

# Freeze-point furnaces



- Designed for long plateaus
- Automated controllers, RS-232 included
- Top access to high-stability Hart controllers
- External cooling coils

Several companies manufacture freeze-point furnaces. Most of these furnaces are of adequate theoretical design and of reasonable quality. Most are priced similarly. However, there is a difference that can't be seen from specifications or price, and that's how well the furnace performs with the freeze-point cells they're designed to maintain.

Establishing and maintaining a freeze-point plateau is what these furnaces are supposed to be about. Nothing they do is more important than this performance issue.

Hart Scientific makes three freeze-point furnaces that, when combined with Hart freeze-point cells, produce the longest plateaus in the industry. A Hart furnace and cell can establish plateaus that range from 24 to 40 hours or more.

Fixed-point furnaces can also be used for comparison calibrations and for annealing. In these processes, stability and uniformity are very important, and nothing speaks more about stability and uniformity than the length of the plateaus produced

by the furnace. No other furnace beats a Hart furnace where it counts.

All three of these furnaces have external cooling coils for circulation of tap water at less than 60 PSIG and approximately 0.4 GPM to reduce heat load to the lab. They also come with RS-232 ports and have equilibration blocks available for comparison calibrations. IEEE-488 interface packages are also available, if that's your preference.

One of Hart's three fixed-point furnace models will meet your needs. Remember, the length of the plateau is the best measure of a furnace's performance. Call us for performance data on actual cell freezes and test data on furnace gradients.

## 9114

This furnace has a range of 100 °C to 680 °C, which includes the indium, tin, zinc, and aluminum fixed points, all in one furnace.

The 9114 furnace has an inlet for use of clean dry air or inert gas to initiate the

supercool of a tin cell. Other furnaces require the user to remove the hot and fragile tin cell from the furnace by hand before cooling. In a Hart furnace, you simply turn on your gas, monitor your cell during its supercool, and turn the gas off when the freeze begins.

The 9114 is a three-zone furnace with the best in Hart digital controller technology. Hart designs and builds proprietary controllers that have a reputation of being the best in the business. All of our fixed-point furnaces use them to achieve excellent stability and uniformity.

For easy access and visibility, all three zones are controlled from the top of the unit. The primary controller can be set in 0.01 °C increments, and actual temperature is readable to two decimal places.

The freezing and melting process can be automated using eight preset, user-programmable temperature settings. The top and bottom zones are slaved to the primary zone using differential thermocouples. A high-temperature PRT acts as the main control sensor for the best accuracy, sensitivity, and repeatability.

## 9115A

The 9115A Sodium Heat Pipe Furnace is specifically designed for maintenance of aluminum and silver freeze-point cells.

It has a temperature range of 550 °C to 1000 °C with gradients of less than  $\pm 0.1$  °C throughout. The sodium heat-pipe design provides a simple, yet uniform, single heating zone that ensures very uniform changes in states during heating and cooling.

Melting, freeze initiation, and plateau control for a variety of freeze-point cells are possible by entering up to eight set-points, ramp rates, and soak times. The controller displays temperature in degrees C or F, and temperature feedback is done via a thermocouple. Freeze-point plateaus of 8 to 10 hours are typical, and 24 hours are possible under controlled conditions.

External cooling coils are included for circulation of tap water to reduce chassis temperature and heat load to the lab. Temperature cutouts protect your SPRTs and the furnace from exposure to excessive temperatures.

## 9116A

The Hart Scientific 9116A Furnace has a temperature range of 550 °C to 1100 °C and is designed for use in achieving aluminum, silver, or copper freezing point measurements. An advanced high temperature Sodium heat pipe extends usage to more than 1000 hours at 1100 °C and

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Specifications	9114	9115A	9116A
Temperature Range	100 °C to 680 °C	550 °C to 1000 °C	550 °C to 1100 °C
Temperature Stability	± 0.03 °C	± 0.25 °C	± 0.15 °C
Temperature Uniformity	± 0.05 °C (± 0.1 °C in the pre-heat well)	+0.1 °C from bottom of well to 100 mm (3.94 in)	± 0.05 °C
Set-Point Accuracy	± 0.5 °C	± 3.0 °C	
Set-Point Resolution	0.01 °C	0.1 °C	
Display Resolution	0.01 °C	0.1 °C below 1000 °C 1 °C above 1000 °C	
Thermal Safety Cutout Accuracy	± 5 °C	± 10 °C	
Heater Power	End Zones: 1000 W each (at 230 V ac nominal) Primary Zone: 1500 W	2500 W	
Exterior Dimensions (HxWxD)	838 x 610 x 406 mm (33 x 24 x 16 in)		
Power Requirements	230 V ac (± 10 %), 50/60 Hz, 1 Phase, 22 A maximum		
Weight	92 kg (203 lb)	82 kg (180 lb)	82 kg (180 lb)

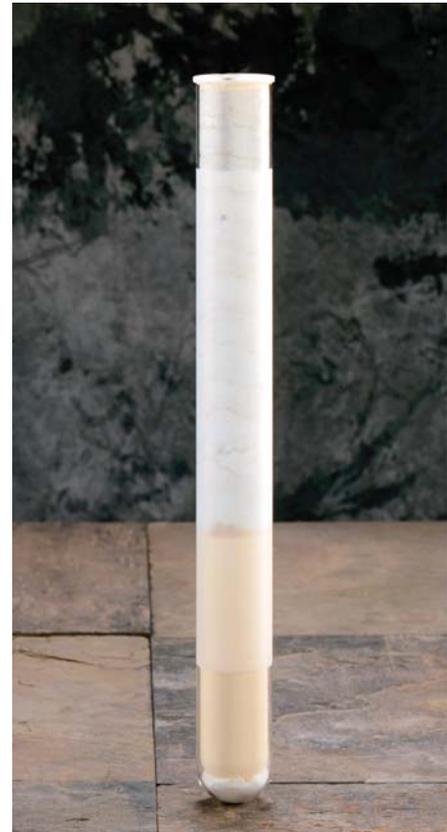
5000 hours at 982 °C. The heater is embedded in a fiber ceramic insulating block. A hollow section through the center contains the heat pipe.

The minimum working temperature of the Sodium heat pipe is about 500 °C. Above that temperature, the sodium circulates throughout the tube providing a uniform temperature zone for freezing point measurements. With uniformity of ± 0.05 °C, zone adjustments are eliminated simplifying installation and increasing throughput.

The uniform temperature is maintained over the full length of the metal freeze point cell. A programmable temperature controller simplifies freeze initiation, melting and plateau control. Control stability is ± 0.15 °C, the best in the industry, enabling extension of freezing plateaus of quality fixed point cells for up to 20 hours and longer. For compatibility with automation programs, plateaus may be controlled through standard RS-232 and optional IEEE-488 PC interfaces.

## Ordering Information

<b>9114</b>	Metrology Furnace (includes Cell Support Container)
<b>2125</b>	IEEE-488 Interface (9114 only)
<b>2126</b>	Comparison Block, 9114
<b>2940-9114</b>	Cell Support Container, 9114
<b>2127-9114</b>	Alumina Block, 9114
<b>2941</b>	Mini Freeze-Point Cell Basket Adapter
<b>9115A</b>	Sodium Heat Pipe Furnace (includes Cell Support Container)
<b>2940-CC</b>	Cell Support Container, 9115A, 9116A
<b>9116A</b>	Three-Zone Freeze-Point Furnace (includes Cell Support Container)
<b>2127-CB</b>	Block, Ceramic, Non-contaminating, 9115A/9116A



Protect platinum thermometers from metal ion contamination with a low-cost alumina block.

## Specifications - 2127

<b>Dimensions</b>	<b>2127-9114:</b> 54 x 510 mm (2 x 20 in)
<b>Wells</b>	Three: 8 mm ID x 488 mm (0.31 x 19.2 in)
<b>Immersion Protection</b>	Last 156 mm (6.1 in) in alumina
<b>Well-to-Well Uniformity</b>	10 mK at 660 °C in 9114
<b>Temperature Range</b>	Up to 1100 °C