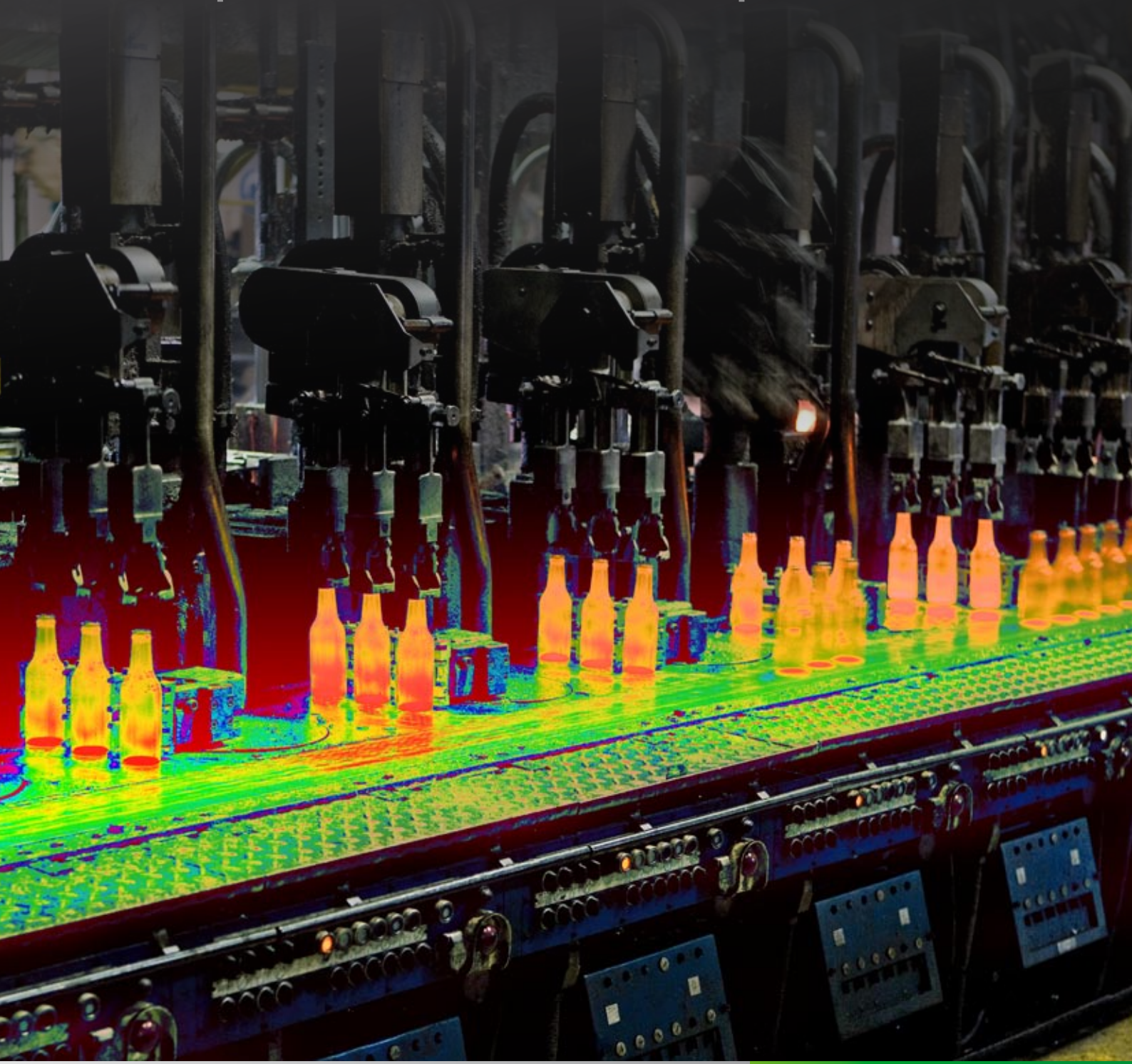
DIAS Infrared Systems

Glass application

Pyrometers and thermal imagers for the glass industry

Temperature measurement up to 3000 °C



Successful process optimization with non-con

Pyrometers and thermal imagers for the production and processing of

Useful temperature measurement with infrared instruments in the glass production

The temperature is one of the mostly measured physical values and is extremely important for the production, processing and quality control of glass. The temperatures measured with infrared thermometers (pyrometers) and infrared cameras will be used for process control, energy control and for securing of the processability and forming. Moreover material limits and alarm values can be observed. The usual measuring places are in the production of container glass, float glass, fiber optic cables, technical glass and special glass, e.g. ultrathin glass.

Glass tank

Which measuring tasks are usual?

– Temperature measurement of the melted glass inside the furnace and at the exit
– Temperature of the refractory of
  - the roof
  - the tank bottom
  - the side walls

Why is the use of measuring technique so important here?

✓ Optimization of the melting process
✓ Quality improvement of the raw material → Quality improvement of the final product
✓ Extension of the lifetime of the refractory walls
✓ Increase in economy by reduction of wear and tear
✓ Recognition of danger caused by possible cracks or perforation of the refractory walls
✓ Early detection of worn out bottom isolation
✓ Prevention of economic and production loss, damages and accidents for men, environment and machines

Roof and wall temperature

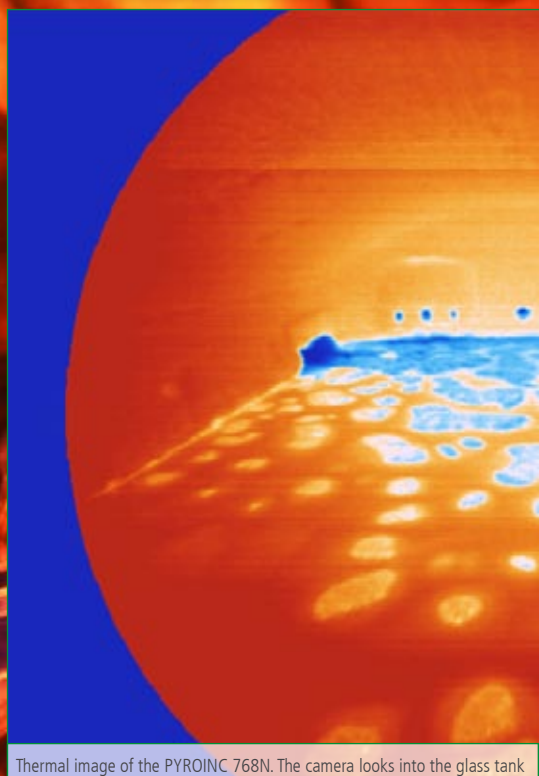
1 2

Stationary pyrometers with **fiber optic cables** and **air purge units** withstand ambient temperatures up to 250 °C at the glass tank. The optic head of the pyrometer will be fixed in a quick release mounting device with air purging and aims trough a **ceramic sighting** tube at the glass. The tube will be lead through a hole in the roof. So the optic head is protected and does not see reflections. The pyrometer is usually a 2-wire pyrometer but is also available in 4-wire technique with RS-485.

Our solution: Pyrometer PYROSPOT DSF 30 NG and DSF 34NG

2 3

The furnace camera PYROINC is equipped with a cooling system and an automatic retraction system for emergency cases.



Thermal image of the PYROINC 768N. The camera looks into the glass tank through a hole in the refractory wall.

tact temperature measurement
glass

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Pyrometer Pyrospot DSF 30NG with fiber optic cable, quick release mounting device with air purging and sighting tube

Inspection of roof and walls

1 2

Our portable instruments are useful for the periodic inspection of the walls and roof. The portable thermal imager PYROVIEW 480N can create images and measure temperatures of the glass melt, the walls and roof. The portable pyrometers of PYROSPOT series 80 with color video display offer temperature ranges between 200 °C and 2500 °C. These pyrometers are equipped with a focusable optics and are used for e.g. the temperature measurement of the forefront. Damages of the walls can be detected early or even avoided. All important parameters can be set at the pyrometer, the built-in data logger can store up to 999 values. The stored values can be transferred for analyzing via USB interface to a PC and with displayed with the software PYROSOFT.

Our solution: Portable Pyrometers PYROSPOT Serie 80 portable and thermal imagers PYROVIEW 480N portable

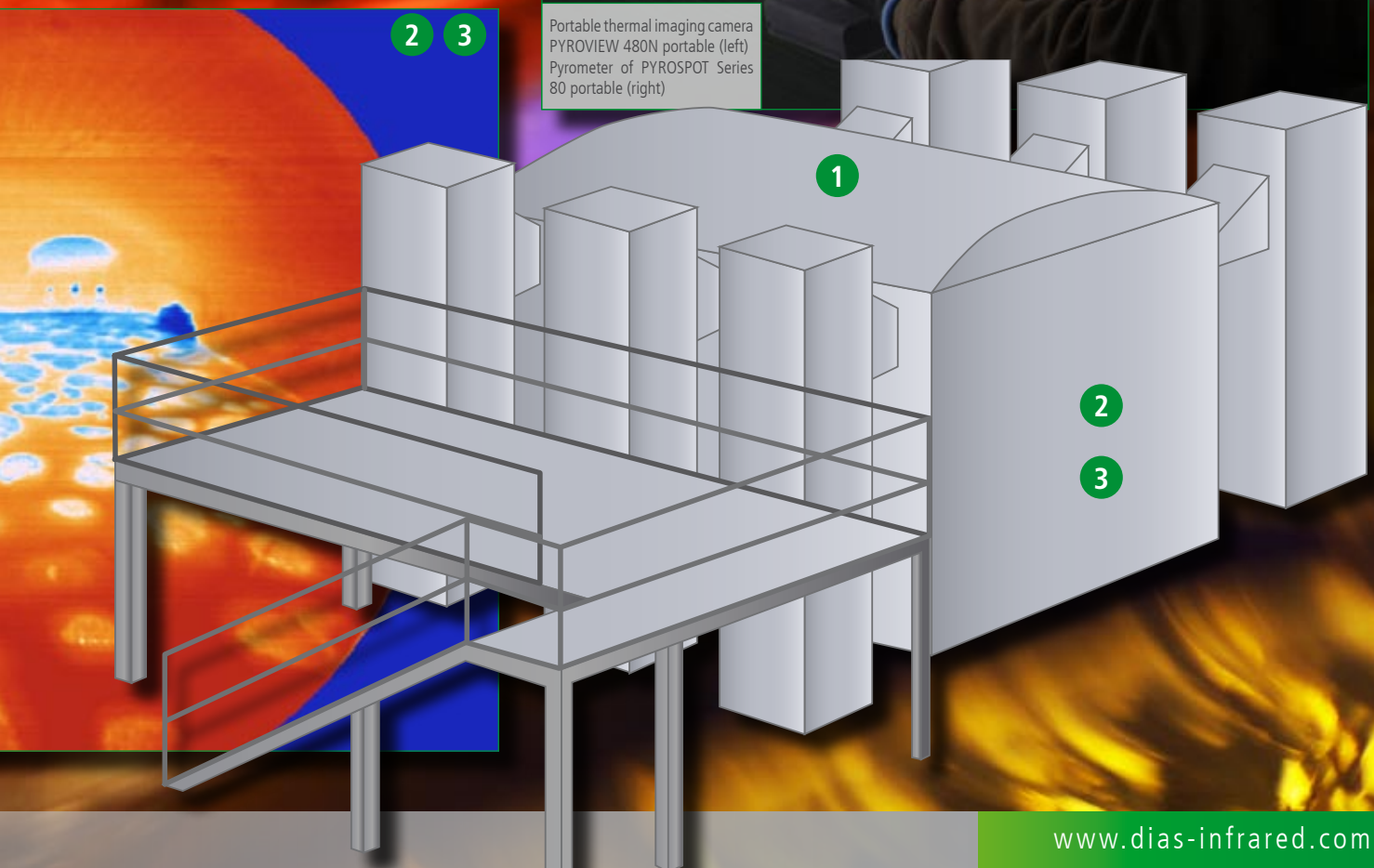
Glass melt and refractory walls

2 3

The furnace camera PYROINC is a special, very robust infrared camera for the imaging and temperature measurement of the glass melt and walls of the glass tank. It is equipped with a special cooling system and an automatic retraction system to withstand the very high temperatures and special conditions at the site.

Our solution:
Stationary infrared furnace camera PYROINC

Portable thermal imaging camera PYROVIEW 480N portable (left) Pyrometer of PYROSPOT Series 80 portable (right)



Successful process optimization with non-con

Pyrometers and thermal imagers for the production and processing of

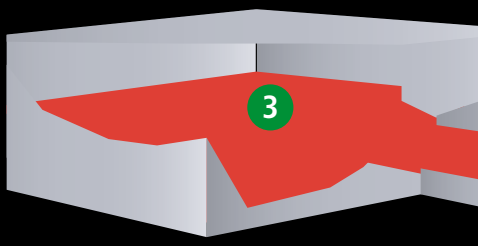
Production of container glass

Which measuring tasks are usual?

- Temperature distribution of the glass melt in working end, observation of the combustion
- Glass temperature in fore hearth and feeder for continuous process control and optimization of the heating process
- Measurement of the glass gob for the correct temperature of further processing
- Temperature distribution of the glass mold for controlling of the coolant and securing of the homogeneity and wall thickness of the product

Why is the use of measuring technique so important here?

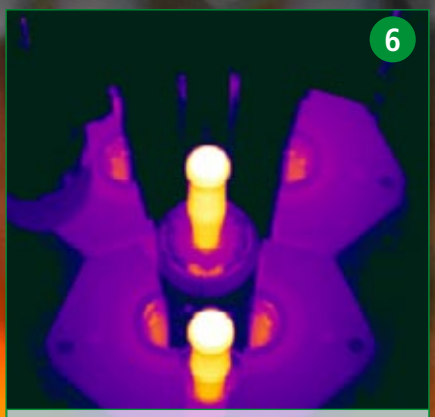
- ✓ Process optimization
- ✓ Quality improvement of the raw material → Quality improvement of the final product
- ✓ Early detection of worn out bottom isolation
- ✓ Prevention of economic and production loss, environment and machines



Working end 3

Pyrometers with a temperature range from 600 °C to 1800°C are used for the temperature measurement in the working end. High demands to the repeatability of the measurement require a safe screening of disturbing radiation in the furnace. This will be accomplished with the help of special ceramic or Inconel sighting tubes.

Our solution: Pyrometer PYROSPOT DSF 30 NG and DSF 34 NG



Thermal image of glass molds

Forming 6

Pyrometers PYROSPOT and thermal imagers PYROVIEW are used for the measurement of the temperature or the temperature distribution of the glass mold.
The controlling of the water and air flow will be optimized with the help of the temperature measurement. Thereby the homogeneity and wall thickness will be secured.

Our solution: thermal imagers PYROVIEW 640G, PYROVIEW 320N, pyrometers PYROSPOT DG 44N or DG 54N or DG 56N, PYROSPOT DT 54G or DT 56G

tact temperature measurement
glass

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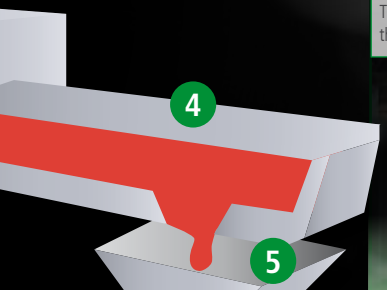
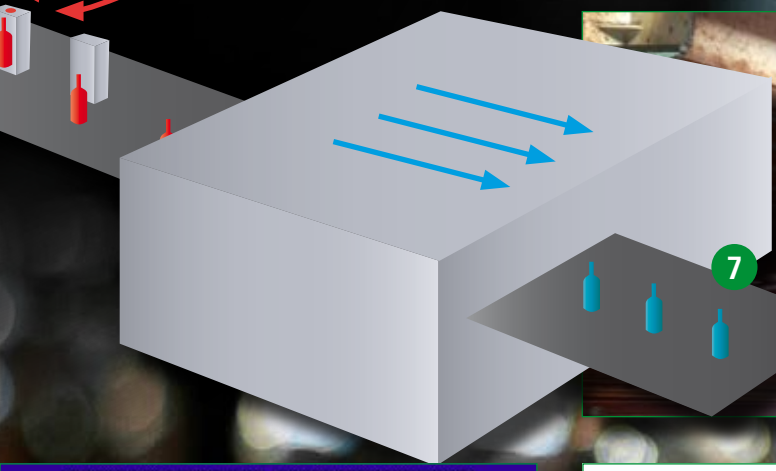


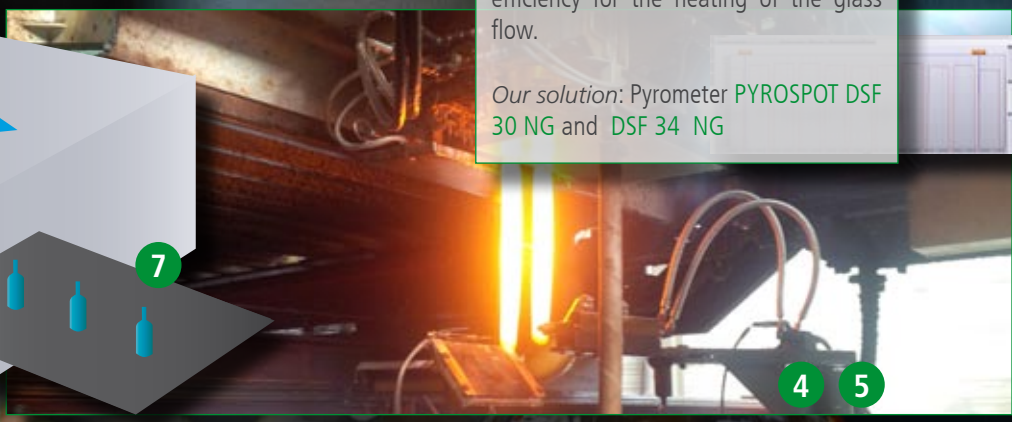
The pyrometers PYROSPOT DSF30/34NG with fiber optic cable can be installed directly at the forehearth and feeder.

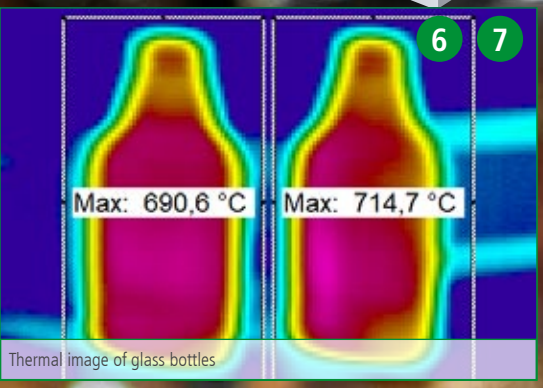
Forehearth and feeder 4

Robust, near infrared pyrometers with fiber optic and special mounting equipment are required for the temperature measurement of the melted glass in the forehearth. The components can be installed very easily and are very easy to maintain. The temperature range is adjustable between 600 °C and 1800 °C. These pyrometers ensure a continuous process control and energy efficiency for the heating of the glass flow.

Our solution: Pyrometer PYROSPOT DSF 30 NG and DSF 34 NG







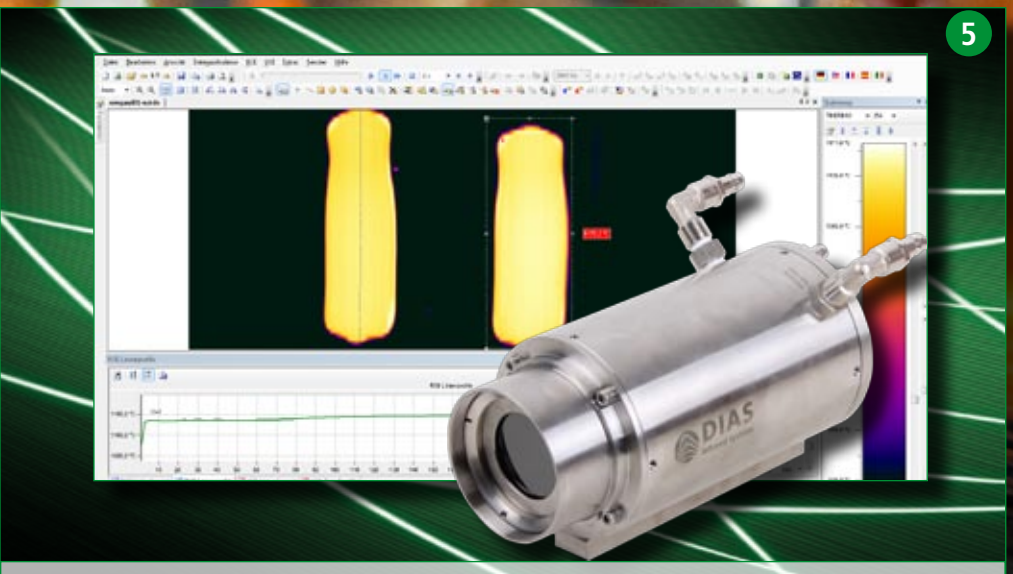
Thermal image of glass bottles

The pyrometer PYROSPOT DSR 54NCV is equipped with a color video module and a rectangular measuring spot.

Glass gob 5

An extremely short response time is required for the temperature measurement of the glass gob. The infrared line camera PYROLINE has a measuring frequency of 2000 Hz.
The ratio pyrometer PYROSPOT has a special optics with a rectangular measuring spot so that the falling glass gob will always pass the spot.
Both instruments operate in the near infrared and with temperature ranges from 600 °C to 1800 °C.

Our solution: Infrared line camera PYROLINE HS 640N, ratio pyrometer PYROSPOT DSR 54NCV



Wärmebild von Glastropfen

Control 7

Thermal imagers with special spectral range for the imaging and temperature measurement of the glass surface are used for the final inspection and control. Thereby the complete forming process can be checked and optimized.
Our solution: thermal imagers PYROVIEW and infrared line cameras PYROLINE

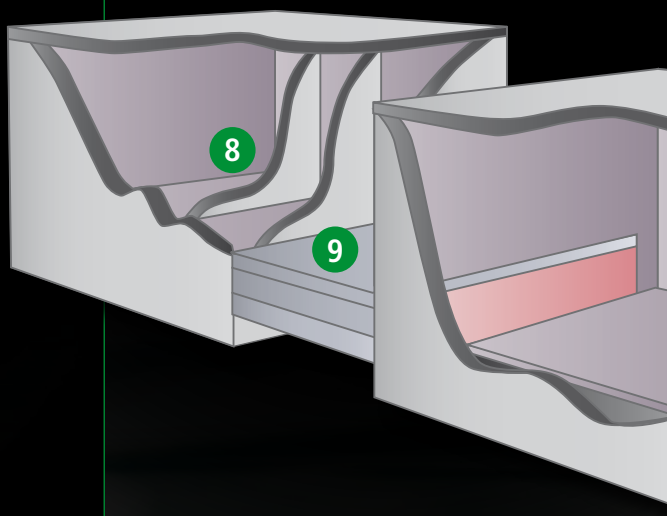
Successful process optimization with non-con

Pyrometers and thermal imagers for the production and processing of

Production of flat glass

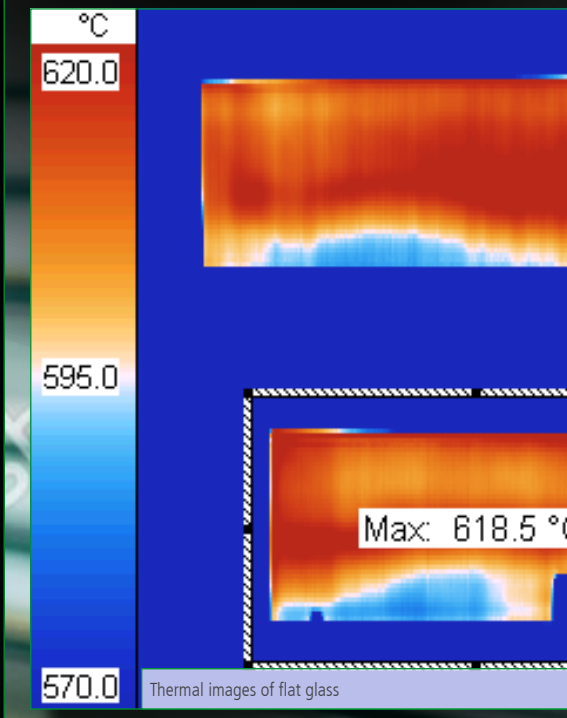
Which measuring tasks are usual?

- Glass temperature in the tank and canal
- Surface temperature measurement of the glass in the tin bath
- Surface temperature measurement in the cooling area: avoiding of mechanical tension
- Temperature distribution of the glass plate: ensuring an uniform temperature distribution
- Exit temperature behind the lehr (cooling zone): ensuring the correct temperature of the flat glass after the cooling



Why is the use of measuring technique so important here?

- ✓ Tank: controlling of the correct melting temperature
- ✓ Canal: controlling of the correct starting temperature, which is important for the complete further process, controlling of the flow speed via the viscosity of the melted glass
- ✓ Tin bath: observation of the correct temperature to secure a uniform glass plate
- ✓ Lehr (cooling zone): controlling of the cooling rate of the glass
- ✓ Flat Glass: observation of the temperature distribution by thermal visualization, readjustment of the temperature
- ✓ Lehr exit: controlling of the exit temperature of the flat glass to avoid tensions, cracks, or blister caused by temperature shock



tact temperature measurement
glass

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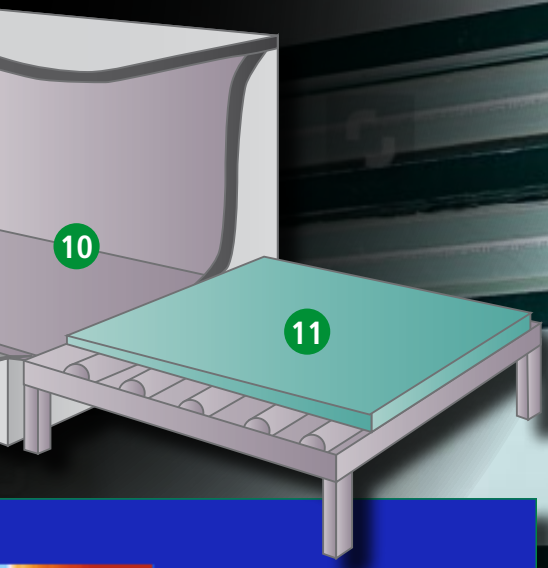

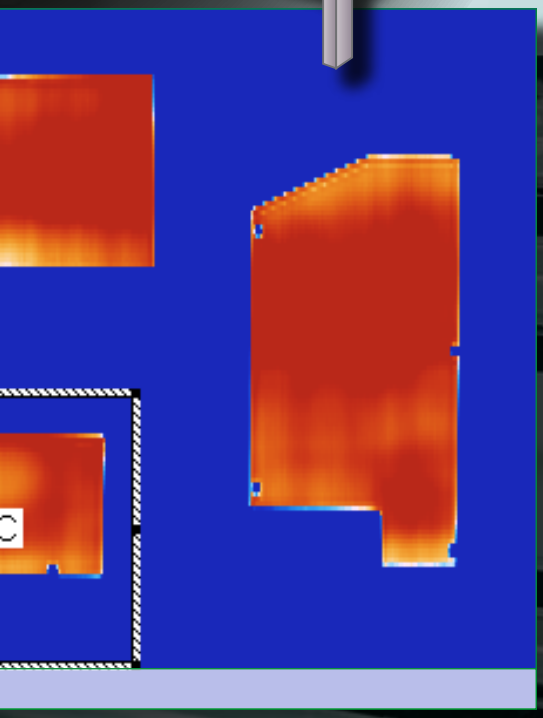

Glass tank and canal 8 9

To ensure the complete manufacturing process the temperature transitions and the temperature distribution from galls tank to canal must be controlled accurately. As the glass is only a few millimeter thick in the tin bath a pyrometer in special spectral range is necessary to measure the glass surface temperature accurately. This is done at a narrow band around of 5 micron.

Our solution: PYROSPOT DSF 30NG and DSF 34NG with inconel or ceramic sighting tube, pyrometers PYROSPOT DT 4xG and DT 5xG, infrared line cameras PYROLINE 128G and 256G and thermal imager PYROVIEW 640G

Lehr (cooling zone) 10

Pyrometers, line cameras or thermal imagers check the temperature distribution in the cooling zone to achieve a well-defined cooling rate of the glass plate to avoid tensions in the glass and preparation for further processing. The spectral range of 5 micron is required.

Our solution: Pyrometers PYROSPOT DT 4xG or DT 5xG, PYROSPOT DT 4xL or DT 5xL, PYROSPOT DY 10G, infrared line cameras PYROLINE 128G or 256G, PYROLINE 128L or 256L, thermal imagers PYROVIEW 640G, PYROVIEW 380L or 640L

Lehr exit (glass cutting) 11

A correct temperature measurement is required at the exit of the lehr for further processing of the glass. Also here pyrometers, line cameras and thermal imagers are used.

Our solution: Pyrometers PYROSPOT DT 4xL or DT 5xL, infrared line cameras PYROLINE 128L or 256L, thermal imagers PYROVIEW 380L or 640L

Infrared line camera PYROLINE, thermal imager PYROVIEW protection and pyrometer PYROSPOT Series 56

12

Technical glass, special glass

Different technical glass and special glass demand very special requirements for technique and quality. Specially modified instruments are used for such applications.

Ultratthin glass, (e.g. touch screens for smart phones) 12

✓ Measuring instrument: pyrometer PYROSPOT DT 54U

Technisches Glas 13

✓ Measuring instrument: pyrometer PYROSPOT DT 54G, DT 56G, DY 10G, DPE 10 MF

Glass wool 14

✓ Measuring instrument: infrared line camera PYROLINE and thermal imager PYROVIEW

Device overview

Pyrometers & thermal imagers for the glass industry

DIAS Infrared Systems

Our products are reliably available for the non-contact temperature measurement in glass production and glass processing:

„PYROINC" = furnace cameras (very robust IR cameras for extreme ambient conditions at furnaces

„PYROVIEW" = thermal imaging cameras (infrared image, temperature distribution, temperature profiles)

„PYROLINE" = infrared line cameras (temperature profiles, thermal images)

„PYROSPOT" = pyrometers/infrared thermometers (spot temperature measurement, temperature profiles)

Device	Measurement point	Spectral range	Temperature measurement range
Infrared line cameras PYROLINE			
PYROLINE HS 640N	5, 7, 14	0.8 µm to 1.1 µm	750 °C to 1500°C
PYROLINE 128G/256G	7, 9, 14	4.8 µm to 5.2 µm	250 °C to 1250 °C
Thermal imagers PYROVIEW and PYROINC			
PYROVIEW 512N	7, 14	0.8 µm to 1.1 µm	600 °C to 3000 °C
PYROVIEW 480N portable	2, 7, 14	0.8 µm to 1.1 µm	600 °C to 1500 °C
PYROINC 768N	1, 2, 3, 7	0.8 µm to 1.1 µm	600 °C to 1700 °C
PYROVIEW 320N	6, 7, 14	1.4 µm to 1.8 µm	300 °C to 1200 °C
PYROVIEW 640G	6, 7, 9, 14	4.8 µm to 5.2 µm	200 °C to 1250 °C
Pyrometers PYROSPOT			
PYROSPOT DSF 30NG, PYROSPOT DSF 34NG	1, 3, 4	0.8 µm to 1.1 µm	600 °C to 1800 °C
PYROSPOT DSR 54NCV	5	0.8 µm to 1.1 µm	500 °C to 3000 °C
PYROSPOT DS 80NV portable, PYROSPOT DG 80NV portable, PYROSPOT DSR 80NV portable	3	0.8 µm to 1.1 µm	200 °C to 2500 °C
PYROSPOT DS 44N, PYROSPOT DS 54N, PYROSPOT DS 56N	14	0.8 µm to 1.1 µm	550 °C to 3000 °C
PYROSPOT DG 44N, PYROSPOT DG 54N, PYROSPOT DG 56N	6, 14	1.4 µm to 1.8 µm	200 °C to 2500 °C
PYROSPOT DT 40F, PYROSPOT DT 44F	13	around 3.9 µm	300 °C to 2500 °C
PYROSPOT DPE 10MF	13	around 3.9 µm	50 °C to 2500 °C
PYROSPOT DT 4G, PYROSPOT DT 40G, PYROSPOT DT 42G, PYROSPOT DT 44G	9, 10	around 5.14 µm	100 °C to 2500 °C
PYROSPOT DT 54G, PYROSPOT DT 56G	6, 10	around 5.14 µm	100 °C to 2500 °C
PYROSPOT DY 10G	13	around 5.14 µm	100 °C to 2500 °C
PYROSPOT DT 54U	12	around 7.8 µm	300 °C to 1200 °C
PYROSPOT DT 4L, PYROSPOT DT 40L, PYROSPOT DT 42L, PYROSPOT DT 44L	10, 11	8 µm to 14 µm	–40 °C to 1000 °C
PYROSPOT DT 54L, PYROSPOT DR 56L	10, 11	8 µm to 14 µm	–40 °C to 1000 °C

We are certified for many years according to ISO 9001

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