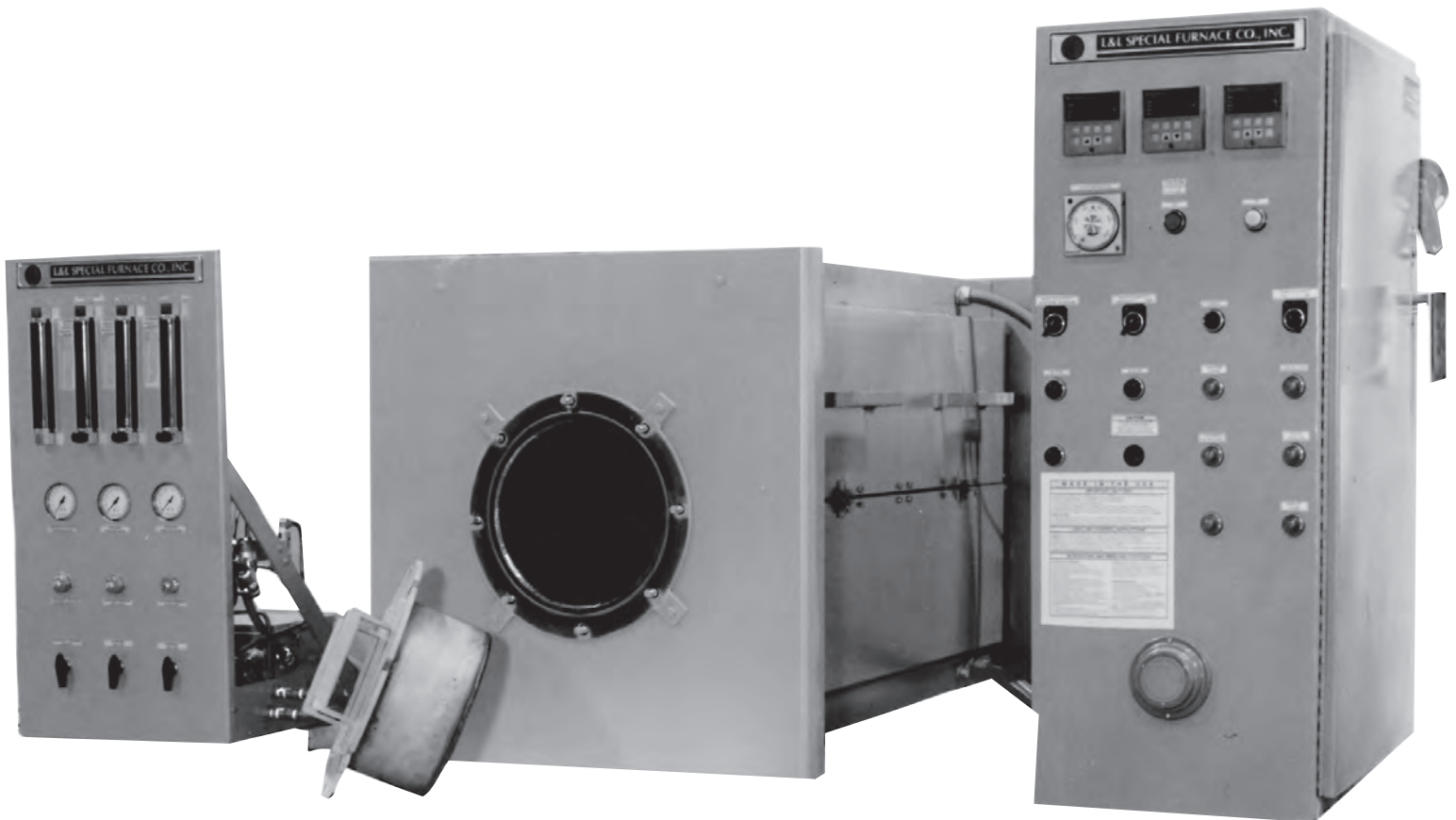


## THREE-ZONE HIGH UNIFORMITY CERAMIC FIBER LINED SPLIT TUBE FURNACES 2,100°F (1,150°C)

### APPLICATIONS

The TBU Series bench mounted electric three-zone tube furnaces utilize three separate heating zones to achieve  $\pm 5^{\circ}\text{F}$  ( $\pm 2.7^{\circ}\text{C}$ ) or better within the center zone over a wide temperature range. The two end zones compensate for end heat losses. They are ideally suited for laboratory and small production requirements where precision temperature gradients are necessary. They are limited to 2,100°F (1,150°C), although special versions can reach 2,200°F (1,200°C).



# FEATURES

## LOW MASS INSULATION

The furnace is insulated with 6" of low "K" factor ceramic fiber and mineral wool insulation. Two inches of this insulation consists of a removable mold- ed element/insulation module that lines the interior of the oven. It is not brittle, so maintenance is minimal. The insulation has a very low thermal mass and hence heats up very quickly. Heat-up to 1,800°F (980°C) takes ap- proximately 45 minutes. No asbestos is used.

## CERAMIC FIBER MOLDED ELEMENTS

Elements are embedded in ceramic fiber and are made of coiled iron-alu- minum-chrome alloy. There are three separately controlled zones of heat- ing with separate elements, one on each end and one in the center. Spe- cial versions feature even more zones than the standard three for greater uniformity or for special applications. The elements are preoxidized, which is what protects this particular alloy from the high temperatures. The ele- ments are easily replaced. They are evenly spaced along the entire surface of the interior and hence will provide the maximum in temperature unifor- mity by consistently radiating along the surface of the tube. The insulation is fitted with vestibules at both ends. These protect the elements and help hold the tube in place. They hold heat in around tubes that are inserted into the furnace. The vestibules split open with the furnace case.

## BENCH MOUNTED CASE CONSTRUCTION

The furnace case is constructed of welded 10- and 14-gauge steel. The case is primed with 800°F silicone paint and finished in machine enamel. The hinged case splits open in the center from one side and latches on the other side.

## DIGITAL PID CONTROL SYSTEM

The standard control system uses three separate Honeywell UDC 2500 digi- tal PID 3 mode controls. One zero fired SCR for each zone is used for pre- cise power control. Thermocouples are Type K with inconel sheathing. They are typically located inside the tube and the controls are tuned to prevent overshoot. A Honeywell UDC 1200 digital high limit backup control with

manual reset, backup contactors and separate thermocouple is included. The control voltage is transformed to 120 volts. All fuses, transformers, contactors and controls are located in a detached bench mounted NEMA 1 panel. Control and power circuits are branch fused. A NEMA 13 lighted on/ off switch is included. The customer must connect fused power supply to a single point on the panel.

## TESTING AND INSTRUCTIONS

The furnace is power tested to ensure proper watt ratings. The controls are fully calibrated and the control system is completely tested. A com- plete instruction manual includes startup instructions, theory of opera- tion, maintenance instructions, parts list and a detailed troubleshooting guide. A ladder logic diagram and panel layout are prepared on CAD for easy readability.

## WARRANTY

The furnace is warranted for one year except for elements and thermo- couples, which are warranted for six months.

## OPTIONS

- **JIC CONTROL OPTION:** This includes a NEMA 12 control cabinet, all oil tight switches and a panel mounted fused disconnect switch.
- **ATMOSPHERE CONTROL:** The TBU furnaces are often fitted with an alloy tube for atmosphere operation. The alloy used depends on the temperature needed. Inert atmosphere and combustible atmosphere systems are both available. See the H2 and MPH Bulletins, which explain the various safety systems for hydrogen and forming gas.
- **CERAMIC TUBES:** Closed one end or two open ends.
- **RAMP/SOAK PROGRAM CONTROLS:** Honeywell UDC 3200 digital pro- gram control features six ramps and six soaks. This controls the center zone and sends a remote set point to the two end zone controls so that they ramp with it. Another excellent control for this application is the Honeywell 900.
- **TEMPERATURE RECORDERS:** Round and strip chart.
- **ANGLE IRON STAND:** Includes leveling bolts.

# SPECIFICATIONS

Model Number	Inside Tube Diameter	Heater Diameter	Uniform Center Length	Total Inside Length	Outside Dimensions		Total K.W.	Ship Weight
TBU 26	2	3 ½	6	24	20	30 28	3.6	250
TBU 212	2	3 ½	12	30	20	30 34	4.3	300
TBU 224	2	3 ½	24	48	20	30 52	6.8	350
TBU 512	5	6 ½	12	36	24	34 42	9.0	350
TBU 524	5	6 ½	24	48	24	34 54	11.4	400
TBU 536	5	6 ½	36	60	24	34 66	15.0	450
TBU 612	6	8	12	36	26	36 42	10.6	400
TBU 624	6	8	24	48	26	36 54	13.6	450
TBU 636	6	8	36	60	26	36 66	17.6	500
TBU 648	6	8	48	72	26	36 78	20.4	600
TBU 812	8	10	12	48	28	38 56	16.8	550
TBU 824	8	10	24	60	28	38 68	20.4	600
TBU 836	8	10	36	72	28	38 80	25.2	700
TBU 848	8	10	48	84	28	38 92	28.4	800
TBU 1224	12	14	24	72	32	42 82	36.0	800
TBU 1236	12	14	36	84	32	42 94	40.0	900
TBU 1248	12	14	48	96	32	42 106	45.6	1000

Dimensions are in inches. Weight is in pounds. Uniform inside diameter is 1" less than nominal Inside Tube Diameter. Control panel is approximately 24" wide by 42" high by 36" deep. 240 or 460 volts is normal; other voltages are optional. Single phase is normal. Three phase is possible but some models will have unbalanced loads. Longer uniform heating zones are possible. Larger inside diameter furnaces are possible; however, uniformity may not be as tight. Specifications subject to change without notice .

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