maintenance

## 6.1. Technical safety inspection (TSI)

During the technical safety inspection, the safety and functionality of the argon coagulation unit, accessories and, if used, the equipment trolley is checked. It must be carried out in order to detect equipment defects and verify the safety of the medical device.

Technical safety inspections must be carried out:

- once a year
- after every time that the argon coagulation unit is opened
- The product and accessories may only be inspected by persons who have the required training, knowledge or experience and who can perform the inspection independently.
- ► When carrying out the technical safety inspection, observe the rules and regulations that apply in the relevant country.
- ► If necessary, refer to IEC 62353 for assistance when carrying out the inspection.
- Document the results of the technical safety inspection and keep this record in the medical device logbook for the argon coagulation unit.

#### 6.1.1. Carrying out the TSI

Prescribed checks:

- Visual inspection
- Functional test
- Electrical tests
- Argon gas flow measurement

0	•	The TSI test record can be found in Section 13, on page 72.
<u>][</u>	•	The TSI test instructions can be found in Section 12, on page 61.

If the results deviate from the values shown in the test record or are outside the stated maximum values, the argon coagulation unit must be calibrated and the technical safety inspection carried out once again. If this does not remedy the situation, contact the Technical Service at BOWA-electronic GmbH & Co. KG.

In doing so, observe the procedures described in section 8.2, on page 41.

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![](_page_31_Picture_1.jpeg)

## 7. Problem solving

If the argon coagulation unit is not working properly, use this section to rectify faults.

## 7.1. Functional test of boards

The boards and their functions can be checked with the aid of the information provided in chapter 5.

For rapid and efficient troubleshooting, please contact the BOWA service department.

### 7.1.1. Dealing with a board fault

If the functional test is unsuccessful, there is a fault in one of the components of the board that has been tested. In this event, proceed as follows:

1. Change the entire board.

Removal and installation of boards is described in Section 9, page 43.

2. Carry out a technical safety inspection (see Section 12, page 61).

![](_page_32_Picture_1.jpeg)

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# 7.2. Information messages displayed on ARC PLUS

# 7.2.1. Procedure to be followed when information messages appear

The argon coagulation unit continuously runs a self-test, as indicated by information messages on the display of the connected ARC 400 electrosurgical unit.

If short information messages repeatedly appear, the unit's accessories and settings must be checked.

If the information messages persist after the argon coagulation unit has been switched off and back on or after correcting the fault, contact the Technical Service department at BOWA-electronic.

#### Information messages

The argon coagulation unit generates information messages in the form of:

- An audible alarm (ARC 400)
- Information message displayed on ARC 400 electrosurgical unit

If faults appear during the self-test that might cause an accident, the argon coagulation unit switches itself off until the fault is repaired.

A list of the faults that have occurred is stored in the unit and can be called up as required (see section 7.3, page 34).

900-001\_SM\_V2.5\_11284\_S1\_20210527-EN

![](_page_33_Picture_1.jpeg)

## 7.3. Reading out the fault memory

The fault memory can be read out using the **BOWA-ARC-Servicetool.exe** software. The data from the fault memory can only be evaluated by the BOWA service department. This data may enable the cause of the fault to be identified more precisely, so for various fault symptoms it is necessary to read out this data and forward it to the BOWA service department.

#### The following materials are required:

- Laptop/PC
- BOWA-ARC-Servicetool.exe software
- BOWA transmission cable (Item no.: 70278)

#### System requirements:

Microsoft Windows® XP (32 and 64 bit) Microsoft Windows® Vista (32 and 64 bit) Microsoft Windows® 7 (32 and 64 bit)

- 1 GHz or larger Pentium-compatible processor
- 512 megabytes (MB) RAM

1. Launch the Setup.exe file

• 10 MB free hard drive space

#### 7.3.1. Installation of the BOWA-ARC-Servicetool software

![](_page_33_Figure_14.jpeg)

Figure 7-1: Installation Wizard

Zehrenzeichen Wähn Sie der preisen Indelkonverzeichne aus. Die Schware wirt in klanzlich weiserhinzen mitaliet. Zur Assend anderer Verzeichnes Weiser Sie auf Schwart:	
Die Schwae wiel in felgenden Verzeichnissen installest. Zur Auswärl anderen Verzeichnisse Kölchen Sie auf "Suchen".	
Varzeichnis für BOWA - ARC - Servicetool	
C1Pregram Rise (dB)/BOWA - ARC - Servicetor/	shan
Verzeichnis für Produkte von National Instruments. CAProgram Files 606/Vlational Instruments/	cher

Figure 7-2: Installation Wizard

- 2. Follow the usual Windows installation routine.
- 3. After successful installation, please restart your computer to apply all system settings.

![](_page_34_Picture_1.jpeg)

## 7.3.2. Transmission cable (70278) driver installation

Figure 7-3: Transmission cable [70278]

allieren von Gerätetre	eibersoftware
32R	O Treibersoftware wird installiert
32R	O Treibersoftware wird installiert

Figure 7-4: Driver installation

Gerätetreiberinstallation	
Das Gerät kann jetzt verwe	ndet werden.
USB Serial Converter USB Serial Port (COM8)	Verwendung jetzt möglich Verwendung jetzt möglich
	Schließen

Figure 7-5: Installation successful

Figure 7-6: Transmission cable [70278]

![](_page_34_Picture_11.jpeg)

Figure 7-8: Transmission cable [70278]

![](_page_34_Picture_13.jpeg)

Figure 7-7: Communication interface

1. Connect the transmission cable to your PC's USB port.

- 2. Depending on your operating system, installation of the device driver for the transmission cable may start automatically or may have to be performed manually. The device driver is installed automatically as part of a Windows update when installing manually.
- 3. Once the driver has been successfully installed, the transmission cable can be used.
- 7.3.3. Using the ARC PLUS-LogFile.exe software
  - 1. Connect transmission cable 70278 to the USB port of the PC/laptop.

- 2. Connect the transmission cable (Item no.: 70278) to the ARC PLUS communication interface **15**.
- 3. Connect the ARC PLUS and the ARC 400 using the optical fibre cables plugged in sockets **6** and **7**.
- 4. Turn on the ARC PLUS and ARC 400 with the corresponding mains switches.

n successful

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![](_page_35_Picture_2.jpeg)

- 5. Select an argon mode in the ARC 400 to start the ARC PLUS.
  - 6. Start the already installed application BOWA-ARC-Servicetool from installation directory: C:\programs\BOWA - ARC - Servicetool\

BOWA - AR

7. Click on the button

Search ARC device...

- 8. As soon as the connection between ARC 400 and PC/laptop is build up, following message will appear:
- 9. Click on the button:

Show information

- 10. Click on the button: Read Errorlog
- Computer + BOWA (E:) 35180012\_07-07-2014T16\_35\_48 Dateityp: ARC Logo atei (".arclog) speichern

Figure 7-10: Save Log file

- 11. Choose now a storage path for the log file. It is not allowed to rename the file. The file name includes important information's for BOWA service.
- 12. Start the data transmission with the button [Save].
- 13. The data is transferred. The download status is indicated by the green progress bar. 66.7
- 14. Send this file to: <a href="mailto:service@bowa-medical.com">service@bowa-medical.com</a> for analysis.

![](_page_35_Picture_17.jpeg)

![](_page_35_Picture_19.jpeg)

![](_page_35_Picture_20.jpeg)


## 7.4. Troubleshooting

Faults may be classified as follows:

- Start-up faults
- Display faults
- Functional faults

The ARC PLUS constantly monitors all relevant unit functions. If a serious error occurs, all display elements are glowing red.



Figure 7-11: Internal error

#### Optical and audible signals in the instance of an error

Error messages are displayed as text messages on the electrosurgical unit, accompanied by optical and audible signals. Additionally, the electrosurgical unit cancels activation on certain errors.

Optical and audible signals:

- Output error display is glowing red
- Audible warning sign is sounded

#### 7.4.1. Dealing with a board fault

If the measures carried out do not remedy the fault, you must fit a new board.

Refer to Section 9 when replacing boards.



#### 7.4.2. Start-up faults

#### Argon coagulation unit will not switch on

Possible cause	Action	
Power plug disconnected	Plug in the power plug.	
Faulty power cable	Check that the power cable is properly connected and making contact.	
Mains switch <b>16</b> is not switched on	Turn on mains switch 16.	
Incorrect incleases cupply voltage to the	<ul> <li>Check the supply voltage.</li> </ul>	
argon coagulation unit	<ul> <li>Connect the argon coagulation unit to a different socket outlet.</li> </ul>	
Faulty / damaged fuses	<ul> <li>Change the fuses.</li> </ul>	
Cables inside the argon coagulation unit are loose or disconnected	Check that all connecting cables are properly connected and making contact.	
Malfunction of parts of front unit	<ul> <li>Change the front unit.</li> </ul>	

#### Argon coagulation unit does not perform a self-test, or does not complete it

Possible cause	Action
Information message was generated	<ul> <li>Check the electrosurgical unit's main display for an information message.</li> </ul>
Cables inside the electrosurgical unit are loose or disconnected	Check that all connecting cables are properly connected and making contact.
Incorrect, inadequate supply voltage to the electrosurgical unit	<ul> <li>Check the supply voltage.</li> <li>Connect the electrosurgical unit to a different socket outlet.</li> </ul>
Software malfunction	Switch the electrosurgical unit off and back on.

#### Argon coagulation unit does not start or activate

Possible cause	Action
Foot switch signal is not being processed by the control board.	Check that all cables are properly con- nected and making contact.
Defective foot switch	Exchange the foot switch.
Defective argon finger switch	Exchange the argon finger switch.
Argon mode at electrosurgical unit not se- lected.	<ul> <li>Select Argon mode</li> </ul>



### 7.4.3. Display faults

### No display; partial or incorrect display

Possible cause	Action	
Cable between front panel unit and control board (front panel power supply) is damaged or not connected.	Check that the cables between the front panel unit and the control board are properly connected and making contact.	
	<ul> <li>Check the supply voltages on the front panel. (see page 24)</li> </ul>	
Malfunction of parts of front panel unit	Change the entire front panel unit.	



## 8. Repairs

BOWA-electronic GmbH & Co. accepts liability for the safety, reliability and performance of the argon coagulation unit subject to the following conditions:

- All instructions for installation and correct usage in accordance with the User Manual and the Service Manual have been precisely followed.
- Changes, repairs, new settings and similar procedures have been carried out only by persons authorised by BOWA to do this work.
- The electrical installation in the relevant room complies with local regulations and legal requirements.

## 8.1. Repair on site

Repairs to the ARC PLUS may only be carried out on the circuit boards. When carrying out these repairs, refer to Sections 9 and 10.

- Carry out a technical safety inspection on the argon coagulation unit if you have opened it (see Section 12, page 61).
- Dispose of faulty parts properly.

#### 8.1.1. Ordering of spares

Faulty boards may only be replaced by complete original BOWA subassemblies.

#### Details

Have the following details ready:

- Item no. of the argon coagulation unit
- Serial no. of the argon coagulation unit
- Spare part number



## 8.2. Repair in the factory

If your argon coagulation unit develops a fault that necessitates repair in BOWA's main plant, proceed as follows:

#### Details

Have the following details ready:

- Your full address
- Item no. of the argon coagulation unit
- Serial no. of the argon coagulation unit
- Software version
- A detailed description of the problem or the repair to be carried out

#### Send in the argon coagulation unit

- 1. Disinfect your argon coagulation unit.
- 2. Fill out the warranty / defects report (see Section 13, page 72).
- 3. Send your argon coagulation unit in its original packaging to the address provided.
- You will receive your argon coagulation unit back when it has been successfully repaired.

#### Address

Send your argon coagulation unit, including temporary replacement, to the following address:

#### **BOWA MEDICAL**

BOWA-electronic GmbH & Co. KG Service Heinrich-Hertz-Strasse 4–10 D-72810 Gomaringen



#### 8.2.1. Warranty / Defects report

In order to offer you the necessary technical support quickly and effectively in service situations, it is essential that we are given as much information as possible about your faulty argon coagulation unit.

For this reason, a warranty / defects report that gives our service department important initial information about your problem is provided in the appendix (see Section 13, page 72)

For a more comprehensive fault analysis, it is necessary to measure the output flow when the various modes are running (see instructions on the technical safety inspection in Section 12, page 61).

- 1. Please fill in the warranty / defects report as completely as possible.
- 2. Send the completed warranty / defects report to the technical service department at BOWA-electronic GmbH & Co. KG:
  - Telefax: +49 (0) 7072-6002-33
  - E-Mail: <u>service@bowa-medical.com</u>



## 9. Removal and installation of parts

## ▲ CAUTION

Risk of injury due to electric shock. The components are not protected against contact with foreign objects!

- Pull out the power plug.
- Switch off the argon coagulation unit at least 5 minutes before commencing any service work.
- Use an earthing strap and an ESD mat for protection against electrostatic discharge.
- Read the notes in Section 2 and follow the instructions in this section.



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### 9.1. Mains fuse



Figure 9-1: Mains fuse

#### **Tools required:**

- Flat screwdriver

#### **Removing:**

- Operate the locking mechanism on both sides of the fuse holder using a screwdriver and pull it out of the connector socket.
- Take the 2 fuses out of the fuse holder.

#### Assembly:

- Insert the new fuses into the fuse holder.
- Insert the fuse holder into the connector socket until you feel it click into position.

Supply	Mains fuse
voltages	to be used
100 – 240 V	2x T, 1 A



## 

#### Incorrect mains fuse rating may damage the unit!

When replacing the fuse, be sure to use the correct fuse type.



## 9.2. Opening / closing the ARC PLUS



Figure 9-2: Bodenplatte

#### **Tools required:**

- Torx Screwdriver, size T10
- Torx Screwdriver, size T20

#### **Removing:**

- Remove the 6 screws (M3x6 mm) shown in *Figure 9-2* using the T10 Torx screwdriver.



Figure 9-3: Rear



Figure 9-4: Housing cover

- Turn the 2 screws shown in *Figure 9-3* using the T10 Torx screwdriver.

- Turn the 4 screws (M4x6mm) shown in *Figure 9-4* using the T20 Torx screwdriver and remove the plate discs
- Remove the cover from the unit.

#### Assembly:

Reassemble by reversing the steps described above for dismantling.



## 9.3. Control board

#### **Tools required:**

- Torx screwdriver, size T10



#### **Removing:**

- Open the argon coagulation unit as described in section 9.2, page 45.
- Remove the cable connections to the control board marked green in *Figure 9-5*.
- Use pointed pliers for this if necessary. Avoid pulling on the cable when removing the connector!
- Remove the screws (M3x5mm) marked orange in *Figure 9-5* using the size T10 Torx screwdriver.
- The control board can now be removed.

Figure 9-5: Control board

#### Assembly:

Reassemble by reversing the steps described above for dismantling.

#### Following plugs have to be reconnected:

Plug nr.	Function
JP1	Glass front status LED control
JP2	24VDC power supply from the low voltage power supply unit [10971]
JP4	Gas connector illumination
JP6	Input for analog pressure sensor signals from the control board [70097]
JP8	UART interface
JP10	Valve control V1 – V6
JP12	Gas canister pressure sensor, canister 2
JP13	Gas canister pressure sensor, canister 1
JP14	Optical interface connector
JP20	Data bus (SPI) and glass front power supply



#### \land CAUTION

After changing the component, out a complete calibration must be performed of the unit! This calibration can be performed only from the BOWA-service.

### 9.4. Low voltage power supply

The low voltage power supply unit is located on the left in the rear section of the ARC PLUS.

#### **Tools required:**

- Torx screwdriver, size T10

#### **Removing:**

- Open the argon coagulation unit as described in section 9.2, page 45.
- Remove the cable connections marked green in *Figure 9-6* from the low voltage power supply.
   Use pointed pliers for this if necessary. Avoid pulling on the cable when removing the connector!
- Remove the screws (M3x5mm) marked orange in *Figure 9-6* using the size T10 Torx screwdriver.
- You can now remove the low voltage power supply unit.

#### Assembly:

Reassemble by reversing the steps described above for dismantling.

#### 

- A calibration of ARC PLUS after exchange of low voltage power supply is not necessary!
- During assembly, make sure that the protective film is reinstalled.



Figure 9-6: Low voltage power supply



## 9.5. Sensor board

#### **Tools required:**

- Torx screwdriver, size T10
- Philips screwdriver size PH1
- 2x flat screwdriver

#### **Removing:**

- Open the argon coagulation unit as described in section 9.2, page 45.
- Remove the control board cable connection marked green in *Figure 9-7*.
   The latches marked by arrows have to be opened for this purpose.
- Remove the screws (M3x20mm) marked red in *Figure 9-7* using the Philips size PH1 screwdriver.
- Remove the screws (M3x5mm) marked orange in *Figure 9-7* using the size T10 Torx screwdriver.
- Remove the flow sensor by applying levers with the flat screwdrivers on the points marked in the picture. Now the sensor board can be removed.

#### Assembly:

Reassemble by reversing the steps described above for dismantling.



Figure 9-7: Sensor board screws



Figure 9-8: Flow sensor



## ▲ CAUTION

After changing the component, out a complete calibration must be performed of the unit! This calibration can be performed only from the BOWA-service.



## 9.6. Pneumatic Block

#### **Tools required:**

- Torx screwdriver, size T20



Figure 9-9: Pneumatic block ribbon cable



Figure 9-10: Pneumatic block valves



#### **Removing:**

- Open the argon coagulation unit as described in section 9.2, page 45.
- Remove the control board cable connection marked green in *Figure 9-9*.
   The latches marked by arrows have to be opened for this purpose.

- Remove the valve connections to valves V1 to V6 which are marked green in *Figure 9-10*.
- Open the cable clamp marked red in Figure 9-10.
- Unfasten the gas tube connectors on the pneumatic block marked yellow in *Figure 9-10*.

#### Danger of mix-ups!

Label the gas tubes and their connectors so tubes cannot be accidentally swapped round during assembly.





Figure 9-11: Pneumatic block screws



Figure 9-12: Pneumatic block connectors

- Remove the screws (M4x35mm) marked orange in *Figure 9-11* using the Torx size T20 screwdriver.
- The pneumatic block can now be removed.

#### Assembly:

Reassemble by reversing the steps described above for dismantling.

Check to correct connection of the gas tubes before starting up.

The gas tube connectors of the pneumatic block must be connected as follows:

- (1) Gas canister 1 connection
- (2) Gas canister 2 connection
- (3) Front side gas plug connector
- (4) Not used

\rm **CAUTION** 

 After changing the component, carry out a complete functional and activation test.



## 9.7. Front panel unit

#### **Tools required:**

- Torx screwdriver, size T20

#### **Removing:**

- Open the argon coagulation unit as described in section 9.2, page 45.
- Remove the plugs JP1 to JP3 from the front panel unit.
- Remove the screws (M4x8mm) marked orange in *Figure 9-13* using the Torx size T20 screwdriver.

Figure 9-14: Front panel fixation right



Figure 9-15: Front panel screws

- Remove the plugs marked yellow in *Figure 9-14* from the bottom housing.
- Remove the tube connector marked green in *Figure 9-14* from the pneumatic block.

- Remove the screws (M4x8mm) marked orange in *Figure 9-14* using the Torx size T20 screwdriver.
- Remove the front panel.

#### Assembly:

Reassemble by reversing the steps described above for dismantling.





## 9.8. Front side gas connector

#### **Tools required:**

- Torx screwdriver, size T20

#### **Removing:**

- Open the argon coagulation unit as described in section 9.2, page 45.
- Remove the front panel unit as described in section 9.7, page 51.



Figure 9-16: Front panel unit



Figure 9-17: Gas connector screws



Figure 9-18: Front gas connector

- Remove the screws (M4x8mm) marked orange in *Figure 9-17* using the Torx size T20 screwdriver.

- Remove the gas connector as displayed in *Figure 9-18*.

#### Assembly:

Reassemble by reversing the steps described above for dismantling.



## 9.9. Optical link board

#### **Tools required:**

- Torx screwdriver, size T10

#### **Removing:**

- Open the argon coagulation unit as described in section 9.2, page 45.
- Remove the control board connector plug marked by an arrow in *Figure 9-19.*
- Remove the screws (M3x5mm) marked orange in *Figure 9-19* using the size T10 Torx screwdriver.
- The optical link board can now be removed.

#### Assembly:

Reassemble by reversing the steps described above for dismantling.



Figure 9-19: Optical link board

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## 9.10. Potential equalisation connection

#### **Tools required:**

- Open-ended spanner, size 10
- Socket wrench, size 10

#### **Removing:**

- Open the argon coagulation unit as described in section 9.2, page 45.
- Remove nut 1 shown in *Figure 9-20* using the size 10 openended spanner.
- Remove the serrated lock washer and spacer washer.
- Remove the 3 protective earth cables.
- Remove the spacer washer.
- Remove nut 2 shown in *Figure 9-20* using the size 10 openended spanner, while holding the potential equalisation connection tightly with the size 10 socket wrench.
- Remove the potential equalisation connection shown in *Figure 9-21* from the housing.

#### Assembly:

Reassemble by reversing the steps described above for dismantling.



Figure 9-20: Potential equalisation bolt



Figure 9-21: Potential equalisation connection



## 9.11. Connector socket / Mains filter

#### **Tools required:**

- Socket wrench size 5.5



Figure 9-22: Mains filter connection



Figure 9-23: Connector socket screws

#### **Removing:**

- Open the argon coagulation unit as described in section 9.2, page 45.
- Detach the cable connections marked red in *Figure 9-22* from the mains filter.
  - To do this, pull off the plug-in connectors while gently pressing together the plastic cover.
- Remove the M3 nut marked orange in *Figure 9-22* using the size 5.5 socket wrench.
- Remove the second nut through the hole in the bottom housing as displayed in *Figure 9-23*.
- Take the connector socket out of the housing.

#### Assembly:

Reassemble by reversing the steps described above for dismantling.



## 10. Parts list

Item no.	Component	
70304	Control board	
70305	Optical link board	
10971	Low voltage power supply ECS100US24	
70097	Pressure sensor board	
10593	Differential pressure sensor RCOP001DP	
70096	Pneumatic block PB-003-B	



ltem no.	Component	
70319	Front panel unit	
70311	Pressure sensor con- nection socket 3-pin	255 mm
11061	Ferrite suppressor with security locking	
10893	Potential equalisation contact pin	E.
10896	Potential equalisation colour marking washer	T
11128	Mains connector socket with mains filter and switch	
10633	Mains fuse 1 A, T	
MN605- 058	Housing foot black, self-adhesive	
11125	Bottom housing case	
11126	Top housing case	



## 11. Technical specifications

Compatibility		
BOWA electrosurgical units	ARC 400 from V1.0.0.4.16.8 (Item no.: 900-400), ARC 350 (Item no.: 900-351)	
BOWA pressure reducer	Item no.: 900-901, 900-902, 900-903, 900-904, 900-906, 900-907, 900-908, 900-909	

Argon functions	
Argon plasma coagulation	
Argon assisted cutting	
Gas flow control	
Flow settings	(on BOWA electrosurgical unit)
Flow display	( on BOWA electrosurgical unit )
Max. flow	10.0 l/min.
Min. flow	0.1 l/min.
Manual Purge	<b>I</b>

Gas supply	
Gas type	Argon 4.8 (99,998 %)
Gas connector, input	2x
Gas input pressure with gas canisters	Max. 4.5 bar
Gas input pressure with centralised gas supply	Max. 6.0 bar (optional)
Electronic determination of gas canister fill level, electronic	(with 4-20mA current interface) Only in connection with 900-906, 900-907, 900-908, 900-909.
Gas output pressure	Max. 2 bar
Switching of gas canisters automatic / manually	<ul> <li>/ (manually with</li> <li>BOWA electrosurgical unit)</li> </ul>
Display of gas canister fill level	(by BOWA electrosurgical unit)
Warning of gas shortage optical / audible	<ul><li>✓ / ✓</li></ul>



Handling / display	
One capacitive key (backlit)	Manual Purge
Status LED	<b>I</b>
Activation display optical / audible	🕑 / 📀
	(by BOWA electrosurgical unit)
Error display optical / audible	🕑 / 🤡

Documentation	
Logging and saving data in the unit	(System information with time stamp)
Error states	<b>I</b>
Handling error	<b>I</b>
Display of data by BOWA electrosurgical	<b>I</b>
unit	(Text message with additional information)

Communication	
External interface for communication with BOWA electrosurgical unit (optical link)	
External PC interface, CAN / UART, using BOWA software	<b></b>

Service support	
Interface for service support, CAN / UART, using BOWA software	<b></b>

Safety features	
ISSys: Integral Safety System	<b>Ø</b>
Continuous flow monitoring	<b>Ø</b>
Continuous self-test	<b>I</b>
Continuous status indication on the display	<b>I</b>
Detection of tube blockings	<b>I</b>
Warning sound	<b>Ø</b>
Error display on the ARC PLUS and de- tailed error description by BOWA elec- trosurgical unit	



Insulation type / Classification	
EMC	IEC 60601-1-2: 2007 + Cor. (2010)
Level of protection provided by housing	IP 22
Protection class as per EN 60601-1	I
Compliance with standards	IEC 60601-1: 2005 + Cor.1 (2006) + Cor.2 (2007)
	IEC 60601-1-2: 2007
	IEC 60601-2-2: 2009
	IEC 62366:2007
	ISO 14971: 2007
	ISO 13485: 2003 + Cor.1 (2009)
Classification as per EC Directive 93/42/EEC	lla

Mains connection	
Power consumption in sleep mode	1 W / 20 VA
Power consumption in standby mode	5 W / 25 VA
Maximum power consumption	32 W / 65 VA
Max. current intake	0.6 A
Input voltage range	100 V - 240 V (+/-10%)
Mains frequency	50/60 Hz
Mains fuse	2 x 1 A slow-blow
Connector for potential equalisation	<b>I</b>

Dimensions and weight		
External dimensions: width x height x depth (mm)	433 x 97 x 489	
Weight	approx. 7.7 kg	



## **12.** Test instructions for TSI

Required equipment:

- Safety analyser, e.g. Metron QA 90MK II Safety Analyser
- Argon flow meter Vögtlin red-y compact
- Electrosurgical unit with foot switch and finger switch
- Manometer with T-piece and pressure connectors

#### Key to symbols

$\bigcirc$	Mains voltage		Earth
L, N	Mains connection	PE	Protective earth ter- minal
MP	Power supply unit (MAINS PART)	AP	Applied part (Applied Part)
AP	Applied part type F	AP1 AP2	Applied part with different functions
- MD -	Internal resistance safety tester (Measuring Device)		Optional connection
Ω	Ohmmeter	ΜΩ	Insulation resistance meter
	Casing with no protective earth con- nection	Ţ	Connection to electrically conductive parts

Figure 12-1: Symbols

### 12.1. Visual inspection

- 1. Check the argon coagulation unit and accessories for visible external damage.
- 2. Check the pressure limiters for visible external damage and correct fitting
- 3. Check legibility of labels, CE marks and rating plate **18**.
- 4. Make sure that the fuses in the power input socket **10** correspond to the prescribed rating on the rating plate **18**.
- 5. Ensure that potential equalisation cable and connection **8** are in place and operational.
- 6. Ensure that the User Manual is at hand.



Figure 12-2: Rating plate

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## 12.2. Electrical safety test

Measuring protective earth conductor resistance

## 

Risk of injury due to electric shock!

 For this measurement, disconnect the argon coagulation unit from the power supply



Figure 12-3: Measuring the PE conductor resistance as per IEC 601-1 / IEC 62353:2007

- 1. Measure the PE conductor resistance between the power cable and the potential equalisation connection "**8**".
- 2. Record the measured value in the TSI report.
- 3. Measure the PE conductor resistance between the power cable and the housing.
- 4. Record the measured value in the TSI report.
- 5. Measure the PE conductor resistance between the power cable and the LuerLock gas socket **1** on the device front.
- 6. Record the measured value in the TSI report.
- 7. Measure the PE conductor resistance between the power cable and the gas connectors **12** and **14** on the device rear.
- 8. Record the measured value in the TSI report.



#### Insulation resistance

## 

Risk of injury due to electric shock!

 For this measurement, disconnect the argon coagulation unit from the power supply



Figure 12-4: Measuring the insulation resistance

- 1. Measure the insulation resistance of the mains connector.
- 2. Record the measured value in the TSI report.



#### Measuring contact current (equipment leakage current)



### ▲ CAUTION

Risk of injury due to electric shock!

- Insulate the argon coagulation unit.
- If measurement is possible in both positions of the power plug, record the higher value.



Figure 12-5: Circuit for measuring the unit's leakage current as per IEC 62353:2007

- 1. Connect the LuerLock gas socket **1** on the device front and the potential equalisation socket **8** on the device rear and measure the unit's leakage or contact current.
- 2. Record the measured value in the TSI report.



## 12.3. Functional test

#### Handling and display elements

- 1. Check the mains switch **16** for smooth operation.
- 2. All display elements are glowing white during self-test and the purge key flashes.

	Ċ	

Figure 12-6: Self-test display

3. The internal beeper should sound audibly when the purge key is activated and the display glows green.

•	

Figure 12-7: Purge activation display

4. The light ring should glow orange when an argon mode is selected.

If the "Argon parameters" window is open, the light ring should flash.



Figure 12-8: Gas socket light ring

5. Check the sleep mode by selecting a non-argon mode on the ARC 400.

The ARC PLUS should recognize that no argon mode is active and switch to sleep mode within 3 seconds.



Figure 12-9: Sleep mode



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#### Checking inbound gas pressure

- 1. Remove the connector of the gas canister 1 pressure reducer from its gas input of the ARC PLUS.
- 2. Insert the T-piece with manometer between pressure reducers and the gas input **12** of the ARC PLUS.
- 3. Record the pressure value in the TSI report.
- 4. Repeat this procedure for gas canister 2 (if present)

# Checking gas canister fill level sensors

- 1. Open and close the valve of gas canister 1 so that the highest possible pressure is displayed on the manometer of the pressure reducer on gas canister 1.
- 2. The display of the properly connected ARC 400 will now show the gas canister fill level depending on the gas canister pressure:
  - 200-130 bar: Canister filled blue (full)
  - 130-50 bar: Canister filled blue for 2/3
  - 50-20 bar: Canister filled blue for 1/3
  - 20-0 bar: Canister nearly completely white
- 3. Empty the gas buffer remaining in the argon coagulation unit slowly via finger switch, foot switch or purge key. The fill level displayed on the ARC 400 should decrease, and on reaching the minimum the main display will show a warning about the gas pressure being too low.
- 4. Record the result in the TSI report.
- 5. Repeat this procedure for gas canister 2 (if present)



Figure 12-10: Inbound gas pressure manometer

Figure 12-11: ARC 400 fill level display



#### 12.4. Measuring the argon gas flow rate

Equipment required:

- Argon flow meter Vögtlin red-y compact with power supply
- 2x gas tubes (6mm diameter) •
- Finger switch
- Neutral electrode cable with shortening connector
- ARC 400 electrosurgical unit
- Argon Gas canister with pressure reducer

#### Argon flow meter Vögtlin red-y compact

The argon flow meter Vögtlin red-y compact is a flow meter solely calibrated for argon. The included power supply has exchangeable mains socket for different international standards.



Figure 12-13: Flow direction



Figure 12-14: Sealing plug

- The direction of the gas flow through the gas flow meter must be observed or no measurement is possible; the arrow on the back of the meter marked orange in Figure 12-13 marks the direction.
- In delivery condition, the gas sockets on the flow meter are sealed with protecting plugs to stop particles from entering; these must always be applied when the device is stored.

The pneumatic tubes must be pushed in the sockets as deep as possible (about 15 mm) to ensure a proper connection.



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#### Gas flow measurement in the range 0.3 - 0.9 l/min

- 1. Connect the gas canister and the optical link cable to the argon coagulation unit.
- 2. Activate the "Argon Flex" mode on the ARC 400's display.



3. Set the corresponding gas flow rates in the "Argon Parameter" window as shown in Figure 12-15.



Menu

Figure 12-15: Setting a gas flow

Status of bottles

- 4. Connect the finger switch and neutral electrode cable as shown in Figure 12-16.
- 5. Connect the gas flow meter to the included power supply and the power supply to a mains socket.
- 6. Connect the argon flow meter as shown in Figure 12-16 to the LuerLock gas socket 1 of the ARC PLUS.



#### Figure 12-16: Gas flow measurement in "Argon Flex" mode



7. Start the flow measurement with the blue finger switch. The activation has to last at least 10 seconds for the flow to stabilise.

Following values are to be measured:

Set flow [I/min]	Activated mode in the electrosurgical unit	Measured value [I/min]
0.3	Argon Flex	
0.6	Argon Flex	
0.9	Argon Flex	

8. Record the measured values in the TSI report.



#### Gas flow measurement in the range 2.0 – 5.0 l/min

1. Activate the "Argon Open" mode on the ARC 400's display.

"Argon Parameter" window.





Figure 12-17: Setting a gas flow

3. Start the flow measurement with the yellow finger switch. The activation has to last at least 10 seconds for the flow to stabilise.



Figure 12-18: Gas flow measurement in "Argon Open" mode

Set flow [l/min]	Activated mode in the electrosurgical unit	Measured value [I/min]
2.0	Argon Open	
3.5	Argon Open	
5.0	Argon Open	

4. Record the measured values in the TSI report.



## 12.5. Final activities

#### **Read out Log Files**

 Read out the log file as described in *chapter 7.3, page 33* and send this file to: <u>service@bowa-medical.com</u>.

#### Set new TSI date

- 1. With the button **[Set new TSI-Date]** you are able to change the TSI date. Confirm the message with the button **[Continue...]** as shown at *figure 12-19*.
- Set the date for the next TSI-check to 24.07.2015 ? Yes No

Figure 12-19: TSI note

Figure 12-20: Set new date



Figure 12-21: Set individual date

12:00:	00,000	01.01.	2013			
Januar				-	2013	*
Mo	Di	Mi	Do	Fr	Sa	So
		2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			
Mitte	leurop	äische	Zeit			
	Ak	tuelle	Zeit ve	rwend	en	

Figure 12-22: Calendar

2. If you want to extend the new TSI date by 1 year, you have to press **[YES]**. If you want to set the TSI date individually, press the **[NO]**.

- 3. If you have confirmed the previously displayed dialog with [NO], then it is possible to set an individual TSI date. Click on the calendar button which is shown at *figure 12-21*.
- 4. Now it is possible at the calendar to set an individual TSI date. Confirm your setting with the **[OK]** button.





## 13. Appendix

The appendix contains the following documents and forms:

- 1. Warranty and defects report
- 2. Service Report ARC PLUS
- 3. Overview of the wiring diagram
#### **BOWA-electronic GmbH & Co. KG** Tel

Heinrich-Hertz-Strasse 4-10 72810 Gomaringen Deutschland

+49 (0) 7072-6002-0 +49 (0) 7072-6002-33 E-Mail service@bowa-medical.com



## WARRANTY / DEFECTS REPORT

Fax

Warranty

Repair

Service Number:

Completed by BOWA-electronic GmbH & Co. KG

Warranty claims will only be recognised if the defective part is returned with the fully completed warranty report to BOWA-electronic GmbH & Co. KG, 72810 Gomaringen, Germany.								
PROCE	SSED	B Y :	Date:		CUST		MER/HOS	PITAL:
Name:					Name:			
Street:					Address:			
Postcode / Town:					Contact person:	Contact person:		
Country:					Country:			
E-mail / Telephone:					E-mail / Telephone:			
UNIT /	ACCE	SSORY D	ETAI	ILS				
Unit / Accesso	ry type:	Serial no. / LOT r	10.:	Installation date	:	Start	of warranty:	Contact person at agency:
DESCR	ΙΡΤΙΟ	NOFFA	JLT	ļ				
ACCES	SORI	ES INCL	UDEC					

### Danger of infection!

Electrosurgical devices / accessories:

Carry out a surface disinfection and package the unit in addition to the shipping packaging before it leaves the hospital/practice environment in order to avoid transmission of germs and infections. Instruments:

Clean and sterilise the instrument before it leaves the hospital / practice environment to avoid transmission of germs and infections.

# Service-Prüfprotokoll / Service Inspection sheet BOWA ARC PLUS II (ab / valid from V1.0)



		/	
Geräte-Typ: / Unit type:	ARC PLUS II	Prüfer: / Inspector:	
Artikel-Nr.: / REF no.:		Software Version:	
Serien Nr.: / Serial no.:		Datum: / Date:	

anden / ed	hgefallen /	
besta	durcl failec	Sichtprüfung / Visual inspection
		Gerät und Zubehör ohne erkennbare Beschädigungen / Equipment and accessories with no visible damage
		Alle Aufschriften und Typenschild lesbar / All labels, CE marks and rating plate legible
		Netzsicherungen entsprechen dem vorgeschriebenen Wert / Mains fuses are of the prescribed rating

			Schutzklasse: / Protection class:			
		Electrical safety check according to IEC 62353/	Typ des Anwendungsteils: / Applied part:			
			MPG-Klasse: / Classification:			
		Messergebnisse, siehe separat angehängtes Messprotokoll / For measurement results, see separately attached measurement protocol				
		Netzspannung / Mains voltage		Grenzwert / Limit value	Messwer Measured v	t / alue
		Phase - Neutralleiter / Phase - neutral 90 - 264 V <sub>AC</sub>				$V_{\text{AC}}$
	Schutzleiterprüfung / Protective earth conductor test					
		Schutzkontakt - Luer Lock / max. 0,3 Ω			Ω	
		Schutzkontakt - Gasanschluss hinten /       max. 0,3 Ω         Earthing contact power cable - rear gas connector       max. 0,3 Ω			Ω	
	Ableitstrommessung / Leakage current test					
		Geräteableitstrom [Ersatzmessung] / Device leakage current [equivalent method] max. 1000 µA		μA		
Isolationswiderstand / Insulating resistance						
		Isolationswiderstand [Netz - POAG] /     min. 2 MΩ       Insulating resistance [mains - POAG]     min. 2 MΩ		MΩ		

	Funktionsprüfung / Functional test
	Bedien- und Anzeigeelemente / Display and operating elements
	Netzschalter ist leichtgängig / Mains switch is moving smoothly
	Alle Elemente des Displays leuchten während dem Selbsttest weiß auf und die Purge-Taste blinkt / All display elements glow white and the purge key flashes during self-test
	Alle Bedientasten funktionsfähig / All buttons of the front panel respond to operation
	Interner Beeper ist bei Aktivierung der Purge-Taste hörbar sowie Gasfluss vorhanden / The internal beeper sounds audibly when the purge key is activated and gas flow is available
	Lichtring Luer Lock Gasanschluss leuchtet / Luer Lock gas socket light ring is illuminated
	Kommunikation im Menüpunkt "Systeminformation" vorhanden / Communication function in menu "System information" available
	Funktion Cut/Coag Aktivierungsanzeige (gelb/blau) / Function Cut/Coag activation on display (yellow/blue)
	Überprüfung der Standby-Stromsparfunktion / Sleep mode test
	Prüfung Eingangsdruck / Inbound pressure test
	Eingangsdruck an Flasche 1 zwischen 2,5 - 3,5 bar sowie korrekte Anzeige der Flasche an HF Gerät / Input pressure at argon bottle 1 between 2,5 - 3,5 bar and correct display of the bottle at HF generator
	Eingangsdruck an Flasche 2 zwischen 2,5 - 3,5 bar sowie korrekte Anzeige der Flasche an HF Gerät / Input pressure at argon bottle 2 between 2,5 - 3,5 bar and correct display of the bottle at HF generator
	Anschluss Flasche 1 Flaschendruckerkennung / Argon bottle 1 fill level detection
	Anschluss Flasche 2 Flaschendruckerkennung / Argon bottle 2 fill level detection

Service-Prüfproto BOWA ARC P			
Geräte-Typ: / Unit type:	ARC PLUS II	Prüfer: / Inspector:	
Artikel-Nr.: / REF no.:		Software Version:	
Serien Nr.: / Serial no.:		Datum: / Date:	

		Messung der ARGON-Durchflussmenge / Measurement of argon gas flow rate					
		ARGON-Gas Eingangsdru	ARGON-Gas Eingangsdruck zwischen 2,5 - 3,5bar / Argon gas inbound pressure from 2.5 to 3.5bar				
bestanden / passed	durchgefallen / failed	Einzustellender Fluss [l/min] / Set flow [l/min]	Zu verwendender Modus im HF-Gerät / Activated mode in the electrosurgical unit	Zulässige Grenz- werte [l/min] / Ac- ceptable limits [l/min]	Messwert Flasche 1 [l/min] Measured value bottle 1 [l/min]	Messwert Flasche 2 [l/min] Measured value bottle 2 [l/min]	
		0,2	Argon flexibel / flexible	0,16 - 0,24			
		0,4	Argon flexibel / flexible	0,32 - 0,48			
		0,8	Argon flexibel / flexible	0,64 - 0,96			
		1,6	Argon flexibel / flexible	1,28 - 1,92			
		3,0	Argon	2,40 - 3,60			
		4,0	Argon	3,20 - 4,80			
		5,0	Argon	4,00 - 6,00			

Verwendete Prüfmittel / Test devices used				
	Modell /	Serien-Nr. /	Kalibrierung gültig bis /	
	Model	Serial no.	Calibration valid until	
Argon Gas Flussmesser / Argon gas flow meter				
Sicherheitstester / Safety tester				

Abschlussarbeiten / Final activities

□ □ Fehlerspeicher löschen / Delete error log

□ □ STK Datum aktualisieren und überprüfen/ Update and check TSI date

Bemerkungen / Comments

Abschlussbeurteilung / Final assessment

Prüfplakette vergeben / Inspection sticker issued

Gerät weist keine sicherheitsrelevanten Mängel auf und darf weiterhin verwendet werden / Device has no safety-relevant defects and can continue to be used

Prüfplakette nicht vergeben / Inspection sticker not issued

Gerät darf bis zur Beseitigung der festgestellten Mängel nicht weiterverwendet werden / Device must not be used until identified defects are corrected

Abnahme / Acceptance				
Prüfer / Acceptance inspector	Datum, Unterschrift / Date, signature			
Unabhängig von den in verschiedenen Ländern vorgeschr	iehenen Prüfintervallen für Medizingeräte, emofehlen wir eine Funktions-			
und Sicherheitsüberprüfung des Geräts mindestens alle 12 Monate /				
Regardless of the test intervals for medical devices prescribed in various countries, we recommend a functional and safety check				
of the device at least every 12 months				

### Block wiring diagram ARC PLUS item no. 900-001





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