BC Biomedical
A UNIT OF BC GROUP INTERNATIONAL, INC.

DIGITAL ULTRASOUND WATTMETER

USP-100A

USER MANUAL

BC BIOMEDICAL
USP-100A ULTRASOUND WATTMETER
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WARNING - USERS

The USP-100A is for use by skilled technical personnel only.

WARNING - USE

The USP-100A is intended for testing only and should never be used in diagnostics, treatment or any other capacity where it would come in contact with a patient.

CAUTION - MODIFICATIONS

The USP-100A is intended for use within the published specifications. Any application beyond these specifications or any unauthorized user modifications may result in hazards or improper operation.

CAUTION - SERVICE

The USP-100A is intended to be serviced only by authorized service personnel. Troubleshooting and service procedures should only be performed by qualified technical personnel.

CAUTION - ENVIRONMENT

Exposure to environmental conditions outside the specifications can adversely affect the performance and accuracy of the USP-100A. If the unit is outside the Operating Specifications, allow it to acclimate to specified conditions for at least 30 minutes before attempting to operate it.

CAUTION - INSPECTION

Inspect the USP-100A before each use for wear. It should be serviced if any parts are in question.

CAUTION - LIQUIDS

Do not submerge or spill liquids on the USP-100A. Do not operate the USP-100A if internal components not intended for use with fluids may have been exposed to fluid, as the internal leakage may have caused corrosion and be a potential hazard.

CAUTION - CLEANING

Do not immerse. The USP-100A should be cleaned by wiping gently with a damp, lint-free cloth. A mild detergent can be used if desired.

NOTICE – SYMBOLS

Symbol	Description
	Center Negative
	Per European Council Directive 2002/95/EC, do not dispose of this product as unsorted municipal waste.

NOTICE – ABBREVIATIONS

C	Celsius
°	degree
DUT	Device Under Test
F	Fahrenheit
g	gram(s)
IEC	International Electrotechnical Commission
kg	kilogram(s)
MHz	Megahertz
mm	millimeter(s)
mW	milliwatt(s)
PPM	Parts Per Million
Lbs	pounds
USA	United States of America
V	Volt(s)
VAC	Volt(s) Alternating Current
VDC	Volt(s) Direct Current
W	Watt(s)

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NOTICE – CONTACT INFORMATION

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INTRODUCTION

The Ultrasound Wattmeter, Model USP-100A, is designed to measure the ultrasound power output of diagnostic or therapeutic transducers up to 30 Watts. The principle of measurement is the radiant force method. The USP-100A uses a positioning clamp to hold the transducer in degassed water above a conical target. The ultrasonic energy passes through the water to reflect off the target and is then absorbed by the rubber lining. The radiant power is directly proportional to the total downward force (weight) on the target. This force is then transferred through the target support assembly to the electro-mechanical load cell inside the scale. The cell is in a computer-controlled feedback loop and produces a digital readout; Watts of power (custom units) or grams of force. The choice of units (Watts or grams) is selected by front panel pushbuttons.

TEST SETUP

Water as a Measurement Medium*

The measurements are to be performed in water because ultrasound propagation in water closely approximates that in tissues. The ultrasonic attenuation in water can be taken as a lower limit on the attenuation that will be encountered in the body. Large areas in the body can consist of low attenuating material such as urine and amniotic fluid. The use of water prevents measurements in a more highly attenuating material, such as liver equivalent gels, from representing the highest possible intensities that might be encountered in the body.

* Ultrasound propagation in water closely approximates human tissue and degassed water is the generally accepted test medium for ultrasound transducers (see AIUM/NEMA Standards Publication #UL-1-1981, SAFETY STANDARD FOR DIAGNOSTIC ULTRASOUND EQUIPMENT).

Degassed Water

Ultrasound Power measurement accuracy is affected if the water contains more than 5-10 PPM of air. To degas, boil distilled water for 30 minutes, then seal the container tightly and place it in a refrigerator. An alternate method of degassing water is to heat the water to the boiling point, then pull a vacuum on it for five to ten minutes. The degassed water storage container should be made of glass or plastic. Polystyrene containers should not be used since they allow oxygen to permeate and degrade the water quality.

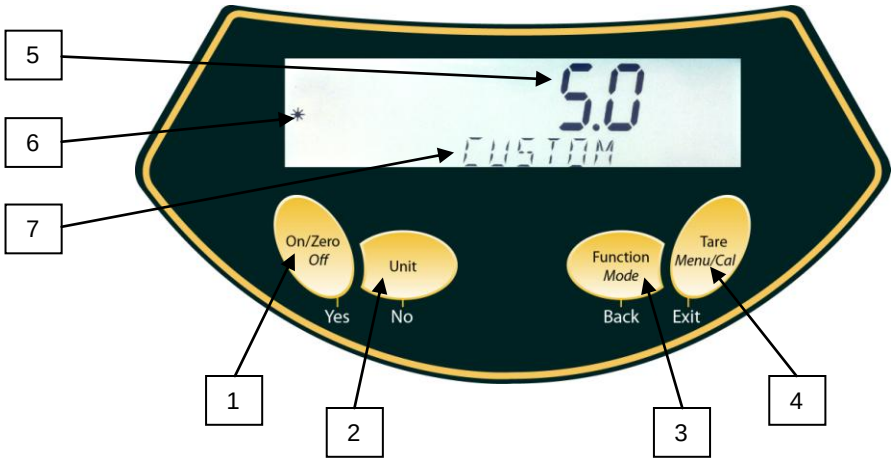
Before testing, pour water into tilted test tank with minimum amount of turbulence. The test tank water surface will absorb oxygen, therefore a change of degassed water is recommended before each test. Water temperature affects accuracy, so it is

recommended to use an ambient testing temperature of 24.0 ±3.0 °C (75.2 ±5.4 °F). Sonic energy agitates the water surface through heating and scattering. The time duration of each test should be limited to a few minutes. Prolonged testing, particularly at higher power levels, will show visible signs of air bubbles on the transducer, target, and the absorbing rubber surface.

Transducer Wetting and Placement

To avoid introducing air into the degassed water, insert the transducer at a 45° angle, then position so it is facing the target. Verify that the transducer surface is uniformly wetted, if not, wipe the surface clean using your finger. The transducer should be pointed toward and center-positioned directly above the cone target. Small measurement variations will occur due to placement of the transducer. Try various positions above the target to minimize the magnitude of error due to positioning.

LAYOUT



1. **On/Zero - *Off* - Yes** button: Press to turn unit on or zero, press and hold until OFF is displayed then release to turn off.
2. **Unit - No** button: Press and hold then release when unit desired is displayed.
3. **Function - *Mode* - Back** button
4. **Tare - *Menu/Cal* - Exit** button: Press to tare.
5. 7-Segment display: Displays readings. A “g” after the reading indicates grams.
6. Stability Indicator: Displays once the scale is stabilized and ready to take a measurement.
7. 14-Segment display: Displays units. “CUSTOM” indicates watts.

BATTERY INSTALLATION

The USP-100A operates using four user-serviceable AA (IEC LR6) alkaline batteries. Install the batteries as indicated in the battery compartment, accessible from the bottom of the unit. Remove the batteries if storing the unit for long periods of time.

TESTING

1. Remove the top of the carrying case by unlatching the clamps located on two ends. The USP-100A is mounted on the base of the carrying case.

2. Place the USP-100A on a stable and level surface. Avoid air currents and mechanical vibrations. Level the unit.

3. Loosen the transducer positioning clamp and move it out of the way, remove the cone target from the clips where it is normally stored. Place the tank on the rubber circle.

4. Fill the test tank to ¼ inch (6.4 mm) below the top of the tank liner with fresh degassed water at a temperature of 24.0 ±3.0 °C (75.2 ±5.4 °F).

5. Plug the AC Adapter into a power outlet, and plug the cord into the power jack at the rear of the unit (unless operating from battery power).

6. Lower the cone target into the concentric target support sleeve located to the back/left of the test tank (small tube inside of larger tube), while simultaneously placing the cone target into the tank. If the cone can swing in an arc, it is not down far enough. Tip the rod back and forth slightly to fully engage the rod. Press the **On/Zero** button.

7. To avoid introducing air into the degassed water, insert the transducer at a 45° angle. Then position so it is facing the target ⅛ to ¼ inch (3.2 to 6.4 mm) below the water level, parallel to the water surface, and directly above the center of the cone. Check the transducer surface for uniform wetting (no air pocket or bubbles should be on its surface).

8. Allow 5 minutes for the scale to stabilize. With no ultrasonic power applied to the transducer, press the **On/Zero** button to zero the unit.

9. Check response by placing the 1 gram weight on the arm of the cone target (the flat part that is out of the water). The USP-100A should read 1.00 ±0.10 grams. Change the units to the watts mode by pressing and holding the ***Unit*** button until "CUSTOM" is displayed then release. The USP-100A should read 14.6 ±0.2 Watts.

10. Remove the 1 gram weight.

11. After the display's stability indicator is shown, activate the DUT and record the measurement. It is a good practice to take three readings and average them. If measurement conditions are not stable, use the grams mode and multiply the readings by 14.65 to obtain Watts.

12. When finished, unplug the USP-100A, empty the tank, and place the dry target cone in the tank for protection.

MAINTENANCE

Verification of Proper Scale Functioning

Small variations of water surface motion, air currents, or mechanical movements may cause uncertainties in power measurements. To test scale accuracy at low levels, set up the scale as in the Operating Procedure section. Place the 1 gram weight on the flat surface of the target arm. Read meter three times; readings should be within ± 0.2 counts (for example, 14.4 to 14.8). In case of doubt about lower power resolution, repeat the same procedure using light objects such as thin paper slices to produce readings of 5 to 10 counts; repeat readings. Average uncertainty should be within ± 0.2 counts on the Watts scale. Avoid mechanical and air movement or variations in magnetic fields while making tests.

TROUBLESHOOTING

Out of Measurement Range Warnings

Model USP-100A accommodates weight up to 410 grams. When the scale exceeds this range, “Error 8.3” will be displayed. Something may be pressing against the target or support. “Error 8.4” indicates underweight condition. If no obvious error has been made by the user the unit should be returned for service when any code is displayed.

No Display

1. Make sure the AC adapter’s plug is fully seated in the jack at the back of the unit.
2. Use a voltmeter to verify the adapter is producing approximately 12 VDC.
3. Call our service department for assistance.

CALIBRATION

A 1 gram weight is supplied to check the calibration and programming. With the DUT turned off, zero the unit. Place the weight on the arm of the cone target. Within 3 seconds the unit should read 14.6 ±0.2 Watts or 1.00 ±0.01 grams. If this reading is not accurate, the USP-100A needs to be calibrated by BC Group.

It is recommended that the USP-100A be returned to BC Group on a routine yearly basis for calibration and certification.

MANUAL REVISIONS

Revision #	Revisions Made
Rev 01	Origination
Rev 02	Misc. Edits
Rev 03	Misc. Edits, Format Updated
Rev 04	Misc. Edits, Format Updated, Specifications Updated
Rev 05	Specifications Updated

LIMITED WARRANTY

WARRANTY: BC GROUP INTERNATIONAL, INC. WARRANTS ITS NEW PRODUCTS TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP UNDER THE SERVICE FOR WHICH THEY ARE INTENDED. THIS WARRANTY IS EFFECTIVE FOR TWELVE MONTHS FROM THE DATE OF SHIPMENT.

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SPECIFICATIONS

ULTRASONIC POWER MEASUREMENT	
POWER RANGE	0 to 30 W
RESOLUTION	± 200 mW or ± 0.01 g (150 mW)
MINIMUM DETECTABLE POWER LEVEL	200 mW
ACCURACY	±3% @ 10 W, 25 °C (77 °F)
DIGITAL FILTER	2.5 seconds Integration
DUT OPERATING FREQUENCY	0.5 to 10 MHz
DUT MAXIMUM TRANSDUCER SIZE	3.00 Inches (76.2 mm)
TEST MEDIUM	Degassed Water @ 24.0 ±3.0 °C (75.2 ±5.4 °F)

ELECTRICAL		
BATTERY	Quantity 4, AA (IEC LR6) Alkaline	
BATTERY LIFE	CONTINUOUS	20 hours
BATTERY ELIMINATOR	12 VAC, 500 mA12 BC20-40337 (USA) BC20-40341 (EURO)	

PHYSICAL & ENVIRONMENTAL		
DISPLAY	3-Digit Backlit LCD	
CONSTRUCTION	TANK LINING	0.5 Inch (12.7 mm) thick Neoprene
	CARRYING CASE	Black Powder-Coated Aluminum
SIZE	OVERALL (Including case): 13.10 x 8.75 x 10.05 Inches (332.7 x 222.3 x 255.3)	
WEIGHT	OVERALL (Including case): < 11.0 Lbs (5.0 kg)	
OPERATING RANGE	15 to 30 °C (59 to 86 °F)	
STORAGE RANGE	-40 to 60 °C (-40 to 140 °F)	

NOTES

NOTES

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