

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 scan width (@ 90 cm 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 ... 900 °C, 200 ... 1500 °C
Sighting range	0 ... 250 °C
Frame rate	80 Hz / switchable to 27 Hz
Optics (FOV)	80° x 54° FOV / f = 5.7 mm or 53° x 38° FOV / f = 7.7 mm max. FOV: 96° / 955 pixels per scan line ¹⁾ 3.4 m scan width @ 90 cm distance
Thermal sensitivity (NETD) ²⁾	150 mK (at T _{Obj} = 650 °C)
Accuracy	±2 °C 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 ... 70 °C
Relative humidity	20 – 80 %, non-condensing
Enclosure (size / rating)	46 x 56 x 68 – 77 mm (depending on lens + focus position) / IP 67 (NEMA)
Weight	237 - 251 g (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
Spectral range	2.2 - 6 μm
Optical resolution (90 % energy)	30:1
System accuracy ³⁾ (at T _{Amb} 23 ±5 °C)	± (0.3% of reading +2 °C)
Temperature resolution (NETD) ⁴⁾	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 ⁵⁾	-20 °C ... 70 °C (sensing head: 50 °C with laser on) 0 °C ... 85 °C (electronics)
Vibration (sensor)	IEC 60068-2-6 / -64
Shock (sensor)	IEC 60068-2-27 (25 G and 50 G)
Weight	600 g (sensing head) 420 g (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 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

5) The functioning of the LCD display may be limited at ambient temperatures below 0 °C

Scope of supply Bottom 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



TECHNICAL DATA

The diagram illustrates the glass tempering process. A glass sheet is shown moving from left to right through two main zones: a heating process zone at 600 °C and a cooling process zone at 50 °C. A glass breakage sensor is located at the transition between these zones. Two infrared cameras are positioned to monitor the glass sheet during the cooling process.

[illegible]

Glass area	
Area 1	3,5m ² 617,1°C
Area 2	618,5°C
Area 3	622,4°C
Area 4	624,8°C
Area 5	615,5°C

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