

Application report: Temperature Measurement of Filaments

Description of Application

The temperature of filaments within light bulbs, x-ray tubes, mass spectrographs and radiant tubes is an important indicator of process performance and effectiveness, whether to determine the filaments' radiation properties and degree of deterioration or to control the heating process.

Methods of the Past

Because of their inherent small size, in the past it was only possible to measure the temperature of filaments using filament pyrometers or modern intensity-comparison pyrometers. These methods require the user to view the colour or intensity of a calibrated reference wire and match the colour of this wire to that of the target filament. The clear disadvantages of this manual technique is that it is time-consuming and cannot be integrated into automated processes to regulate heat.



New Technique

To measure the temperature of such small target objects using a modern pyrometer, the pyrometer must have a



Pyrometer CellaTemp PZ 40 AF 94 with special lens

high-grade optical system, i.e. a high resolution lens and razor-sharp target imaging. In addition, such instruments benefit from broadband multiple-lens optical systems so that the detected target of the infrared measurement corresponds exactly to the viewed target spot.

An electronic pyrometer automatically detects the filament temperature and uses this data to regulate and control the heating process. The automatic recording of a temperature profile is useful in analysing deterioration or in investigating the radiation characteristics of various geometric shapes of filaments.

System solution

To perform this measurement, we used the CellaTemp PZ 40 AF 94 two-colour pyrometer with special optics together with an attached close-up lens. With this instrument assembly a target spot of \varnothing 0.4 – 0.5 mm was achieved at a measurement distance of 105 – 130 mm. Parallel to the two-colour measurement reading, a two-colour pyrometer can provide

temperature measurements of the spectral channels. Furthermore, the pyrometer was specially calibrated with a correction factor to allow for the infrared radiation properties of tungsten. The pyrometer can transmit the data directly to a PC by means of a digital interface. With the CellaMevis software the data can be visualised, analysed and systematically maintained.

The CellaCap Video System can be mounted to the backside of the pyrometer to enable the filament to be observed visually. This facilitates correct pyrometer alignment towards the target spot. For documentation and analysis purposes, the video signal can be recorded.

Instruments / accessories employed

- PZ 40 AF 94 (range 1000 – 3000 °C)
- connection cable VK 01/B
- PC-terminal box VK 01/C
- AC adapter plug
- cross clamp PZ 10/R
- camera module PZ 10/C AF 1
- grabber module
- CellaMevis Software