

KELLER

*infrared
temperature
solutions*

ITS

No 1

in terms of
ACCURACY
RELIABILITY
INNOVATION



Measuring system CellaCombustion

Temperature measurement of sooty flames
and hot combustion gases in incineration plants

Measuring system CellaCombustion

The limit values for NO_x emissions are being lowered further and further by statutory provisions and licensing requirements. Furthermore, pressure is increasing on the operators of thermal waste incineration plants to reduce operating costs. At the same time efforts are made to increase the efficiency of the furnace and to minimize the wear of the furnace wall. For all optimization options, the correct measurement of the temperature in the combustion chamber represents a crucial measure. Nitrogen oxides arise from the nitrogen content in the waste and the high combustion temperatures, which are necessary for the destruction of the organic pollutants. With the aid of ammonia water as a reducing agent in the temperature range of 850 to 1050 °C the nitrogen oxides are converted to nitrogen (N₂) and water (H₂O).

Temperature is measured by means of thermocouples near the wall. However, it does not correspond to the furnace internal temperature, especially if the walls are equipped with heat exchangers. The inertia of the thermocouples causes a wide range of process control fluctuations. Furthermore, thermocouples present the physical problem of aging, that is to say a slowly increasing measurement uncertainty. They need to be replaced regularly, so consumption costs constantly arise.

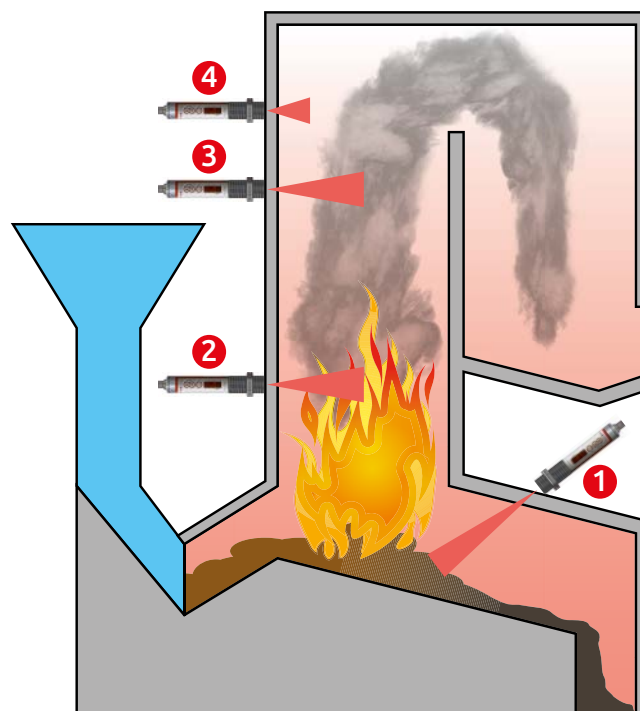
Therefore, the use of pyrometers which determine the temperature in milliseconds from the infrared radiation of the measurement object is considered advisable for this measurement task.

Since the combustion process is very complex, an appropriate pyrometer must be chosen for it. Different devices are used, depending on the measuring point. They differ in their spectral sensitivity and measuring method.

Measuring point Firebed 1

CellaTemp® PK 51 / CellaTemp® PA 13 / CellaPort PT 113

These devices were developed especially for temperature measurements in flame heated furnaces. Thanks to the selective spectral range of 3.9 µm, water vapour and CO₂ existing in the pyrometer's field of vision have no effect on the measuring results, even when measuring from large distances. This allows precise measurements through flames and combustion gases.



Measuring point Sooty flames 2

CellaCombustion PK 62 / PA 47 / PT 147

Special pyrometers are used for non-contact temperature measurement of sooty flames in coal-fired power stations and incineration plants. The measurement and signal processing, both based on the two-colour method, detect the heat radiation of the soot emitting particles of the flame in the near infrared range at two wavelengths. In order to correct the influence of the wavelength-dependent radiation properties of the soot particles and the optical density of flames, a special algorithm is used during the temperature determination. The flame temperature can be used to optimize burnout in the furnace operation, reduce pollutant emissions and minimize slagging of the combustion chamber and heat exchangers.

Measuring point hot combustion gases 3

CellaCombustion PK 73 / PA 18 / PT 118

The pyrometers measure at a specific wavelength at which the chemical components of the hot combustion gas have a high optical density. The measuring depth depends on the concentration of the components and the proportion of particles in the gas at the measuring point. The devices are used in large combustion plants such as thermal waste-disposal plants and coal power plants.

Measuring point Hot CO₂ gas 4

CellaCombustion PK 72 / PA 17 / PT 117

These devices carry out the measurement at a specific wavelength at which hot, carbonaceous gases have a high optical density and thus good radiative properties. The pyrometers are used to measure the exhaust gas temperature in gas-fired boilers and small combustion plants. The measuring depth depends on the CO₂ concentration of the hot gas.

Measuring system

Measuring system	Pyrometer	Model	Measuring range	Sighting device	Assembly combination
Firebed 1					
PK 51-K001	PK 51 AF 1	stationary*	400 - 1400 °C	–	PK 15-004
PK 51-K002					PK 15-005
PA 13-K001	PA 13 AF 1		500 - 1600 °C	Through-the-lens-sighting	PA 15-007
PA 13-K002	PA 13 AF 1/C			Video camera	PA 15-008
–	PT 113 AF 1	portable	500 - 1600 °C	Through-the-lens-sighting	–
Sooty flames 2					
PK 62-K001	PK 62 AF 1	stationary*	700 - 1700 °C	–	PK 15-004
PK 62-K002					PK 15-005
PA 47-K001	PA 47 AF 1			Through-the-lens-sighting	PA 15-007
PA 47-K002	PA 47 AF 1/C			Video camera	PA 15-008
–	PT 147 AF 1	portable		Through-the-lens-sighting	–
Hot combustion gases 3					
PK 73-K001	PK 73 AF 1	stationary*	500 - 2500 °C	–	PK 15-004
PK 73-K002					PK 15-005
PA 18-K001	PA 18 AF 1			Through-the-lens-sighting	PA 15-007
PA 18-K002	PA 18 AF 1/C			Video camera	PA 15-008
–	PT 118 AF 1	portable		Through-the-lens-sighting	–
Hot CO₂ gas 4					
PK 72-K001	PK 72 AF 1	stationary*	400 - 2000 °C	–	PK 15-004
PK 72-K002					PK 15-005
PA 17-K001	PA 17 AF 1			Through-the-lens-sighting	PA 15-007
PA 17-K002	PA 17 AF 1/C			Video camera	PA 15-008
–	PT 117 AF 1	portable		Through-the-lens-sighting	–

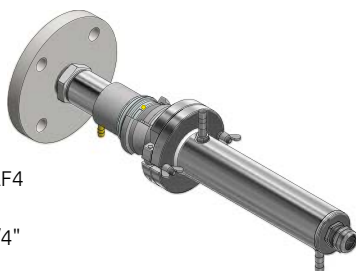
* The stationary measuring systems include a 5 meter long cable.

Accessories

Assembly combination PK 15-004

consisting of:

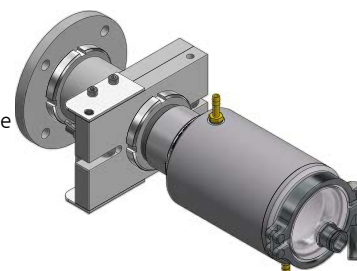
- Cooling jacket, closed
PK 01/C AF1
- Sapphire window
PS 15/I AF1
- Bayonet coupling PS 11/N AF4
- Air purge PS 01/A AF2
- Double nipple, conical R1.1/4"
- Flange DN50 G1.1/4"



Assembly combination PA 15-007

consisting of:

- Cooling jacket, closed
PA 20/M AF1
- Sapphire window with hinge
PZ 15/I AF2
- Air purge PZ 20/A
- Flange PZ 20/F



Assembly combination PK 15-005

consisting of:

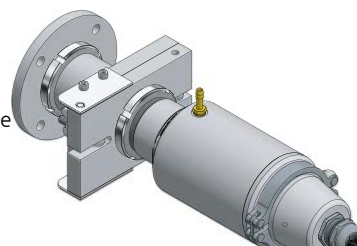
- Sapphire window
PS 15/I AF1
- Bayonet coupling
PS 11/N AF5
- Air purge PS 01/A AF1
- Shim Ø 35 mm
- Flange PK 20/F-70



Assembly combination PA 15-008

consisting of:

- Cooling jacket, closed
PA 20/M AF2
- Sapphire window with hinge
PZ 15/I AF2
- Air purge PZ 20/A
- Flange PZ 20/F





- Headquarters
- Sales and Service Center
- Sales abroad



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