

## LINN HIGH THERM GMBH

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### QUESTIONNAIRE FOR LABORATORY + HIGH TEMPERATURE FURNACES

CUSTOMER : Company: \_\_\_\_\_  
 Contact: \_\_\_\_\_  
 Department: \_\_\_\_\_  
 Street: \_\_\_\_\_  
 City: \_\_\_\_\_  
 Country: \_\_\_\_\_  
 phone.: \_\_\_\_\_ fax: \_\_\_\_\_  
 www. \_\_\_\_\_ e-mail: \_\_\_\_\_

#### 1. Furnace Load

Kind of load: material..... shape..... chem. formula.....  
 specific weight.....g/cm<sup>3</sup> spec. heat capacity.....kJ/kg°K  
 radioactive       toxic       explosive       hazardous  
 no

Dimensions of load: per piece.....mm<sup>3</sup> total.....mm<sup>3</sup>  
 Weight of load: per piece.....kg total.....kg  
 Charging device/setters: material..... shape..... weight total.....

Burn out:  yes  no  condensing at temp.....  combustable at temp.....  
 weight loss.....%  dangerous.....  
 waste gases.....

furnace process (kind of heat  
 treatment).....

.....cycles/week.....

#### 2. Chamber Furnace

Front loader

Bottom loader

Top loader

Max internal useful chamber dimensions: L= .....mm W= .....mm H= .....mm

Max outside dimensions of furnace housing: L= .....mm W= .....mm H= .....mm

Max. short-time (<1/2h) temp.required: T= .....°C min. temp for unloading:.....°C

Continuous temperature: T<sub>cont</sub> =.....°C for ..... hours max.

Temperature accuracy in chamber in °C:  ± 20  ± 10 (standard)  ± 5  < 3

Max.wall temperature.: ..... °C

**\*Please notice that there is a remarkable price difference for furnaces max Temp <1380°C< on air and <1200°C< for furnaces under controlled atmosphere**

**3. Tubular Furnace:****Furnace**

- horizontal       vertical       tiltable (max tilt angle.....degree)       split type  
 heated length.....mm      dia.....mm  
 max outside length.....mm      dia.....mm      max. wall temp.....°C  
 max. temp.....°C      cont. temp.....°C      number of heating zones.....  
 temp. accuracy      $\pm 5^{\circ}\text{C}^*$         $\pm 3^{\circ}\text{C}$       length of const. temp.zone:.....mm  
  
 rotary furnace      rotary speed.....rpm      particle size....mm      spec.weight .....  
 furnace moveable      speed (normal).....mm/min      speed (fast).....mm/min  
 gradient furnace      gradient.....°C/cm       continuous  
**\* standard**

**Tube:**

- internal dia.....mm      external dia.....mm      length.....  
 open at one end       open at both ends      end plugs.....qty.  
 endplug 1 feedthrough:  
 gas dia.....mm       vac dia.....mm       thermocouple.....qty.  
 endplug 2 feedthroughs:  
 gas dia.....mm       vac dia.....mm       thermocouple.....qty.

## Tube material:

- Quartz      up to 1100 °C      (best thermoshock behavior, clean)  
 Inconel /APM (metal)      up to 1200/1250°C      (good thermoshock behavior)  
 Silimantin (ceramic)      up to 1300 °C      (not gastight)  
 Al<sub>2</sub>O<sub>3</sub> (ceramic)      up to 1750 °C      (gastight,vac tight up to 1400°C)  
 Sapphire (single crystal)      up to 1900 °C      100% gas/vac tight      dia<sub>max</sub>= 40mm

Tube supplier:       Linn High Therm       customer

**Control Unit for Multizone Furnaces**

- master-slave       individually controlled

**4.Furnace Atmosphere**

- Air       Hydrogen\*(H<sub>2</sub>)      (dew point.....)  
 Oxygen (O<sub>2</sub> %.....)       H<sub>2</sub>/N<sub>2</sub>(Ar)- Mixture \*\*      (....% H<sub>2</sub>,....%N<sub>2</sub>)  
 Nitrogen (N<sub>2</sub>)       Exogas \*      (10% CO<sub>2</sub>,5%CO,15%H<sub>2</sub>)  
 Argon (Ar)       Endogas\*      (40% H<sub>2</sub>,20% CO)  
 Helium (He)       cracked Ammonia\*      (H<sub>2</sub> 8%)

Others.....

gas channels.....qty.      flowmeters.....qty.

\*burn off device necessary    \*\*H<sub>2</sub> >10% burn off device necessary

gas flow:      .....l/min  
 gas overpressure:      .....mbar  
 partial pressure:      .....mbar - .....mbar

vacuum:       10<sup>-1</sup>mbar       10<sup>-3</sup>mbar       10<sup>-5</sup>mbar      under cold conditions  
                   10<sup>-1</sup>mbar       10<sup>-3</sup>mbar       10<sup>-5</sup>mbar      under warm conditions

max temp. under vacuum: .....°C.

