*sensor head*

*stainless steel proctection tube*

*alumina housing tube*

*ceramic measuring tip*


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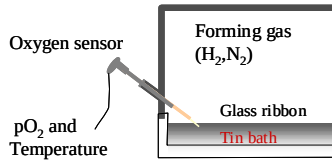
# Oxygen Sensor for Tin Bath




***On-line Measurement in the Tin Bath of Furnaces***

# Tin Bath sensor

*Continuous monitoring of the tin bath*

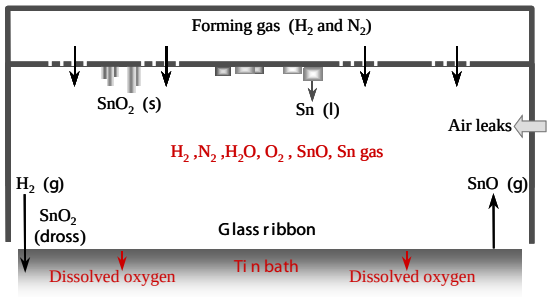
- *Easy installation and long lifetime*
- *Reduced oxygen related defects*
- *Early warning and hydrogen saving*
- *Providing new insight in tin and oxygen chemistry*

*The tin bath sensor has been dveloped especially for the continuous measurement of the oxygen activity in the molten tin in the float tank of a float glass production line.*

*One of the major concerns in the operation of the float tank is to prevent oxidation of the tin bath. Oxygen may enter the furnace by air leaks or by diffusion from the glass sheet.*

*A too high oxygen content of the bath leads to various (bottom and top) surface defects and to quality problems of special solar-control coatings. Moreover, using this sensor, the forming gas consumption can be optimised in order to save expensive hydrogen gas.*

*Oxygen cycle in the float tank*

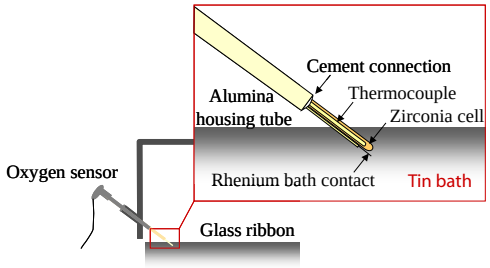



## *Easy Installation and long lifetime*

The geometry of the sensor is similar to that of a regular thermocouple. This allows simple replacement of the existing thermocouples along the tin bath side wall. The built-in K-type tc of tin bath sensor takes over the temperature measurement at the specific measuring location.

Simple formulas are provided in the manual for the calculation of the oxygen activity of the tin bath, the oxygen concentration (ppm O) and the relative oxygen saturation of the tin bath.


Only the measuring tip is immersed in the tin bath. The measuring tip is free of cement connections. This construction increases lifetime and stability considerably in the aggressive molten tin. An indicative lifetime is about 4 to 6 months at 750 °C.




## *Reduced oxygen related defects*

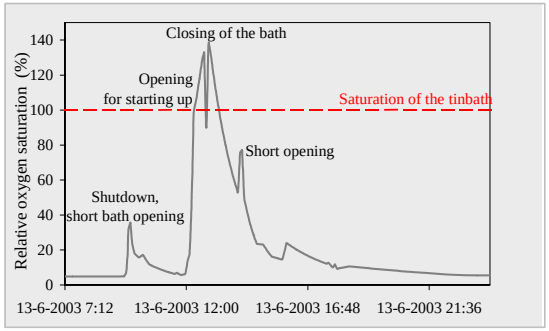
A too high oxygen content of the tin bath may cause:

- Top surface defects such as:
  - Tin drops
  - Cassiterite particles

- Bottom surface defects such as:
  - Tin pick up ($SnO_2$ adherence or so-called dross)
  - High tin count values resulting in bloom after tempering or bending

## *Early warning and hydrogen saving*

During bath openings a large quantity of air enters the float tank, which immediately results in a steep increase of the oxygen level of the tin bath. However, to prevent surface defects, it is important to avoid high oxygen levels during and after a bath opening. After closing of the bath, the sensor signal may help the operator to adjust the hydrogen level in the forming gas in order to return in a controlled way to the regular oxygen level.




## *Providing new insight*

A glass sheet thickness decrease causes an increase in the oxygen level of the tin bath. During the production of a thinner sheet more surface area of glass passes through the float tank. This results in more oxygen diffusion from the sheet to the tin bath.

Maintenance actions such as a filter change and a short side wall opening are clearly visible as distinct peaks in the sensor signal.