

Hot Air Tool Heater

FOR SAFETY AND LONG HEATER LIFE,
CAREFULLY READ THIS MANUAL BEFORE USE.



SureHeat



THANK YOU FOR CHOOSING A HOT AIR TOOL

TUTCO HOT AIR TOOL

Thank you for purchasing a TUTCO SureHeat process air heating product. Our heaters efficiently heat air or inert gases to meet the needs of the most demanding applications using our innovative Serpentine™ Technology— ensuring better heat transfer, faster, and higher temperatures and a heating element life unmatched in the marketplace. With hundreds of stocked heating solutions and the flexibility to customize our products to individual customer specifications, our products have been integrated into a variety of OEM manufacturing processes and facilities worldwide. In addition to our standard industrial air heater products, our solutions are used for research, testing, and other critical high-temperature applications throughout the aerospace, aviation, defense, and automotive industries.

HOT AIR TOOL HEATER SPECIFICATIONS

Maximum Inlet Air Pressure	60 PSI (4 BAR)
Minimum Inlet Pressure	0.3 PSI (20mBAR)
Maximum Inlet Air Temperature	120°F (50°C)
Maximum Exit Air Temperature	1400°F (760°C)
Minimum Airflow (Recommended)	60 SCFH (28 SLPM)
UL File #	E177292 (For part numbers listed in this manual, otherwise contact factory)

GENERAL INFORMATION

Environmental Conditions:

Ambient Temperature	32°F to 104°F (0°C to 40°C)
Humidity	0% to 95% R.H.

Ventilation:

Use in a well-ventilated area away from excess dust, dirt, and moisture.

Cleaning:

With unit OFF and unplugged, exterior surfaces may be wiped clean using a dry, lint-free cloth.

Protective Grounding:

Each heater comes with a convenient grounding stud and hardware located at the inlet of the heater for earth ground.

WARNINGS!



TUTCO SureHeat Process Air Heaters contain high watt-density elements and must be controlled carefully to prevent element failure.

IMPORTANT: Be sure to read and understand this operating manual before turning the system ON. Follow all checklists shown in the manual. Failure to do so can cause a heater failure and may void warranty.

ONLY qualified individuals should install and service this heater and related controls.

Do not hesitate to contact TUTCO SureHeat with any questions
Phone: 1-800-258-8290
E-Mail: support@tutcosureheat.com



ELECTRICAL SHOCK HAZARD!

Follow all applicable electrical codes and use proper wiring.



BURN/FIRE/EXPLOSION HAZARD!

For use with Air or Inert Gases Only -

Do not use with or near explosive or reactive gases.



Avoid contact with the surface of the heater especially the air exit-end during or soon after operation. Depending on the installation location customer may need to install protective screen or guard to prevent injury to personnel and comply with OSHA code.

DO NOT USE NEAR VOLATILE OR COMBUSTIBLE MATERIALS.

PRECAUTIONS

Caution: Do not operate heater without air

1. Use filtered air. Avoid grease, oil, or oil vapors, corrosive or reactive gases which will damage heater.

Note: When using compressed air, a pressure reduction valve and an oil & water separation unit should be installed to avoid contaminating the heater and reduce heater life.

2. Operate at safe voltages as shown on the Performance Curves (see page 11). Excess voltage will cause premature failure.

3. Always have sufficient airflow through the heater before applying power. Otherwise the element will overheat very quickly, and burn out.

Note: A thermocouple cannot detect temperatures if there is no airflow – turn on air supply before applying power, even when a controller with a thermocouple is being used.

4. Use phase angle fired power controllers, unless using PID controlled solutions approved by TUTCO SureHeat engineering. On-Off based controllers will shorten heater life if not programmed using proper PID controls.

5. For closed-loop control, a type “K” thermocouple has been integrated into the heater.

6. For closed-loop control, use a temperature controller with a fast sampling period (<500ms) and minimal overshoot.

EXTENDING THE LIFE OF YOUR HEATERS ELEMENT

The life of a TUTCO SureHeat heater is directly based on the temperature of the heater's filament wire. Most failures are due to low air flow or damage associated to power control and voltage ramp up rates which elevate the element wire temperature above 2200°F (1204°C). TUTCO SureHeat Serpentine elements heat up very fast and good control is necessary to avoid overshoot. A thermocouple has been integrated into the heater to allow you to monitor and maintain the proper filament temperature and extend the life of your heater's element wire.

Tips

- Ensure airflow is on before voltage is applied to heater.
- Use a temperature controller with 200ms of quicker cycle time.
- Use a power controller (SCR/SSR) equally as fast to regulate voltage to the heater.



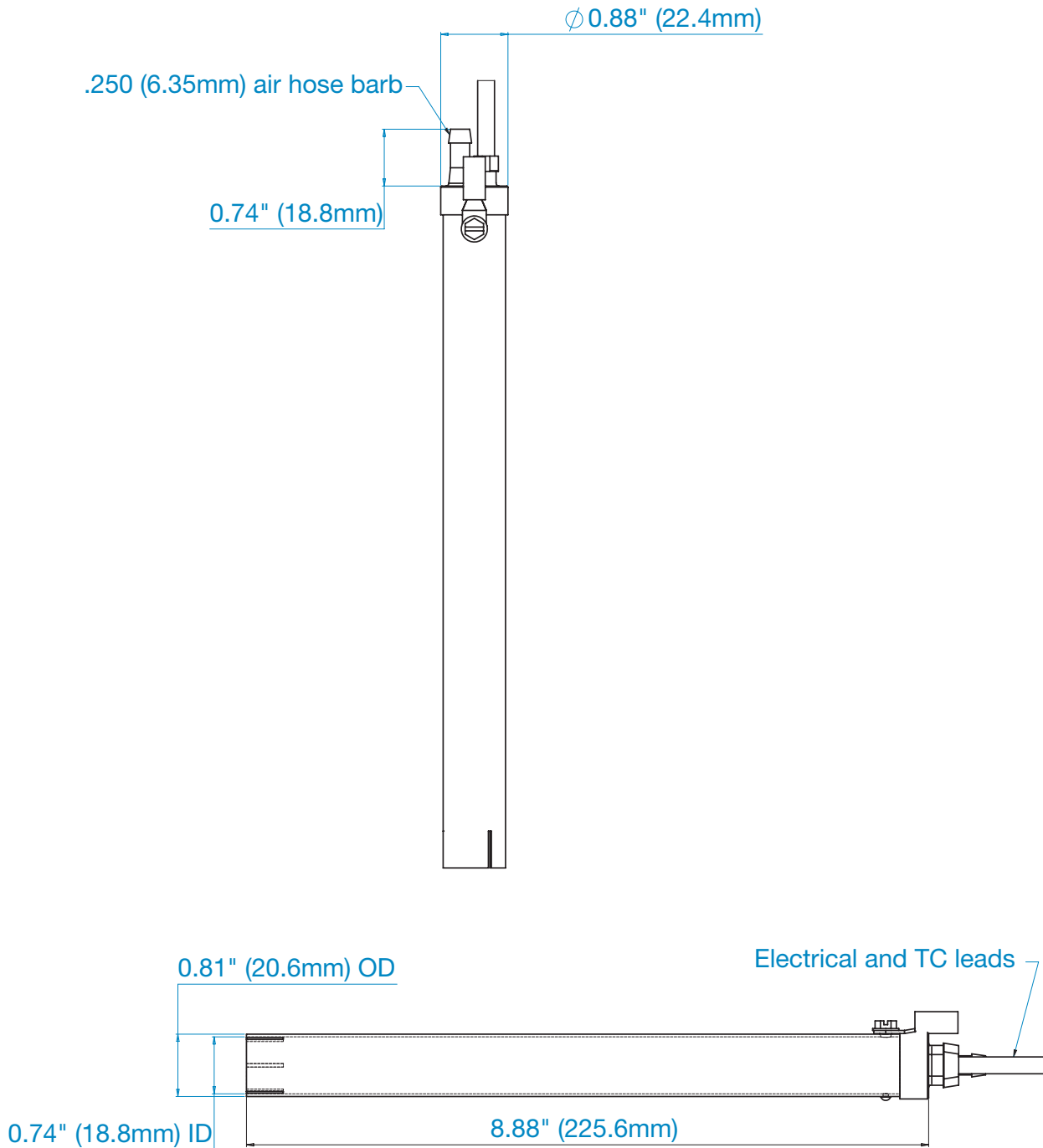
HEATER MODEL AND PARTS LIST

Part Number	Maximum Wattage	Maximum Voltage	Maximum Amperage	Minimum Flow SCFH (SLPM)
F068462	1500	120 – 1Ø 50/60Hz	13	60 (28)
F068463	2000	240 – 1Ø 50/60Hz	9	60 (28)
F068464	3500	240 – 1Ø 50/60Hz	15	60 (28)
F070878	2000	240 – 1Ø 50/60Hz	9	60 (28)
F071383	3500	240 – 1Ø 50/60Hz	9	60 (28)
F075145	3500	240 – 1Ø 50/60Hz	15	60 (28)

** Follow applicable electrical codes during installation*

DIMENSIONS/MOUNTING

NOTE: The inlet side of the heater is located where the electrical leads and thermocouple wires come out of the housing. Failure to install the heater in its proper orientation can result in heater damage and is not covered under the manufacturer's warranty.



INSTALLATION



WARNING: THE INLET AIR/GAS SIDE OF THE HEATER IS THE PLASTIC HOUSING END WHERE THE POWER TERMINALS AND THERMOCOUPLE TERMINAL BLOCK IS LOCATED. INSTALLING THE HEATER IN THE WRONG ORIENTATION WILL DAMAGE THE HEATER AND CAN CREATE ADDITIONAL HAZARDS AS A RESULT. POWER CONNECTION WIRE SIZES ARE RECOMMENDED IN THE PRODUCT TABLE ABOVE. THESE ARE RECOMMENDATIONS ONLY, AND ALL LOCAL, REGIONAL AND NATIONAL ELECTRICAL CODES SHOULD BE CONSULTED.

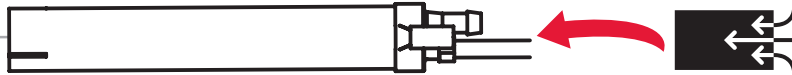
1



MOUNT HEATER

Securely mount the heater. Do not clamp so tightly as to distort the stainless steel housing.

2



CONNECT AIR SOURCE TO HEATER

Connect the filtered air source to the heater using 1/4" ID high pressure tubing.

3



COMPLETE POWER, GROUNDING AND THERMOCOUPLE WIRING

Connect the two power leads, grounding screw, and thermocouple leads to the appropriate connections. For "K" thermocouples, the red lead is negative (-), and the yellow lead is positive (+).

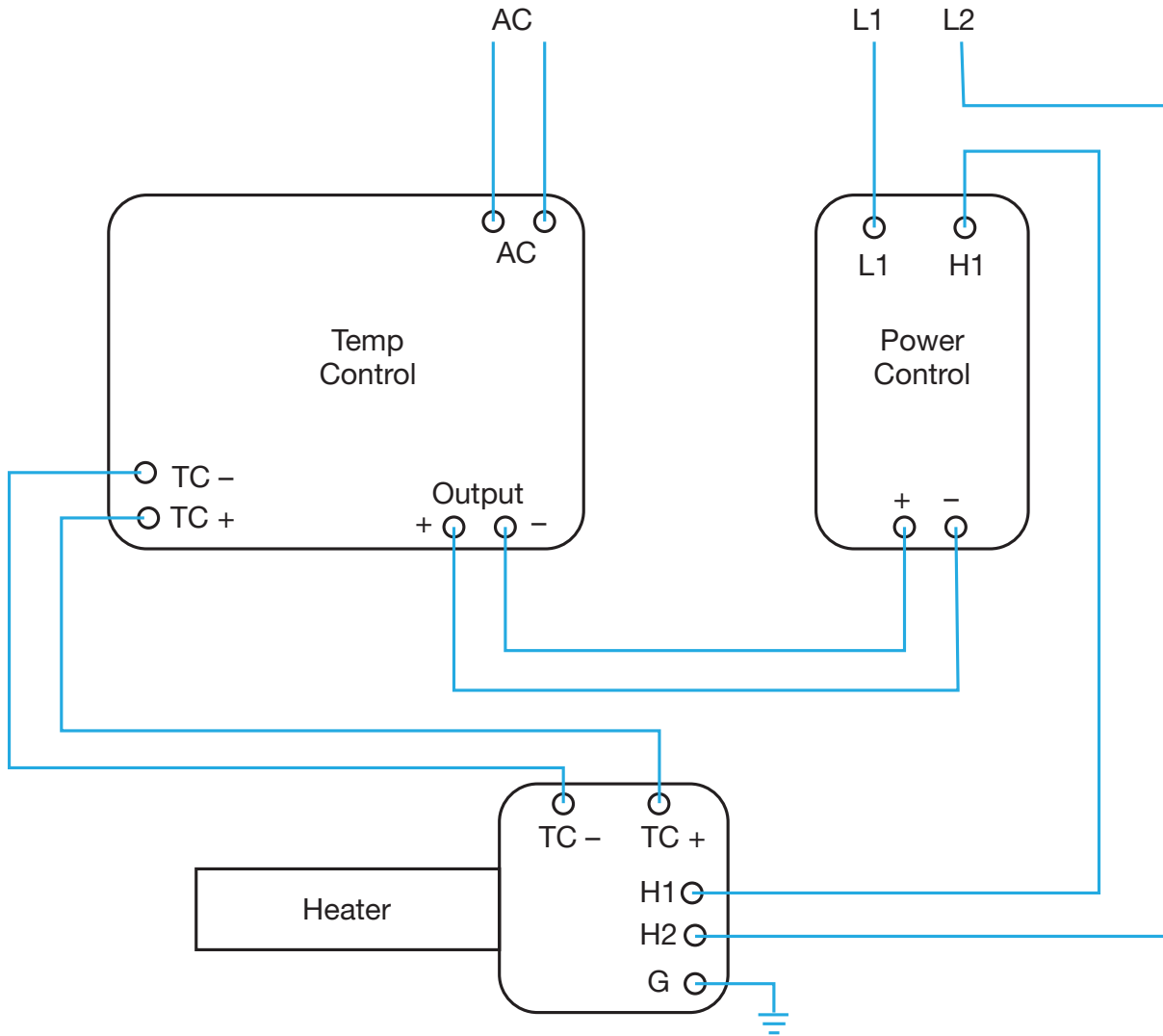
4



OPTIONAL EXTERNAL THERMOCOUPLE PLACEMENT

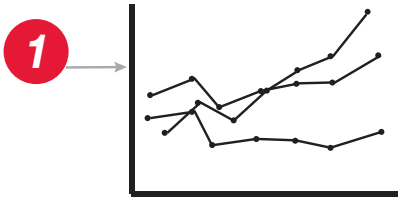
If a thermocouple is used external to the heater instead of the internal thermocouple, ensure that it is located within one inch of the heater exit.

TYPICAL WIRING



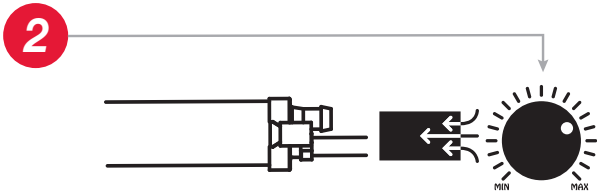
OPERATION

START-UP



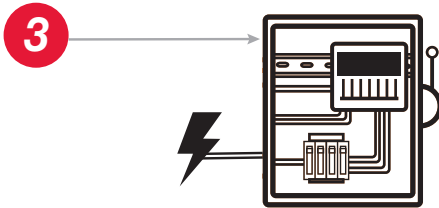
1

REFERENCE PERFORMANCE CURVES
Beginning on page 11 prior to operating heater.



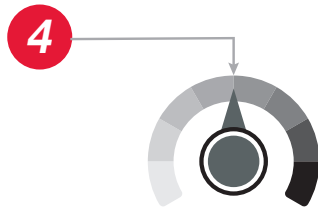
2

TURN ON AIR
Set pressure or flow to desired operating level.



3

ENERGIZE MAIN POWER LINE
Via disconnect switch or circuit breaker on control cabinet.



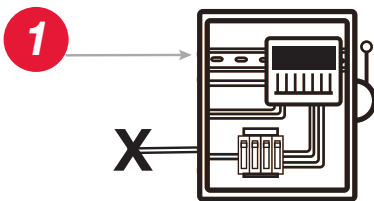
4

SET DESIRED TEMPERATURE

5 CONTROL AIRFLOW
Ensure airflow is on before voltage is applied to heater. The heater should be operated with an airflow of less than 1 SCFM or 60 SCFH may cause the heater's element to overheat too quickly and burnout.

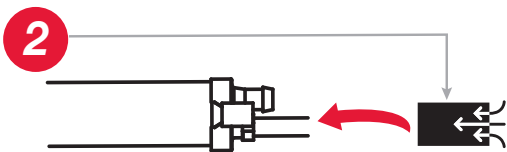
6 CLOSED OR OPEN-LOOP SYSTEM
If using a closed loop system, turn on power to the temperature and power controller, then set the desired temperature on the temperature controller. If using an open loop system, increase power to the heater through the power controller until the desired temperature is attained.

SHUT-DOWN



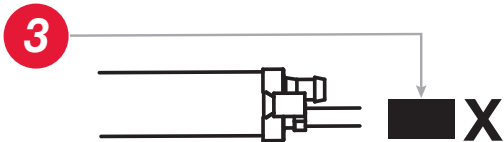
1

TURN OFF MAIN POWER



2

CONTINUE AIR FLOW
Allow air to continue to flow for a minimum of 1 minute or until exit air temperature is 300°F/150°C or less for safety. Continue airflow longer as necessary to prevent burn hazard to personnel.



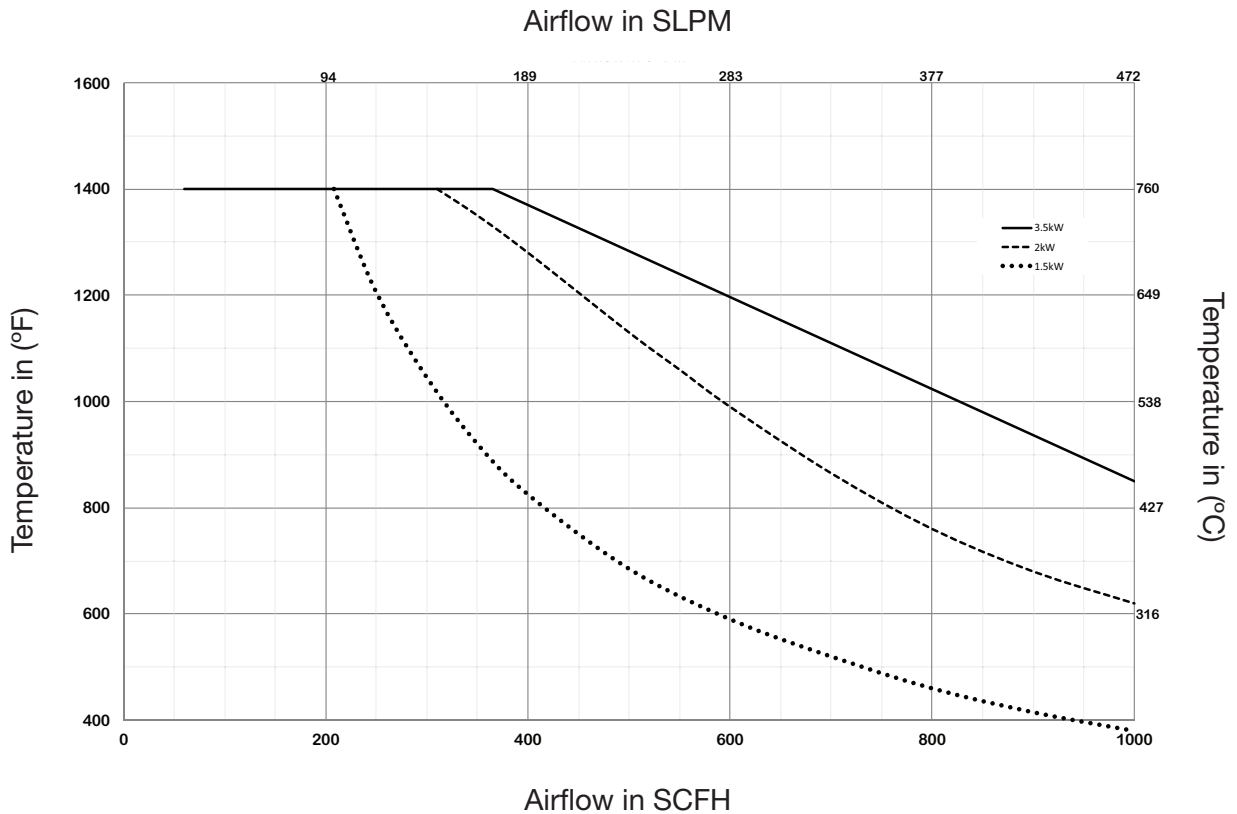
3

TURN OFF AIR TO SYSTEM

PERFORMANCE CURVES

The attached performance curves show exit air temperatures at different airflows and voltages. Pressure readings (longer dashed lines) are measured at the inlet to the heater with no entrance or exit restrictions.

HOT AIR TOOLS MAXIMUM PERFORMANCE CURVE



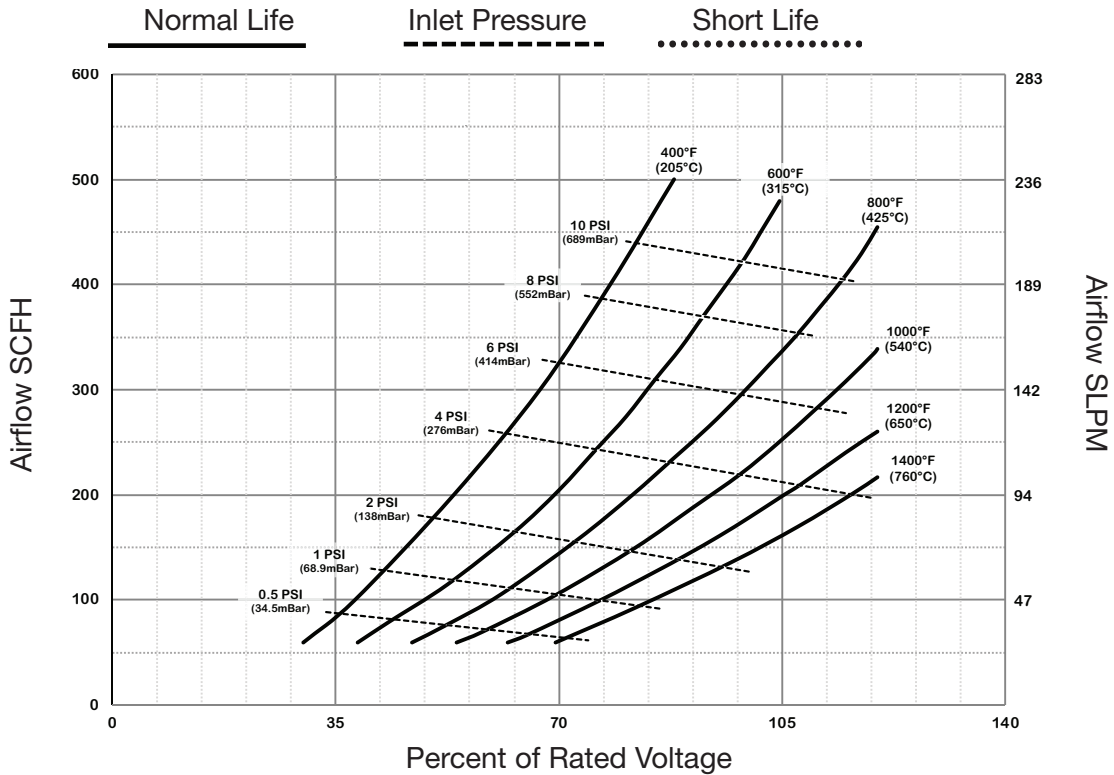
Temperature are measured by internal “K” T/C sensor. Use of other sensor types and/or locations can result in heater damage if used for process control.

Minimum airflow for accurate control is 60 SCFH (28 SLPM)

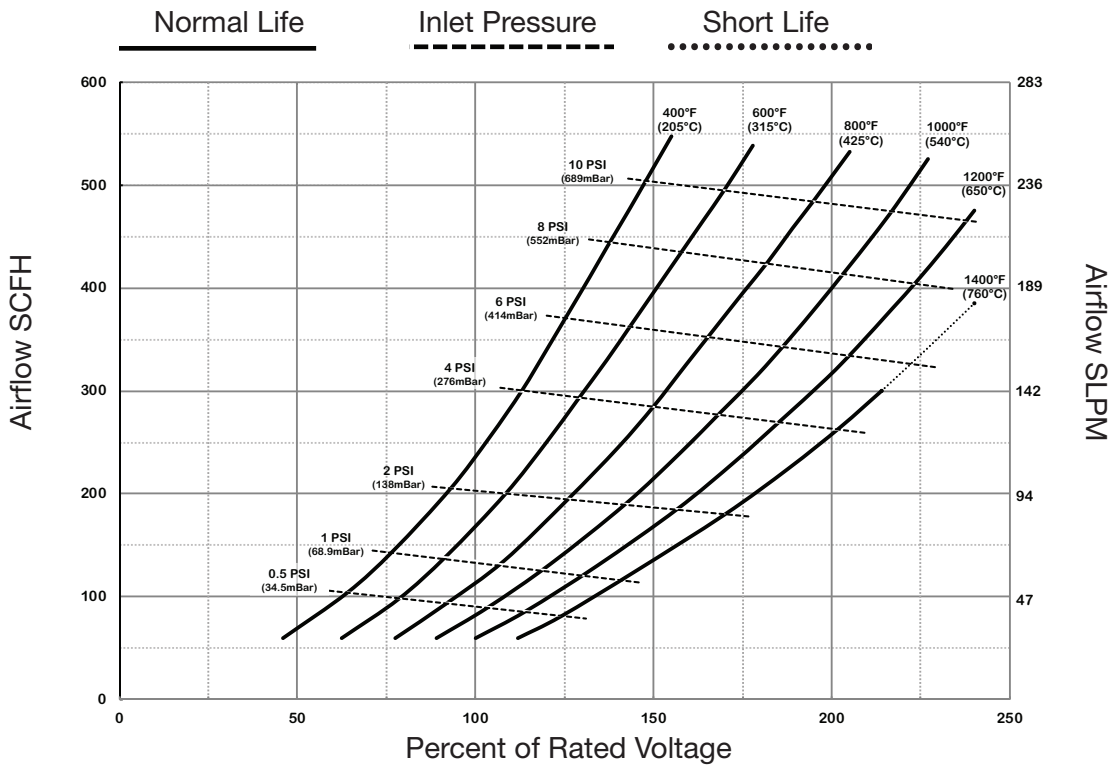
Maximum air temperature is 1400°F (760°C) with supplied “K” T/C.
(Operating above this will void the warranty)

The attached performance curves show exit air temperatures at different airflows and voltages. Pressure readings (longer dashed lines) are measured at the inlet to the heater with no entrance or exit restrictions. Solid lines indicate safe, normal-life operating conditions. The shorter dash lines indicate marginal, shorter-life operating conditions leading to premature burnout. With a known flow (or pressure) at the heater entrance, follow the flow (or pressure) line across until it meets the desired temperature curve. Drop a line straight down to intersect the x-axis. This point, along the "Heater volts – true RMS" axis, represents the voltage required to generate the desired exit air temperature at the chosen flow rate (inlet pressure).

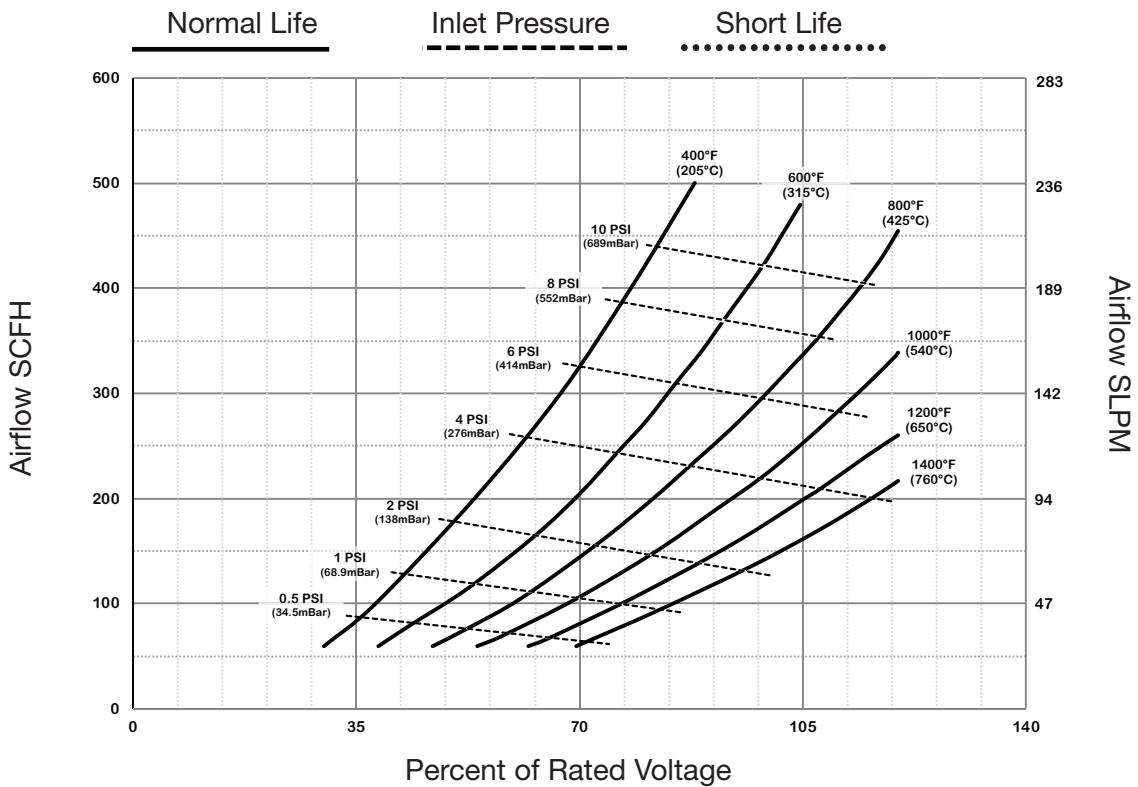
HOT AIR TOOL PERFORMANCE CURVE – 1.5kW



HOT AIR TOOL PERFORMANCE CURVE – 2.0kW



HOT AIR TOOL PERFORMANCE CURVE – 3.5kW



TROUBLESHOOTING AND HEATER REPLACEMENT

- 1.** Note that “TYPICAL” Element Life is based on heater element operating at or below temperatures shown on PERFORMANCE CURVE. In addition to normal end of life, elements can fail due to mechanical damage, or problems with the control system.
- 2.** If an element has failed prematurely, it should be inspected by SureHeat to determine the cause of the element failure.
- 3.** When replacing or troubleshooting heaters, turn off power to the system and be sure to follow lock-out/tag-out procedures.
 - a.** For Troubleshooting Heater
 - i.)** Use multi-meter to check continuity between:
 - 1.** Power terminals H1 to H2
 - 2.** Thermocouples positive (+ yellow) to negative (- red)
 - ii.)** If there is continuity on all above tests, check system wiring:
 - 1.** Crossed thermocouple wires.
 - 2.** Reversed thermocouple wire polarity – Note: RED is NEGATIVE (-).
 - 3.** Verify inlet air temperature is below set point on INLET TEMPERATURE controller.
 - iii.)** If there is no continuity on any test, then contact your local TUTCO SureHeat representative for assistance.
- 4.** Remove entire heater assembly from system. Internal components are typically not replaceable.
- 5.** Reconnect thermocouples, power and ground wires for new/replacement heater.
- 6.** Attach any covers and operate heater per operating manual.

PROPER CONTROL SETUP



- TUTCO SureHeat process air heaters contain high watt-density elements and must be controlled carefully to prevent element failure.
- Sudden applications of power can damage heater and void warranty.
- Following each of these guidelines will help to ensure safe heater operation.

✓ **Start the heater with a 0° (F or C) Set-Point (SV):** This will ensure the output signal to the power control starts off low (0% output) before the contactor is engaged and immediately applying full power.

✓ **Use proper closed loop control (PID) settings.** TUTCO SureHeat typically uses the following PID; Proportional (P), Integral (I) and Derivative (D); settings as a starting point for stable temperature control. Some manual tuning may be required for more precise control.

Description:	Range:	Default:
(P) roportional	90-250	131
(I) ntegral	8-20	9
(D) erivative	0-2	2
Scan/Cycle Rate	< 500mSec	200mSec

✓ **Incorporate a Ramp Rate for the start-up of the heater.** The slower you ramp to your final set-point the less overshoot and problems you will have. Typically TUTCO SureHeat heaters should be ramped up over a period of several minutes. The following are recommended ramp rates based on final temperature. (For custom ramp rates consult with factory)

Set-Point Temperature	Degrees per Minute
Up to 600°F (up to 300°C)	360°F (150°C)
601-1000°F (301-500°C)	240°F (100°C)
1001-1400°F (501-760°C)	120°F (50°C)

LIMITED WARRANTY

TUTCO SureHeat warrants that all products to be delivered hereunder will be free from defects in material and workmanship at the time of delivery. TUTCO SureHeat's obligation under this warranty shall be limited to (at its option) repairing, replacing, or granting a credit at the prices invoiced at the time of shipment for any of said products. This warranty shall not apply to any such products which shall have been repaired or altered, except by TUTCO SureHeat, or which shall have been subjected. TUTCO SureHeat shall be liable under this warranty only if (A) TUTCO SureHeat receives notice of the alleged defect within sixty (60) days after the date of shipment; (B) the adjustment procedure hereinafter provided is followed, and (C) such products are, to TUTCO SureHeat's satisfaction, determined to be defective.

THE WARRANTY SET FORTH IN THE PRECEDING PARAGRAPH IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR OF MERCHANTABILITY.

The information contained in this manual is based on data considered to be true and accurate. Reasonable precautions for accuracy has been taken in the preparation of this manual, however TUTCO SureHeat assumes no responsibility for any omissions or errors, nor assumes any liability for damages that may result from the use of the product in accordance with the information contained in this manual.

Please direct all warranty/repair requests or inquiries to the place of purchase, and provide the following information, in writing:

- (A) Order number under which products were shipped
- (B) Model/Serial Number of product
- (C) Reason for rejection

PRODUCTS CAN NOT BE RETURNED TO TUTCO SUREHEAT WITHOUT AUTHORIZATION.

Replacement, repair, or credit for products found to be defective will be made by the place of purchase. All products found to be not defective will be returned to the Buyer; transportation charges collect or stored at Buyers expense.



Aerospace Automotive 3D Printing Electronics Medicine Packaging Printing Plastics Textiles

Electric Industrial Air Heaters for Demanding High-Temperature Applications

The technical data and specifications supplied in this operating manual are subject to change without prior notice. Contact TUTCO SureHeat for additional assistance.



603-418-7662

support@tutcosureheat.com orders@tutcosureheat.com

22 Industrial Drive Exeter, NH 03833 USA