



# Electrical Heating of Forehearth and Practical Experiences

Glassman America 2013

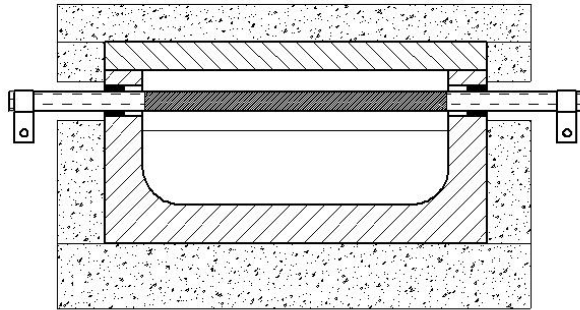
Las Vegas

# Electrical Heating of Forehearth and Practical Experiences

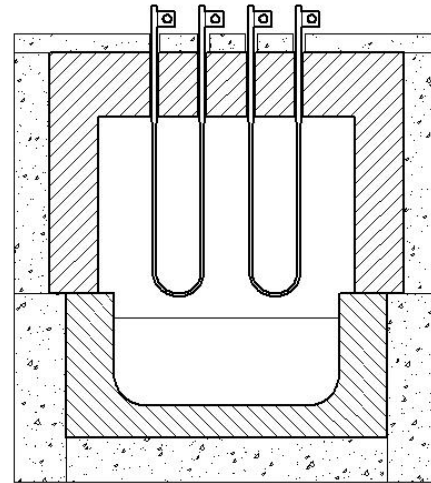
- ▶ Electrical heating of forehearth
- ▶ Indirect heating (with heating elements)
- ▶ Direct heating (with electrodes)
- ▶ Spout heating

Indirect heating  
(with heating elements)

# Indirect heating (with heating elements)



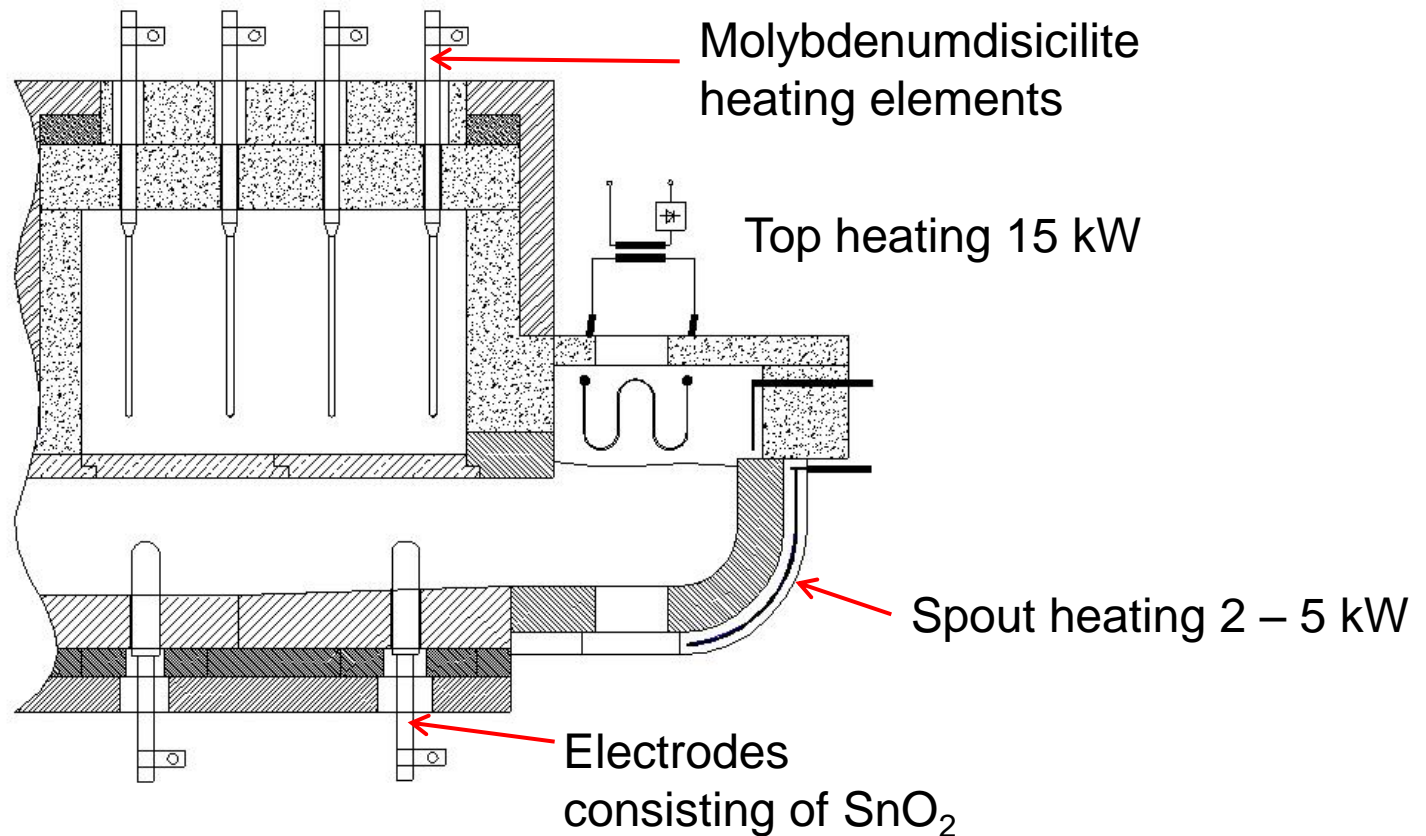
with SiC rods



with Molybdenumdisilicite rods

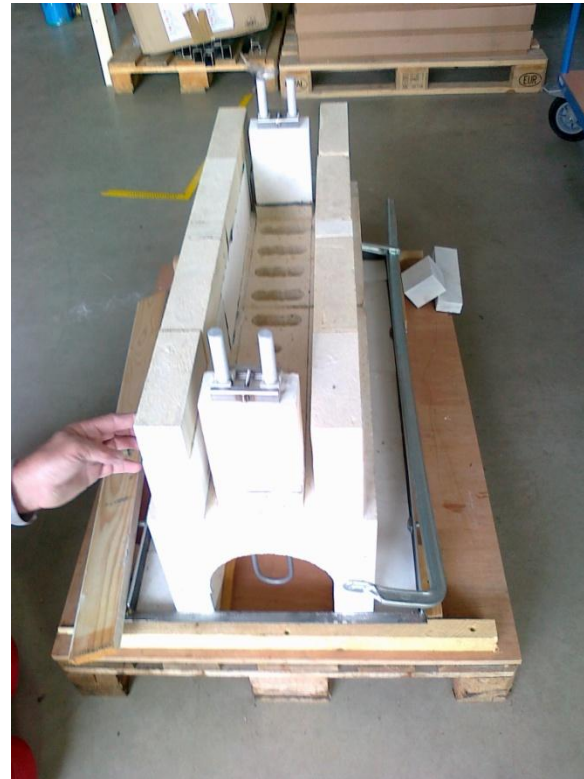
# Indirect heating (with heating elements)

Example: Design of a feeder head



# Indirect heating (with heating elements)

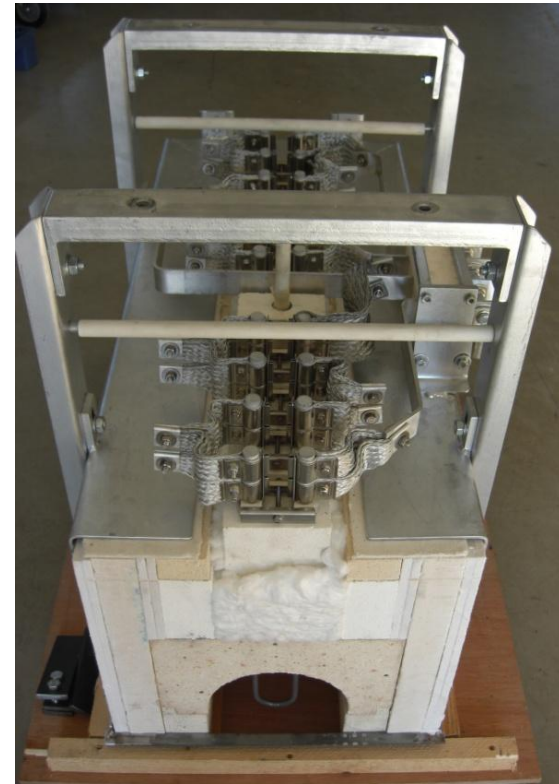
## Construction of a forehearth



# Indirect heating (with heating elements)

## Fully assembled unit

with an installed capacity of 3,5 ft.  
24 kW, temperature 2,372 ° F



# Indirect heating (with heating elements)

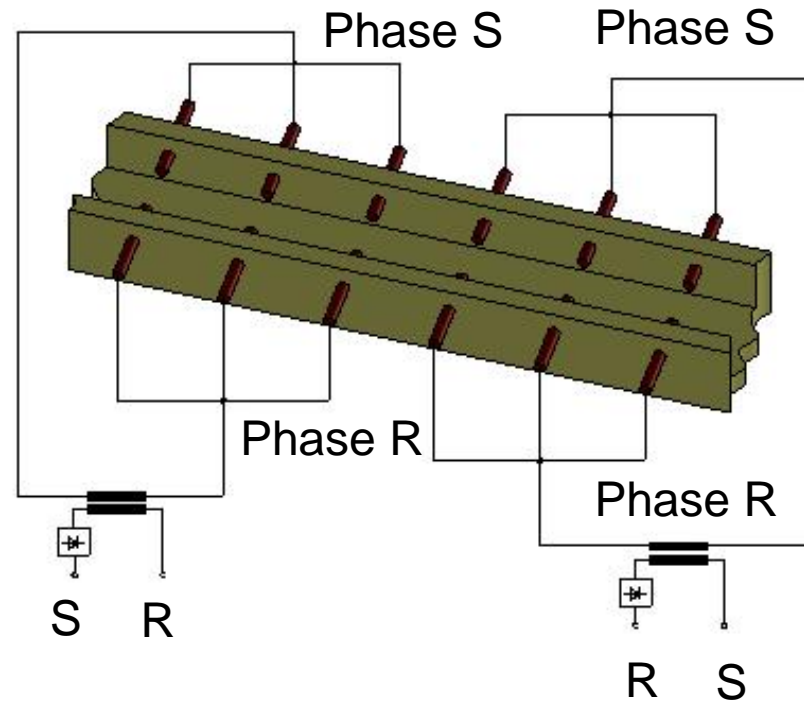
Electrical equipment,  
power supply and  
control





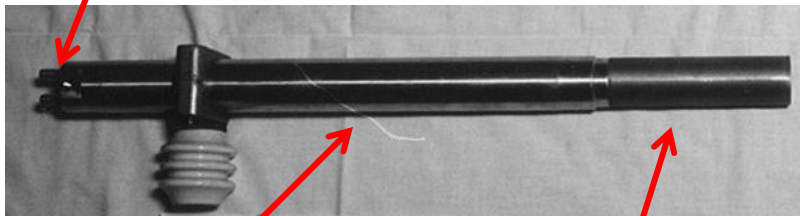
Direct heating  
(with electrodes)

# Direct heating (with electrodes)



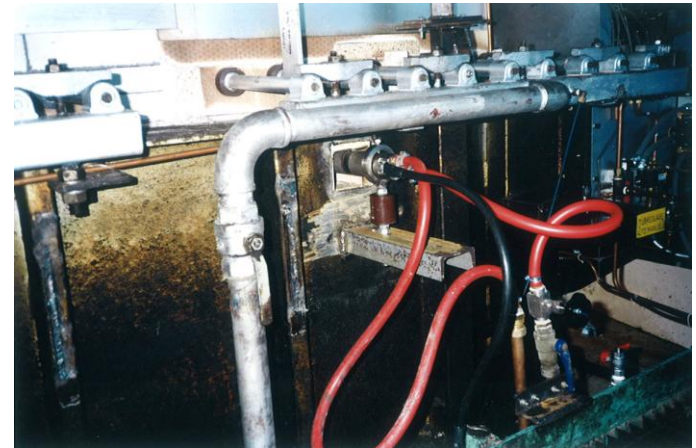
# Water cooled electrodes

Water inlet



Shaft for  
cooling water

Part of  
molybdenum



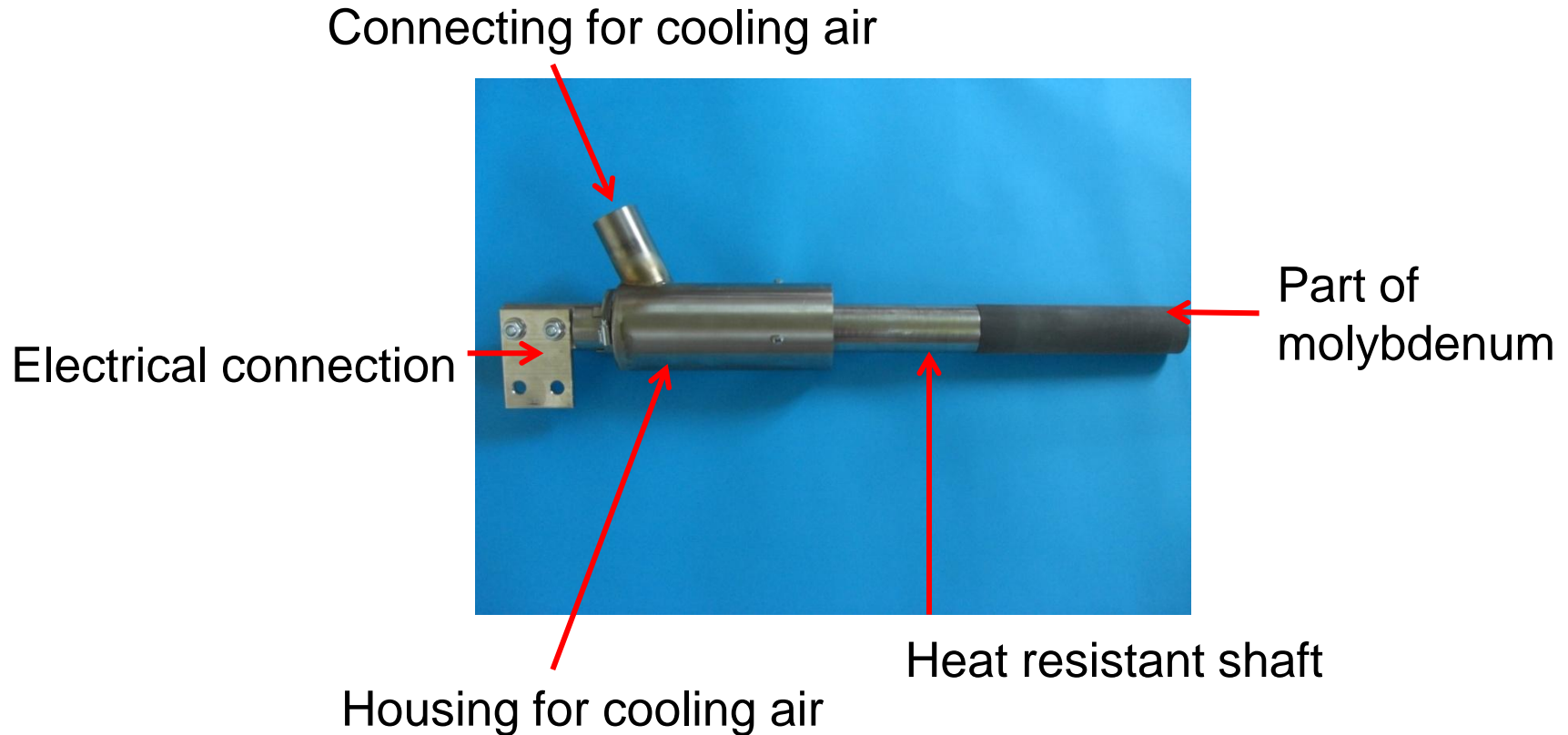
Installed  
watercooled electrodes

# Water cooled electrodes

Installed watercooled  
bottom electrodes



# Air cooled electrodes

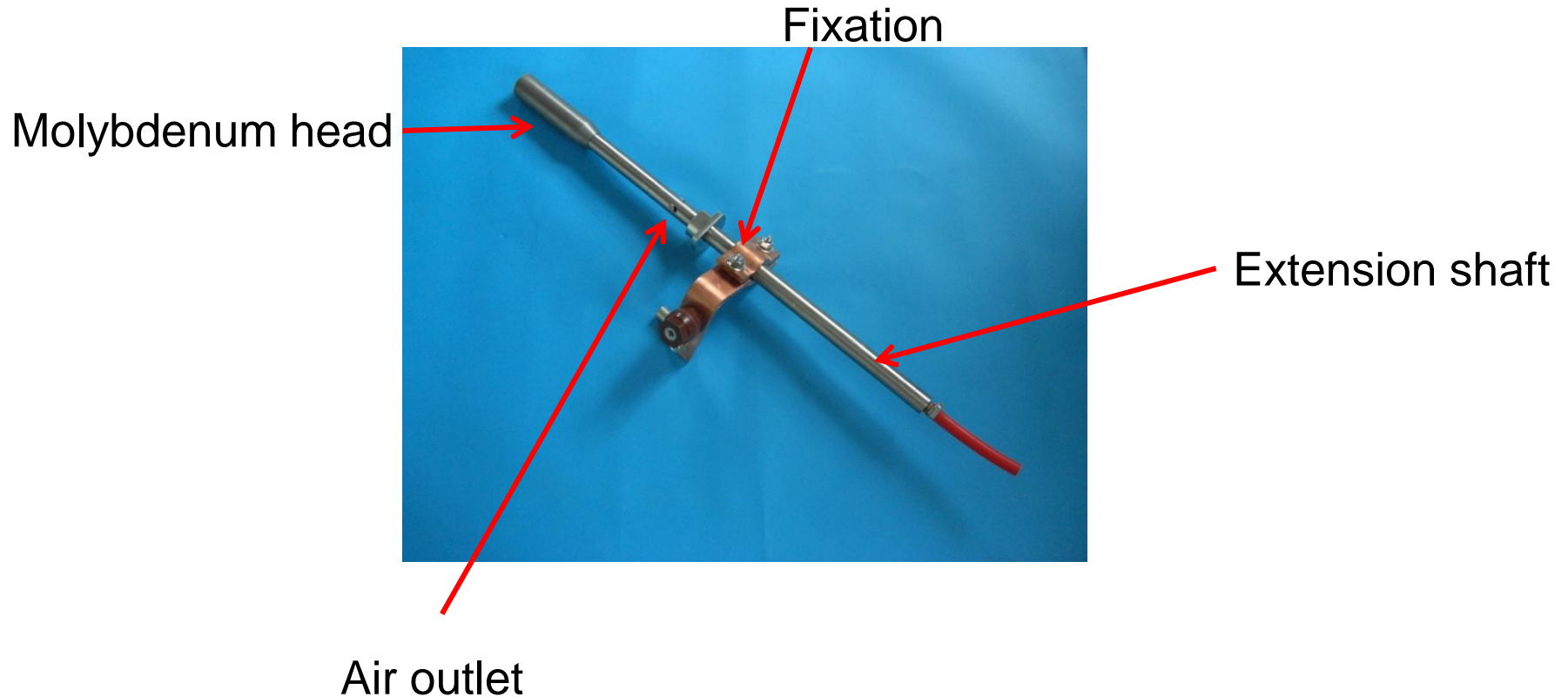


# Air cooled electrodes

Installed  
air cooled electrodes



# Electrodes without additional cooling





# Electrode passing without cooling

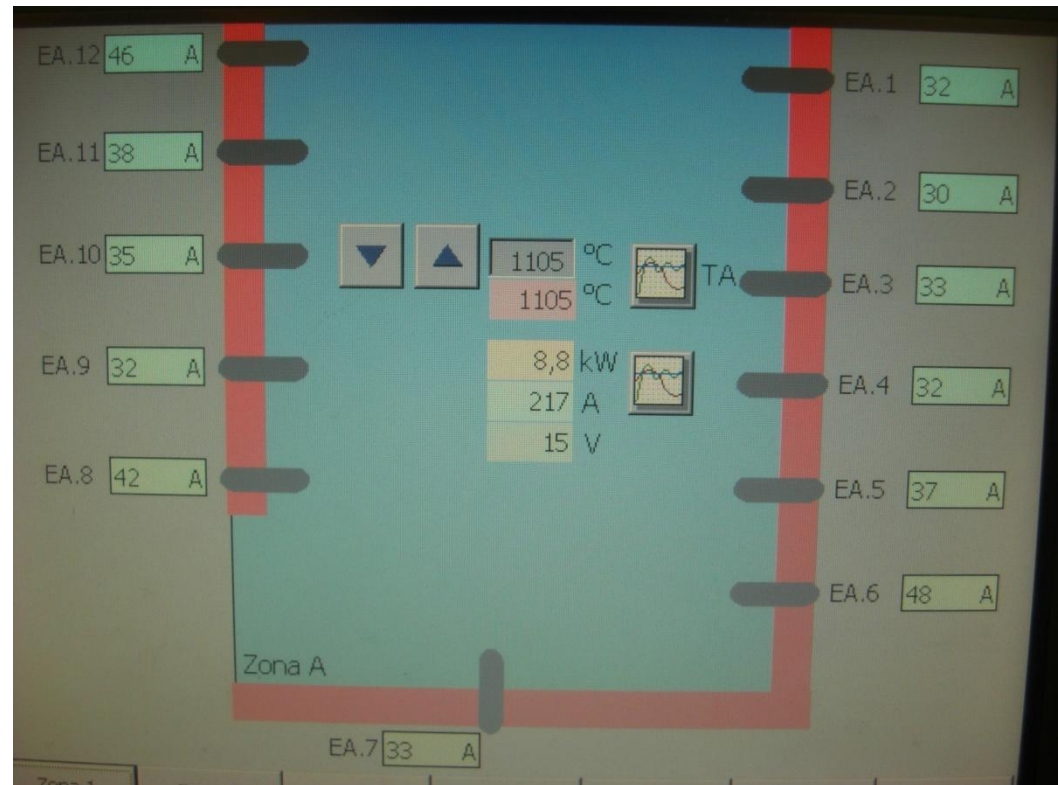


Example for electrode passing without cooling



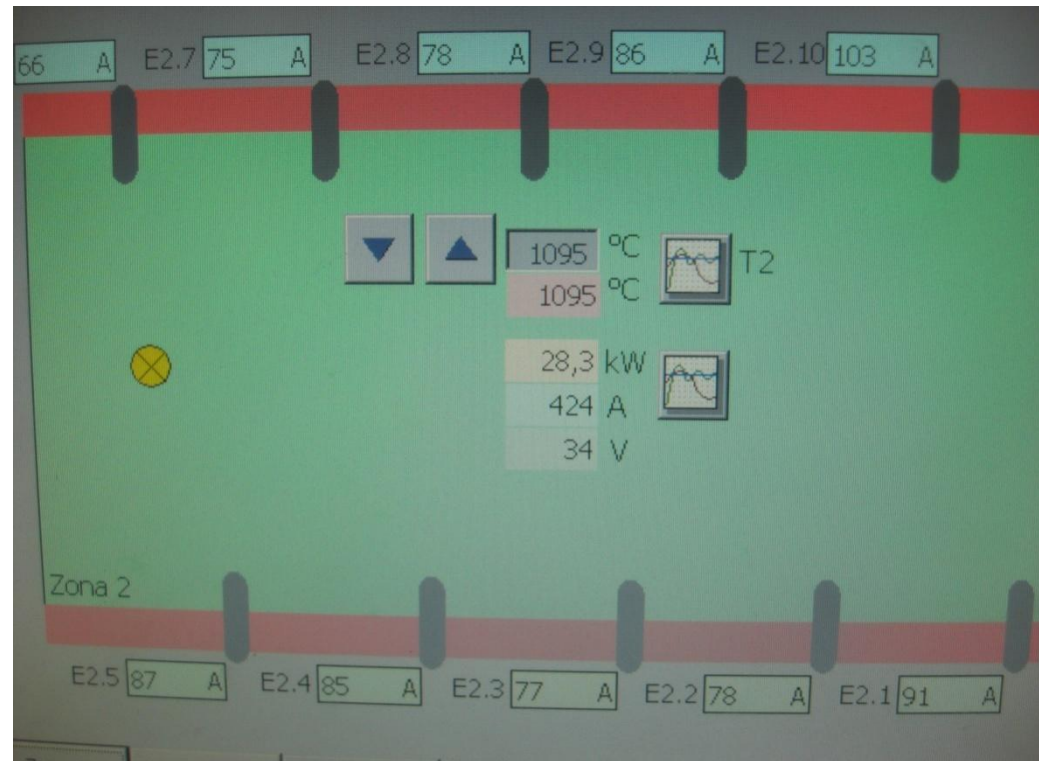
# Visualization

Overview of  
individual control zones



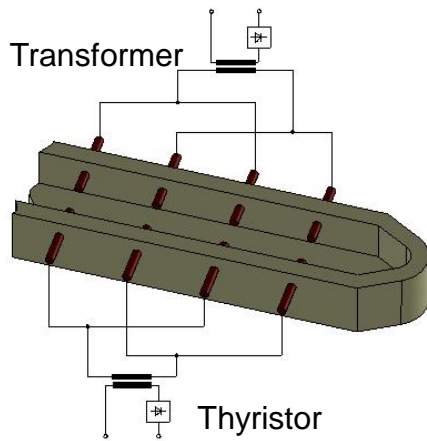
# Visualization

Overview of  
individual control zones

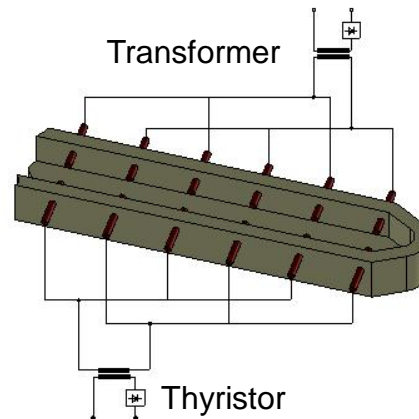


# Interconnection and control options

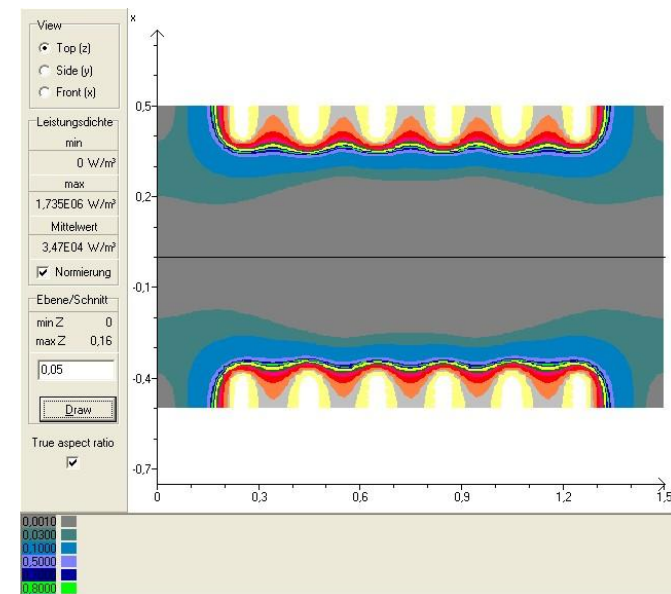
Forehearts  
8 electrodes



Forehearts  
12 electrodes



Mathematical  
modelling  
12 electrodes



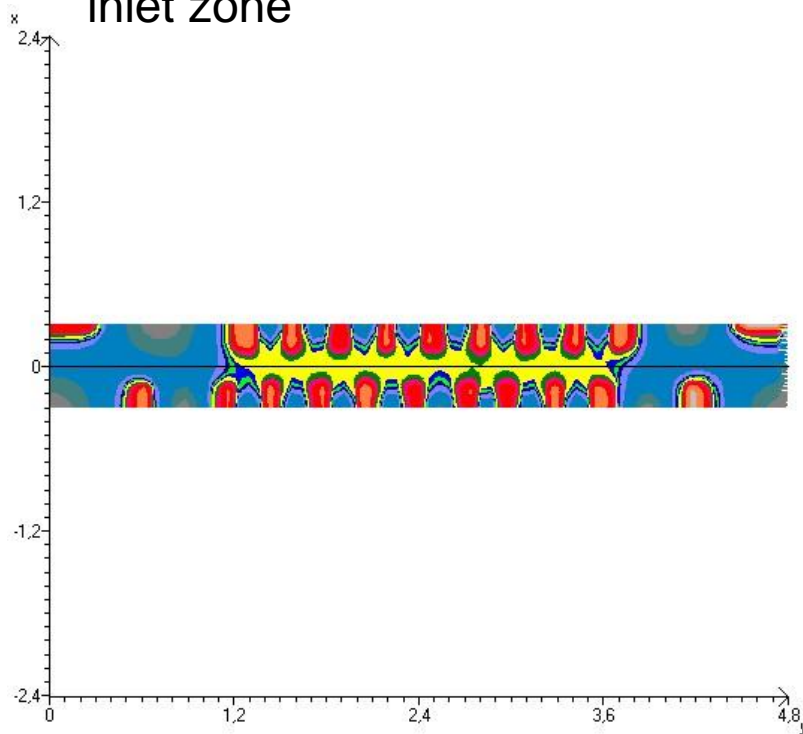
# Interconnection and control options

Measuring equipment and power supply

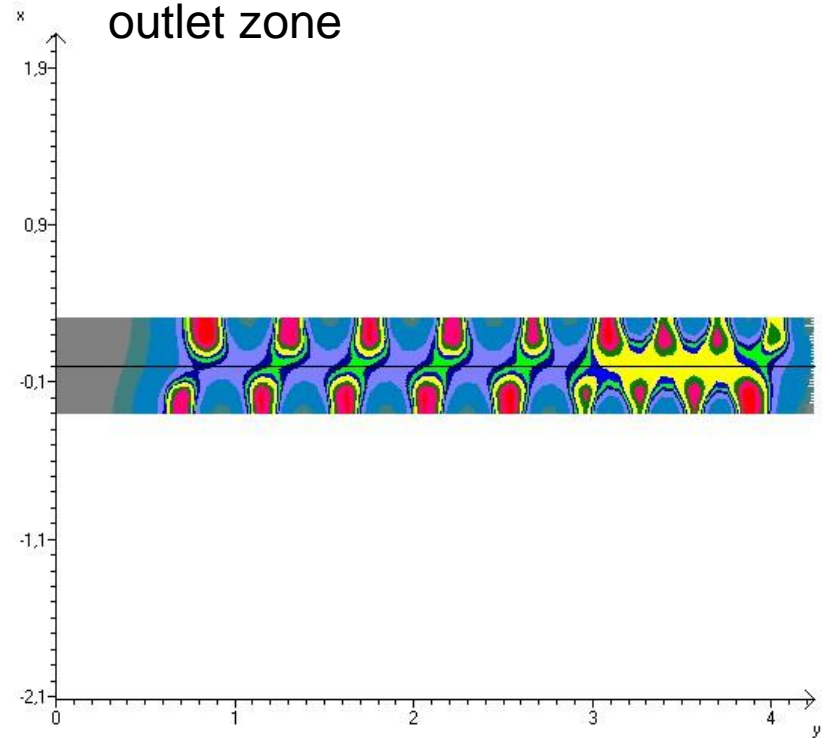


# Mathematical modelling

Forehearth  
inlet zone



Forehearth  
outlet zone

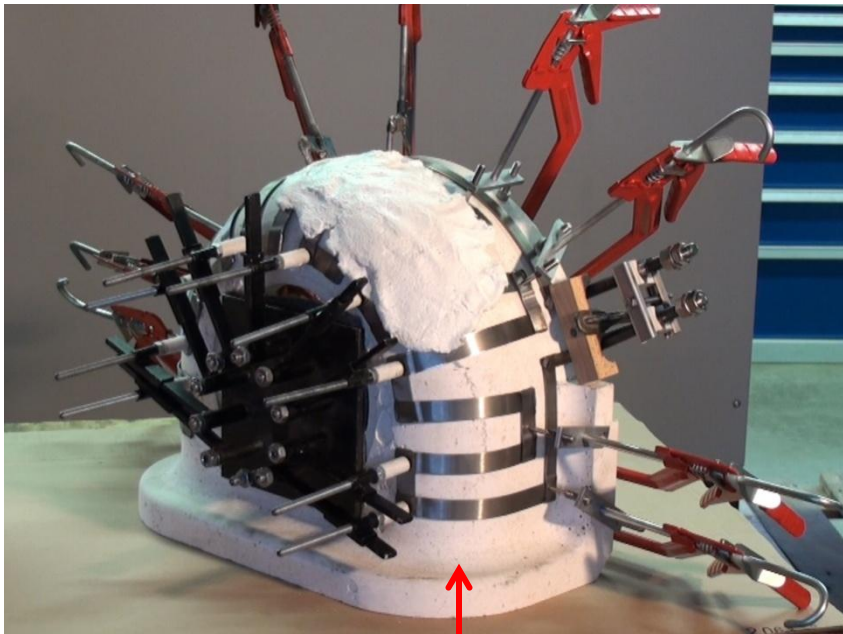


Special spout heating



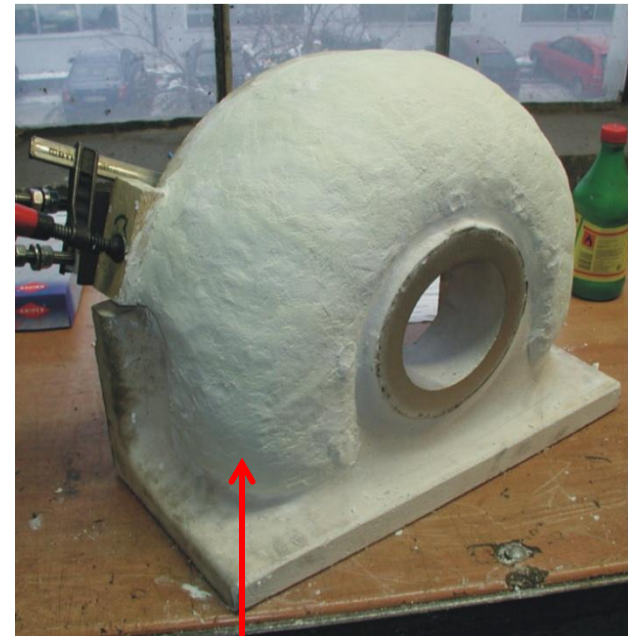
# Special spout heating

During preparation



Heater

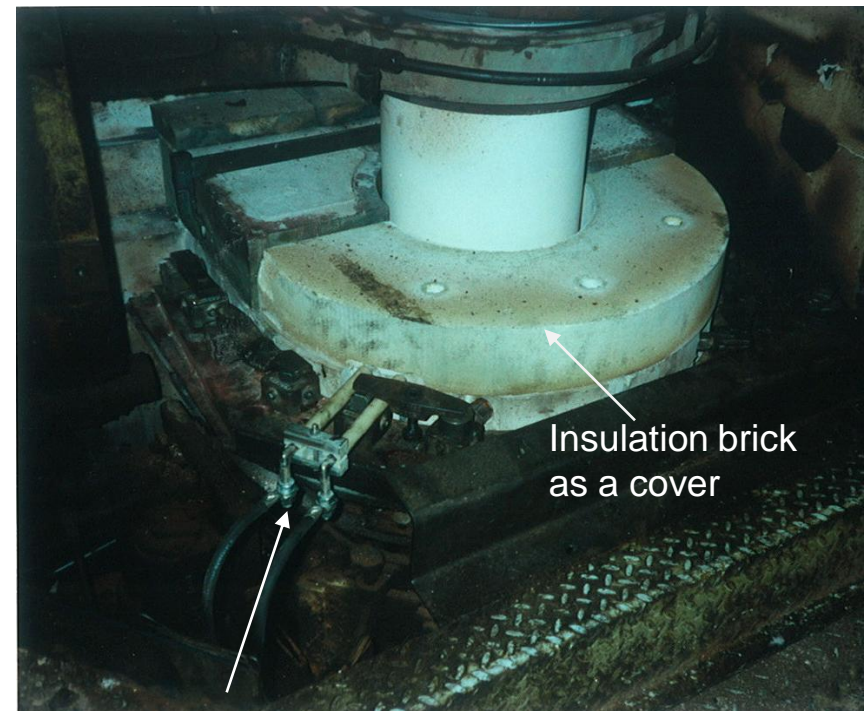
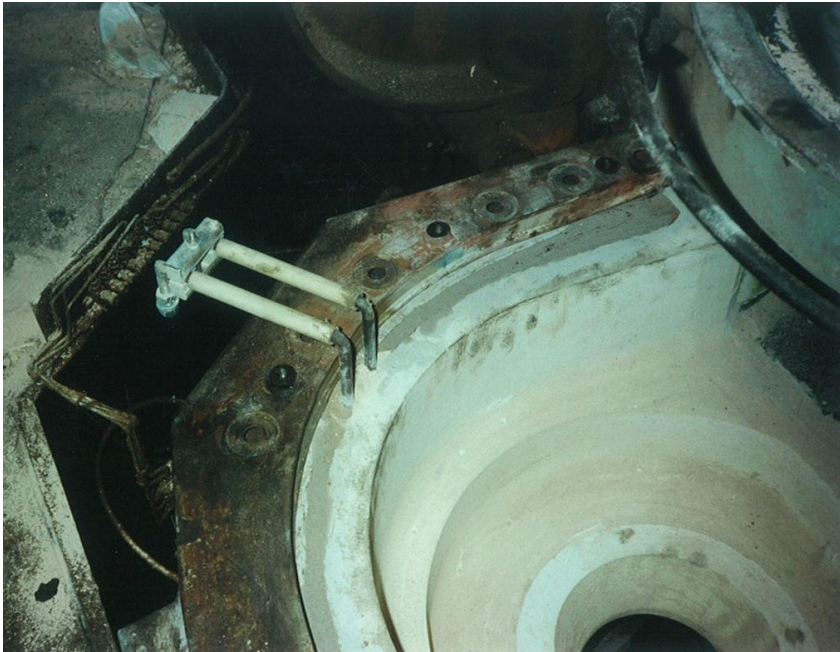
Ready for installation



Molded insulation  
1.400°C / 2.600° F

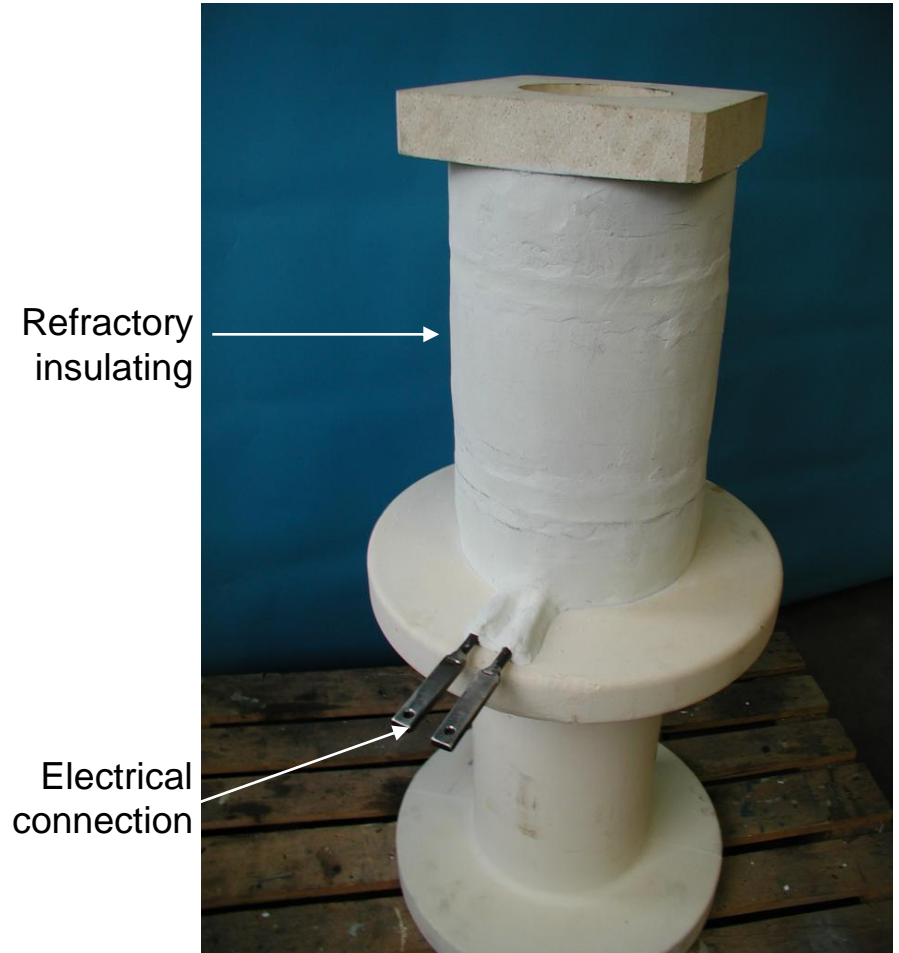
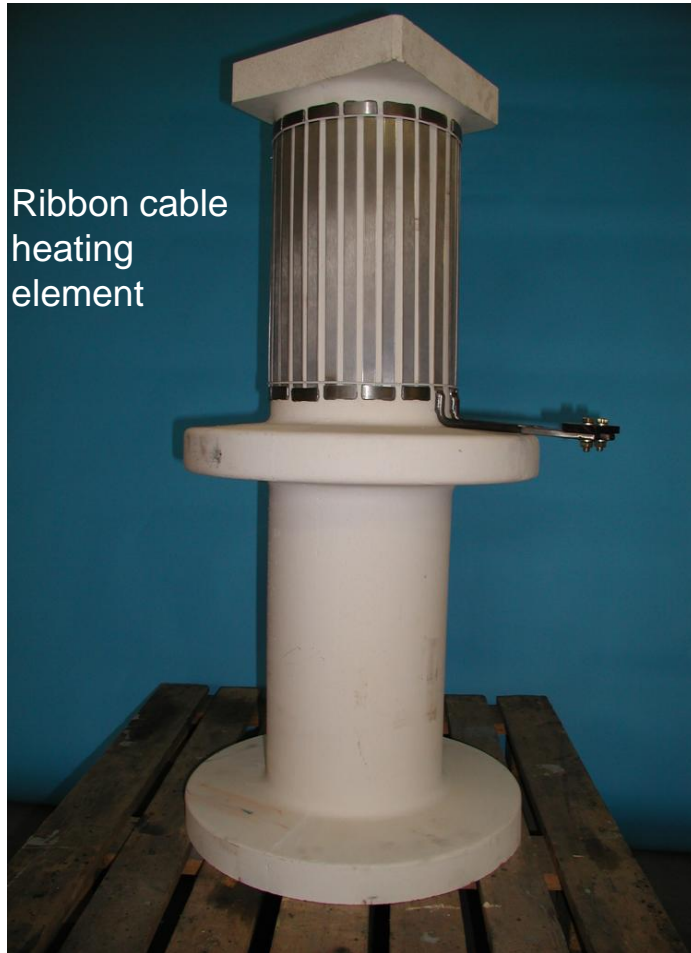
# Special spout heating

## Installation example of a feeder tank





# Special spout heating (shaft spout)

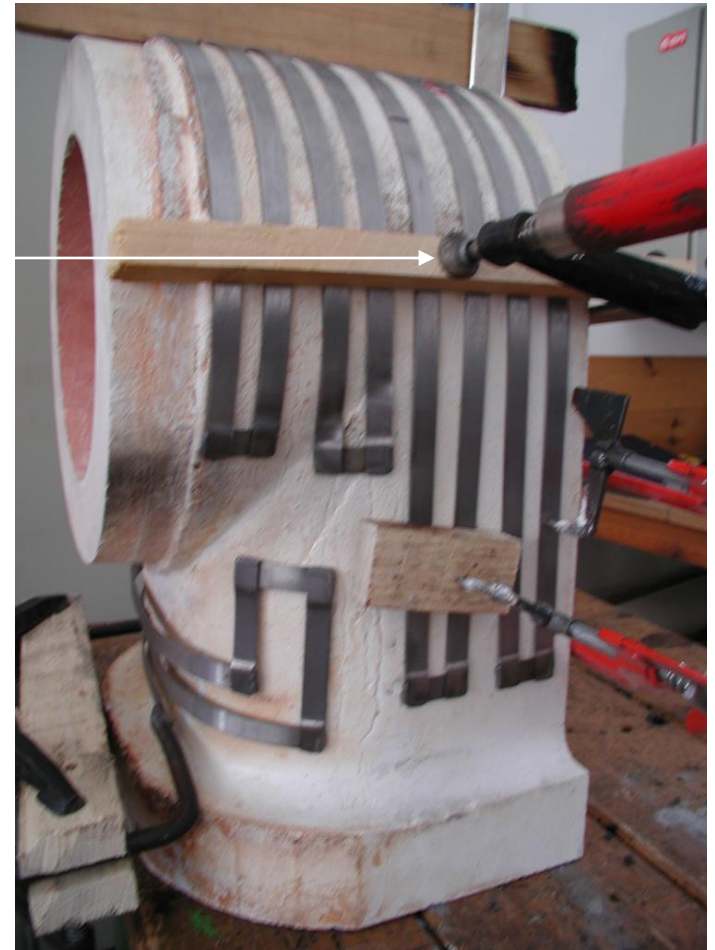


# Indirect spout heating (special shaft outlet)



fixations  
before application  
of the insulating  
refractory material

Electrical  
connections



# Special spout heating

- Complete compensation of heat loss in the feeder bowl
- Better temperature equalization of colored glass
- Improvement of product thermal homogeneity
- Reduced heat-up time after a bowl change
  - thereby the production downtime is considerably shortened
  - faster production start

# Special spout heating

- Reduction of gas consumption in the heat required from above
- A special benefit is realized in feeder bowls with inside platinum coating
- Significant price to performance ratio
- Lifetime over six years – from our experience reporting

# Thank you for your attention

**More information about our products?**

**[www.bock-energiotec.de](http://www.bock-energiotec.de)**

**or**

**[www.allstatesrefractory.com](http://www.allstatesrefractory.com)**

*Electrical melting in perfection*

