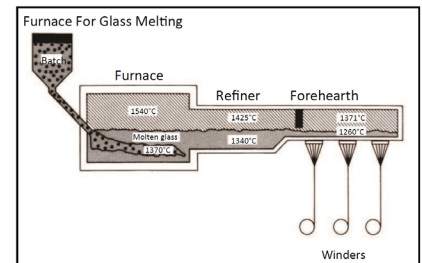


# Temperature Sensing Instrumentation for Glass Manufacturing

A common measurement challenge for today's glass manufacturers is the need for consistent, accurate temperature control. Glass furnaces operate over high temperatures ranging from +1100 °C to +1600 °C. Associated instrumentation must therefore offer necessary extreme survivability for accurate, repeatable measurements. To ensure these parameters are met, rare metal thermocouples, such as those offered by TT Electronics under our Roxspur Measurement & Control brand, are most commonly specified. The figure below depicts the steps of a typical glass manufacturing process. It further illustrates the wide temperature extremes within the environment. A description of the two major glass manufacturing heat sources, the forehearth and melter furnace, are also explained below.



## Glass Melter Furnaces and Equipment

During the initial melting of glass cullet, the melter furnace is used to achieve the necessary extreme melt temperatures required for manufacturing process optimisation and consistent production quality.

Melter furnaces are either natural gas or oil fuelled, and are constructed from highly heat-resistant materials. This design allows for fuel consumption efficiency and temperature output uniformity. The furnaces may be either front or bottom loaded, with the latter serving the majority of glass industry requirements.

A unique application condition for Melter furnaces is their need for continuous high-temperature measurements over extended timeframes. Each glass manufacturing campaign can run as long as five to 15 years over unusually harsh and extreme temperature ranges, making furnace reliability a needs must.

To ensure consistent and uniform heat output, temperature sensors are incorporated within the walls, roof (crown) and bottom portions of Melter furnaces. These sensors may be identified within the furnace by location, such as Melter bottom, sump bottom, riser sidewall, channel bottom, crown, Melter sidewall, and others.

Supporting Melter furnaces are also series of pumps, compressors, coolers and other ancillary equipment, whose operations are essential to the manufacturing process, and all of which require monitoring and control.

## Forehearth and Zone Temperatures

The forehearth helps to condition molten glass to specific forming machinery requirements. In a typical container glass factory, the forehearth further helps to achieve

glass homogeneity and reduce potential stresses on the end product. The achievement of both heat uniformity and glass homogeneity are vital to gob viscosity and subsequent processing as the melter output moves through to the working end. The use of effective temperature sensing instrumentation can save fuel costs; reduce end product breakage, scrap and rework costs; and improve production throughput.

To determine proper glass stream characteristics, forehearths incorporate an array of tri level thermocouples. Immersed in the molten glass, they are used to determine stream characteristics and monitor temperatures in and around forehearth zones, as well as of annealing ovens

(Lehrs) and forming machines. Extra heating in the stream will optimise flow uniformity. A final temperature sensor in the spout bowl is common, along with glass level electrodes.

Thermocouples are also used within in glass manufacturing plants to obtain accurate flue and re-generator temperature measurements. They are also important for monitoring heating /cool zones.

Pyrometers may also be specified, in applications where extreme temperature measurements are required through the molten glass.

# Precision Sensors and Instrumentation for Glass Manufacturing

We are one of the UK's largest manufacturers and suppliers of thermocouples, temperature probes, pyrometers and infrared thermometers for the full glass manufacturing process. We offer standard and custom designs, backed by an experienced applications help desk and an extensive global technical sales network.

## Thermocouples

- Ranges from -200°C to +1800°C
- All types manufactured (K, R, S, B)
- Materials and components held in stock
- In-house calibration and repair services

## Infrared Thermometers

- 0°C to +3000 °C range
- Adjustable emissivity
- Datalogging function
- Fixed or portable versions
- Optional UKAS calibration

## Temperature Transmitters

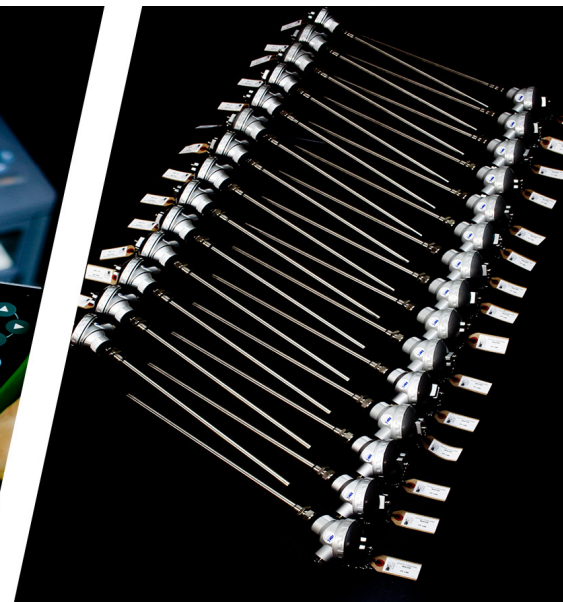
- Head or DIN rail mounted
- Configurable input/output
- In-head display and alarm relay options
- Intrinsically safe options
- Open HART® protocol

## Calibration and Repair Services

- Over 50 years of expertise
- Portable and fixed calibrations
- UKAS and traceable calibration
- ISO/IEC 17025 accredited procedures
- Fast and efficient maintenance and repair service

## Infrared Pyrometers

- Covering the complete temperature range, the use of IR pyrometers enables us to enhance our capabilities to cover applications once the temperature range exceeds the normal working range of traditional technologies
- Up to +3200 °C
- Wide range of applications
- Proven Technology



For more information, visit us at

[www.ttelectronics.com/roxspur](http://www.ttelectronics.com/roxspur)

The aim of our technical documents is to inform and advise our customers. The information provided herein is correct to the best of TT Electronic's knowledge. No liability for any errors, facts or opinions is accepted. Customers must satisfy themselves as to the suitability of each product for their application. No responsibility for any loss as a result of any person placing reliance on any material contained herein will be accepted. Product names followed by ® are trademarks registered by TT Electronics.