7911A

Constant Temperature Ice Bath

User's Manual

FLUKE®
Calibration

7911A

Constant Temperature Ice Bath

User's Manual

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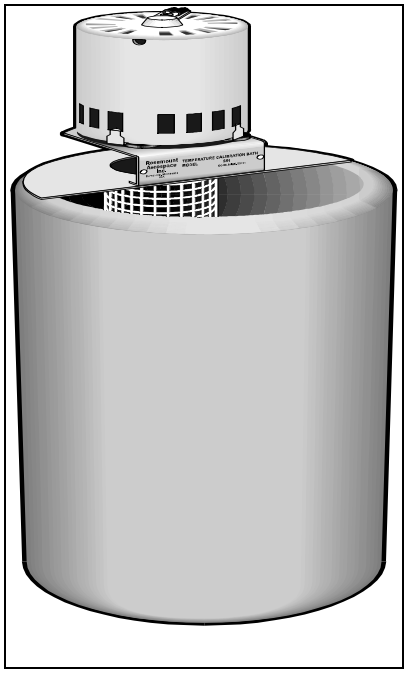
TABLE OF CONTENTS

INTRODUCTION



This instruction manual describes the characteristics of the Hart Rosemount Design Model 7911A Constant Temperature Ice Bath as shown in Figure 1. A functional description and specifications of the 7911A are included in this handbook, as well as instructions for installation, safety precautions, operation, maintenance and disassembly and reassembly. A dimensional drawing (Figure 2) accompany the text to better define the Model 7911A features and operation.

Also contained in this handbook is a parts breakdown, by part number and description of repairable or replaceable items in the 7911A

Description

The Model 7911A is a constant temperature ice bath which is used for the calibration of thermocouples, resistance sensors, liquid-in-glass thermometers, and other related devices. Other applications include production sorting of thermistors, and environmental testing of electronic components or assemblies.

Because of the reproducibility and convenience with which an ice bath can be prepared, the ice point is a principal reference temperature for most kinds of temperature sensors. The ice point is the temperature at which pure ice and air-saturated water are in equilibrium at normal atmospheric pressure, 0±.002° C. A large environmental zone is established in the bath that maintains long term stability at 0° C.

The Model 7911A is a stirred ice bath which promotes air saturation and has excellent temperature uniformity. The complete system consists of a dewar, flow chute, stirrer and stirrer motor. A vacuum-insulated dewar provides a large calibration zone and long bath life. Properly prepared, the bath will maintain 0° C within 0.002° C.

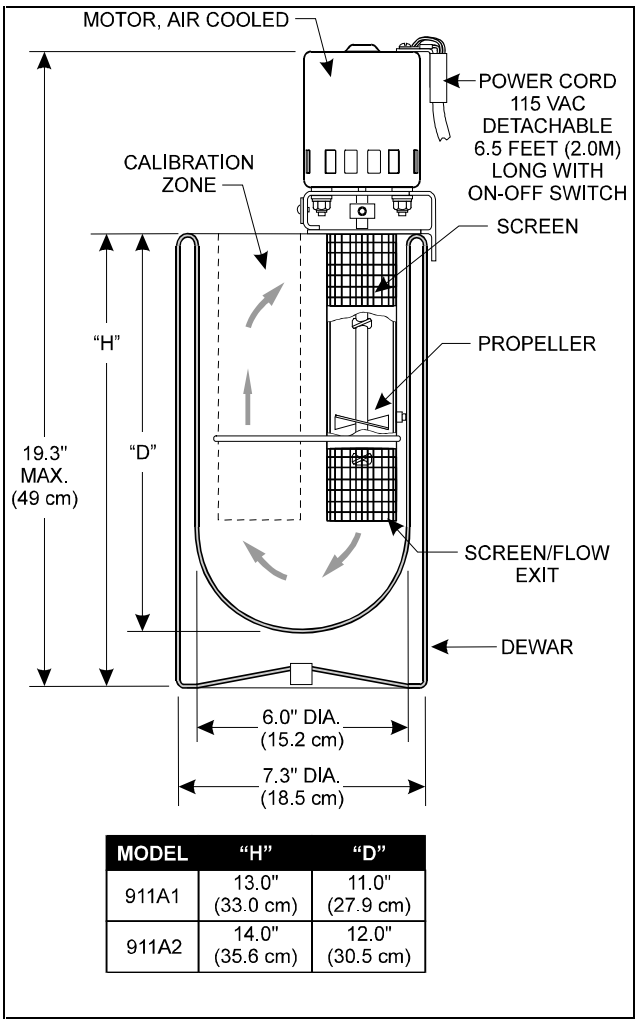
Mechanical and Electrical Specifications

Construction

Baths may be specified with a glass dewar (Model 7911A1) or stainless steel dewar (Model 7911A2). The flow chute assembly for both models is nickel-plated stainless steel. The calibration medium is distilled or demineralized water and flaked ice made from distilled or demineralized water.

Dimensions

See Figure 2. For best performance results, the calibration zone, shown in the drawing, is 2-1/2 inches (6.4 cm) in diameter and 8 inches (20 cm) deep. The stainless steel dewar (Model 7911A2) capacity is approximately 5.0 liters (1.4 gallons) and the glass dewar (Model 7911A1) capacity is approximately 4.5 liters (1.2 gallons).



MODEL	"H"	"D"
911A1	13.0" (33.0 cm)	11.0" (27.9 cm)
911A2	14.0" (35.6 cm)	12.0" (30.5 cm)

Weight

Model 7911A1 - 11 pounds.
Model 7911A2 - 13-1/2 pounds.

Electrical Power

The stirrer motor is designed to operate on 115 volts AC, 60 Hz. The motor will operate on 50 Hz; however, it will then operate hotter and slower but this will not affect performance. A detachable 6.5 foot (2.0 m) three-wire cord with an OFF-ON switch is furnished.

WARNING

ALWAYS CONNECT THE POWER CORD TO A THREE WIRE GROUNDED OUTLET TO AVOID ELECTRICAL SHOCK HAZARD.

Performance

The bath is designed to maintain a constant temperature of 0° C. To achieve, this, *it is very important that the water and ice be distilled or demineralized, and the ice should be finely shaved or flaked*. Temperature uniformity is ±0.002° C, or better, and is defined as the maximum deviation, at a given time, between the temperature at any given point within the calibration zone and the mean temperature in the zone. Temperature stability is ±0.002° C, or better, and is defined as the slope of a best-fit line plotted at a given point within the calibration zone.

INSTALLATION INSTRUCTIONS

Introduction

Installation of the Model 7911A Ice Bath is explained in this section. These instructions should be read thoroughly before installing and operating the bath. Should any difficulties arise, please contact Hart Scientific Customer Service at 801-763-1600.

Shipping Information

The ice bath is packaged and shipped in a custom shipping container. Upon receipt of the instrument, a thorough inspection should be made to determine any possible shipping damage. If damage is found, a damage claim should be filed with the transportation agency.

Inspection

Rotate the stirring shaft by hand to make sure that the propeller does not rub on the inside of the flow chute. If the propeller contacts the flow chute, either straighten the stirring shaft by hand or readjust the motor mounting nuts to correct the problem.

Place the flow chute into the dewar. Connect the line cord to a grounded 115 VAC source and turn on the stirring motor to make sure it operates satisfactorily. It is not necessary to fill the dewar with ice or water for this test.

SAFETY PRECAUTIONS FOR DEWARS

Glass or Stainless steel dewar flasks are used in the ice bath. When used carefully, these dewars will provide years of trouble free service.

Glass Dewars

Glass dewars are susceptible to implosion and breakage if subject to mechanical shock or temperatures sufficient to soften the glass. The glass dewars used are made of Pyrex® glass and are protected by metal shields on the outer diameter. The use of safety glasses is recommended when handling, washing, or filling the dewars. SAFETY GLASSES PROVIDE ADDITIONAL PROTECTION AGAINST FLYING GLASS SHOULD AN ACCIDENT CAUSE A DEWAR IMPLOSION.

Stainless Steel Dewars

Stainless steel dewars are more rugged than glass and can be used over a wider temperature range. While breakage is not a problem, an undetected loss of vacuum can cause dewar failure.

When a stainless steel dewar is placed in service for the first time, it should be visibly inspected for any large dents or scratches which might indicate mishandling and loss of vacuum. Another simple qualitative test is to snap the side of the dewar with a fingernail. A dewar with a good vacuum will ring like a bell, but if there is air present, only a dull thud will result.

A more conclusive test is to fill the dewar with liquid nitrogen. Frost or condensation normally occurs where the inner and outer sides of the dewar are joined and around penetrations of the vacuum jacket by drains. However, if condensation or frost occurs over most of the outer surface of the dewar, a vacuum leak is indicated. Rapid boiling of the liquid nitrogen is also a good indication of a leak.

OPERATING INSTRUCTIONS

Preparation of Ice

The successful preparation of an ice bath depends on the purity of the water which is used. Slight amounts of contamination will lower the freezing point, depending on the nature and amount of the contaminant. Distilled, demineralized or deionized water is sufficient for ±0.002° C reproducibility. Ordinary tap water is not recommended but will usually freeze within 0.05° C of the true ice point.

When water freezes naturally, the impure portion freezes last. In commercial block ice, the clear, bubble-free portion is of the highest purity and is suitable for use in making a reproducible ice bath. Chip off the outer clear portions and wash them with water. Discard the cloudy central part of the block. An alternate procedure is to make ice using distilled or demineralized water.

The ice should be finely shaved or crushed into pieces smaller than about 6 mm (1/4 inch). Larger pieces or cubes may allow temperature gradients to exist in the bath. If ice baths are used routinely, an ice-making machine which automatically shaves the ice is more efficient and convenient. A commercial ice machine which is supplied with distilled or deionized water, will automatically form, shave, and store many pounds of ice.

Preparation of Ice Bath

Before preparing the bath, wash the dewar thoroughly and exterior parts of the flow chute which will contact the ice and rinse them with distilled or demineralized water. Place the flow chute into the dewar **before** filling the dewar with shaved ice. **DO NOT fill the flow chute with ice.**

Add precooled distilled or demineralized water and more ice if necessary until the water level is about 15 mm (1/2 inch) below the dewar rim. A properly prepared bath should be completely filled with ice (all the way to the bottom).

Turn on the stirring motor. A vortex should develop around the stirring shaft which draws some air into the water in the flow chute, assuring air-saturation. This condition can also be noticed by air bubbles rising in the calibration zone and a gurgling noise when the motor is on. If air is not being drawn into the bath, remove some of the water with a syringe. After allowing the bath to stabilize for about 5 minutes, the ice bath is ready to use.

Checkout/Test

When setting up the ice bath for the first time, and if highest accuracy is desirable, the bath should first be monitored with a precision temperature sensor, or a primary standard such as a Model 162CE SPRT. This can be done by immersing a platinum resistance temperature standard into the ice bath to a depth of from 12 to 20 cm (4.72 inches to 7.87 inches) and monitoring the output resistance of the standard with a high accuracy bridge. (Use a glass, plastic or metal rod to make a hole in the ice to accommodate the standard.) If the ice bath has been properly prepared and the standard has a known ice point value (R_O), the resistance reading on the bridge should be within 0.002° C of the known value. While it normally is not necessary to monitor the temperature of an ice bath, one may choose to do so until confidence is gained in the purity of the ice source.

A well-prepared ice bath will normally last several hours without attention; however, the ice will eventually melt and float to the top. This may cause a warmer area near the bottom of the bath since at 0° C, warm water is more dense than cold water. When this happens, draw some water off the top of the bath with a syringe and add more flaked ice.

MAINTENANCE

General

Once the stirring shaft has been centered in the flow chute so that the propellers do not touch the walls, no further adjustments are required. The motor should be oiled at least once each year. If the motor should fail to operate, it can be replaced by any equivalent motor which operates in the range 1000-1550 RPM

Cleaning

If clean water and clean ice are used, the Model 7911A should not require cleaning. However, if cleaning of the Ice Bath is required, any cleaning solution may be used. To avoid contamination of the Ice Bath, thoroughly rinse the dewar and all external parts that will contact the ice with distilled or demineralized water.

DISASSEMBLY AND REASSEMBLY OF MODEL 7911A

General

Complete disassembly is not required for repair or replacement purposes of the 7911A Constant Temperature Ice Bath. Refer to parts list in the Parts Breakdown Section, when performing disassembly procedures. Disassemble only to the extent necessary to effect a repair. All other malfunctions or problems require that the ice bath be sent back to the factory. Call Hart Scientific Customer Service at 801-763-1600. The numbers in parentheses in the following procedures are index numbers on the parts list.

WARNING

ALL PROCEDURES SHOULD BE PERFORMED WITH THE POWER SOURCE DISCONNECTED.

Disassembly

1. Disconnect power cable assembly (1) from motor assembly (2).
2. Lift motor assembly (2), propeller assembly (3), and flow chute (6) from stainless steel (7) or glass (8) dewar.
3. Remove two self-locking nuts (9) and two flat washers(10) securing motor assembly (2) to flow chute (6).
4. Lift motor assembly (2) and propeller assembly (3) from flow chute (6).
5. Unscrew set screw (4) from coupling (5) on the propeller assembly.
6. Pull propeller assembly (3) from shaft of motor assembly (2).

Reassembly

1. Insert propeller assembly (3) on shaft of motor assembly (2).
2. Tighten set screw (4) securing coupling (5) to motor assembly (2).
3. Place motor assembly (2) and propeller assembly (3) in flow chute (6).
4. Secure motor assembly (2) to flow chute (6) with two self-locking nuts (9) and two washers (10).
5. Place motor assembly (2), propeller assembly (3), and flow chute (6) in dewar.
6. Connect power cable assembly (1) to motor assembly.

PARTS BREAKDOWN

General

This section contains a parts list. Refer to the specific part number when ordering.

The quantity listed indicates the number of the particular part required for the 7911A ice bath assembly, and not necessarily the replacement quantity. Order replacement quantities as required.

MODEL 7911A
PARTS LIST

Index Number	Part Number	Item Description	Quantity
1	00911-0045-0001	Power Cable Assembly	1
2	00911-0046-0001	Motor Assembly	1
3	00911-0047-0001	Propeller Assembly	1
4	AN565DC8H3	Screw, Set, 8-32 x 3/16	1
5	00911-0040	Coupling	1
6	00911-0009-0001	Flow Chute	1
7	00910-0065-0001	Dewar, SST, 5.0L (7911A2)	1
8	00910-0500-0002	Dewar, Glass, 4.5L (7911A1)	1
9	MS21083C08	Nut, Self-Locking, 8-32	2
10	AN960C8	Washer, Flat, No. 8	2
11	C11885-0002	Grommet, Rubber	4
12	00910-0120-0001	Beaker, Aluminum (Optional)	1