

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

Non-contact 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 typical application areas 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?

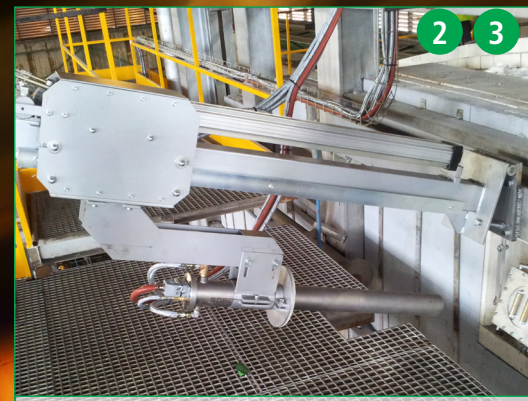
- ✓ Optimization of the melting process
- ✓ Quality improvement of the raw material → Quality improvement of the final product
- ✓ Extension of the lifetime of the refractory walls
- ✓ Increase in economy by reduction of wear and tear
- ✓ Recognition of danger caused by possible cracks or perforation 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

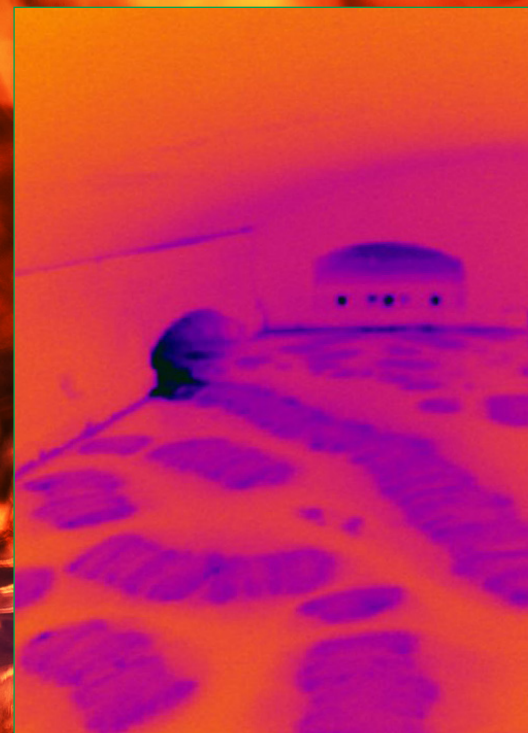
Stationary pyrometers with fiber optic cables and air purge units withstand ambient temperatures up to 250 °C at the glass tank. The optic head of the pyrometer will be fixed in a quick release mounting device with air purging and aims through a ceramic sighting tube at the glass. The tube will be lead 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 or Ethernet.

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

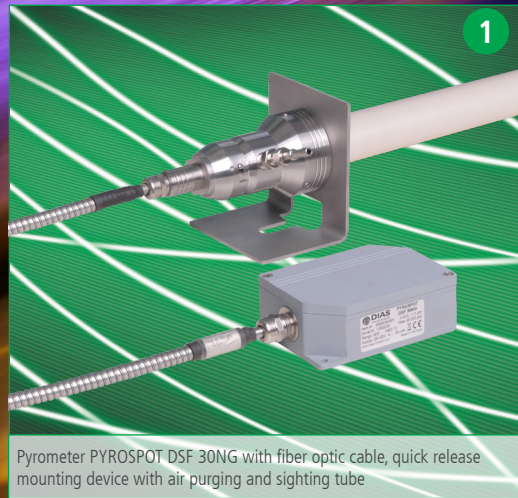


2 3

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



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



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 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 then displayed with the software PYROSOFT.

Our solution: Portable PYROSPOT Serie 80 portable

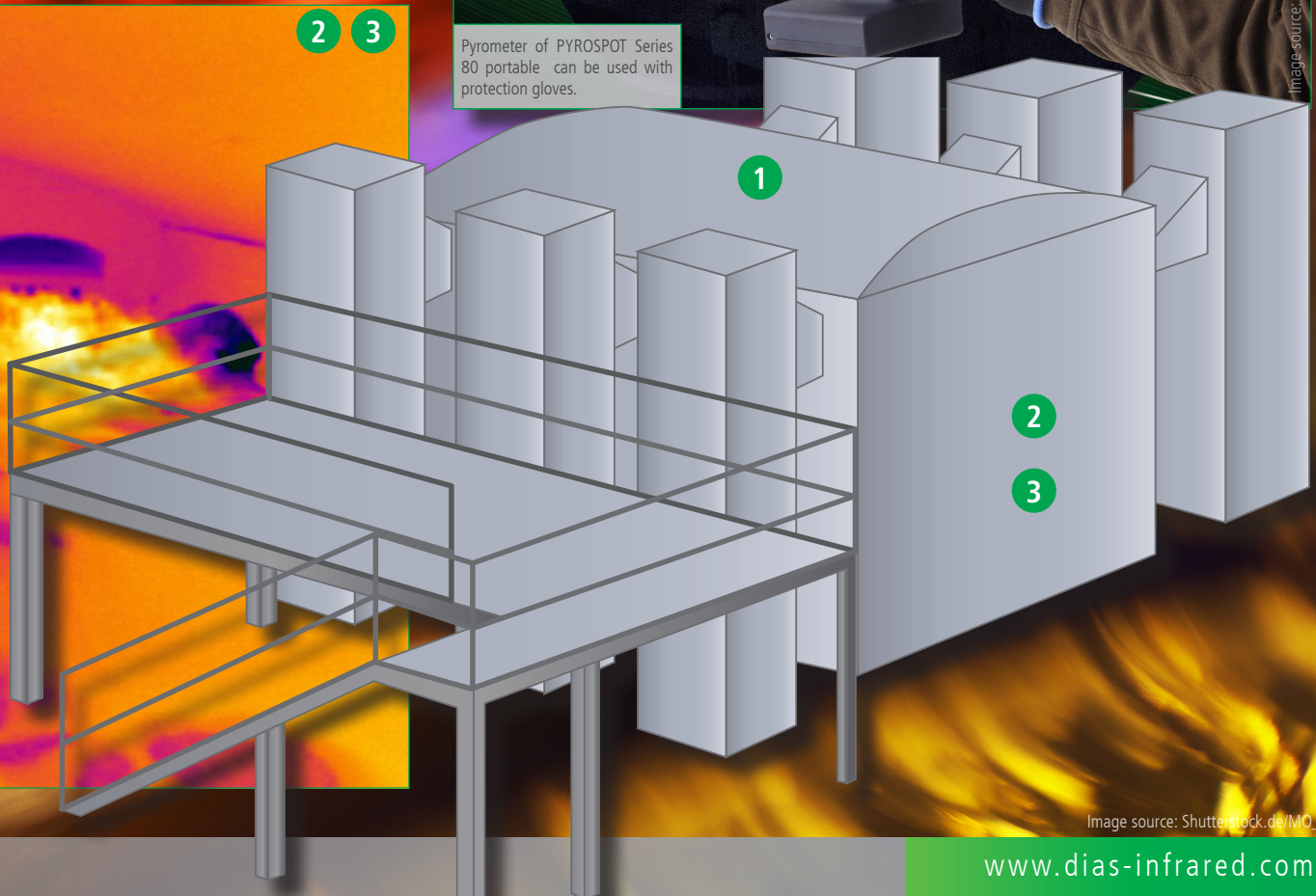
Glass melt and refractory walls

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



Successful process optimization with non-con

Pyrometers and thermal imagers for the production and processing of



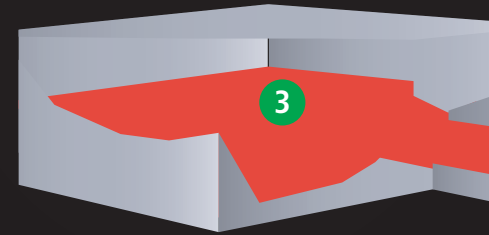
Production of container glass

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

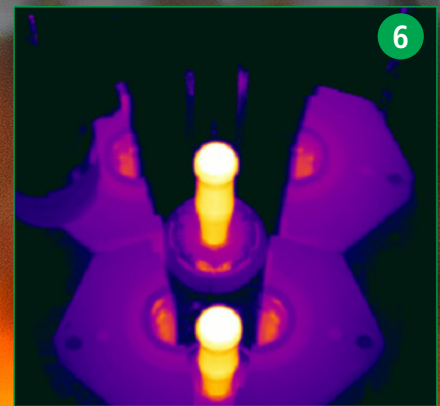


Working end

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**



6

Thermal image of glass molds

Forming

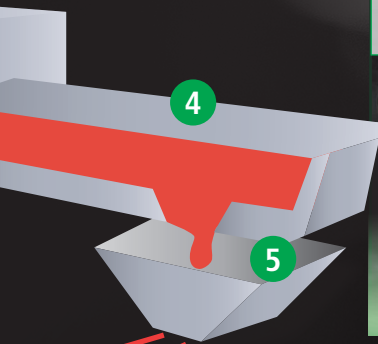
6

Pyrometers PYROSPOT and thermal imagers PYROVIEW are used for the measurement of the temperature or the temperature distribution of the glass mold.

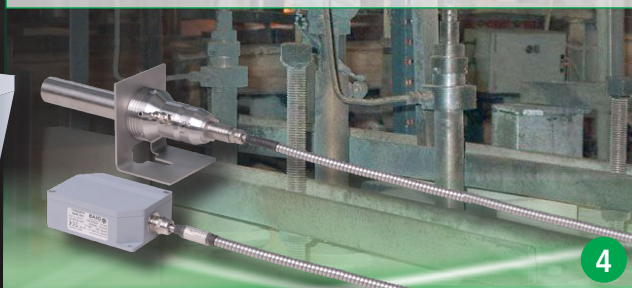
The controlling of the water and air flow will be optimized with the help of the temperature measurement. Thereby the homogeneity and wall thickness will be secured.

Our solution: thermal imagers **PYROVIEW 640G, PYROVIEW 320N**, pyrometers **PYROSPOT DG 4xN** or **DG 5xN** or **DG 80NV**

contact temperature measurement glass



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

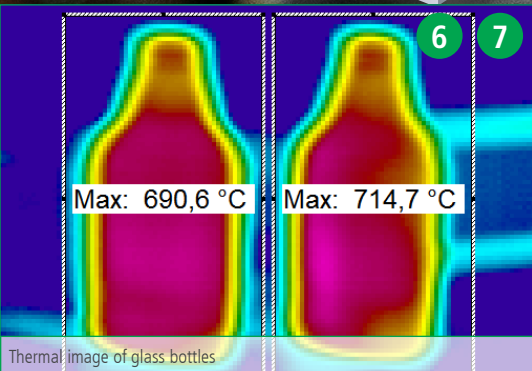
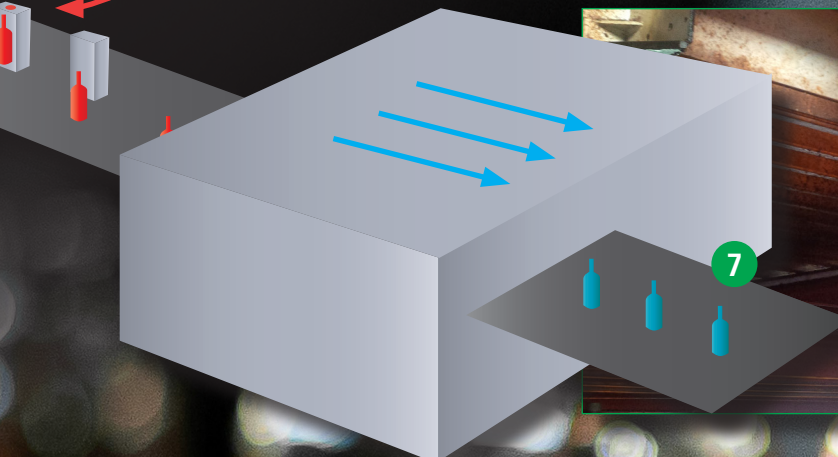


Forehearth and feeder

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 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



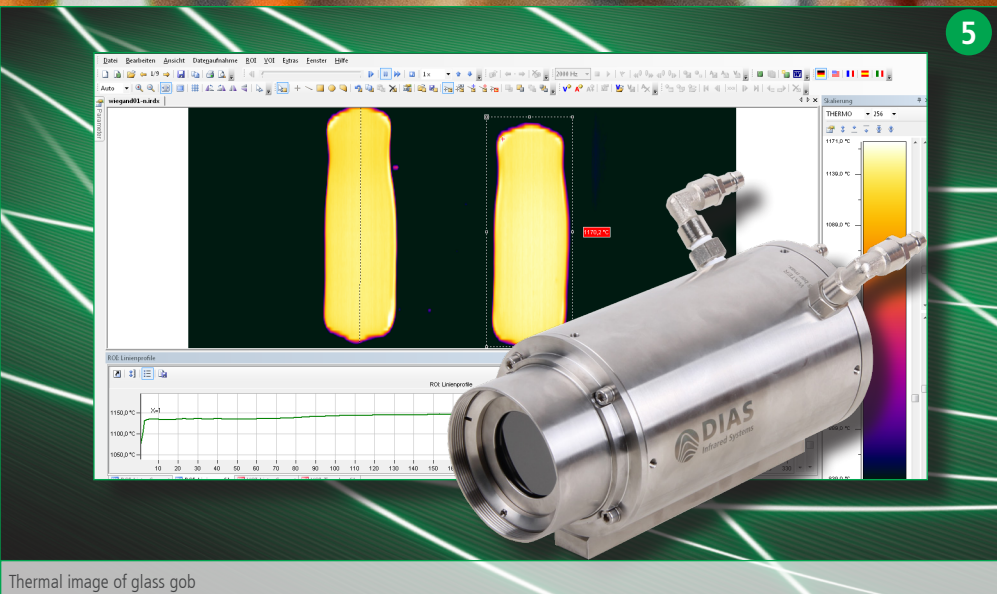
The pyrometer PYROSPOT DSR 54NCV is equipped with a color video module and a rectangular measuring spot.

Glass gob

5

An extremely short response time is required for the temperature measurement of the glass gob. The infrared line camera PYROLINE HS 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 700 °C to 1800 °C.

Our solution: Infrared line camera PYROLINE HS 512N, ratio pyrometer PYROSPOT DSR 54NCV



Thermal image of glass gob

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

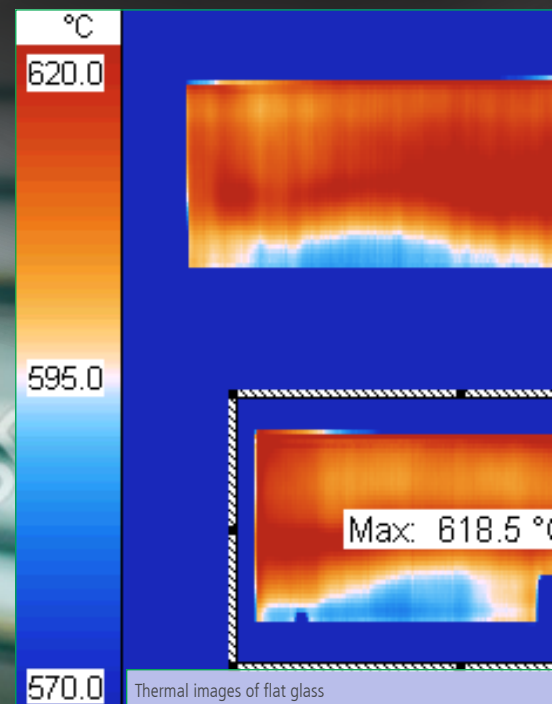
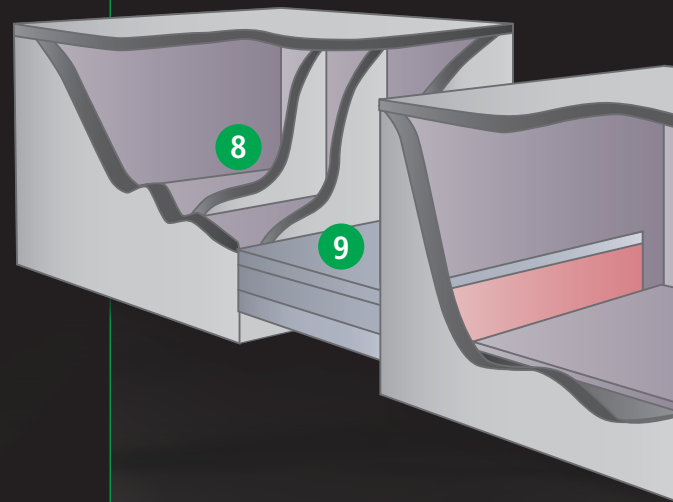
Production of flat glass

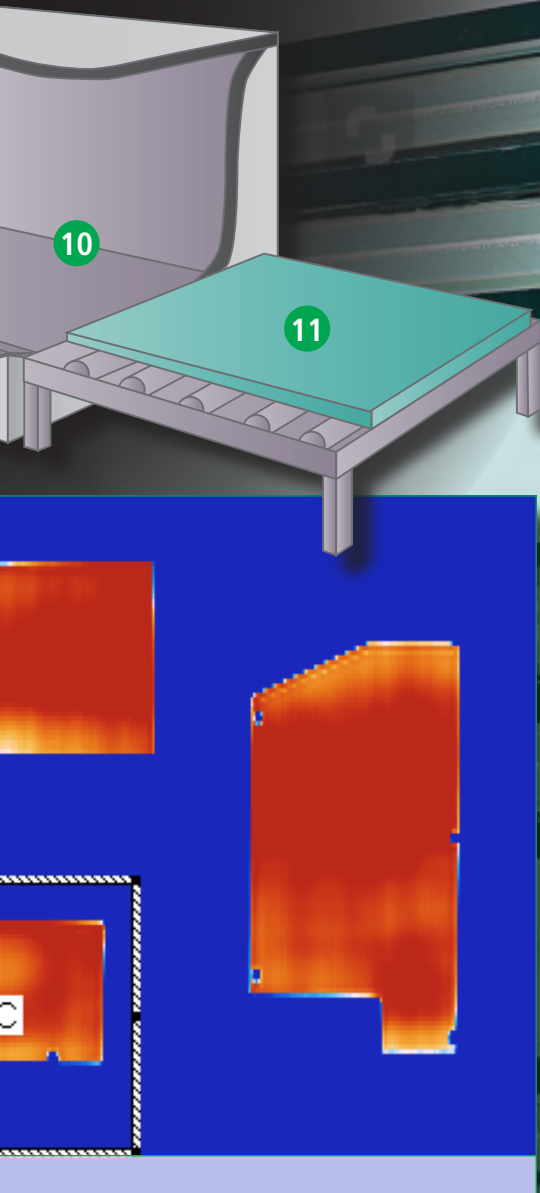
Which measuring tasks are usual?

- 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 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
- ✓ Cooling zone: controlling of the cooling rate of the glass
- ✓ Flat Glass: observation of the temperature distribution by thermal visualization, readjustment of the temperature
- ✓ Cooling zone exit: controlling of the exit temperature of the flat glass to avoid tensions, cracks, or blister caused by temperature shock





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 measurement device 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 DA 4xG, infrared line cameras PYROLINE 128G and 256G and thermal imager PYROVIEW 640G

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 DA 4xG, PYROSPOT DT 4xL, PYROSPOT DA 10G, infrared line cameras PYROLINE 128G or 256G, PYROLINE 128L or 256L, thermal imagers PYROVIEW 640G, PYROVIEW 380L or 640L

Cooling zone exit (glass cutting)

11

A correct temperature measurement is required at the exit of the cooling zone for further processing of the glass where pyrometers, line cameras and thermal imagers are also used.

Our solution: Pyrometers PYROSPOT DT 4xL, 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



14

Technical glass, special glass

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

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

✓ Measuring instrument: pyrometer PYROSPOT DT 40U

Technical glass 13

✓ Measuring instrument: pyrometer PYROSPOT DA 4xG, DA 4xF, DA 10G, DA 10MF and DA 10F

Glass wool 14

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

Device overview

Pyrometers & thermal imagers for the glass industry



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

PYROSPOT: pyrometers/infrared thermometers (spot temperature measurement, temperature profiles)

PYROVIEW: thermal imaging cameras (infrared image, temperature distribution, temperature profiles)

PYROINC: furnace cameras (very robust IR cameras for extreme ambient conditions at furnaces)

PYROLINE: infrared line cameras (temperature profiles, thermal images)

Device	Measurement point	Spectral range	Temperature measuring range
Pyrometers PYROSPOT			
PYROSPOT DSF 30NG, PYROSPOT DSF 34NG	1, 2, 3, 4, 8	0.8 µm to 1.1 µm	600 °C to 1800 °C
PYROSPOT DSR 54NCV	5	0.8 µm to 1.1 µm	700 °C to 1800 °C
PYROSPOT DS 80NV portable, PYROSPOT DG 80NV portable, PYROSPOT DSR 80NV portable	1,2,3,6	0.8 µm to 1.1 µm. 1.5 µm to 1.8 µm 0.7 µm to 1.1 µm	200 °C to 2500 °C
PYROSPOT DS 44N, PYROSPOT DS 47N, PYROSPOT DS 54N, PYROSPOT DS 55N, PYROSPOT DS 56N	14	0.8 µm to 1.1 µm	550 °C to 3000 °C
PYROSPOT DG 44N, PYROSPOT DG 47N PYROSPOT DG 54N, PYROSPOT DG 55N, PYROSPOT DG 56N	6	1.5 µm to 1.8 µm	200 °C to 2500 °C
PYROSPOT DT 40F, PYROSPOT DA 44F, PYROSPOT DA 47F	13	around 3.9 µm	100 °C to 2500 °C
PYROSPOT DA 10F, PYROSPOT DA 10MF	13	around 3.9 µm. 3.5 µm to 4.0 µm	75 °C to 2500 °C
PYROSPOT DT 4G, PYROSPOT DT 40G, PYROSPOT DT 42G, PYROSPOT DA 44G, PYROSPOT DA 47G	9, 10	around 5.14 µm	50 °C to 2500 °C
PYROSPOT DA 10G	10, 13	around 5.14 µm	75 °C to 2500 °C
PYROSPOT DT 40U	12	around 7.7 µm	300 °C to 1100 °C
PYROSPOT DT 4L, PYROSPOT DT 40L, PYROSPOT DT 42L, PYROSPOT DT 44L, PYROSPOT DT 47L	10, 11	8 µm to 14 µm	-40 °C to 1000 °C
Infrared cameras PYROVIEW and PYROINC			
PYROVIEW 512N, PYROVIEW 768N	7, 14	0.8 µm to 1.1 µm	600 °C to 3000 °C
PYROINC 1600N endoscope, PYROINC 1920N endoscope	1, 2, 3	0.8 µm to 0.9 µm	1100 °C to 1800 °C
PYROVIEW 320N	6, 7, 14	1.4 µm to 1.6 µm	300 °C to 1200 °C
PYROVIEW 640G	6, 7, 9, 14	4.8 µm to 5.2 µm	200 °C to 1250 °C
PYROVIEW 380L, PYROVIEW 640L	10, 11	8 µm to 14 µm	-20 °C to 500 °C
Infrared line cameras PYROLINE			
PYROLINE HS 512N	5, 7, 14	0.8 µm to 1.1 µm	650 °C to 3000°C
PYROLINE 128G/256G	7, 9, 14	4.8 µm to 5.2 µm	250 °C to 1250 °C
PYROLINE 128L/256L	7,10, 11	8 µm to 14 µm	50 °C to 800 °C

Technische Änderungen vorbehalten. Technical details are subject to change. 29.08.22



Phone: +49 351 896 74-0
 Fax: +49 351 896 74-99
 Email: info@dias-infrared.de
 Internet: www.dias-infrared.com

DIAS Infrared GmbH
 Pforzheimer Straße 21
 01189 Dresden
 Germany