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Warner Instruments is proud to introduce our new Electrophysiology & Cell Biology Catalog. This catalog contains many new products for cell imaging, biosensing, microinjection, and electrophysiology.

**NEW Products Featured Include:**

- **PLI-100A Picoliter Microinjector** - With three positive and two negative pressure capabilities, the versatile PLI-100A is capable of large injections into capillaries or small injections into mammalian nuclei.

- **BioStat Multi-channel Potentiostat** - The BioStat is a software-driven, multi-mode potentiostat that can be used for measurement of pH, reactive oxygen species, and nitric oxide.

- **Compact Motorized Micromanipulator** - Linear amplifiers, used to drive the stepper motors, eliminate stray electromagnetic radiation; reducing noise and resulting in improved patch clamp and electrophysiology performance.

- **PFC-1 Proflow Chamber** - Computer designed gaskets optimized for well-defined, well-controlled shear-flow.

- **RC-49FS Perfusion Chamber with Field Stimulation** - Uses popular 18 mm round coverslip. The low profile design allows for low entry angle patch electrodes.

- **CL-200 Dual Channel Bipolar Temperature Controller** - Single control temperature adjustment, built-in protection for Peltier devices, open thermistor fault protection.

- **New Zoom Stereo Microscopes** - Versatile, high performance, ergonomically designed microscopes, with multiple stand options.

- **ProgRes® Microscope Cameras** - These CMOS and CCD cameras are suitable for all contrast methods in light microscopy, C-Mount and USB2.0/FireWire interfaces. All ProgRes® cameras include CapturePro® image capture software.

Sincerely,

Ralph Abate
Business Manager, Warner Instruments
Cell Biology Research Catalog

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Micro-Incubation
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Biosensing
Nitric Oxide Systems, Dissolved O₂, Respirometry, Electrodes

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We appreciate all orders and therefore have no minimum order requirement, however, a small handling fee of $10 will be added to orders below $75.
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Chambers, Perfusion and Temperature Control for Live Cell Imaging

Typical, complete package
for use with 35 mm culture dishes and Warner quick change chambers includes chamber, temperature control, Inline solution heater and stage adapter

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an integrated systems approach

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**Warner Instruments** • Phone (203) 776-0664 • Toll Free U.S. (800) 599-4203 • Fax (203) 776-1278 • [www.warneronline.com](http://www.warneronline.com)
The TC-324B and TC-344B heater controllers have been designed to provide quiet power to a variety of perfusion heating devices including Warner Series 20 heater platforms, solution in-line heaters, and culture dish heaters.

Each channel can supply up to 18 watts into an 8 Ω load. Maintenance of temperature setpoint is controlled automatically via thermistor feedback. A loop-speed selector allows for selection of three feedback speeds to optimize the stability of the thermal response of the device being heated. Temperature setpoint may also be manually set in MANUAL mode.

**Ease of Use**

In AUTO mode, the desired temperature is set with a single SET TEMPERATURE control. The connected platform, solution heater, or other device is automatically driven to the set temperature. Accuracy is typically better than ± 1°C, and under ideal conditions will approach ± 0.1°C.

In MANUAL mode, the controller provides DC output to the heater blocks, adjustable from zero to +12 volts.

Set temperatures range from ambient to 50°C, or from ambient to 65°C for high temperature models.

**Quiet Operation in Recording Setups**

Highly filtered DC supplies and slow-ramped analog switching circuitry deliver power without adding noise to the system. As such, the TC-324B and TC-344B have been optimized for electrophysiology applications.

**Thermistor Readouts**

Each channel reads two thermistors simultaneously: T1 for feedback control of the system, and T2 for any point of interest. Temperatures are displayed on the meter and are also available at front panel outputs for recording devices. Unical thermistors are used throughout and can be replaced without the need for recalibration.

Temperature controllers require the use of an adapter cable (CC-28) to connect to Series 20, Series 30 and QE Series platforms. In-line solution heaters do not require an additional connecting cable.
TC-324B and TC-344B
Chamber System Temperature Controllers – Single and Dual Channel (continued)

Specifications (per channel)

Max. Output Voltage 12 V DC
Max. Output Current 1.5 Amps
Max. Output Power 18 W (8 Ω load)
Manual Voltage Range 0 to 12 V
Temperature Range Ambient to 50°C or ambient to 65°C
Recorder Outputs T1 (Control Thermistor) 100 mV/°C
T2 (Monitor Thermistor) 100 mV/°C
Inputs Rear Panel BNC for T2
(TA-29 Thermistor Cable assembly)
Meter 3 1/2 digit LED display of:
Set Temperature, 50°C maximum
T1 (Control Thermistor) temperature
T2 (Monitor Thermistor) temperature
Heater Voltage, 12 V maximum

Power Requirements 100-130/220-240 VAC, 50/60 Hz, 70 VA
Enclosure Dimensions (H x W x D):
TC-324B 8.9 x 20 x 25.4 cm; Shipping weight 3.6 kg
TC-344B 8.9 x 43 x 25.4 cm; Rack Mount hardware included; Shipping weight 6.8 kg
Warranty Two years, parts & labor

Order # Model Product
W4 64-0100 TC-324B Heater Controller, Single Channel
W4 64-0101 TC-344B Heater Controller, Dual Channel
W4 64-1453 TC-324BHT Perfusion Heater Controller Single Channel with High Temp Modification, 65°C
W4 64-1454 TC-344BHT Perfusion Heater Controller Dual Channel with High Temp Modification, 65°C

Accessories and Replacement Parts
W4 64-0106 CC-28 Cable Assembly for Series 20 Heater Platforms
W4 64-0109 CC-35 Cable Assembly with Unterminated Outboard End
The CL-100 Temperature Controller is an automatic single channel controller capable of accurately maintaining a Peltier device between 0° and 50°C. The CL-100 will also maintain a resistive heater from ambient to +65°C.

While the instrument has several uses, it is specifically designed to control the Warner SC-20 Dual In-line Solution Heater/Cooler. When coupled with the SC-20, the CL-100 provides efficient control of perfusion solution temperatures.

The unit is simple to use with a single control for temperature adjustment and a loop speed switch to optimize the response of the system. Power for the instrument is provided by an ultra low noise power supply making it suitable for use in sensitive electrophysiology applications.

Built-in circuitry limits the maximum temperature of the Peltier to prevent damage and a freeze alert indicates when the cold side of the Peltier reaches 0°C.

- Quiet operation
- Built-in protection for Peltier devices
- Single control temperature adjustment
- Freeze alert
- External inputs for computer control

The CL-100 Temperature Controller is an automatic single channel controller capable of accurately maintaining a Peltier device between 0° and 50°C. The CL-100 will also maintain a resistive heater from ambient to +65°C.

While the instrument has several uses, it is specifically designed to control the Warner SC-20 Dual In-line Solution Heater/Cooler. When coupled with the SC-20, the CL-100 provides efficient control of perfusion solution temperatures.

The unit is simple to use with a single control for temperature adjustment and a loop speed switch to optimize the response of the system. Power for the instrument is provided by an ultra low noise power supply making it suitable for use in sensitive electrophysiology applications.

Built-in circuitry limits the maximum temperature of the Peltier to prevent damage and a freeze alert indicates when the cold side of the Peltier reaches 0°C.
NEW CL-200
Dual Channel Bipolar Temperature Controller

- Single control temperature adjustment
- Built-in protection for Peltier devices
- Open thermistor fault protection
- Heat loss compensation mode
- Quiet operation

The CL-200 Dual Temperature Controller is an automatic two channel controller capable of accurately maintaining two Peltier devices between -6° and 65°C. Power for the instrument is provided by a low noise power supply making it suitable for use in sensitive electrophysiology applications.

While the instrument has broad compatibility, it is specifically designed to control the SC-20 Dual In-line Solution Heater/Cooler in combination with any of our heated and cooled stage chambers.

The CL-200 is simple to use with a single control for temperature adjustment. While total automatic control is provided in the automatic mode, a manual control mode is also available. A loop-speed selector is available to optimize the feedback response of the system to the intrinsic thermal delay characteristics of the setup.

In addition, the CL-200 has a new heat-loss compensation control that allows the instrument to control the temperature at a location downstream from the temperature source.

A feedback thermistor switch allows the user to select which thermistor is used for feedback control. Choosing T1 (control thermistor) uses the built-in thermistor attached to the peripheral device. Selecting T2 (monitor thermistor) allows control at the user selected location of the monitor thermistor (T2).

Built-in circuitry limits the maximum temperature of the Peltier to prevent thermal damage, and a freeze alert/alarm indicates when the cold side of the Peltier reaches 0°C.

### Specifications
- **Max. Output Voltage**: ±15V Heat/Cool, 0-15V Heat-Only
- **Max. Output Current**: 5.0 Amps DC each channel
- **Max. Output Power**: 75 Watts @ 3Ω load each channel
- **Set-Temperature Range**: -6 °C to 65 °C Heat/Cool ambient to 65 °C resistive
- **Recorder Outputs, each channel**: Control Temperature, 100mV/°C
  - Monitor Temperature, 100mV/°C
- **Inputs, each channel**: Monitor Thermistor, 10KΩ @25 °C
  - 100KΩ @25 °C (switchable)
  - External Temp Set (auto mode)
  - External Voltage Set (manual mode)
- **I/O Connector, each channel**: 15-pin “D” connector
- **Panel Meter, each channel**: 3-digit LED display of:
  - Heat Loss Compensation Temp
  - Set Temperature
  - Control Temperature
  - Monitor Temperature
  - Output Voltage
  - Output Current
- **Panel Meter Resolution**: 0.1 °C / 0.01 V / 0.01 A
- **Power Requirement**: 97-265 VAC / 200VA Max
- **Weight**: 4.54 kg
- **Dimensions (HxWxD)**: 8.9 x 42.6 x 29.2 cm (H x W x D)
- **Warranty**: One year, parts & labor

### Order #  Model  Product
| W4 64-1708 | CL-200 | Dual Channel Bipolar Temperature Controller |

### Accessories and Replacement Parts
- **W4 64-0353** SC-20  Solution Heater/Cooler Two Line
- **W4 64-1659** QE-1HC  Quick Exchange Stage Incubator
- **W4 64-1632** TB-3 CS  Thermal Insert for Prior NanoScanZ and chamber slides
- **W4 64-1636** TB-3 CCD  Thermal Insert for Prior NanoScanZ and 35 mm Petri dishes

Warner Instruments • Phone (203) 776-0664 • Toll Free U.S. (800) 599-4203 • Fax (203) 776-1278 • www.warneronline.com
The LCS-1 Liquid Cooling System from Warner Instruments is a versatile and simple to use thermal control accessory. This apparatus circulates water through a fan/radiator housing and is designed to easily and quietly remove excess heat from the Peltier portion of all Warner devices employing this technology.

This heat exchanger can also be used with any apparatus, allowing the quiet removal of heat energy via the movement of circulating water. A great deal of effort has been dedicated towards making this system both mechanically and electrically quiet.

The LCS-1 is supplied with 20 feet of 1/8” ID x 1/4” OD Tygon tubing, one bottle of antifreeze, and a desktop power supply with line cord.
TC-202A
Bipolar Temperature Controller

Works with all Harvard Apparatus Micro-Incubation and Tissue Slice Chambers

Flexible
The TC-202A allows the researcher to control the command temperature from alternative locations. In the case of the PDMI-2, PSMI, and CSMI micro-incubators, temperature is controlled either from a thermistor placed in the bath, or from a second thermistor permanently positioned on the plate containing the regulated surface of the Peltier devices.

Accurate
Accurate thermal control (±0.2°C) is achieved by sensing temperature with a miniature thermistor, digitizing the thermistor signals, and then proportionally regulating a low noise DC current output. Current output is also regulated to match the thermal time constants of small systems (such as micro-incubators), thus minimizing initial overshoot and oscillations about the set point.

Other Features
• Low electrical noise for sensitive electrophysiology recordings
• Stable long term operation
• Excellent temperature stability at user selectable set points
• Easy to use, digitally set command temperatures
• Versatile monopolar or bipolar operation (heat only or heat and cool)
• Temperature profile monitoring capability
• Over-temperature shut down

Order # Model Product

W4 65-0045 TC-202A Bipolar Temperature Controller for use with PDMI-2, PSMI, CSMI, LU-CB-1, LU-CPC-CEH, and BSC-BU. Includes BSC-T3 Thermistor

Accessories and Replacement Parts

W4 65-0057 BSC-T3 Bath Thermistor for use with PDMI-2, PSMI, LU-CB-1, and TC-202A (36 KW total)

W4 65-0056 BSC-T3A Bath Thermistor for use with LU-CPC-CEH

W4 65-0098 BSC-T2 Old Style Bath Thermistor for Obsolete TC-102

W4 65-0016 BSC-T2A Old Style Bath Thermistor for use with LU-CPC-CEH and TC-102

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Setting Range</td>
<td>0 to 50°C</td>
</tr>
<tr>
<td>Temperature Regulation</td>
<td>±0.2°C</td>
</tr>
<tr>
<td>Temperature Display</td>
<td>0.1°C resolution</td>
</tr>
<tr>
<td>Chamber Temperature Sensor</td>
<td>Thermistorial type, 36 KΩ nominal at 25°C</td>
</tr>
<tr>
<td>Voltage Range</td>
<td>0 to ±5 V</td>
</tr>
<tr>
<td>Current Range</td>
<td>0 to ±6 A DC</td>
</tr>
<tr>
<td>Case Size (W x H x D)</td>
<td>48.3 x 8.9 x 33.7 cm (19 x 3.5 x 13.25 in), 19 in. rack mountable</td>
</tr>
<tr>
<td>Weight</td>
<td>5.7 kg (12.5 lb)</td>
</tr>
<tr>
<td>Power</td>
<td>150 W, 120/230 VAC, 50/60 Hz, user selectable</td>
</tr>
</tbody>
</table>

Low Noise
Bipolar or monopolar operation
Temperature control from 0°C to 50°C
Digital display
Excellent stability

The TC-202A Bipolar Temperature Controller is the next generation of the TC-102 Monopolar Temperature Controller. This instrument operates with all Harvard Apparatus micro-incubators to provide both heating and cooling functions for life science research purposes.

Because the TC-202A is bipolar, it is ideally suited for use with Peltier devices such as those built into our PDMI-2 Open Perfusion Micro-incubator, PSMI Patch Slice Micro-incubator, and CSMI Chambered Slide Micro-incubator.

While the unit has multiple uses, it has been designed as an ideal companion for Harvard Apparatus/Medical Systems Peltier-based micro-incubators. In its monopolar mode, the TC-202A efficiently controls microincubators that use resistive heaters such as the Leiden Micro-incubator Systems and the BSC-BU Brain/Tissue Slice units.

Flexible

The TC-202A allows the researcher to control the command temperature from alternative locations. In the case of the PDMI-2, PSMI, and CSMI micro-incubators, temperature is controlled either from a thermistor placed in the bath, or from a second thermistor permanently positioned on the plate containing the regulated surface of the Peltier devices.

Accurate

Accurate thermal control (±0.2°C) is achieved by sensing temperature with a miniature thermistor, digitizing the thermistor signals, and then proportionally regulating a low noise DC current output. Current output is also regulated to match the thermal time constants of small systems (such as micro-incubators), thus minimizing initial overshoot and oscillations about the set point.

Other Features

• Low electrical noise for sensitive electrophysiology recordings
• Stable long term operation
• Excellent temperature stability at user selectable set points
• Easy to use, digitally set command temperatures
• Versatile monopolar or bipolar operation (heat only or heat and cool)
• Temperature profile monitoring capability
• Over-temperature shut down

Order # Model Product

W4 65-0045 TC-202A Bipolar Temperature Controller for use with PDMI-2, PSMI, CSMI, LU-CB-1, LU-CPC-CEH, and BSC-BU. Includes BSC-T3 Thermistor

Accessories and Replacement Parts

W4 65-0057 BSC-T3 Bath Thermistor for use with PDMI-2, PSMI, LU-CB-1, and TC-202A (36 KW total)

W4 65-0056 BSC-T3A Bath Thermistor for use with LU-CPC-CEH

W4 65-0098 BSC-T2 Old Style Bath Thermistor for Obsolete TC-102

W4 65-0016 BSC-T2A Old Style Bath Thermistor for use with LU-CPC-CEH and TC-102

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Setting Range</td>
<td>0 to 50°C</td>
</tr>
<tr>
<td>Temperature Regulation</td>
<td>±0.2°C</td>
</tr>
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<td>0.1°C resolution</td>
</tr>
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<td>Chamber Temperature Sensor</td>
<td>Thermistorial type, 36 KΩ nominal at 25°C</td>
</tr>
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<td>Voltage Range</td>
<td>0 to ±5 V</td>
</tr>
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</tr>
</tbody>
</table>

Low Noise
Bipolar or monopolar operation
Temperature control from 0°C to 50°C
Digital display
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The TC-202A Bipolar Temperature Controller is the next generation of the TC-102 Monopolar Temperature Controller. This instrument operates with all Harvard Apparatus micro-incubators to provide both heating and cooling functions for life science research purposes.

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Flexible

The TC-202A allows the researcher to control the command temperature from alternative locations. In the case of the PDMI-2, PSMI, and CSMI micro-incubators, temperature is controlled either from a thermistor placed in the bath, or from a second thermistor permanently positioned on the plate containing the regulated surface of the Peltier devices.

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Accurate thermal control (±0.2°C) is achieved by sensing temperature with a miniature thermistor, digitizing the thermistor signals, and then proportionally regulating a low noise DC current output. Current output is also regulated to match the thermal time constants of small systems (such as micro-incubators), thus minimizing initial overshoot and oscillations about the set point.

Other Features

• Low electrical noise for sensitive electrophysiology recordings
• Stable long term operation
• Excellent temperature stability at user selectable set points
• Easy to use, digitally set command temperatures
• Versatile monopolar or bipolar operation (heat only or heat and cool)
• Temperature profile monitoring capability
• Over-temperature shut down

Order # Model Product

W4 65-0045 TC-202A Bipolar Temperature Controller for use with PDMI-2, PSMI, CSMI, LU-CB-1, LU-CPC-CEH, and BSC-BU. Includes BSC-T3 Thermistor

Accessories and Replacement Parts

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W4 65-0056 BSC-T3A Bath Thermistor for use with LU-CPC-CEH

W4 65-0098 BSC-T2 Old Style Bath Thermistor for Obsolete TC-102

W4 65-0016 BSC-T2A Old Style Bath Thermistor for use with LU-CPC-CEH and TC-102

Specifications

<table>
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<td>Temperature Setting Range</td>
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<td>Temperature Regulation</td>
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<tr>
<td>Temperature Display</td>
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<tr>
<td>Chamber Temperature Sensor</td>
<td>Thermistorial type, 36 KΩ nominal at 25°C</td>
</tr>
<tr>
<td>Voltage Range</td>
<td>0 to ±5 V</td>
</tr>
<tr>
<td>Current Range</td>
<td>0 to ±6 A DC</td>
</tr>
<tr>
<td>Case Size (W x H x D)</td>
<td>48.3 x 8.9 x 33.7 cm (19 x 3.5 x 13.25 in), 19 in. rack mountable</td>
</tr>
<tr>
<td>Weight</td>
<td>5.7 kg (12.5 lb)</td>
</tr>
<tr>
<td>Power</td>
<td>150 W, 120/230 VAC, 50/60 Hz, user selectable</td>
</tr>
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</table>
The TC-124A Temperature Controller from Warner Instruments is a simple, low cost device designed for use with our microscope objective warmers and the SWS Series syringe warmers.

This unit is a basic on-off controller with slowly ramped switching speeds making it ideal for large mass devices where the temperature changes slowly.

The LED display reports the actual temperature of the connected device. Adjustment of the set temperature using either the heat up or heat down buttons causes the display to momentarily report the set temperature.

• Easy to use
• Command temperatures digitally set
• Ambient to 65°C temperature range
• Can be powered from 12 volt battery for sensitive electrophysiology applications

The TC-124A Temperature Controller takes up very little space and may be powered from the 12 VDC wall power supply (included), or a 12 volt battery for low noise applications.

**Specifications**

- **Input Voltage Range**: 9 to 16 VDC
- **Max. Output Current**: 1.2 A
- **Max. Output Power**: 13 W
- **Temperature Ranges (4)**: Set by DIP Switch: Ambient to +65°C
- **Meter**: 3-Digit LED display
- **Meter Resolution**: 0.1°C
- **Panel Indicators**: Red: Heat-up Condition, Green: Heat-down Condition, Yellow: Displaying Set-Temperature
- **Features**: Pushbutton entry of Set-Temperature Set-Temperature displayed for 3 seconds after adjustment
- **Enclosure Dimensions**: 2.1 x 6.6 x 11.1 cm (H x W x D)
- **Weight**: 92 grams
- **Warranty**: One year, parts & labor

**Order #**

<table>
<thead>
<tr>
<th>Product</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery Adapter Cable</td>
<td>W4 64-1606 BAC-1</td>
</tr>
<tr>
<td>Temperature Controller, 120 VAC US</td>
<td>W4 64-1545 TC-124A</td>
</tr>
<tr>
<td>Temperature Controller, 240 VAC Europe</td>
<td>W4 64-1545E TC-124AE</td>
</tr>
</tbody>
</table>
Model TC-144
Dual Temperature Controller

- Ambient to 65°C temperature range
- Compatible with Warner’s objective warmer, syringe warmers, and warmed stage insert
- Can be powered from 12 volt battery for sensitive electrophysiology applications
- Large, easy to read LED display

The TC-144 Dual Temperature Controller from Warner Instruments is a simple, low cost device designed for use with our microscope objective warmer or the SWS Series syringe warmers. This device is capable of driving two objective warmers simultaneously.

This compact instrument is a basic on-off controller with a slowly ramped switching speed, making it ideal for large mass devices where the temperature changes slowly.

The LED display reports the actual or set temperature of either channel. Front panel LED’s indicate the currently displayed information.

Supplied with universal input voltage power supply and plug kit for major countries.

Specifications

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage Range</td>
<td>9 to 16 VDC</td>
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<tr>
<td>Maximum Output Current</td>
<td>1.2 A (per channel)</td>
</tr>
<tr>
<td>Maximum Output Power</td>
<td>13 W (per channel)</td>
</tr>
<tr>
<td>Temperature Ranges (4)</td>
<td>Set by DIP switch: ambient to +65°C</td>
</tr>
<tr>
<td>Meter Resolution</td>
<td>0.1 °C</td>
</tr>
<tr>
<td>Display</td>
<td>LED, 3 digit, 10 mm (0.4 in) high</td>
</tr>
<tr>
<td>Panel Indicators:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Red: Heat-up condition</td>
</tr>
<tr>
<td></td>
<td>Green: Heat-down condition</td>
</tr>
<tr>
<td></td>
<td>Yellow: Displaying set-temperature or view temperature</td>
</tr>
<tr>
<td>Features</td>
<td>Pushbutton entry of modes, dust-proof, splash-proof case</td>
</tr>
<tr>
<td>Physical Dimensions:</td>
<td></td>
</tr>
<tr>
<td>Case Size</td>
<td>2.1 x 6.6 x 11.1 cm (H x W x D)</td>
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<td>Shipping Weight</td>
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<tr>
<td>Warranty</td>
<td>One year, parts &amp; labor</td>
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Order # Model          Product
W4 64-1655 TC-144 Temperature Controller Dual

Accessories/Replacement Parts

<table>
<thead>
<tr>
<th>Order #</th>
<th>Model</th>
<th>Product</th>
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</thead>
<tbody>
<tr>
<td>W4 64-1606</td>
<td>BAC-1</td>
<td>Battery Adapter Cable</td>
</tr>
<tr>
<td>W4 64-1665</td>
<td>OW-1</td>
<td>Objective Warmer for 23-28 mm Objectives</td>
</tr>
<tr>
<td>W4 64-1662</td>
<td>WP-10</td>
<td>Warmed Platform 10 mm Aperture</td>
</tr>
<tr>
<td>W4 64-1663</td>
<td>WP-16</td>
<td>Warmed Platform 16 mm Aperture</td>
</tr>
<tr>
<td>W4 64-1584</td>
<td>SWS-10</td>
<td>Syringe Heater for 10 cc Syringes</td>
</tr>
<tr>
<td>W4 64-1560</td>
<td>SWS-60</td>
<td>Syringe Heater for 60 cc Syringes</td>
</tr>
<tr>
<td>W4 64-1585</td>
<td>SWS-140</td>
<td>Syringe Heater for 140 cc Syringes</td>
</tr>
</tbody>
</table>

Warner Instruments • Phone (203) 776-0664 • Toll Free U.S. (800) 599-4203 • Fax (203) 776-1278 • www.warneronline.com
Model WP-10 and WP-16
Warmed Platforms for 35 mm Petri Dishes

• Temperature control from 25 to 65°C
• Stage adapters for all major brand microscopes
• Low Cost Systems available

Warner Instruments warmed platforms are designed to maintain the temperature of 35 or 50 mm Petri dishes and glass or chambered slides. Available with aperture sizes of 10 and 16 mm, these aluminum platforms provide excellent mechanical access from below and very good heat conductivity. Platforms are finished in black anodize for corrosion protection and to minimize stray light reflectance. A groove in the top surface of the platform allows Petri dishes with a raised bottom to achieve full contact with the platform heated surface.

Control of platform heating is provided by our TC-124A and TC-144 temperature controllers. Complete systems are available for Nikon microscopes using a 108 mm stage insert and for Olympus microscopes using a 110 mm insert.

Complete systems include a warmed platform (choice of aperture), a TC-124A temperature controller (select line voltage), and a SA-NIK stage adapter for the Nikon systems or a SA-OLY/2 stage adapter for the Olympus systems.

Stage adapters are available for all major microscopes; the warmed platforms use Warner’s series 20 stage adapters. Please see page 64 for detailed information regarding the stage adapters.

Specifications
Temperature Range 25° to 65°C
Accuracy ±0.1°C
Feedback Thermistor Built-in Unical 10kΩ at 25°C
Controller TC-124A / TC-144 Single and Dual Channel Controllers

Specifications (continued)
Physical Dimensions:
<table>
<thead>
<tr>
<th>Product Description</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warmed Platforms (D x L)</td>
<td>79.4 x 3.2 mm</td>
</tr>
<tr>
<td>Aperture Size (D)</td>
<td>10 mm-WP-10, 16 mm-WP-16</td>
</tr>
<tr>
<td>Weight</td>
<td>50 g</td>
</tr>
<tr>
<td>Cable Length</td>
<td>2.4 m</td>
</tr>
<tr>
<td>Connector Type</td>
<td>4 pin Male RJ-22</td>
</tr>
</tbody>
</table>

Warranty One Year

Order #  Model  Product
W4 64-1662  WP-10  Warmed Platform 10 mm Aperture
W4 64-1662D  WP-10D  Warmed Platform 10 mm Aperture for use with TC-324B/TC-344B Temperature Controllers
W4 64-1663  WP-16  Warmed Platform 16 mm Aperture
W4 64-1663D  WP-16D  Warmed Platform 16 mm Aperture for use with TC-324B/TC-344B Temperature Controllers

Systems Below Include TC-124A Temperature Controller, Warmed Platform, and Stage Adapter

W4 64-1666  WPN-10  Warmed Platform for Nikon 10 mm Aperture
W4 64-1667  WPN-16  Warmed Platform for Nikon 16 mm Aperture
W4 64-1668  WPN-10E  Warmed Platform for Nikon 10 mm Aperture (for 240 VAC)
W4 64-1669  WPN-16E  Warmed Platform for Nikon 16 mm Aperture (for 240 VAC)
W4 64-1670  WPO-10  Warmed Platform for Olympus 10 mm Aperture
W4 64-1671  WPO-16  Warmed Platform for Olympus 16 mm Aperture
W4 64-1672  WPO-10E  Warmed Platform for Olympus 10 mm Aperture (for 240 VAC)
W4 64-1673  WPO-16E  Warmed Platform for Olympus 16 mm Aperture (for 240 VAC)
SH-27B, SH-27G and SF-28
In-line Solution Heaters

Specifications
- Heater Resistance: 10 Ω
- Voltage Requirement: Variable to 12 V max.
- Maximum Temperature: 50°C
- Internal Dead Volume: 262 µl
- Perfusion Lines: Type 316 Stainless Steel, 0.083 in OD x 0.067 in ID, 2.1 mm x 1.70 mm
- Maximum Flow Rate at 37°C:
  - SF-28: 2 ml/min
  - SH-27B/SH-27G: 10 ml/min
- Temperature of 37°C can be maintained at ±1°C under following conditions: a) Solution temperature at input (nominally 21°C) varies no more than ±10%; b) Solution flow rate varies no more than 25%
- Physical Dimensions:
  - Body (D x L): 12.5 mm x 12.5 cm
  - Cable Length: 1.9 m
- Warranty: One year

Order # | Model | Product
--- | --- | ---
W4 64-0103 | SF-28 | Slow Flow Solution Heater
W4 64-0102 | SH-27B | Solution Heater
W4 64-1503 | SH-27G | Solution Heater with Banana Connectors

Accessories and Replacement Parts
- W4 64-0107 | TA-29 | Replacement Cable with Bead Thermistor
- W4 64-0108 | TA-30 | Replacement Cable with Glass Thermistor
- W4 64-0100 | TC-324B | Heater Controller, Single
- W4 64-0101 | TC-344B | Heater Controller, Dual

In-line solution heating is the simplest and most effective method of warming perfusion solutions. The heater is connected to the chamber with a short length of tubing such that the warmed perfusate flows directly into the chamber bath. Depending on bath volume and other factors, in-line solution heating by itself may be sufficient for many applications.

The model SH-27B will accommodate flow rates up to 10 ml/min while the model SF-28 is designed for slower flow rates of 2 ml/min or less.

Both models feature a straight flow path for easy cleaning. The stainless steel flow channel in both models may be lined with polyethylene tubing (PE-50) when exposing compounds to metal is a problem.

These In-line Solution Heaters require either the TC-324B single or the TC-344B dual channel temperature controller. See pages 108 and 109.

Each heater is supplied with a thermistor cable assembly (p/n TA-29) which allows for monitoring the actual bath temperature during use (T2 output on heater controllers TC-324B/TC-344B).
SC-20
Dual In-line Solution Heater/Cooler

Bipolar Temperature Control for Flowing Solutions

- Heats and cools from 0° to 50°C
- Compatible with Warner Series 20 Chambers
- Optimized for use with the CL-100 Bipolar Temperature Controller

In-line solution heating has proven to be one of the most effective methods of maintaining the temperature of perfusion solutions. The SC-20 Dual In-line Solution Heater/Cooler utilizes Peltier thermoelectric devices to regulate temperature both above and below ambient levels.

The SC-20 is designed to thermally regulate one or two solutions at the same temperature. Solution temperature can be maintained at 0°C at flow rates of 2 ml/min., 5°C at 5 ml/min., or as high as 50°C at 5 ml/min.

An integral water jacket is used to remove excess heat from the SC-20 peltier device. Running water either from a tap or a large reservoir can be used. Flow rates as low as 4 liters per hour are sufficient to maintain cooling efficiency.

The SC-20 can be used with either one or two discrete perfusate solutions, or with a solution/gas combination. When coupled with a PHC Series Imaging Chamber Heater/Cooler Jacket, the SC-20 provides an effective means of temperature control in a Warner chamber, even in the absence of solution flow.

Each SC-20 is supplied with a TA-29 Thermistor Cable Assembly for monitoring the bath temperature during use, 10 feet of PE-160 tubing and 10 feet of 1/8” I.D. x 1/4” O.D. Tygon tubing.

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Temperature</td>
<td>0°C (2 ml/min. max flow)</td>
</tr>
<tr>
<td>Maximum Temperature</td>
<td>50°C</td>
</tr>
<tr>
<td>Maximum Flow Rate at 5°C</td>
<td>5 ml/min.</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.1°C</td>
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<tr>
<td>Internal Dead Volume</td>
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<tr>
<td>Perfusion Lines</td>
<td>Type 316 Stainless Steel</td>
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<tr>
<td></td>
<td>0.032 in ID x 0.062 in OD</td>
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<tr>
<td>Water Jacket Ports</td>
<td>Type 316 Stainless Steel</td>
</tr>
<tr>
<td></td>
<td>0.12 in ID x 0.147 in OD</td>
</tr>
<tr>
<td>Controller</td>
<td>Model CL-100 Bipolar Controller</td>
</tr>
<tr>
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<tr>
<td></td>
<td>Body (D x L) 21 x 165 mm</td>
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<td></td>
<td>Weight 109 g</td>
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<tr>
<td></td>
<td>Cable Length 1.9 m</td>
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<tr>
<td>Connector Type</td>
<td>15 pin Male “D”</td>
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<tr>
<td>Warranty</td>
<td>One year</td>
</tr>
</tbody>
</table>

Order # | Model | Product
---      | ---   | ---
W4 64-0353 | SC-20 | Solution Heater/Cooler Two Line
W4 64-0352 | CL-100 | Bipolar Temperature Controller

Replacement part

Order # | Model | Product
---      | ---   | ---
W4 64-0107 | TA-29 | Cable with Bead Thermistor for Heater Controllers
In-line solution heating is the simplest and most effective method of warming perfusion solutions. The minimal dead space manifold (see right image) at the output allows this heater to be used in any application where from 2 to 8 perfusion lines are connected to a chamber or other device. The manifold dead volume is 30 µl.

The heater is connected to the chamber using a short length of tubing such that the warmed perfusate flows directly into the chamber bath. Connections are made by press fitting (PE-160) tubing onto the 18 gauge stainless steel hypodermic tubes. Cap plugs are supplied to block any unused inputs.

Depending on bath volume and other factors, in-line solution heating itself may be sufficient for many applications. The heaters will accommodate flow rates up to 5 ml/min. Solution reservoir heaters from Warner are recommended if outgassing of solutions is a problem.

These solution heaters require either a single or dual channel temperature controller. See pages 108 to 116.

Each heater is supplied with a TA-29 thermistor cable assembly which allows for monitoring the actual bath temperature (T2 output on heater controllers TC-324B/TC-344B), and 3 meters of PE-160 tubing, a three way valve and replacement O-rings.
The SHM-828 is an eight line solution heater designed for superfusion. Construction is such that all eight lines can be used simultaneously. The solution is heated as it flows through 21.5 cm of 18 gauge type 316 stainless steel tubing. The straight flow path allows for easy cleaning.

If contact with stainless steel tubing is undesirable, polyethylene tubing (PE-50) can be drawn through the heater tubes. This eliminates metal contact and reduces the dead volume of the tubes.

For single output applications an MP-8 Perfusion Manifold can be connected directly to the 18 gauge tubes. An ML-8 Miniature Manifold may be used if PE-50 polyethylene tubing is pulled inside the heater tubes. Solution temperatures can be maintained at 37°C for flow rates up to 5 ml/min., or 50°C at 3 ml/min., per line. Higher flow rates at any given temperature can be achieved if fewer lines are used.

Each heater is supplied with a TA-29 Thermistor Cable Assembly which allows for monitoring the actual bath temperature and 3 meters of PE-160 Tubing. This heater requires the CL-100 Bipolar Temperature Controller; see page 110.
PHC Series
Heater/Cooler Jackets

Maintains temperature in both perfused and static baths

- Designed for Series 20 chambers
- Optimized for the SC-20 In-line Solution Heater/Cooler
- Jackets available for both upright and inverted microscopes
- Includes Series 20 platform

The Warner PHC Heater/Cooler Jackets are designed to bring heating and cooling to our classic Series 20 Imaging and Recording Chambers. Accurate temperature control from 5° to 50°C can be achieved using the PHC jackets in concert with the SC-20 Dual In-line Solution Heater/Cooler. Heated or chilled water flows from the SC-20 into a PHC jacket which is in direct thermal contact with the chamber bottom coverslip.

The PHC-1 is used for upright microscopes and provides a thermal barrier between the chamber-forming coverslip and the local environment. The PHC-2 and PHC-3 are designed for inverted microscopes and provide either rectangular or round openings.

Heater/Cooler Jackets are provided with a mounting platform, which replaces the standard platforms used with Series 20 chambers. The platform functions as a base for the jacket/chamber sandwich and provides the clamping pressure to make a tight seal. Mounting platforms are machined from black Delrin and are compatible with all Series 20 stage adapters, see pages 64 to 69.

<table>
<thead>
<tr>
<th>Model</th>
<th>Aperture Size</th>
<th>For Chamber Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHC-1</td>
<td>17.0 x 37 mm</td>
<td>RC-22/22C/24N/26/26G/26GLP/26Z</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RC-22/22C/24N/27N/27NE/28/RC-27L/RC-29</td>
</tr>
<tr>
<td>PHC-2</td>
<td>15 mm diameter</td>
<td>RC-22/22C/24N/26/26G/26Z/26GLP</td>
</tr>
<tr>
<td>PHC-3</td>
<td>8.0 x 25 mm</td>
<td>RC-27/27N/27NE</td>
</tr>
</tbody>
</table>

Order #  Model  Product
W4 64-0354  PHC-1  Heater/Cooler Jacket, Upright
W4 64-0355  PHC-2  Heater/Cooler Jacket, Inverted
W4 64-0356  PHC-3  Heater/Cooler Jacket, Inverted
A common problem with immersion optics is the loss of thermal control of the solution directly adjacent to the microscope objective. The need to keep a sample at a temperature different from ambient during observation is directly compromised by the heat-sink character of the microscope objective.

The OWS Series Objective Warmer from Warner Instruments provides a simple and effective method for maintaining a stable temperature within a microscope objective. This in turn reduces the thermal gradient between the lens and sample.

A thermally controlled collar attaches to the microscope objective via soft silicone rings. The collar incorporates a resistive heater and thermistor which allows the included electronic controls to maintain the objective warmer at a constant and well maintained temperature.

Heat generated by the isolated collar is not directly communicated to the objective but is instead distributed around the objective via a conducting sleeve.

The conducting sleeve warms the surrounding air, which in turn gently warms the objective. This approach allows the apparatus to take full advantage of the thermal characteristics of the surrounding air. The warmer achieves its task without directly contacting or exposing the objective to significant stresses associated with temperature gradients.

Collars are available to fit objectives from most microscope manufactures and custom designs are available.

- Reduces thermal gradient between objective and sample
- No direct contact between warmer and objective
- Heated collar warms the surrounding air which then gently warms the objective
- Fits microscope objectives from most manufactures
- Can be powered from Warner’s low noise TC-324B/TC344B temperature controller or a 12 volt battery for sensitive electrophysiology applications

Order # | Model | Product
---|---|---
W4 64-1664 | OWS-1 | Objective Warmer System for 23-30 mm Lens Includes TC-124A Controller
W4 64-1676 | OWS-2 | Objective Warmer System for 30-35 mm Lens Includes TC-124A Controller
W4 64-1664E | OWS-1E | Objective Warmer System for 23-30 mm Lens Includes TC-124A Controller (240VAC)
W4 64-1676E | OWS-2E | Objective Warmer System for 30-35 mm Lens Includes TC-124A Controller (240VAC)

Accessories / Replacement Parts

Order # | Model | Product
---|---|---
W4 64-1665 | OW-1 | Objective Warmer Collar for 23-30 mm Lens; Requires a TC-124A Controller
W4 64-1674 | OW-2 | Objective Warmer Collar for 30-35 mm Lens; Requires a TC-124A Controller
W4 64-1665D | OW-1D | Objective Warmer Collar for 23-30 mm Lens; Requires a TC-324B/344B Controller
W4 64-1674D | OW-2D | Objective Warmer Collar for 30-35 mm Lens; Requires a TC-324B/344B Controller

Temperature Controllers

Order # | Model | Product
---|---|---
W4 64-1545 | TC-124A | Temperature Controller 100-120 VAC
W4 64-1545E | TC-124AE | Temperature Controller 240 VAC
W4 64-1655 | TC-144 | Temperature Controller Dual Channel Universal Input Voltage
Eliminates the need for a large heated water bath

SW-10/6 Syringe Warmers

• Accommodates 6 x 10 cc syringes
• Compact design
• Quiet operation in recording setups
• Compatible with TC-324B and TC-344B Heater Controllers

Solution reservoir heating is an important technique used to eliminate outgassing of solutions in a heated perfusion chamber. Since the gas load of a solution has dependence on pressure and temperature, preheating a solution at the final pressure before delivery to the chamber will minimize the occurrence of bubbles in the bath, even if the solution is allowed to cool en route. Solution reservoir heaters from Warner Instruments are designed for applications where the use of a large heated water bath is inconvenient.

Designed to accommodate six 10 cc syringes, the SW-10/6 heater housing is made of anodized aluminum which is both corrosion resistant and serves as an excellent conductor. These heaters may be mounted on any 3/8" or 1/2" diameter lab rod. Solutions will reach set temperature approximately 15 minutes after the application of power.

Each unit is supplied with a cable assembly for connection to Warner’s TC-324B or TC-344B heater controllers, see pages 108 and 109. Also supplied is a TA-29 thermistor for monitoring the temperature within any syringe.

Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syringe Size</td>
<td>10 cc</td>
</tr>
<tr>
<td>Heater Resistance</td>
<td>10 Ω</td>
</tr>
<tr>
<td>Voltage Requirement</td>
<td>Variable to 12 V max</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>Ambient to 50°C</td>
</tr>
<tr>
<td>Temperature Accuracy</td>
<td>±1°C</td>
</tr>
<tr>
<td>Physical Dimensions:</td>
<td></td>
</tr>
<tr>
<td>Body (H x W x D)</td>
<td>7.5 x 17.8 x 2.5 cm</td>
</tr>
<tr>
<td>Cable Length</td>
<td>1.9 m</td>
</tr>
<tr>
<td>Weight</td>
<td>680 g</td>
</tr>
<tr>
<td>Warranty</td>
<td>One year</td>
</tr>
</tbody>
</table>

Order # | Model  | Product                               |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>W4 64-0111</td>
<td>SW-10/6</td>
<td>Six 10 cc Syringe Heater</td>
</tr>
</tbody>
</table>

Accessories and Replacement Parts

<table>
<thead>
<tr>
<th>Order #</th>
<th>Model</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>W4 64-0165</td>
<td>SL-6</td>
<td>Stopcock with Luer Connector, pkg. of 6</td>
</tr>
<tr>
<td>W4 64-0162</td>
<td>RS-1</td>
<td>Support Stand</td>
</tr>
<tr>
<td>W4 64-0220</td>
<td>FR-50</td>
<td>Flow Valve</td>
</tr>
<tr>
<td>W4 64-0221</td>
<td>FR-55S</td>
<td>Flow Valve with On-Off Switch</td>
</tr>
<tr>
<td>W4 64-0210</td>
<td>MP-6</td>
<td>6 to 1 Perfusion Manifold</td>
</tr>
<tr>
<td>W4 64-0755</td>
<td>PE-160/10</td>
<td>Polyethylene Tubing</td>
</tr>
</tbody>
</table>

Warner Instruments • Phone (203) 776-0664 • Toll Free U.S. (800) 599-4203 • Fax (203) 776-1278 • www.warneronline.com
Solution reservoir heating is an important technique used to eliminate outgassing of solutions in a heated perfusion chamber. Since the gas load of a solution has dependence on pressure and temperature, preheating a solution at the final pressure before delivery to the chamber can minimize the occurrence of bubbles in the bath, even if the solution is allowed to cool en route.

Solution reservoir heaters from Warner Instruments are designed for applications where the use of a large heated water bath is inconvenient. Designed to accommodate one 60 cc syringe, the SW-61 Heater housing is made of anodized aluminum which is both corrosion resistant and serves as an excellent conductor. These heaters may be mounted on any 3/8” or 1/2” diameter lab rod, and each unit is supplied with a cable assembly for connection to Warner's TC-324B or TC-344B heater controllers, see pages 108 and 109.

Also supplied is a TA-29 thermistor for monitoring the temperature within any syringe. Solutions will reach set temperature approximately 15 minutes after the application of power.

**Specifications**

- **Syringe Size**: 60 cc
- **Heater Resistance**: 10 Ω
- **Voltage Requirement**: Variable to 12 V maximum
- **Temperature Range**: Ambient to 50°C
- **Temperature Accuracy**: ±1°C

<table>
<thead>
<tr>
<th>Physical Dimensions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body (H x W x D)</td>
</tr>
<tr>
<td>14.8 x 8.1 x 6.4 cm</td>
</tr>
<tr>
<td>Cable Length</td>
</tr>
<tr>
<td>1.9 m</td>
</tr>
</tbody>
</table>

- **Weight**: 900 g
- **Warranty**: One year

**Order #** | **Model** | **Product**
---|---|---
W4 64-0112 | SW-61 | 60 cc Syringe Heater

**Accessories and Replacement Parts**

- W4 64-0165 | SL-6 | Stopcock with Luer Connector, pkg. of 6
- W4 64-0162 | RS-1 | Support Stand
- W4 64-0182 | PS-560 | Syringe Heater Stand*

*see page 129.

**TC-324B & TC-344B Heater Controllers**

One or two heater blocks may be powered from the single channel TC-324B or dual channel TC-344B heater controller, respectively. See pages 108 and 109 for details on these models.
Solution reservoir heating is an important technique used to eliminate outgassing of solutions in a heated perfusion chamber. Since the gas load of a solution is dependent on partial pressure and temperature, preheating the solution at atmospheric pressure before delivery to the final heater will minimize the occurrence of bubbles in the bath, even if the solution is allowed to cool en route.

The ability to independently control each heater block allows the researcher to control the initial temperature of each solution without influencing other nearby solutions. This system is available to fit 60 cc syringes. The heater housing is made of anodized aluminum which is both corrosion resistant and serves as an excellent conductor of heat. Heater blocks can be mounted on any 9.5 mm (3/8 inch) diameter metal rod with an insulating bushing supplied with each SW-60. If multiple SW-60 heaters are to be mounted, the stand must have a heavy base for stability.

**PS-560 Syringe Heater Stand**

Having a large base for stability, the syringe heater stand will accommodate up to eight syringe heaters. Mounting rods are thermally non-conducting plastic. The 90 cm long vertical rod permits a wide range of height adjustment.
SWS-10, SWS-60 and SWS–140
Syringe Warmers

Independent temperature control for individual syringes

• Designed for use on a syringe pump or support stand
• Accommodates 10, 60 and 140 cc syringes
• Scale marking ports permit volume monitoring during use
• Can be powered from 12 volt battery for sensitive electrophysiology applications

The SWS-Series Syringe Warmers provide a simple and effective method for maintaining a stable temperature within a syringe. The compact design of this warmer allows it to be used either with a syringe pump or mounted on a support stand.

The thermally controlled heater housing slides onto a 10, 60, or 140 cc syringe and is held in place with a self adjusting friction band. The housing incorporates a resistive element and thermistor, which when connected to a TC-124 temperature controller, allows the syringe warmer to be maintained at a constant temperature.

The heater housing is made of anodized aluminum which is both corrosion resistant and serves as an excellent thermal conductor. Solutions usually reach the set temperature approximately 15 minutes after application of power.

Be sure to order the TC-124 temperature controller with your syringe warmer.

Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Weight</th>
<th>Length</th>
<th>OD</th>
<th>ID</th>
<th>Syringe Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWS-10</td>
<td>32.7 g</td>
<td>38.2 mm</td>
<td>22.2 mm</td>
<td>16.2 mm</td>
<td>Becton Dickinson</td>
</tr>
<tr>
<td>SWS-60</td>
<td>76 g</td>
<td>83.7 mm</td>
<td>35.0 mm</td>
<td>29.1 mm</td>
<td>Becton Dickinson</td>
</tr>
<tr>
<td>SWS-140</td>
<td>192 g</td>
<td>109.5 mm</td>
<td>51.0 mm</td>
<td>41.4 mm</td>
<td>Monoject</td>
</tr>
</tbody>
</table>

Order # | Model | Product
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>W4 64-1584</td>
<td>SWS-10</td>
<td>Syringe Heater for 10 cc Syringes</td>
</tr>
<tr>
<td>W4 64-1560</td>
<td>SWS-60</td>
<td>Syringe Heater for 60 cc Syringes</td>
</tr>
<tr>
<td>W4 64-1585</td>
<td>SWS-140</td>
<td>Syringe Heater for 140 cc Syringes</td>
</tr>
<tr>
<td>W4 64-1545</td>
<td>TC-124A</td>
<td>Temperature Controller, 120 VAC US</td>
</tr>
<tr>
<td>W4 64-1545E</td>
<td>TC-124AE</td>
<td>Temperature Controller, 240 VAC Europe</td>
</tr>
<tr>
<td>W4 64-1655</td>
<td>TC-144</td>
<td>Temperature Controller</td>
</tr>
<tr>
<td>W4 64-1606</td>
<td>BAC-1</td>
<td>Battery Adapter Cable</td>
</tr>
</tbody>
</table>
Temperature Control Accessories and Cables

SHH-1, SHH-2, SHH-3 and SHH-4 Holders for In-line Solution Heaters

An ideal tool for holding Warner In-line Solution Heaters close to the chamber. Machined from a solid Delrin block, these sturdy holders can be secured to your microscope stage using gaffer or duct tape.

- The SHH-1 works with both our SH-27B and SF-28 Solution Heaters.
- The SHH-2 mounts our SC-20 In-line Solution Heater/Cooler.
- The SHH-3 is used for the SHM-6, SHM-8, and SHM-828 Multiline In-line Heaters.
- The SHH-4 works with our FR-50 and FR-55S flow valves.

Cables and Thermistors

Order # | Model | Product
---|---|---
W4 64-1555 | SHH-1 | Holder for Solution Heaters Models SH-27B & SF-28
W4 64-1556 | SHH-2 | Holder for Solution Heaters Model SC-20
W4 64-1557 | SHH-3 | Holder for Solution Heaters Models SHM-6, SHM-8, SHM-828
W4 64-1558 | SHH-4 | Holder for Flow Valves Models FR-50 and FR-55S

Additional replacement parts are shown on page 62 (Platforms).
Model TM-3 Three-Scale Thermistor Temperature Monitor

**Fahrenheit, celsius, Kelvin**

- Celsius, Fahrenheit, or Absolute (Kelvin) scales
- Analog output for data acquisition systems or pen recorders
- Dust-proof, splash-proof and battery powered for use in the field
- Compatible with any 10kΩ unical thermistor
- Large easy to read LCD display

The TM-3 is a portable thermistor thermometer built for lab accurate temperature measurement. Designed to use any 10 kΩ unical thermistor, no recalibration is required when changing probes. The meter features three scales, Celsius, Fahrenheit, and Absolute (Kelvin), pushbutton selectable from the dust-proof and splash-proof front panel interface.

Meter will operate for approximately 100 hours with a single 9 volt alkaline battery or may be powered from the supplied AC wall adapter. A front panel LED indicates low battery condition.

Probes (thermistor) not included. Select from Thermistor Options to the right.

### Specifications

<table>
<thead>
<tr>
<th>Temperature Range:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Celsius 0 °C to 104 °C</td>
</tr>
<tr>
<td>Fahrenheit 2 °F to 220 °F</td>
</tr>
<tr>
<td>Absolute (Kelvin) 256 K to 378 K</td>
</tr>
</tbody>
</table>

- Accuracy 0.3°C ± 1 digit between 20° to 60°C
- Meter Resolution 0.1 degrees
- Display LCD, 4 digit, 10 mm (0.4in) high
- Sensor 10kΩ Unical Thermistor
- Input & Output Connectors BNC female
- Analog Output 10 mV/°C
- Power Requirements AC wall adapter 9 Volt transistor alkaline battery or supplied
- Physical Dimensions: Case Size 2.4 x 7.9 x 12.8 cm (H x W x D)
- Shipping Weight 0.5 kg
- Warranty Two years, parts & labor

### Order # Model Product

<table>
<thead>
<tr>
<th>Order #</th>
<th>Model</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>W4 64-1654</td>
<td>TM-3</td>
<td>Three-Scale Temperature Monitor</td>
</tr>
<tr>
<td>W4 64-1654E</td>
<td>TM-3</td>
<td>Three-Scale Temperature Monitor 230 VAC</td>
</tr>
</tbody>
</table>

### Thermistor Options

<table>
<thead>
<tr>
<th>Order #</th>
<th>Model</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>W4 64-0107</td>
<td>TA-29</td>
<td></td>
<td>Bead Thermistor 1 mm Diameter</td>
</tr>
<tr>
<td>W4 64-1657</td>
<td>TA-31</td>
<td></td>
<td>Probe Thermistor 2 mm Diameter 10 mm Long Plastic Housing</td>
</tr>
<tr>
<td>W4 64-1656</td>
<td>TA-32</td>
<td></td>
<td>Probe Thermistor 1.63 mm Diameter 32 mm Long Stainless Steel Housing</td>
</tr>
</tbody>
</table>

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Temperature Control Accessories and Cables

PI-1 Power Interface

The PI-1 Power Interface Module will allow a single syringe warmer to run from a 12 volt battery or power supply. Voltage outputs at 100 mV/°C are provided to monitor both the set and actual temperatures. Fuse protected.

Specifications

<table>
<thead>
<tr>
<th>Input DC Voltage</th>
<th>12 V nominal 16 V maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectors</td>
<td>1 mm jacks</td>
</tr>
<tr>
<td>Physical Size</td>
<td>2.8 x 5.7 x 2.2 cm (H x W x D)</td>
</tr>
<tr>
<td>Warranty</td>
<td>One year</td>
</tr>
<tr>
<td>Fuse</td>
<td>1.5A - 3AG</td>
</tr>
</tbody>
</table>

Order #   Model       Product
---------- -------   ----------
W4 64-0180 PI-1     Power Interface

PS-560 Syringe Heater Stand

The PS-560 syringe heater stand will accommodate up to eight syringe heaters. The stand has a large base for stability. Mounting rods are thermally non-conducting plastic. The 90 cm long vertical rod permits a wide range of height adjustment.

Specifications

<table>
<thead>
<tr>
<th>Dimensions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base, H x W x D</td>
</tr>
<tr>
<td>Main Pole, D x H</td>
</tr>
<tr>
<td>Sub Poles, D x L</td>
</tr>
<tr>
<td>Weight</td>
</tr>
</tbody>
</table>

Order #   Model     Product
---------- -------   -------
W4 64-0182 PS-560  Syringe Heater Stand
specialized tools for
Electrophysiology
& Cell Biology Research

HARVARD
APPARATUS

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508.893.8999
Fax: 508.429.5732
Email: bioscience@harvardapparatus.com

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