



## TL-600 MOBILE PHASE HEATER

### INSTRUCTION MANUAL



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## TL-600 FEATURES

### PRINCIPLE OF OPERATION

The Timberline TL- 600 Mobile Phase Heater is used to heat the mobile phase before it enters a semi-preparative or preparative HPLC column. The advantages of operating at elevated column temperatures are plentiful. It has been shown that lowering mobile phase viscosity by operating at elevated temperatures can enhance column efficiency. Controlling column temperature improves retention time reproducibility for individual sample components. Achieving higher column efficiencies and maintaining retention time stability results in higher yields for preparative HPLC systems.

The TL-600 heating unit consists of two lengths of tubing cast into a solid metal block. The metal alloy block provides excellent temperature stability and efficient heat transfer. The tubing is coiled in a unique pattern that minimized the size and weight of the unit and reduces band broadening. For lower flow rates, the mobile phase is run through a single coil. For higher flow rates the two coils are connected in series for increased heating capacity.

The electronics for temperature control are housed in a separate case, away from the heated block, to ensure years of trouble free operations. The control unit displays the actual temperature and the set point. This calibrated temperature controller keeps temperature of coils within  $\pm 0.1^{\circ}\text{C}$  of the set point. The control unit will shut power off to heaters if temperature exceeds fuse rating, protecting laboratory and column from excessive temperatures.



Column temperature control for columns exceeding 1" in diameter is primarily achieved by controlling the inlet temperature of the mobile phase. From a heat transfer point of view heating the exterior of the column can not control the internal temperature of a larger ID column. For example, if a 1" OD SS column body is heated and room temperature mobile phase is flowing at 20 - 40mL/min, the temperature of the packing at column inlet would be between 10 to 20°C lower than the temperature at the column outlet. Insulating the column body and using the TL-600 to heat the mobile phase before it enters the column eliminates this temperature gradient.

### ELECTRICAL DESCRIPTION

#### HEATER AND CONTROL CIRCUIT DESCRIPTIONS

The microprocessor base controller provides a 5-volt signal, actuating a solid-state relay which, controls power to a pair of silicone heaters. The controller sensor is a 100-ohm RTD probe inserted into a 0.16" hole in the aluminum block. The RTD probe is placed adjacent to the heaters to provide close temperature control.

#### THERMAL FUSE PROTECTION

The heater is equipped with a secondary form of over temperature protection in a 121°C resettable thermal fuse. If a failure occurs in the electronic circuitry, the thermal fuse will protect the apparatus against an over temperature condition. The thermal fuse must be reset when an over temperature condition opens the heater circuit. Contact Timberline for reset instructions.

## ELECTRICAL FUSE PROTECTION

The standard configuration for 120V operation is two 5A or 10A, 250V fuses.

## MOBILE PHASE HEAT EXCHANGER

The TL-600 Mobile Phase Heater is equipped with 2 heat exchange coils. These coils are numbered on the front of the unit 1 through 4. The connections are ports 1 in and 2 out, and 3 in and 4 out. These may be connected in series to provide for better heating of the mobile phase. The outlet temperature shows the temperature of the tube at port 4.

## INSTALLATION

### VOLTAGE

1. The connector cords coming out of the TL-150 should be connected to the TL-600 before plugging in the TL-150. The cables will only fit one way into their respective holes. Do not force a connection.
2. Then plug in the TL-150. The displays on the front of the TL-150 should light up and display temperature readings. If the set point on the "Control" is higher than room temperature the unit will start heating immediately and the "Control" temperature will start to rise. If the unit does not light up and begin heating when plugged in, make sure the switch on the back of the TL-150 is in the on position and that the fuses are intact.

### CONNECTING THE TL-600

1. Connect the mobile phase to be heated to the desired inlet of the TL-600, port 1 or 3.
2. **Always use two wrenches when making and breaking connections to the bulkhead fittings. DO NOT permit the bulkhead fittings to turn. Failure to do this will result in internal leaks.**
3. The inlets and outlets may be connected in series depending on application.

### SETTING THE TEMPERATURE

To set the temperature, push the select button once on the controller labeled "Control". A red rectangle should light up next to SV. This stands for set temperature, using the up and down arrows select the desired temperature and then push select one more time. The controller labeled "Outlet" is just for display purposes and will never need to be adjusted. The maximum set temperature is 100°C.

## SPECIFICATIONS

Temperature Range	Ambient+5°C to 100°C*
Temperature Stability	± 0.1°C
Heater Unit Case Dimensions	5.25"H x 8.625"W x 13.5"D
Controller Case Dimensions	3.25"H x 8"W x 8.625"D
Tubing Material	Stainless Steel or Hastelloy C®*
Controller Operating Voltage	120VAC or 240 VAC*

\* Each unit is custom built according to customer specifications

## **WARRANTY**

Timberline Instruments, Inc. (Timberline) warrants its products and services to meet the written performance and quality and to be free of defects in material and workmanship. They are not warranted, nor does Timberline assume liability, if the buyer has misused the product in any manner, has failed to use the product in accordance with industry standards and practices, or has failed to use the product in accordance with instructions, if any, furnished by Timberline. Timberline's sole responsibility and the buyer's exclusive remedy with respect to the purchase of any product proved to Timberline satisfaction to be defective or nonconforming, is repair, replacement, or credit, in Timberline's sole discretion. No other warranty or representation is implied or expressed by Timberline for its products with respect to merchantability, fitness for a particular purpose or any other matter. Timberline shall not under any circumstances be liable for any incidental, consequential or compensatory damage arising from the use of, or in conjunction with its products, even if Timberline has been advised of the possibility of such damages. The maximum liability that can be assumed by Timberline for breach of warranty shall be the invoice price of the product. All claims must be brought within one (1) year of shipment, regardless of their nature.

Components that are subject to normal wear and/or are scheduled for routine replacement within the warranty period, and/or parts that are subjected to effects of corrosion or deterioration by chemical or other action are excluded from the above warranty. Repair or replacement will not be made under warranty for malfunction because of inadequate facilities, operating conditions or utilities.

Guarantees/Warranties on accessories and equipment included by Timberline from other manufacturers are limited to the guarantees given on such equipment by the respective manufacturers.

## **SHIPMENTS**

All shipments are made F.O.B. Boulder, CO. Instruments and major components will be packed and shipped via surface, unless otherwise requested. Supplies and/or replacement parts are packed and shipped via UPS, UPS Blue, air parcel post, or parcel post, unless otherwise requested.

## **DAMAGED SHIPMENTS**

The Interstate Commerce Commission has held that carriers are as responsible for concealed damage as for visible damage in transit. Unpack shipment promptly after receipt, as there may be concealed damage even though no evidence of it is apparent. When concealed damage is discovered, cease further unpacking of the unit involved and request immediate inspection by the local agent or carrier and secure a written report of the findings to support a claim. This request must be made within 15 days of receipt. Otherwise, the carrier will not honor the claim. Do not return damaged goods to the factory without first securing an inspection report and contacting Timberline for a return authorization number.

## **FILING OF CLAIMS**

After a damage inspection report has been secured, Timberline will cooperate in supplying replacements and handling a claim that may be initiated by either party.

## **RETURNS**

Timberline Instruments, Inc. tries to accommodate all requests for returns. Inspect shipment upon receipt and report shortages, incorrect or damaged materials to us immediately. Report shipping damage to the carrier. Damaged shipments must remain with the original packaging for freight company inspection. Products not supplied in accordance with your orders or products that are

defective at the time you receive them are accepted for full credit. Products ordered in error are subject to a 15% restocking charge. Special or custom orders cannot be returned unless defective. All returned merchandise must be in unused, resalable condition, and must not consist of hazardous materials.

No returns will be accepted more than 90 days after shipment for any reason. Before 90 days, no returns will be accepted without prior authorization. If it is necessary to return a product to us, please contact our customer service department to obtain a return material authorization (RMA) and shipping instructions. When you call, be prepared to supply the information necessary for us to identify your order, including your company name, address, purchase order number/invoice number, shipping date, product description and catalog number. Write the RMA number on all shipping labels and correspondence about the shipment. Returns without this number will be returned to you collect. Be careful to address the shipment to the street address. Shipper will not deliver to our post office box numbers. We require that you prepay shipping costs; COD's will not be accepted. Returns must be made through a traceable carrier.

Shipment of authorized returns should be made within 30 days of the issuance of RMA. If products are not returned within the time limit, the RMA may expire. Timberline Instruments, Inc. reserves the right to refuse any return or credit after a RMA has expired.