High performance Bottom up glass inspection system for process control in glass tempering machines

**Features**

- Compact bottom up system for coating independent underneath measurement
- Superb 955 px resolution on maximum 3.4 m (11.15 ft) scan width (@ 90 cm [2.95 ft] distance)
- Integrated ultra-fast glass breakage detection combined with Digitally controlled lens protection system (DCLP)
- No cooling or air purge requirement
- Glass area calculation
- Pre-assembled system for easy installation on glass tempering furnaces

### Specification PI 450i G7

- **Optical resolution**: 382 x 288 pixels
- **Detector**: FPA, uncooled (17 µm x 17 µm)
- **Spectral range**: 7.9 µm
- **Temperature ranges**: 150 °C ... 900 °C (302 °F ... 1652 °F) 200 °C ... 1500 °C (392 °F ... 2732 °F)
- **Sighting range**: 0 ... 250 °C (32 ... 482 °F)
- **Frame rate**: 80 Hz / switchable to 27 Hz
- **Optics (FOV)**: 80° x 54° FOV / f = 5.7 mm (f=0.2 in) or 53° x 38° FOV / f = 7.7 mm (f=0.3 in) max. FOV: 96° / 955 pixels per scan line
- **3.4 m (11.15 ft) scan width @ 90 cm (2.95 ft) distance**
- **Thermal sensitivity (NETD)**: 150 mK (at T_obj = 650 °C [1202 °F])
- **Accuracy**: ±2 °C or ±2 %, (±3.6 °F or ±2 %) whichever is greater
- **PC interface**: USB 2.0 / USB to GigE (PoE) interface
- **Process interface (PIF)** (industrial): 2x 0 – 10 V input, digital input (max. 24 V), 3x 0/4 – 20 mA output, 3x relais (0 – 30 V/ 400 mA), fail-safe relay
- **Ambient temperature**: 0 °C ... 70 °C (32 °F... 158 °F)
- **Relative humidity**: 20 – 80 %, non-condensing
- **Enclosure (size / rating)**: 46 x 56 x 68 – 77 mm [1.8 x 2.2 x 2.68 – 3.03 in] (depending on lens + focus position) / IP 67 (NEMA)
- **Weight**: 237 - 251 g [8.36 - 8.85 oz] (depending on lens)
- **Vibration**: IEC 60068-2-6 / -64
- **Shock**: IEC 60068-2-27 (25 G and 50 G)

### Specification glass breakage sensor CTlaser 4ML

- **Temperature range**: 0 °C ... 500 °C (32 °F ... 932 °F)
- **Spectral range**: 2.2 - 6 µm
- **Optical resolution (90 % energy)**: 30:1
- **System accuracy**: ± (0.3 % of reading +2 °C [3.6 °F])
- **Temperature resolution (NETD)**: 120 mK
- **Exposure time**: 90 µs (90% signal)
- **Response time**: 300 µs (90% signal)
- **Emissivity/Gain**: (adjustable via programming keys or software) 0.100 – 1.100
- **Environmental rating**: IP 65 (NEMA-4)
- **Ambient temperature**: –20 °C (4 °F)  ... 70 °C (158 °F), (sensing head: 50 °C [122 °F] with laser on)
- **0 °C (32 °F) ... 85 °C (185 °F), (electronics)
- **Vibration (sensor)**: IEC 60068-2-6 / -64
- **Shock (sensor)**: IEC 60068-2-27 (25 G and 50 G)
- **Weight**: 600 g (21.6 oz) (sensing head)
- **420 g (14.8 oz) (electronics)

1) With 80° optics and usage of a diagonal scan line; maximum pixel count based on two cameras without overlapping
2) Measurement of the noise equivalent temperature difference (NETD) according to VDI 5585 standard, method B; 650 °C (1202 °F) black body temperature, frame rate 20 Hz averaged
3) ε = 1, response time 1 s
4) At time constant 1 ms and T_obj = 50 °C (122 °F)
5) The functioning of the LCD display may be limited at ambient temperatures below 0 °C (32 °F)

### Scope of supply Button Up GIS 450i G7

- 2x PI 450i G7 imager with 80° or 53° FOV
- 2x Industrial Process Interface
- CTlaser 4ML glass breakage sensor with USB interface
- 2x DCLP Shutter system with mounting brackets for imagers
- 2x USB Server Gigabit
- Control cabinet with cable set (10 m each) and remote control box
- Software package
- 100-230 V AC/ 24 V DC power supply for initial start-up
**Measurement principle**

![Diagram showing heating and cooling processes with temperature differences and sensors.]

**System overview**

![Diagram showing system components including electric cabinet, remote control, power supply, Ethernet, USB, PIF, shutter cables, and software integration.]

**Software PIX Connect**

![Software interface with thermal profile, IR live view, snapshot history, measurement zones, and glass area calculation.]

*The software provides excellent image quality and manifold analysis features as profiles, measurement areas and alarm indication.*

*Exemplary software layout with thermal profile, IR live view, snapshot history, five measurement zones and glass area calculation.*