Highest Purity

103S Still

No Expendables !

HIGH Q®

- Substantially more effective and reliable than other stills or *Type I Ultrapure* and EDI systems
- Lowest TOC, microorganisms, endotoxin, ribonuclease, particulates . . .
- Truly automatic, controls
- Self-cleaning / Self-sanitizing
- Rugged / Shipped assembled

It makes good science . . .

103S Glass Still

Recognized world wide as an example of carefully applied science, the 103S Still is definitely not *just another* water purification system. It produces exceptionally pure water and costs most laboratories nothing to operate. It is truly automatic and easy to install and maintain.

✓ For more detail, take an interactive tour - www.high-q.com

Introduction

Why is the 103S Still a better choice?

Better than other stills

Constructed of high-tech, chemically-resistant glass and plastics, the 103S Still is designed with features that enable it to take maximum advantage of the distillation process.[1] The 103S Still removes all classes of contaminants without contributing new ones in the process; performs consistently, year after year, with very little maintenance; requires no expendables; and can be conveniently and inexpensively monitored. Other laboratory water stills do not perform nearly as well as the 103S Still, including so-called double or triple stills, because they lack many essential features. (see **103S Design** below)

Better than cold-technology systems

The 103S Still also out performs systems based on cold technologies (e.g., filtration, reverse osmosis, batch ion exchange, electrodeionization, carbon sorption, UV, etc.). It consistently produces water of very high purity, it requires no expendables that must be monitored for failure or exhaustion, and it costs virtually nothing to operate when utilities are part of fixed overhead. Properly applied, cold technologies can be very effective; however, microorganisms proliferate; membranes foul and degrade; ion exchange and sorption beds exhaust, shed particulates, and bleed organics; UV sources become coated and weaken; . . . In order to achieve their potential for producing water of high purity, cold-technology systems must be intensively monitored and carefully maintained. A single resistivity meter will not detect the majority of discrete component failures that are likely to occur. Resistivity only measures mobile ions, so most contaminants are not detected – 18 MW-cm water is likely to be significantly contaminated. But the cost of necessary monitoring equipment, such as additional resistivity meters, total organic carbon (TOC) meters, UV meters etc., and effective maintenance is prohibitive for laboratory-scale systems. The cold technologies are simply not well suited for producing high purity water on a laboratory-scale. [2]

What do the standards mean?

A 103S Still can produce water that surpasses the following standards: USP (USP-24-NF19) *Purified and High-Purity* and ISO (3696:1987) *Grade 1*; however, these standards have not been written with sensitive bioscientific applications in mind.[3] ASTM D1193-99 *Type-I* water has been widely promoted as being the *highest purity* water or *ultrapure* water; however, the ASTM standard is awash with inconsistency and does not require validation of product water or maintenance of purification equipment.[4] High-Q recommends using CLSI C3-A4 *Preparation and Testing of Reagent Water in the Clinical Laboratory* and AH/LabWater-1, *Standard for Laboratory Reagent-grade Water*. These standards provides a range of practical specifications and include informative application notes that anyone with the responsibility of operating or purchasing water purification equipment will find extremely helpful.

1 *Design of laboratory water still systems.* High-Q, Inc. Available at: http://www.high-q.com > Lab Water References

2 *Water purification technologies in perspective.* High-Q, Inc. Available at: http://www.high-q.com > Lab Water References

3 http://www.high-q.com/standards.html

4 Gibbs, E.L., Editor, *A Critique of ASTM Standard D 1193 - Standard Specification for Reagent Water. Available at http://www.high-q.com > Lab Water Standards*

Overview

Simple Installation

The 103S Still is shipped virtually assembled. It can be bench or wall mounted (Elfa® adjustable shelving system) and its water and power requirements are easily met. Its ground-fault, fail-safe, solid-state controls are ISO rated and designed to operate on all types of power (208-240 VAC, 50/60 hertz, balanced or unbalanced). Because the 103S Still is designed to function as a docking station for portable High-Q 103C containers, it can serve many work stations and does not have to be located where the water is used. 103C containers have a footprint of $< 0.07\ m^2$, they are specifically designed to maintain the quality of high-purity water, and they are an ideal means for providing high-purity water to your workstations and instruments. (see **High-Q 103C Brochure**)

Easy to Use and Maintain

It is difficult to imagine any laboratory water purification system that is easier to use and maintain than a 103S Still. Turn it on and it does the rest. There are no expendables, so it is likely that a 103S Still will cost you essentially nothing to operate; most laboratories include power and pre-treated water as part of the fixed overhead .

- ✓ Automated drain and rinse cycles keep the boiler of the 103S Still clean.
- ✓ Each time the 103S Still starts, its condenser is sanitized with boiling-hot distilled water before any product water is sent to the container system.
- ✓ The Still-Guard™ feature ensures that only product water produced under optimal conditions enters the container system.
- ✓ Sophisticated, solid-state controls respond *intelligently* to fluctuations, or even total loss, of water pressure or power.
- ✓ The 103S Still turns off all its power and water when the docked containers have been filled.

Specifics of Design

Chemically Resistant Glass

Chemically resistant borosilicate glass is the ideal material from which to construct the 103S Still.

- ✓ It is virtually insoluble in high-purity water.
- ✓ It can be fabricated into the necessarily intricate shapes and flawless seals.
- ✓ Its hydrophilic nature is essential in order to minimize dead spaces and to maintain films of water on critical surfaces of the compound condenser and transition stage.
- ✓ Its non-porous, impermeable surface does not harbor contamination.
- ✓ It is extraordinarily durable.
- ✓ Its transparency permits visual inspection of internal components.

Boiler Stage

103S Still boilers are designed with a large water surface area and horizontally positioned heaters to promote gentle boiling and thereby, minimize the formation of mist and overheated pockets of steam. A magnetic water level sensor makes it possible to accurately regulate the flow of boiler feed water and avoid overflow. Overflow is a poor way to keep a still boiler clean and it increases the concentration of volatile water contaminants in the steam. The level sensor also plays a key role in the control of the efficient automated drain and rinse cycles that keep 103S Still boilers clean.

Special low-mass, quartz/tungsten heaters are an integral part of the boiler stage and the advantages of their unique design contribute significantly to the 103S Still's reputation for dependability and ease of operation.

- ✓ Energy-converting jackets reduce the radiation of energy outside of the boiler water to a bare minimum.
- ✓ They are unaffected by deionized water.
- ✓ Their low mass permits rapid heating and cooling, which makes automated drain and rinse cycles practical.
- ✓ They have an extraordinary life expectancy.

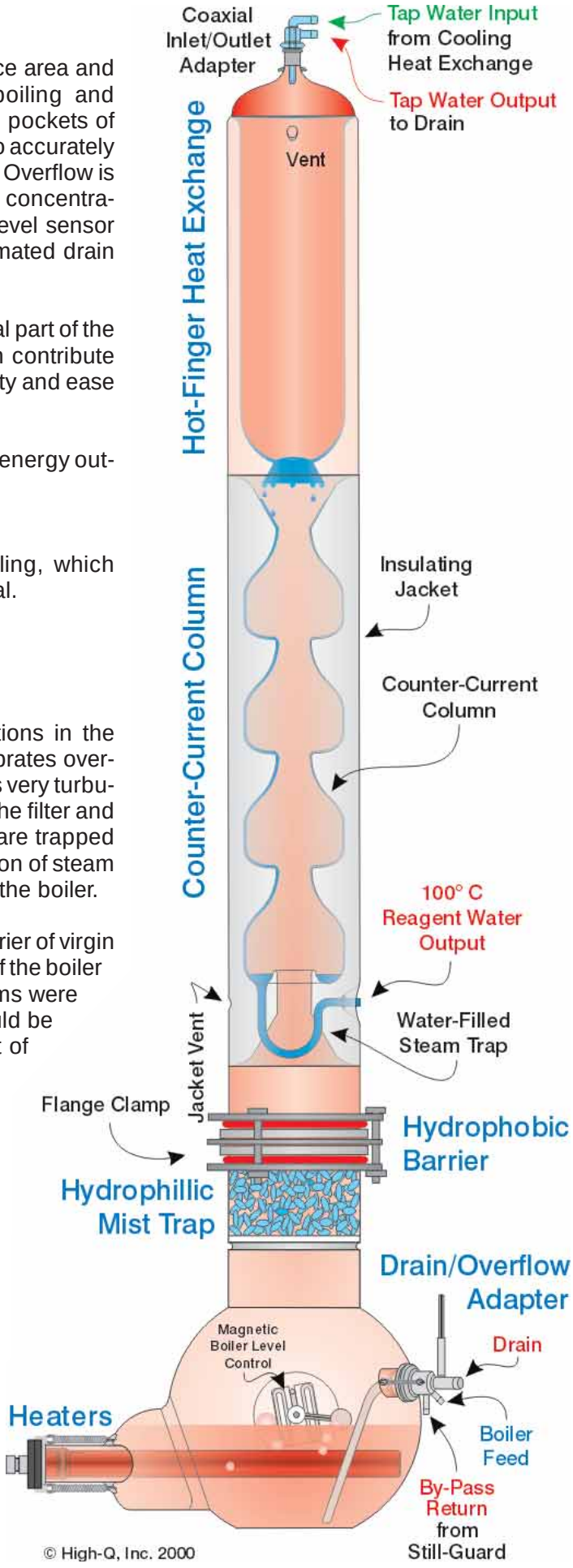
Dual-Action Transition Stage

The transition stage corrects for any non-ideal conditions in the boiler. The hydrophilic steam filter traps mist and equilibrates overheated pockets of steam. The flow of the steam becomes very turbulent as it passes through the tortuous, fine passages of the filter and mist particles, which are expanding due to nucleation, are trapped when they impinge on wet surfaces. A small condensation of steam in the filter automatically rinses contaminants back into the boiler.

In the top of the transition stage, a long, hydrophobic barrier of virgin Teflon® prevents the films of water on the glass surfaces of the boiler and condenser stages from communicating. If these films were to make contact, significant amounts of boiler water could be moved through the film into the condenser by the draft of steam.

Compound Condenser Stage

The most striking feature of the 103S Still is its compound condenser, which combines a hot-finger heat exchanger with a counter-current column. Such a condenser is absolutely essential in order to remove volatile water impurities effectively. The condensing surfaces of the hot-finger heat exchanger are designed to operate at the boiling point of water, with no cold points. The steam and condensed water phases approach equilibrium in this heat exchanger, which makes it possible to achieve the high concentrations of volatile impurities necessary in order for venting to be effective. However, the hot-finger heat exchanger cannot concentrate volatiles without the counter-current column. Condensed water, dropping from the hot-finger heat exchanger, falls as a film



down the inside of the insulated, segmented counter-current column and exits through the water filled trap at its base. As the film of water falls, it remains in equilibrium with the steam rising from the boiler to the heat exchanger. This *counter-current* action strips the falling water film of re-dissolved volatiles, forcing them into the rising steam and concentrating them toward the Hot-Finger; thereby, separating highly purified distilled water from the volatile-enriched steam.

Note: Coil or jacket heat exchangers have cold surfaces, especially during the winter in cold climates (possibly <5° C), where the cooling water first enters. There can be no steam-water equilibrium and any steam vented from such heat exchangers might as well be vented from the boiler.

Distillate Cooler

By design, the product water leaving the trap at the bottom of the 103S Still condenser remains at the boiling point. Because boiling-hot water would be incompatible with many plastics and is inconveniently hot for typical laboratory purposes, the 103S Still is equipped with a glass heat exchange that cools the distilled water to approximately room temperature.

Controls

Sophisticated, solid-state controls make the 103S Still simple to operate and permit unattended operation without sacrificing product water quality. Other stills lack essential controls and the quality of the water they produce falls dramatically during unattended operation.

- ✓ Safety circuits continuously monitor the 103S Still for malfunction or abnormal operating conditions. Interruption of electrical power, cooling water, or boiler feed water will suspend operation in a controlled fashion until conditions normalize. If the boiler overfills or the heaters receive power when they should not, the controller turns off all water and disconnects from the building power source.
- ✓ The controls are designed to permit separate sources of water for cooling and boiler feed. The flow of cooling water is controlled by means of a pressure regulator. If the source pressure drops too low for effective regulation, the controls go into standby mode. The flow of boiler feed water is controlled through feedback from the boiler level sensor and is independent of the source pressure. This is important, because the pressure of pretreated water sources tends to be rather unstable.
- ✓ The boiler is automatically drained and rinsed at regular intervals.
- ✓ The Still-Guard™ control prevents product water from being collected unless the condenser has been sanitized with boiling-hot distilled water and is operating at an optimum temperature for venting volatiles.
- ✓ When all of the docked storage containers are filled, the controls automatically turn off the power and both sources of water.
- ✓ Surge and ground-fault protection is standard.

Specifications

Product Water

- **Production rate**
  Approximately 80 L/day @230 VAC
- **Purity**
  CLSI C3-A4 – Special Reagent Water (SRW)
  AH/LabWater-1 – CD-R10-TOC010-EU001

Reliability / Warranty

- **Mean time between failure**
  projected to exceed 5 years
- **1 year, limited warranty**

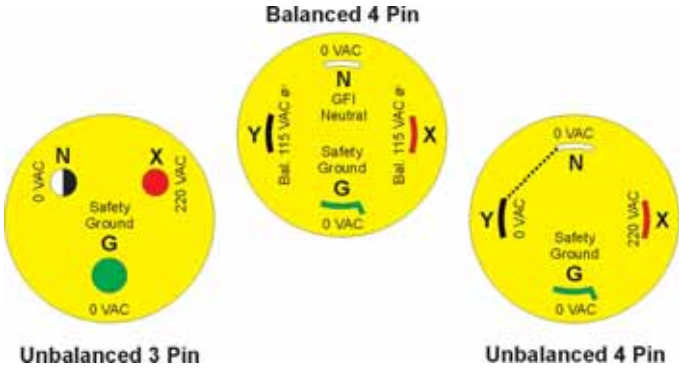
Water Connections

- **Cooling (tap or chilled, recirculated water)**
  Minimum 1/4" NPT or approx. 3/8" ID tubing
  1.4 bar (20 PSI) to 5.9 bar (85 PSI)
- **Boiler feed (non-precipitating)**
  Minimum 1/8" NPT or approx. 1/4" ID tubing
  0.34 bar (5 PSI) to 5.9 bar (85 PSI)
- **Drain (drain must be below the level of the still base)**
  Minimum ½" NPT or approx. 5/8" ID tubing

Electrical

- **200–240 VAC, 50/ 60 Hz, Nominal 3000 watts**
- **Connector:**
  Balanced: 20A/ 250V with 4 pin – 3 pole (balanced + neutral) and ground [NEMA L14-20 or equiv.]

  Unbalanced: 20A/ 250V with 3 pin – 2 pole (unbalanced) and ground [Optional Standard]



- **Emission and sensitivity:**
  ISO Compliant

Materials

- **Active surfaces of still and container system:**
  Chemically resistant, borosilicate glass and Teflon®
- **Stand:**
  Aluminum (anodized/epoxy paint) and stainless steel
- **Cooling/Drain/Feed water controls:**
  Stainless steel, brass (tap water circuits only), and plastics
- **Electronics case and chassis:**
  Aluminum (anodized/epoxy paint)

Dimensions

- **Overall height** **1.5 meters**
- **Footprint** **50 x 50 cm**
- **Weight** **18 kg**

- **Shipping**
  Dimensions 1.66 x 0.78 x 0.47 m
  Weight (50 kg)

Made In USA **US Patent 3,546,431**

To Learn More

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