

# KELLER

*infrared  
temperature  
solutions*

## ITS



**NO1** in terms of  
ACCURACY  
RELIABILITY  
INNOVATION



## Measuring system CellaCombustion

Non-contact temperature measurement of sooty flames  
and hot combustion gases in incineration plants

## Measuring system CellaCombustion

Within the framework of legal regulations and licensing requirements, the limit values for NO<sub>x</sub> emissions must be complied with. The 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. In the temperature range of 850 to 1050 °C the nitrogen oxides are converted to nitrogen (N<sub>2</sub>) and water (H<sub>2</sub>O).

Temperature is measured by means of thermocouples near the wall. The inertia of the thermocouples causes a wide range of process control fluctuations. Thermocouples age so that measurement errors increase over time. The thermocouples must therefore be replaced regularly. This results in permanent consumption costs. Therefore, the use of wear-free pyrometers which determine the temperature in milliseconds from the infrared radiation of the measurement object is considered advisable for this measurement task. Different devices are used, depending on the measuring point.

### Measuring point Firebed 1 7

#### CellaTemp® PK 51/CellaTemp® PX 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 CO<sub>2</sub> existing in the pyrometer's field of vision have no effect on the measuring results. This allows precise measurements of the firebed through flames and combustion gases.

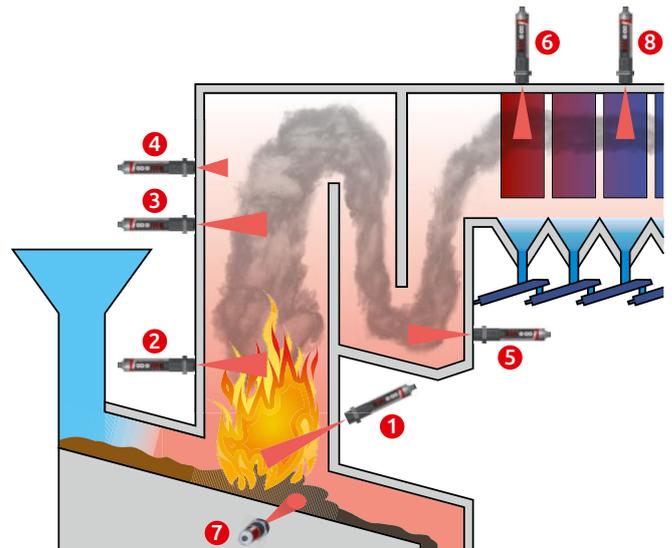
#### CellaTemp PK 68

If there are no flames in the pyrometer's field of view, the CellaTemp PK 68 ratio pyrometer is preferably used to measure the firebed. Due to the special measuring method, the pyrometer delivers reliable measured values even in the case of stronger visual obstruction due to soiling.

### Measuring point Sooty flames 2

#### CellaCombustion PK 62/PX 47/PT 147

Special pyrometers are used for non-contact temperature measurement of sooty flames in combustion 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 CO combustion gases 3

#### CellaCombustion PK 73 / PX 18 / PT 118

The devices detect the infrared radiation in a special wavelength range in which the carbon monoxide of the hot combustion gas has a high optical density. The pyrometer uses this to measure the temperature of the hot gases inside the boiler through the cold gas in the viewing opening and in the area close to the wall. The measuring depth depends on the concentration of the carbon monoxide and the proportion of particles in the gas at the measuring point. The devices are used in large combustion plants (> 4m) such as thermal waste-disposal plants and coal power plants.

### Measuring point hot CO<sub>2</sub> combustion gases 4

#### CellaCombustion PK 72/PK 74/PX 17 / PT 117

The devices detect the infrared radiation in a special wavelength range in which the Carbon dioxide of the hot combustion gas has a high optical density. The pyrometer uses this to measure the temperature of the hot gases inside the boiler through the cold gas in the viewing opening and in the area close to the wall. Eingesetzt werden die Pyrometer in gasbeheizten Kesseln und Kleinfeuerungsanlagen (<4 m). Die Sichttiefe ist von der Gastemperatur und der Konzentration des Kohlendioxids des heißen Gases abhängig.

### Measuring point hot exhaust gases 5

#### CellaCombustion PK 73 / PX 18 / PT 118

In order to keep the pollutant emission below the permissible limit values, the minimum temperature of the exhaust gas, after feeding combustion air, must be between 850 – 1100 °C, depending on its composition.

### Measuring point heat exchanger 6

#### CellaTemp PK 68

To ensure the efficiency of the heat exchanger of the firing system, the pipes of the heat exchanger are continuously monitored for their temperature. If the temperature exceeds a certain level due to increasing encrustation of the tubes, they must be cleaned. Pyrometers that work according to the two-colour measurement method

are used to measure the temperature. This method provides reliable measured values even under extreme conditions in the boiler with strongly changing particle content. Modern ratio pyrometers also have a function to monitor the reliability of the measurement and soiling of the viewing window.

## Measuring point Flue gas cleaning 8

### CellaCombustion PK 74

The type PK 74 is used to measure the temperature of colder, carbon dioxide-containing flue gases prior to flue gas cleaning.

## Measuring system

| Measuring system  | Pyrometer    | Model        | Measuring range | Sighting device           | Assembly combination |
|---|--------------|--------------|-----------------|---------------------------|----------------------|
| <b>Firebed <span style="color: red;">1 7</span></b>   |              |              |                 |                           |                      |
| PK 51-K001  | PK 51 BF 1   | stationary*  | 400 - 1400 °C   | -                         | PK 15-004            |
| PK 51-K003  |              |              |                 |                           | PK 15-009            |
| PK 68-K009  | PK 68 BF 1   |              | 550 - 1400 °C   |                           | PK 15-009            |
| PX 13-K001  | PX 13 AF 1   | portable     | 500 - 1600 °C   | Through-the-lens-sighting | PA 15-007            |
| PX 13-K002  | PX 13 AF 1/C |              |                 | Video camera              | PA 15-008            |
| -   | PT 113 AF 1  |              |                 | Through-the-lens-sighting | -                    |
| <b>Sooty flames <span style="color: red;">2</span></b>                                      |              |              |                 |                           |                      |
| PK 62-K001  | PK 62 BF 1   | stationary*  | 700 - 1700 °C   | -                         | PK 15-004            |
| PK 62-K003  |              |              |                 |                           | PK 15-009            |
| PX 47-K001  | PX 47 AF 1   |              |                 | Through-the-lens-sighting | PA 15-007            |
| PX 47-K002  | PX 47 AF 1/C | Video camera | PA 15-008       |                           |                      |
| -   | PT 147 AF 1  | portable     |                 | Through-the-lens-sighting | -                    |
| <b>Hot combustion gases with large measuring depth <span style="color: red;">3 5</span></b> |              |              |                 |                           |                      |
| PK 73-K001  | PK 73 BF 1   | stationary*  | 500 - 2500 °C   | -                         | PK 15-004            |
| PK 73-K003  |              |              |                 |                           | PK 15-009            |
| PX 18-K001  | PX 18 AF 1   |              |                 | Through-the-lens-sighting | PA 15-007            |
| PX 18-K002  | PX 18 AF 1/C | Video camera | PA 15-008       |                           |                      |
| -   | PT 118 AF 1  | portable     |                 | Through-the-lens-sighting | -                    |
| <b>Hot combustion gases with low measurement depth <span style="color: red;">4</span></b>   |              |              |                 |                           |                      |
| PK 72-K001  | PK 72 BF 1   | stationary*  | 400 - 2000 °C   | -                         | PK 15-004            |
| PK 72-K003  |              |              |                 |                           | PK 15-009            |
| PX 17-K001  | PX 17 AF 1   |              |                 | Through-the-lens-sighting | PA 15-007            |
| PX 17-K002  | PX 17 AF 1/C | Video camera | PA 15-008       |                           |                      |
| PK 74-K003  | PK 74 BF 1   | stationary*  | 250 - 1700 °C   | -                         | PK 15-011            |
| -   | PT 117 AF 1  | portable     | 400 - 2000 °C   | Through-the-lens-sighting | -                    |
| <b>Heat exchanger <span style="color: red;">6</span></b>                                    |              |              |                 |                           |                      |
| PK 68-K008  | PK 68 BF 1   | stationary*  | 550 - 1400 °C   | -                         | PK 15-009            |
| <b>Colder combustion gases containing carbon dioxide <span style="color: red;">8</span></b> |              |              |                 |                           |                      |
| PK 74-K003  | PK 74 BF 1   | stationary*  | 250 - 1700 °C   | -                         | PK 15-011            |

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

## Accessories

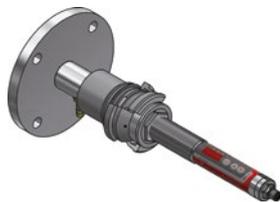
### Assembly combination PK 15-004 consisting of:

- 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 PK 15-009 consisting of:

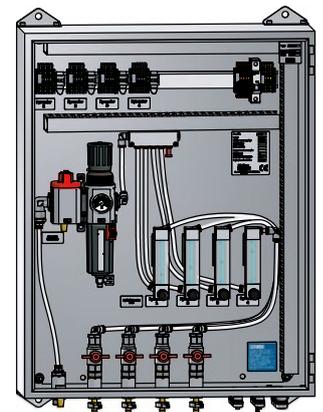
- Sapphire window PS 15/I AF1
- Bayonet coupling PS 11/N AF5
- Air purge PS 01/A AF1
- Shim Ø 35 mm
- Flange PK 20/F-130



### Connecting box

#### VP 20.08 & VP 20.09

- 24 VDC or 240 VAC power supply for up to four pyrometers
- Monitoring and individual adjustment of the purge air volume for up to four pyrometers
- According to IP 65 standard
- Optionally available with sighting window



# KELLER

Creating Solutions

infrared  
temperature  
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## ITS



- Headquarters
- Sales and Service Center
- Sales abroad



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