

# KELLER

*infrared  
temperature  
solutions*

# ITS

## N<sup>o</sup>1

in terms of  
ACCURACY  
RELIABILITY  
INNOVATION



## Application Bar mill

Optical temperature measurement  
in the rolling mill

### Optical temperature measurement in the bar mill

The increasing demands on the material properties of rolled goods become ever more demanding in terms of the production process and production parameters. For this purpose, very narrow tolerances of the rolling temperature are specified by the quality management. In order to be able to meet these high requirements, modern measuring methods and measuring systems adapted to the respective measuring points are absolutely necessary. Temperature-controlled rolling is the prerequisite for achieving the desired material properties while maximizing efficiency in bar production.

Pyrometers have proved their worth for measuring the temperature of the billets and bars. They measure the infrared radiation of the objects and calculate the temperature according to the Planck's law of radiation. The radiation is measured contactless from a safe distance without destroying the workpiece. The temperature is recorded in a few milliseconds and serves as a monitoring and control variable for the heating and rolling process.

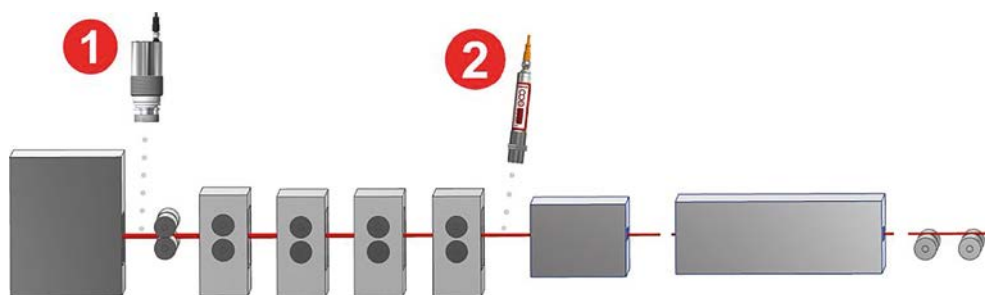
### Environmental and material-related interferences during infrared measurement

Since the pyrometric temperature measurement is an optical measuring method, the reliability of the measurement on the surface and the intermediate media in the visual field can be strongly influenced by dust, steam and smoke. Therefore, two-colour pyrometers are preferably used for measurement. Even if the optics are dirty or the infrared radiation in the field of view is weakened by up to 90 %, the two-colour measuring method still provides reliable measured values.

Scaling and oxidation on the surface of the rolled material have a considerable influence on the measuring accuracy of optical temperature measurement in rolling processes. Consequently, the emissivity, i.e. the radiation ability of the rolled material, changes extremely. However, a scaled surface has a higher emissivity compared to a scale-free surface. Depending on the absolute temperature values, a conventional pyrometer may give a higher reading than at the scale-free location, even at a lower temperature of the scale.



Scale and oxide significantly change the radiation properties



Temperature measuring points in the bar mill

In order to minimise the interfering influence of the scale and oxide on the measurement, the so-called CSD function (Clean Surface Detection) was developed. Based on the two-colour measuring method and a very short measuring time, the software algorithm of the CSD function in the pyrometer is able to filter out especially the measured values of the scale and oxide free surface. The higher the quality of the optics and the higher the optical resolution, i.e. the smaller the pyrometer's measuring field, the more likely the pyrometer is to detect small hot spots. While the rolled material passes the pyrometer, the true temperature at the clean spots is automatically measured and indicated by means of the CSD function.



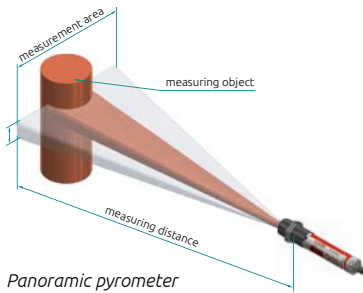
CellaTemp® PX 40 two-colour pyrometer with through-the-lens sighting and focusable optics

### Measuring point after the heating furnace 1

The CellaTemp® PX 40 two-colour pyrometer is used to measure the temperature of the billets at the outlet of the heating furnace. It has a high optical resolution to reliably detect the correct temperature at the scale and oxide free points of the passing billet from a distance of several metres in combination with the CSD function. For optical alignment, the device has a through-the-lens-sighting, a laser pilot light or a video camera. With the camera function, the measuring environment and measuring point can be checked at any time on the monitor in the control room. The measuring field marking, the measured temperature and the measuring point designation are displayed in the monitor image via the video signal. For connection to the plant control system, the pyrometer has a conventional analogue output and a modern IO-Link interface standardised according to IEC 61131-9. This allows the pyrometer to be integrated directly into fieldbus systems such as Profibus, Profinet, EtherCat or EtherNet/IP.



## Measuring point rolling stand and wire mesh 2



Panoramic pyrometer  
with rectangular measuring field

When measuring the temperature in the rolling stand, the rod can oscillate. The CellaTemp® PKL 63 two-colour pyrometer with panoramic optics is used to handle this demanding measuring task. The pyrometer has a rectangular measuring field. This is generated optically without moving components and is therefore wear-free. The two-colour measuring method allows a measurement object to be smaller than the measurement field. Within the measuring field of the panoramic optics, the measuring object may move as required. This ensures reliable temperature measurement of moving objects such as swinging rods. A panorama pyrometer is also much easier to align, especially on small measuring objects, thanks to the rectangular measuring field.

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The integrated LED pilot light is illuminated continuously and offers a high degree of operational safety due to the permanent control option. The special feature of the patented pilot light is that it indicates both the correct measuring distance and the exact position and actual size of the rectangular measuring field.

The CellaTemp® PKL 63 also has a digital IO-Link interface in parallel to the analogue output. This allows all devices used in the system to be easily networked and evaluated in addition to the measured values, diagnostic data and maintenance instructions.

## Mobile temperature measurement

The CellaPort PT 143 portable pyrometer is used for mobile control measurements. Thanks to the panoramic optics, alignment is precise and very easy to perform. With the ATD function (automatic temperature detection), the detection is completely automated. The user only needs to target the hot object. The measurement starts and ends automatically. As soon as a correct measurement value has been recorded, an acoustic signal sounds for a short moment. For further measuring analyses, CellaView software is available to record and analyse the various measurement data.

## Measuring systems

Measuring system	PX 40-K001	PKL 63-K002	PT 143 AF 1
Pyrometer	PX 40 AF 3/L	PKL 63 AF 2	PT 143 AF 1
Model	stationary	stationary	portable
Measuring range	650 – 1700 °C	650 – 1600 °C	650 – 1700 °C
Sighting aid	Laser pilot light	LED pilot light	Through-the-lens-sighting
Measuring spot	round	rectangular	rectangular
Spectral range	0.95 / 1.05 µm		
Mounting	PA 83-010	PK 01-007	-
Scope of delivery	Pyrometer Connecting cable VK 02/L AF 1 (5 m) Mounting PA 83-010	Pyrometer Connecting cable VK 02/L AF 1 (5 m) Mounting PK 01-007	Pyrometer Protective and carrying case Charger

## Mountings

### Mounting PA 83-010

consisting of:

- Dust stop PZ 10/T
- Clamping collar PZ 20/L AF2
- Cooling jacket, sealed PA 20/M AF1
- Intermediate tube PZ 20/C
- Air purge PZ 20/A AF1
- Bracket PB 08/Q AF1
- Flange PB 08/R AF1



### Mounting PK 01-007

consisting of:

- Supplementary tube ZA 01/Q-35 AF1
- Air purge PS 01/A AF1
- Clamping collar PS 11/K-35 AF2





- Headquarters
- Sales and Service Center
- Sales abroad



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