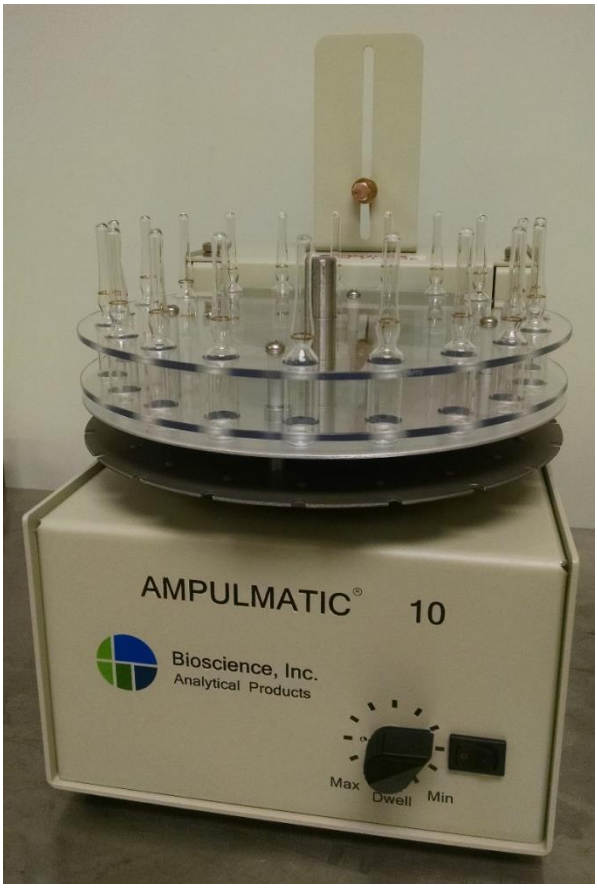
Bioscience, Inc.
Environmental Products & Services
ISO 9001:2015 Certified

Ampulmatic®-10 Laboratory Ampule Sealer Operation and Maintenance Manual



Bioscience, Inc.
2201 Hangar Place, Suite 200
Allentown, PA 18109
Phone: (484) 245-5232 Fax: (484) 245-5236
bioscience@bioscienceinc.com
www.bioscienceinc.com

Original Version (in English)

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Contents

Introduction

Thank you for choosing the Ampulmatic®-10 Laboratory Ampule Sealer. Bioscience, Inc. has striven to create the most reliable, easy-to-maintain and easy-to-use instrument available for bench-scale filling and sealing of small batches of ampules. This equipment has been tested extensively in our labs and in the field to ensure that the components and systems are reliable. We have gone to extra lengths to ensure that should something become misaligned, require adjustment or need to be replaced, it is easily accessed and addressed. Finally, the unit has been designed with a good deal of flexibility to allow a sufficient range of sealing temperatures, dwell times and motor speeds so that the Ampulmatic-10 ampule sealer can easily adapt to the sealing demands of a variety of ampule types, sizes and sources worldwide. We have had extensive experience dealing with the unique sealing problems of our customers over several decades and are proud to be the leader in bench-scale ampule sealing. We will be happy to work with you to furnish custom solutions to your specific filling and sealing problems at your request.

For maximum value and ease of startup, please proceed as follows:

1. Inspect the carton and the unit for shipping damage. Notify the carrier immediately if damage is found.

2. Use the "Accessory Check List" attached to this manual when unpacking the unit to verify that the complete unit has been received. Do not discard packing materials until everything has been accounted for.

3. Read the “Where to Install Your Unit” section of the manual before deciding on an appropriate location for the unit. You must consider the availability of power and other equipment requirements as well as user convenience in operation.

4. Carefully follow directions in the "Unpacking and Assembly" section of the manual.

5. Insist that each operator be familiar with the "Operating Procedures" section of the manual.

6. Follow the recommended preventive maintenance measures found in the “Maintenance” section of this manual for long equipment life. Avoid strong corrosives as they may damage critical components of the system.

7. Keep this manual in a safe location for ready reference to the "Operating Procedures" and "Maintenance" sections.

8. If you have any questions, please contact our Technical Service department at 484-245-5232, 800-627-3069, or bioscience@bioscienceinc.com.

Model Description

The Bioscience, Inc. Ampulmatic®-10 Ampule Sealer is an automated sealing device capable of flame-sealing glass ampules in sizes ranging from 1 ml to 50 ml. It is designed to seal up to approximately 900 ampules per hour in a laboratory setting. Each ampule in the carousel is automatically indexed into position and a hemispherical seal is created as the ampule spins in front of a propane and oxygen flame.

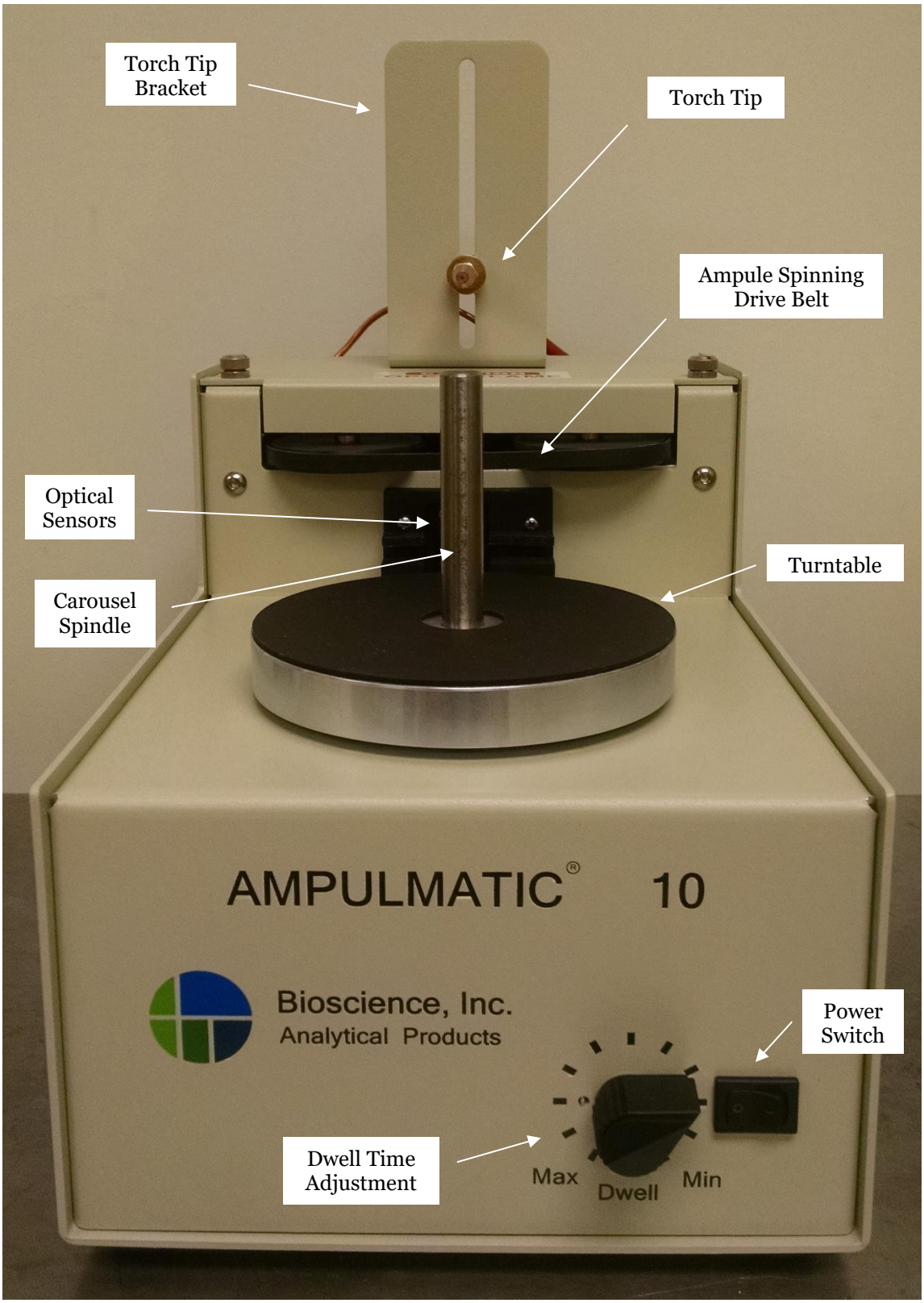
The design provides easy adjustments to ensure that an excellent seal can be obtained under a variety of conditions. Oxygen and fuel gas flow are metered by needle valves on the rear of the unit to control flame size and temperature. The dwell time of each ampule in front of the flame can be adjusted by turning a knob on the front of the unit. The carousel advance speed is also adjustable internally, if necessary. The height of the sealing flame and distance from the ampule can also be changed to accommodate different size ampules. Note: While different sizes can be handled, ampules batch to batch must be consistent in height, diameter, form, etc.

The Ampulmatic-10 Ampule Sealer was designed to withstand non-corrosive chemicals commonly found in lab environments. The case is designed to protect interior components from chemical leakage or spillage. The materials of construction include aluminum (case, carousel parts and machined parts), stainless steel (machined parts and fasteners), brass (machined parts), copper tubing and chemically-resistant polycarbonate (carousel). Corrosive liquids must be tested in advance of filling and sealing for compatibility with the materials of construction of the Ampulmatic-10 base unit and its accessories. Corrosion resistant replacement parts may be available.

A variety of carousels are available to handle ampules of different sizes. They are designed to hold up to 20 ampules (with the exception of the 50 ml carousel which holds 10 ampules). As the carousel rotates, most users will add filled ampules to the left side of the carousel and remove sealed ampules from the right side of the carousel (after they have cooled enough to handle or while wearing heat resistant gloves). However, it is also possible to remove and replace entire carousels for batch operations.

The Ampulmatic-10 sealer was also designed to be expandable to accommodate additional ampule filling and inerting functionality. An add-on port and mounting points are available to allow plug-and-play devices, such as a Purge Gas Injector and a Liquid Filler.

Ampumatic-10 Features - Front View



Ampumatic-10 Features - Back View

Propane Tank Valve Attachment

Torch Height Adjustment

Oxygen Needle Valve

Propane Needle Valve

Oxygen Toggle Valve

Circuit Breaker

Power Inlet

Oxygen Inlet

Propane Tank Bracket

Statement of Warranty

The Ampulmatic®-10 bench-scale automatic ampule sealer and its accessories are warranted against faulty workmanship or the use of defective materials for a period of 365 days from the date of shipment. This warranty is the only warranty made by Bioscience, Inc. (Manufacturer) and is in lieu of all other warranties, expressed or implied, except as to title and can be amended only by a written instrument signed by the Manufacturer. The Manufacturer provides no warranty to the Customer, either express or implied nor for title. Manufacturer further disclaims any warranty of merchantability or fitness for a particular purpose in connection with the customer's purchase of units of any Product under this agreement. The liability of the Manufacturer under this warranty is limited solely to replacing, repairing, or issuing credit (at Manufacturer's discretion) for any device which is returned by the customer during the period provided for above, provided that (a) Manufacturer's product is returned properly packaged in the package made per specifications equal to or better than Manufacturer's original carton specifications, (b) Manufacturer is promptly notified in writing upon discovery of such defects by customer, and customer obtains return authorization from Manufacturer to ship the unit, (c) the defective unit is returned to Manufacturer, transportation charges prepaid by customer, (d) warranty card, with date of receipt of product and signed by the customer, is returned to the Manufacturer within 30 days of purchase, and (e) Manufacturer's examination of such unit shall disclose, to its good faith satisfaction, that such defects have not been caused by misuse (including the filling and/or sealing of corrosive materials), neglect, improper shipping or installation, repair, alteration, or accident. In no event shall Manufacturer be liable for loss of profits, loss of use, or damages of any kind based upon a claim for breach of warranty.

All claims under this warranty will be made directly to Manufacturer. Faulty units are to be shipped prepaid to the Manufacturer's designated location. Manufacturer shall prepay transportation charges when repaired units are returned and bill customer unless the units are found defective under this warranty. Manufacturer shall pay return freight of units found defective under warranty. Claims with the freight carrier for damages in shipment shall be made by the party of destination.

For your records, please record: Ampulmatic-10 Serial No. _____

Complete, Detach and Return Within 30 Days of Receipt

User's Name _____ User's Signature _____

Title_____ Ship Date _____

Company _____ Receipt Date_____

Address_____ Warranty Received at Bioscience_____

_____ Have you set up your new Ampulmatic? _____

Phone _____ Fax _____ Have you operated your Ampulmatic?_____

Ampulmatic 10 Serial No. _____ Carousel Rack Size_____

Comments (Sales, Delivery, Manual, Instructions)

Unit Specifications

Overall Dimensions
The overall dimensions of the Ampulmatic-10 Ampule Sealer are 8.5" W x 12" H x 17" D (21.6 cm W x 30.5 cm H x 43.2 cm D).

Shipping Weight
The shipping weight of the Ampulmatic-10 Ampule Sealer base unit is approximately 21 lbs (9.53 kg).

Carousel Capacity
Carousel racks are available from Bioscience, Inc. in the following sizes and capacities. Refer to the "Replacement Parts List" in this manual for part numbers. Custom carousels are also available by request for other ampule sizes.

Ampule size	Number of ampules
1 ml	20
2 ml	20
5 ml	20
10 ml	20
20 ml	20
50 ml	10

Electrical Requirements
All electrical parts are UL listed/approved. The Ampulmatic-10 base unit operates internally on 12 VDC. This voltage can be supplied by the power transformer furnished with your unit from a power source of from 100 to 240 VAC (50-60 Hz). Power consumption of the base unit (not including add-on modules) is less than 30 watts and the base unit has a resettable circuit breaker on the rear panel which limits the internal current to 3 amps at 12 VDC.

Gas Requirements
The Ampulmatic-10 ampule sealer requires the blending of a propane, MAPP, or natural gas source with oxygen in order to create a flame for sealing. See the "Unpacking and Assembly" section in this manual for more information.

Operating Conditions:
Acoustic Noise: <70db(A)
Atmospheric Pressure: 760-1080mBar
Storage Temperature: Between 5°C to 40°C
Operating Temperature: Between 5°C to 40°C
Altitude: Less than 2000m
Humidity Conditions: Between 30% to 90% (non-condensing)

Country of Origin
The Ampulmatic-10 ampule sealer is manufactured by Bioscience, Inc. in the USA.

Materials of Construction

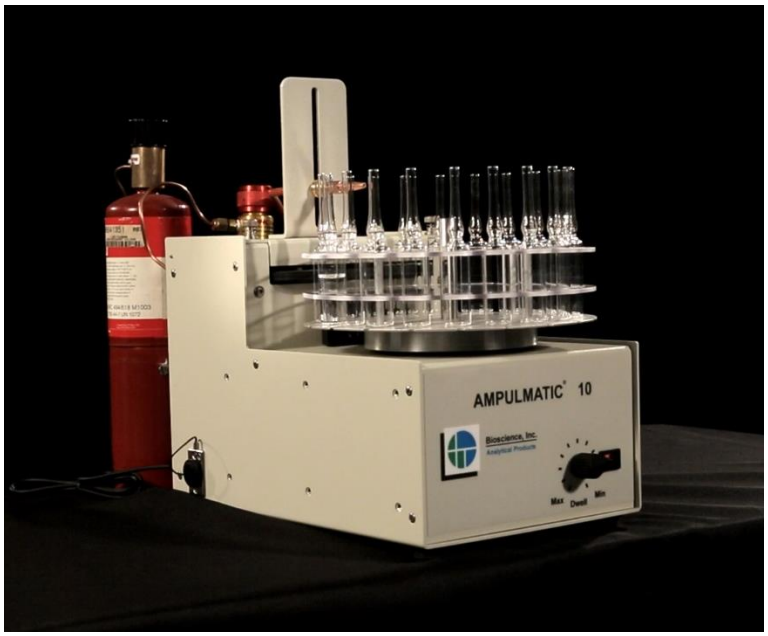
Outside Body	Powder Coated Aluminum
Carousel	Chemical-Resistant Polycarbonate and Anodized Aluminum
Burner Tip	Copper
Gas Tubing and Fittings	Copper, Brass, 316ss

Note: Corrosive liquids must be tested in advance of filling and sealing for compatibility with the materials of construction of the Ampulmatic-10 base unit and its accessories. Special materials for corrosion resistant Ampulmatic-10 models may be available for specific applications by request.

CAUTION: Do not operate the Ampulmatic-10 ampule sealer with corrosive liquids that are incompatible with the materials of construction of the unit.

Durability

The Ampulmatic-10 Ampule Sealer is designed for light to medium duty applications in a laboratory. Consult your Bioscience Technical Representative for recommendations should heavy duty, large scale sealing be desired.



Where to Install Your Unit

The Ampulmatic-10 ampule sealer should be installed on a level and stable bench or table with easy access to required electrical and gas supplies. It must be placed in an area with good ventilation due to its use of flammable gases and the production of by-products from combustion. It is recommended that the unit be placed in or directly in front of a fume hood. Due to the presence of an open flame, the area around the Ampulmatic-10 sealer should be free of combustible materials.

Crimping or excessive bending of the gas tubing leading into the Ampulmatic-10 sealer may create gas leaks or limit gas flow. Use the appropriate length of tubing for your installation. Use a power source easily accessible to the unit to avoid stretching the power cord.

Unpacking and Assembly

The Ampulmatic-10 Sealer carton contains the Ampulmatic-10 base unit, the torch tip assembly, and a stainless steel rod (carousel spindle), along with a spare parts pack and certain tools and any purchased carousels. Please use the "Accessory Check List" in this manual when unpacking to verify that the complete unit has been received.

1. Setting up Oxygen and Propane

The Ampulmatic-10 ampule sealer requires the blending of a propane, MAPP, or natural gas source with oxygen in order to create a flame for sealing. These gases are generally available and are plumbed into the instrument with 1/8" (0.32 cm) outside diameter (OD) copper or plastic tubing. A regulator valve is provided for use with a conventional commercially available tank as a source for propane or MAPP gas. However, other fuel gas sources, such as larger tanks or plumbed natural gas, can also be used with suitable adapters. The oxygen is plumbed into the instrument through the Swagelok® fitting accessible at the rear of the instrument.

You will need a cylinder of commercial grade oxygen with a 2-stage regulator, a standard 14 ounce disposable bottle (3 inch [7.62 cm] diameter) of propane of the type available from hardware or sporting goods stores and a convenient length of 1/8" (0.32 cm) OD tubing to run from the oxygen tank to the Ampulmatic-10 unit. Small oxygen tanks are not recommended. Connect the 1/8" OD tubing to your oxygen regulator and momentarily pass oxygen through the tube to remove any dust particles. Connect the other end of this tube to the oxygen bulkhead connector (a 1/8" Swagelok® compression fitting). Check to see that the propane regulator valve is turned off, and then connect the propane bottle to the propane regulator and install the bottle in the bracket on the rear of the unit. Check for gas leaks with soap solution.

2. Gas Pressures/Flow

A pressure of 10-20 pounds per square inch (psi) for oxygen (and propane if using larger bottles and regulator) is recommended. This allows for the best adjustment of the needle valves for flow control.

Typical propane usage is 0.1-0.15 liters per minute (lpm) and typical oxygen usage is 0.6-0.8 lpm. However, measured gas flow for different sized ampules is variable. Both propane and oxygen flow should be increased as the ampule size increases. Torch tip position adjustments (distance from the ampule during sealing) will also affect gas flow requirements. Slight adjustment may also be required depending on the ampule contents (e.g. solvents and whether solvents are chilled before sealing).

In the Purge Gas Injector accessory, purge gas flow will also depend on ampule size, liquid volume and dwell time. At least 10 ampule headspace volumes are recommended in the normal ~5 seconds of purging. Thus, for a 10mL actual volume (not nominal volume), purge gas flow should be 10mL*10 volumes/5 seconds*60 seconds/min = 1,200 mL/min = 1.2 lpm.

Note: a 1mL nominal ampule contains ~2.5 mL total volume before sealing.

3. Connecting to Compressed Gas Cylinders

The gas inlets to the Ampulmatic-10 base unit are 1/8" compression fittings. To connect to larger cylinders you will need to purchase a regulator and adapter for 1/8" OD tubing. McMaster-Carr is a vendor that supplies a wide range of equipment and components and will typically carry everything you need to get started. Bioscience doesn't endorse a particular vendor and you may be able to find equivalent or better equipment or components at a lower cost. McMaster-Carr part numbers have been provided for reference only.

NOTE: If metric parts are required, contact Bioscience, Inc. for guidance.

Regulators

Single stage regulators, though less expensive, will show significant pressure changes as the supply pressure decreases (as the tank empties). For best results, a two stage regulator is recommended. The example regulators referenced below have "outlet" configurations such as $^{9}/_{16}$"-18 Right Hand (RH) or Left Hand (LH). To adapt the regulator to $^{1}/_{8}$" OD tubing you will need an adapter with ¼" NPT threads on one end and a $^{1}/_{8}$" OD compression fitting on the other. Note that the regulators for each gas type are different. Part specifications can be found below.

Propane

The valve supplied with the Ampulmatic-10 ampule sealer screws onto small propane tanks (generally 14-16 oz.). These are available from vendors ranging from home improvement stores, camping suppliers, and general merchandisers such as Walmart, Sears, or K-mart. The inlet to the Ampulmatic-10 base unit is a $^{1}/_{8}$" compression fitting. To connect to larger cylinders you will need to purchase a regulator and adapter for $^{1}/_{8}$" OD tubing.

Large Propane Cylinder Connection Parts:

- Single-Stage Gas Regulator (McMaster-Carr #7897A66) **or** Two-Stage Gas Regulator (McMaster-Carr #7897A18).
- Straight Adapter (McMaster-Carr #5272K291).
- Copper tubing (McMaster-Carr #5174K1) **or** Nylon tubing (McMaster-Carr #8359K11).

Oxygen

The inlet to the Ampulmatic-10 base unit is a $^{1}/_{8}$" compression fitting. To connect to larger cylinders you will need to purchase a regulator, adapter, and $^{1}/_{8}$" OD tubing. Use only large oxygen cylinders for oxygen supply. Small oxygen cylinders are not recommended.

Large Oxygen Cylinder Connection Parts:

- Single-Stage Gas Regulator (McMaster-Carr #7897A61) **or** Two-Stage Gas Regulator (McMaster-Carr #7897A3).
- Straight Adapter (McMaster-Carr #5272K291).
- Copper tubing (McMaster-Carr #5174K1) **or** Nylon tubing (McMaster-Carr #8359K11).

Gas Regulator Specifications

Gas Type	CGA #	Connection	Type	For Tank Threads	Stage	Operating Pressure (psi)	Tank Content (psi)	McMaster-Carr Item #
Propane	510	Male	Standard Duty	Female	Single	0-50	0-400	7897A66
					Two			7897A18
Oxygen	540	Female	Standard Duty	Male	Single	0-145	0-4,000	7897A61
					Two	0-125		7897A3

Straight Adapter Specifications

Adapter Type	For Tube OD	Pipe Size	Pressure Rating		McMaster-Carr Item #
			For Tube Wall Thick.	Max. psi @ 72°F	
Tube-to-Male Threaded Pipe	1/8"	1/4"	0.035"	2,900	5272K291

Tubing

Type	OD	Wall	ID	Max psi	Bend Radius	McMaster-Carr Item #
Copper Tubing	1/8"	0.03"	0.065"	3,000 @ 100°F	-	5174K1
High Strength Clear Nylon Tubing	1/8"	0.014"	0.096"	430 @ 75°F	1 1/4"	8359K11

4. Placing the Carousel on the Turntable

Place the carousel on the Ampulmatic-10 turntable by sliding the notched bottom of the carousel across the carousel turntable so that the center hole aligns with the hole in the turntable. Insert the carousel spindle through the hole in the carousel and push it down through the carousel guide holes into the turntable, making certain that it is down as far as it will go. The drive belt and drive wheels will fit between the top plates of the carousel. **Be careful not to dislodge the ampule spin belt while placing the carousel**. If the belt is dislodged, see the "Maintenance" section of this manual to restore the belt to operating position. Correct placement of the spindle will leave about 1 inch (2.54 cm) of the spindle showing above the top plate of the carousel. Plug in the power supply and turn on the unit to advance the carousel into position. The carousel should then advance to the next position automatically. The amount of time in front of the torch tip is controlled by the "dwell" knob on the front. Turn the knob toward Minimum to decrease the dwell time and toward Maximum to increase the dwell time.

CAUTION: Do not operate the Ampulmatic-10 ampule sealer without the carousel and carousel spindle in place. Exposed belt drive may present a pinch hazard when carousel is not in place.

5. Placing the Torch Tip Assembly

Loosely attach the torch tip assembly to the top of the unit with the two screws provided. Both washers should be on top of the torch tip assembly plate. Attach the rubber tubing from the torch tip to the hose barb fitting on the rear of the Ampulmatic-10. Next, place an ampule into the carousel one or two positions before the torch tip (carousel rotates clockwise). Turn on the unit and allow the ampule to index in front of the torch tip. Turn off the power and adjust the height of the torch tip to about 3/16" (5 mm) below the top of the ampule to be sealed.

Torch Tip Height

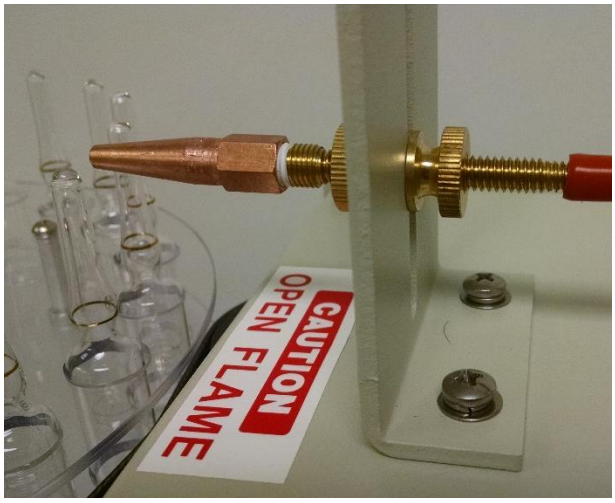
To adjust torch tip height, loosen the torch tip height adjust knurled nut, move the torch tip to the desired height and re-tighten the nut.

Torch Tip Horizontal Position

If necessary, the horizontal alignment of the torch tip can be adjusted by loosening the two screws holding the torch tip bracket to the top of the case. Reposition the bracket and torch tip slightly and retighten the screws.

Torch Tip Distance from Ampule

To adjust the distance of the torch tip to the ampule, adjust the two knurled nuts located in front and behind the torch bracket. We recommend 1/8" (3 mm) distance from the torch tip to the ampule.



6. Power Requirements

The Ampulmatic-10 ampule sealer is supplied with a 3-prong grounded plug power cord (US and selected countries) and an external transformer for your safety. If a power cord is not supplied, a locally obtained power cord with IEC 320 connector should be used. The required power source is 100 to 240 VAC (50-60 Hz). The base unit is designed to draw less than 30 watts of power. Add-on modules such as the Purge Gas Injector and Liquid Filler accessories will have a separate power source.

OPERATING PROCEDURES

Note: Use appropriate Personal Protective Equipment (PPE) when operating the Ampulmatic-10 System. Review the Safety Data Sheets of all chemicals being filling and/or sealed with this equipment. Recommended PPE includes eye protection and heat resistant gloves. See the Safety Accessory section of this manual for more information.

1. Lighting the Burner

Each Ampulmatic-10 ampule sealer is tested by Bioscience, Inc. before leaving the factory. Factory gas flow settings should allow the flame to be ignited and (when oxygen is turned on) an ampule to be sealed with minimal adjustment of gas flows. If multiple sizes of ampules are to be sealed, however, adjustment may be necessary for each ampule size.

CAUTION: Do not light the burner until after the carousel is installed on the turntable. Always turn the burner off before removing the carousel or use flame resistant gloves while removing the carousel spindle to avoid burns.

1. Install carousel on turntable.
2. Verify that the toggle valve on the rear panel marked “oxygen on/off” is off (lever should be parallel to back of case).
3. Open the oxygen tank valve and adjust the oxygen delivery pressure at the regulator to about 20 psi.
4. Open the propane regulator valve at the bottle fully.
5. Ignite the flame, then adjust for a 2-1/2” (6.35 cm) flame, if necessary.
6. Turn on the oxygen flow by pulling the toggle switch slowly to a position perpendicular to the case.
7. Place several ampules in the carousel and turn on the Ampumatic-10 power (switch on front of unit). An ampule will advance to the position in front of the flame and seal before advancing. Make small adjustments to the flame temperature or dwell time until the seal is perfect.

If the ampule is not completely sealed, slowly increase the oxygen to the flame with the oxygen adjust valve (counterclockwise) until the flame is intense blue and oxidizing with no white or yellow area.

If the ampule has a bubble on top or the seal blows out, reduce oxygen flow (clockwise rotation of the oxygen adjust valve).

The dwell time (the time the ampule is in front of the flame) can also be adjusted by rotating the knob next to the power switch (counterclockwise increases dwell time). An increase in dwell time can be used to correct an incomplete ampule seal and a decrease in dwell time can reduce bubble formation or blow-out.

Once adjusted these settings can be maintained by following the turn-off procedure below. The Ampulmatic-10 ampule sealer will then require little or no readjustment when restarted for the same size ampules.

2. Flame and Ampule Dwell Time Adjustment

The Ampulmatic-10 ampule sealer was designed to provide flexibility in sealing ampules ranging from <1 mL capacity to 50 mL capacity and made of various types of glass. As shipped from the factory, the Ampulmatic-10 sealer is set to a relatively short dwell time in order to seal more vials in a given time.

It is possible to shorten the dwell time by using a hotter flame (substituting MAPP gas for propane will allow higher flame temperature). However, remember that as the dwell time is reduced, small inconsistencies in ampules to be sealed (imperfect glass of the ampule, a drop of liquid on the ampule neck, small dimensional variation, etc.) may lead to an imperfect seal. Dwell time is adjustable from approximately 2 seconds to 14 seconds. As ampule size increases, the amount of heat necessary to seal the ampule will increase. Increased heat can be accomplished by increasing flame size (increase fuel and oxygen), increasing temperature (increase oxygen) and/or increasing dwell time.

Once a good sealing flame is achieved for a particular ampule size, it may be most convenient to adjust dwell time to accommodate another ampule size. Use the following table to troubleshoot common sealing problems.

Ampule Sealing Trouble Shooting

Symptom	Possible Causes	Solutions
Seal is brittle, glass cracks	Flame is too hot	Reduce oxygen and increase dwell time
Bubble forms on top of ampule	Flame too hot Ampule dwell time too long	Reduce oxygen Reduce ampule dwell time
Ampules not completely sealed	Flame too cold Ampule dwell time too short	Increase oxygen Increase ampule dwell time
Uneven seal	Turning belt dirty, ampule slipping	Wipe belt with alcohol
Pinhole through seal	Burner hitting too high on ampule Flame too cold Ampule dwell time too short	Lower burner height Slightly increase oxygen Increase ampule dwell time
Discoloration of the components	Corrosive liquids	Stop operation and consult with Bioscience, Inc.
Ampules Breaking	If using accessories, misalignment of purge or fill head.	Adjust purge or fill head position.

3. Turning Off the Ampulmatic-10 Sealer

1. Make sure no ampules are in front of flame.
2. Turn off the Ampumatic-10 base unit power (switch on front of unit).
3. Turn off the oxygen toggle valve on the rear panel marked “oxygen on/off” (lever should be parallel to back of case).

CAUTION: Always turn the oxygen toggle valve to the “Off” position before turning off the propane. The flame will change from blue to orange.

4. After the oxygen has been turned off, turn the propane off at the bottle with the propane regulator valve. The flame will disappear in a few seconds, as quickly as the fuel in the line has burned off.

CAUTION: The burner, spindle, and ampules may be hot. Protect skin from heat damage before handling.
It is not necessary to remove the carousel but if so desired, wear heat-proof gloves or wait until the spindle is thoroughly cooled, remove the spindle from the carousel, then carefully remove the carousel. Keep the carousel parallel to the turntable to avoid dislodging the belt.

4. Sealing Volatile Substances

Many Ampulmatic-10 ampule sealer users seal ampules containing a variety of flammable liquid solvents for gas chromatography standards and other applications. For the safe handling of such flammable liquids use the following guidelines:

a. Flammable solvents may be chilled by immersion in cold baths of various types prior to flame sealing (see table below).

b. The polycarbonate plates, used for the carousel of the Ampulmatic-10 sealer, should not be immersed in a dry ice cold bath to avoid crazing and cracking of the polycarbonate plastic. Ampules should be chilled separately, then inserted into the carousel.

c. A shorter dwell time can be used to minimize the time required to advance and seal the ampules, thus minimizing warm-up of the solvent.

d. An inert gas such as nitrogen or argon can be injected above the liquid (using the optional Purge Gas Injector accessory) to prevent mixing of solvent vapor and oxygen.

e. All procedure development should be done with the smallest volatile liquid volumes possible and a safety shield should be used to protect users from possible explosion.

f. Ampules should be inspected prior to use to remove ampules with cracks or other flaws that might cause breakage and spilling of the contents.

g. Make sure the Ampulmatic-10 sealer is set-up and adjusted correctly to handle the ampule size being used. Make all adjustments with ampules containing non-flammable solvent (e.g., water) to minimize warm-up of the solvent during adjustment.

Bath Components	Concentration of *	Temperature (°C)
Ice/water/NaCl*	Excess	-10 to -15
Ice/water/$CaCl_2$*	Excess	-29
Dry ice*/ethanol or isopropanol	Excess	-72 to -78
Dry ice*/ethylene glycol	Excess	-15

h. Clean solvent spills up as soon as they occur to avoid damage to the Ampulmatic-10 components.

5. Sealing Corrosive Substances (e.g. acids)

Sealing corrosive materials poses special challenges for the Ampulmatic-10 ampule sealer. For concentrated and volatile corrosives, additional steps may need to be taken to ensure a consistent, reliable sealing operation. Corrosion resistant parts may be available by request. Contact your Bioscience Technical Representative for more information.

6. Ampule Glass and Size

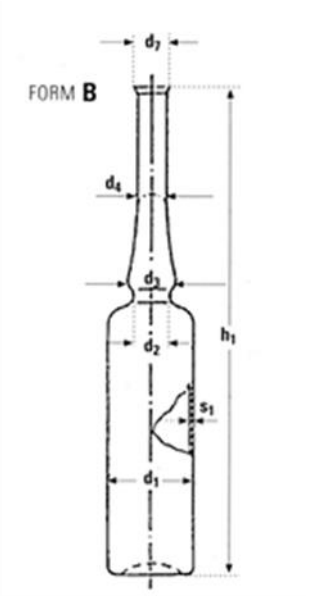
The type of glass and size of ampules are important factors to consider in getting the best results with your sealer. Soft glass is not recommended due to the rapid heating and cooling during flame sealing; seals will tend to be brittle and crack easily especially when volatile substances are being sealed.

Standard carousels are designed for Wheaton gold band ampules or equivalent. The Ampulmatic-10 Ampule Sealing System can be adapted to seal a variety of ampule designs and sizes. However, non-standard sizes or designs should be submitted to Bioscience to confirm suitability prior to purchase. Custom carousels may be available for non-standard ampule sizes.

Ampulmatic®-10 Recommended Ampule Specifications

Wheaton Brand Ampule Specifications

Size	Diameter (mm)	Height (mm)
1ml	10.5	67
2ml	12	75
5ml	16.5	84
10ml	19	107
20ml	22.5	130
50ml	26	150



Ampulmatic Carousel Specifications

Rack Size	Min Outside Diameter		Max Outside Diameter		Min Height		Max Height	
	In	cm	In	cm	In	cm	In	cm
1ml	0.356	0.89	0.418	1.05	2.63	6.68	4.75	12.06
2ml	0.418	1.06	0.480	1.22	2.94	7.47	5.00	12.70
5ml	0.621	1.57	0.683	1.73	2.75	6.98	5.00	12.70
10ml	0.715	1.81	0.777	1.97	3.25	8.26	5.50	13.97
20ml	0.840	2.13	0.902	2.29	3.25	8.26	5.50	13.97
50ml	1.121	2.84	1.183	3.00	3.25	8.26	7.25	18.42

Custom carousels may be available for other ampule sizes.
Please contact your Bioscience, Inc. representative for more information.

7. Sealing Thick Glass Ampules

A Dual Flame module is available for sealing thicker glass ampules. Contact your Bioscience Technical Representative for more information.

8. Opening the Sealed Ampules

Sealed ampules are best opened by sliding an ampule breaker over the top of the ampule to the color break or scored line and then breaking with a bending motion. A piece of flexible or semi-flexible plastic tubing can be placed over the neck of the ampule if no ampule breaker is available. Gloves are recommended to protect hands from broken glass and/or possible contact with contents of the ampule.

Maintenance

Make no attempt to service or repair the Ampulmatic-10 ampule sealer while still under warranty before consulting with Bioscience, Inc. After the warranty period, such consultation is still advised, especially when the repair may be technically sophisticated or difficult. No equipment, however, should be returned to the manufacturer without prior approval. Obtain a Return Authorization (RA) Number from Bioscience, Inc. before returning the equipment. Mark the RA number on the shipping label.

1. Preventive Maintenance Recommendations

The following preventive maintenance measures will help to ensure that the Ampulmatic-10 Ampule Sealer continues to function properly and that there are no unintended interruptions in service from the unit.

Note: Turn the power switch "off" and unplug the unit from its power source. Disconnect all gas connections before attempting to clean any spills or to perform maintenance, repairs or service.

- General cleaning of the outside cabinet is recommended after use. Use a mild detergent and moist towel to wipe the outside surface of the Ampulmatic-10 base unit and the carousel rack clean. Organic solvents other than alcohol are not recommended, especially for the carousel polycarbonate plates.

- Regular cleaning of the Ampulmatic-10 belt is required to ensure proper rotation of the ampule while in the sealing position. Use alcohol on a paper towel or cloth to clean the belt, by gently pressing it against the belt while it is spinning.

- The ampule spinning drive belt should be replaced every 12 months or 1,000,000 ampules. The Ampulmatic-10 ampule sealer will seal about 100,000 ampules per month if used continuously, 40 hours per week.

- Occasional checks for gas tubing leaks are recommended to ensure safe operating conditions.

- Immediately clean all spills of solvents and corrosives. Neutralization of acids with 5% sodium bicarbonate and bases with 5% acetic acid are recommended.

- Any broken glass should be carefully removed with vacuum cleaner.

2. Carousel Advance System

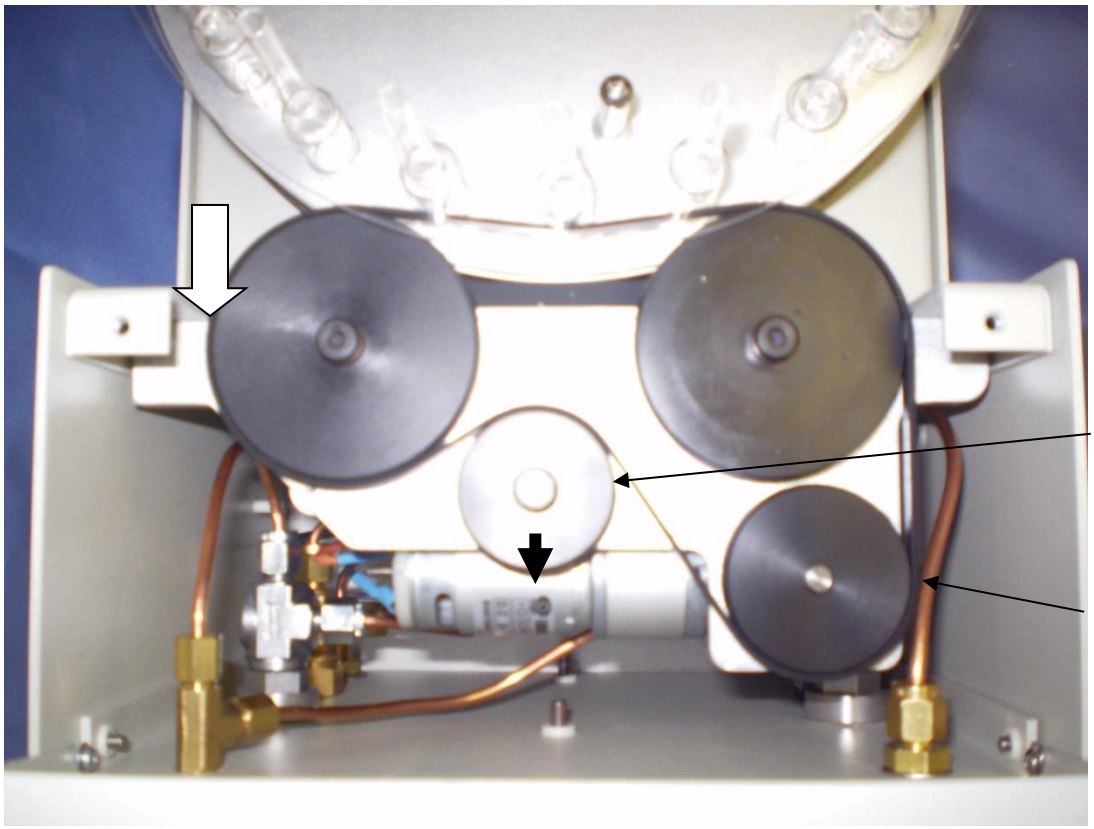
The current design of the Ampulmatic-10 Ampule Sealer uses optical switches to position the carousel. There are no mechanical parts to adjust or replace in the carousel advance system.

3. Ampule Spinning Drive Belt Replacement

The ampule spinning drive belt may require occasional replacement or may become dislodged. Use the following instructions to replace this belt. See diagram below.

1. Verify that power to the unit and the gas are both turned off.
2. Remove the two captive screws in the case directly above the drive belt.
3. Fold back the top lid of the unit. Take note of the belt path.
4. Pull the belt tensioner toward the back to release tension on the belt.
5. Remove the old belt and replace with a new belt using the same routing method.
6. Close the lid of the unit and replace the two captive screws.

Ampule Spinning Drive Belt Diagram



4. Carousel Advance Motor Speed Adjustment

The carousel advance motor speed is pre-set during manufacturing and does not need regular adjustment. Motor speed is controlled by an electronics board that can be programmed to operate at different speeds. Contact Bioscience if the speed needs to be reset.

Troubleshooting Guide

Problem	Possible Causes
Ampulmatic-10 Ampule Sealer does not turn on	• Power switch is OFF. • Unit is not plugged in (or not plugged into a proper working outlet). • Power cord is not securely plugged into power transformer. • Circuit breaker is tripped (push to reset).
Carousel does not rotate	• Carousel not installed correctly with carousel spindle. The spindle will drop down into position. • Power to Purge Gas Injector and/or Liquid Filler accessories is/are not on (if interfaced). • Internal wire connections loose. • Defective interface cable.
Carousel does not index properly or align ampules for sealing	• Carousel rack bottom plate damaged, warped or uneven. • Torch tip bracket needs adjustment (see "Placing the Torch Tip Assembly" under the Unpacking and Assembly" section of this manual). • One of the optical switches may be defective. • Carousel plates are not properly aligned.
Ampules do not spin/rotate in "sealing" position Note: If multiple positions are not spinning, mark the holes to identify if particular positions	• Spinning belt is dirty (see "Preventative Maintenance Recommendations" under the "Maintenance" section of this manual for cleaning instructions). • Ampule spinning belt tension is incorrect. • Ampule spinning belt has fallen off wheels (see "Maintenance" section of this manual). • Carousel holes are damaged or plate is warped. • Condensation on the ampule from chilling liquid/ampule before sealing. We recommend PTFE Inserts. • Deeply dished ampules (where the bottom of the ampule is concave). This causes the ampule bottom to rub on the metal plate, causing friction and resistance. • For new carousels, there may be a burr on the edge of the hole causing resistance. Fine sand paper can be used to smooth out the hole. • Variation in ampule size/dimension. • Misalignment of the carousel. This can cause poor spinning or the ampules to move upward during spinning. If this is the cause, it will typically affect 3-6 ampules in consecutive order.

Ampules are not properly sealed	• Flame temperature and/or dwell time should be adjusted (See "Flame and Ampule Dwell Time Adjustment" under the "Operating Procedures" section of this manual).
Ampules are breaking	• Seals may be brittle if sealed at high temperature and quickly cooled (especially with "soft" glass). Do not invert or check seal until cooled. • If using Purge Gas Injector or Liquid Filler, make sure filling heads are properly aligned.
Equipment is discolored or corrosion is observed	• Clean spills as quickly as possible. • Some solvents may release acidic gases if burned. Make sure ventilation is adequate. Use inert gas purging via Purge Gas Injector accessory to minimize solvent volatilization.

Replacement Parts List

If you need replacement parts for your Ampulmatic-10 ampule sealer, please contact Bioscience, Inc. This is a list of the most commonly requested replacement parts and wear items.

PART NUMBER (PCN)	DESCRIPTION
210 001	Regulator valve for propane tank
210 011	Toggle valve for oxygen supply
210 012	Needle valve for propane and/or oxygen
230 010	Threaded tube for torch tip
230 011	Torch Tip Bracket
210 014	Torch Tip
270 006	Drive Belt
250 013	Power Supply

Accessories List

PART NUMBER (PCN)	DESCRIPTION
295 008	Purge Gas Injector module
295 009	Liquid Filler module
	Dual Flame module
290 002	Carousel rack (1 ml) – 20 ampule
290 003	Carousel rack (2 ml) – 20 ampule
290 004	Carousel rack (5 ml) – 20 ampule
290 005	Carousel rack (10 ml) – 20 ampule
290 006	Carousel rack (20 ml) – 20 ampule
290 007	Carousel rack (50 ml) – 10 ampule

Safety Accessories

PART NUMBER (PCN)	DESCRIPTION
270 113	Flame Shield (does not include Torch Tip Bracket)
270 114	Kevlar Knit Safety Gloves – 6” Long
270 115	Glass Lampworking Safety Glasses