Radiamatic-II
Non Contact Infrared Sensors
for the Glass Industry
The Glass Industry

Glass manufacturing was one of the first industries to use non-contact temperature measurement. Many of today’s non-contact infrared sensor designs evolved directly from the needs and demands of the diverse, and many times harsh processes entailed in the making of glass products in their various forms.

Honeywell has been a supplier of non-contact temperature sensors for the Glass Industry for over 60 years. Honeywell’s sensor specifications and protective housings are in direct response to the special needs of the Industry, and have progressively taken advantage of the dramatic strides in optics, electronics and detector technology.

Today, Honeywell infrared thermometers are to be found globally, in all segments of both primary and secondary glass manufacturing:

- Automotive and Architectural
- Container and Fiber
- Lamp and Lighting
- Decorative and Tableware
- Optical Waveguide Production
- Tempering, Laminating and Forming

Melt tank/forehearth
Non-contact IR sensors located on top of forehearth forehearth
IR sensor installed near glass gob distribution (exit of forehearth)

Glass gob distributor
Glass bottle forming line

IR Sensor measuring temperature of glass gob
Float Glass Process Applications

Melting & Refining
The melt tank (1) and refiner area temperature measurement applications are common to many segments of the Industry. The measurement locations are: The furnace crown, the bridgwall, the burner port block, and the molten glass in the regenerator melt tank furnace. Sensors in the region of 1µ (micron) are used in this area. Due to the extreme environmental temperatures, water-cooling is necessary. Single wavelength (1 color) pyrometers are used throughout the Float Glass Process.

Float Glass
After the melt tank (1), the first points of measurement on Float Glass lines are in the Canal Area (2) followed by the Tin Bath (3), which requires multiple measurements to profile the glass. The Canal Area uses a pyrometer with a 1µ spectral response and sensors in the 5µ spectral response region are used in the Tin Bath to sense the glass surface temperature. In the Annealing Lehr (4), again sensors in the 5µ region are installed to sense near the edge and the center of the glass ribbon in each of the annealing zones. In the Cooling Zones near the end of the Lehr, and to determine the correct ribbon temperature in the glass cutting location (5), more economical sensors with 8-14µ spectral responses can be used.

Bending, Tempering and Sagging
In the bending, tempering and sagging applications associated with the secondary processing of flat glass, sensors in the region of 5µ are used to measure glass surface temperature. Other spectral responses have been used to measure temperatures just below the glass surface as a means of preventing “skin effect” stress patterns.
Container Glass and Fiber Glass
Container and fiberglass lines have common features in that they both have a melt tank refiner area and a distributor with several forehearths. Normally, fiberglass forehearths are longer and therefore have more zones than the container line equivalent. In the distribution area (2) IR sensors in the region of 1µ wavelength are used to measure just below the surface of the glass at one or more points. Due to extremely hot environmental conditions water-cooling is necessary.

In the forehearth (3), again sensors with 1µ spectral response are used to sense each zone temperature, and measure approximately 25mm (1") into the glass. On some forehearths, zone temperature is combined with an additional IR thermometer, sighted into a molybdenum tube through the bottom of the forehearth, just before the orifice, to detect temperature gradients in the glass.

At the end of the glass-conditioning phase in the forehearth, the container and fiberglass processes differ.

Container Lines
The end point of measurement on a container forehearth is the gob (4). Gob temperature measurement requires a sensor with 1µ spectral response to sense beneath the gob surface in order to avoid surface cooling effects. For very small gobs, less than 25mm (1.0") dia., it is necessary to sight up into the orifice to avoid “seeing” partially through the glass. Generally, IR sensors with through-lens sighting are used in this location. Single color with short wavelength are used for the plunger (5) measurement to eliminate inaccuracies due to variable surface emissivity. Typically sensors with a speed of response of 10 milliseconds or less are used for gob or plunger temperature measurements.

In the parison forming area, mold temperature (6) is measured with a fixed sensor. Fixed process sensors with a spectral response of 3.9 are used to see through clean flames impinging on the molds.

Fiber Glass
In fiberglass production, the last point of measurement of the forehearth, is at the platinum bushing (4). A variety of techniques have been used in this final production stage to ensure that correct temperature and temperature distribution across the bushing is maintained. This insures that the holes in the bottom of the Platinum Bushing remain open and unobstructed, allowing the molten glass to flow. For this measurement fixed sensors with narrow-band, short wavelength spectral response are used. All non-contact infrared thermometers avoid the errors attributable to electrical or electromagnetic interference that complicate thermocouple measurements.
Like Container and Fiber Glass production, Lamp and Lighting only differs in the forming and secondary manufacturing stages. Depending on the glass materials under process such as soda lime, lead glass or borosilicate (quartz) temperatures vary, ranging from approximately 500°C to 2200°C respectively. IR Sensors at 5-micron spectral response are used to measure glass surface temperature, whether it is viewed directly or through clean flames. In addition, the IR Sensor’s speed of response should be considered due to the very high-speed nature of the Lamp/Lighting Glass Process.

**Glass to Glass, Glass to Metal, Sealing Applications**

Accurate automotive lamp glass temperature measurement prevents seal failure and Pinch Die breakage due to low glass temperature

Temperature measurement is used to control and prevent a cold seal, rod voids, cracking, and shrinkage

Honeywell Infrared Sensors are used to measure glass to lead glass seal on fluorescent tubes.

Honeywell’s non-contact infrared temperature sensors are ideal for monitoring and control of critical processes in the manufacture of incandescent bulbs, fluorescent tubes (mercury/sodium vapor) metal halide and high intensity discharge lamps.
Diversified industrially hardened pyrometer with precision upright through lens sighting, focusable optics, adjustable emissivity and easy 2-wire installation with 4-20 mA analog output. Speed of response 100ms/100/ms/10ms.