

# Diadem DS09 / DI13 / DI16

Transfer Standard Pyrometer



Digital transfer standard pyrometer for high-precision inspection of calibration sources

- Display resolution 0.01°
- Uncertainty only 0.15% of measured value + 1K
- Thermostatically controlled detector
- High-resolution A/D and D/A converter, directly digitized
- Analog output with 16-bit temperature resolution for high accuracy voltage output
- Consequential design configuration in separate galvanically isolated circuits
- Extremely long-term stable components
- High quality achromatic lenses

## Clever Temperature Transfer

A transfer standard pyrometer (TSP) is a highly accurate and long-term stable pyrometer that is used for comparative measurements between the TS pyrometer and the pyrometer to be tested. Subsequently, the TSP temperature is transferred to the pyrometer to be tested.

- The high temperature stability of the CS1500 enables reliable temperature detection with the TS pyrometer and the transfer to the test pyrometer
- Diadem pyrometers are traceable to the International Temperature Scale ITS 90. They are calibrated with PTB-calibrated reference devices and adjusted. They are also easily transportable and verifiable as opposed to calibration sources.

Of course, Diadem pyrometers can also be used for normal measurement tasks that require very low measurement uncertainty and high reproducibility.

## Features



### Serial Interface RS485

The pyrometer communicates with other digital devices such as a PLC, computer with free *SensorTools* software, or a self-written communication software program via serial interface. Measured values can be recorded and device parameters can be set directly on the device via *SensorTools* software or RS485 serial interface. Long distance transmission lines at high data rates can be realized and the devices can be addressed and used in bus operation. An interface converter RS485 to USB (accessory) allows for easy connection to a PC.

### Analog Output

The high-resolution 16-bit analog output supplies voltage of 0-10 V for external temperature evaluation; an example would be for connection of a temperature display.

### Ambient Temperature

The continuous temperature compensation keeps the measurements independent of ambient temperature variations.

## Sighting Method Selection

Sighting is used to pinpoint the center of the calibration source or the location of the measured target. The available options are:

- Thru-lens view finder
- Laser targeting light

The **view finder** provides upright imagery so that the target under measurement can be viewed visually. A circular reticle shows the measuring spot. This is recommended for glowing measurement objects, as a red laser is difficult to read. For devices with measuring range above 1800°C, the eyepiece can be darkened for eye protection.

**Laser targeting** uses a red laser dot showing the center of the measuring field. At the focus point, the laser dot is the smallest and provides the sharpest image, so that the measuring distance for the smallest spot size can be easily determined.



## Technical Data

| Model   | DS09   | DI13          | DI16                         |
|---|--|---------------|------------------------------|
| Temperature ranges  | 600 – 1500°C<br>700 – 1800°C   | 1000 – 3500°C | 250 – 1400°C<br>300 – 1500°C |
| Temp. sub ranges  | Any temperature sub-range adjustable within the temperature range (minimum span 50°C)  |               |                              |
| Spectral range  | 0.7–1.1 µm   | 1.27 µm       | 1.45–1.8 µm                  |
| Detector  | Silicon  | InGaAs        | InGaAs                       |
| Response time $t_{90}$  | 1 ms<br>(with dynamical adaptation at low signal levels), adjustable up to 10 s  |               |                              |
| Uncertainty<br>( $\epsilon = 1$ , $t_{90} = 1s$ , $T_A = 20-26^\circ C$ )   | Up to 1500°C: 0.15% of measured value in °C + 1K<br>Up to 2500°C: 0.2% of measured value in °C<br>Up to 3000°C: 0.3% of measured value in °C<br>Up to 3500°C: 0.4% of measured value in °C   |               |                              |
| Temperature coefficient   | 32 ppm/°C ambient temperature change in a range of 10 to 40°C  |               |                              |
| Repeatability<br>( $\epsilon = 1$ , $t_{90} = 1s$ , $T_A = 20-26^\circ C$ ) | 0.06% of measured value  |               |                              |
| Parameters  | Adjustable: temperature sub ranges, response time, peak picker, emissivity, device address, interface delay, baud rate.<br>Readable: device temperature  |               |                              |
| Emissivity $\epsilon$   | 0.050–1.000 (corresponds 5–100% in 0.1% steps)   |               |                              |
| Analog output   | 0–10 V DC, load > 100 kΩ<br>Resolution: 16 Bit, corresponds < 0.007% of temperature range  |               |                              |
| Serial interface  | RS485, half duplex 4.8 to 115.2 kBaud, resolution via interface: 0.01°C or 0.01°F  |               |                              |
| Peak picker   | Automatic hold mode or manual time settings to clear (reset) or external clear via configurable input  |               |                              |
| Display   | 10 digit LED display (5 mm high) for temperature in °C or °F, temperature above end of temp. range or below beginning of temp. range, heat-up time or active targeting light. Resolution 0.01°C or 0.01°F  |               |                              |
| Power requirement   | 24 V DC (18–30V DC), maximal 20 VA   |               |                              |
| Isolation   | Measurement circuit and analog output (circuit 1) are galvanically isolated from power supply.<br>Serial interface (circuit 2) is galvanically isolated from power supply.<br>Circuit 1 and circuit 2 galvanically isolated from each other.   |               |                              |
| Sightings<br>(optional)   | <ul style="list-style-type: none"> <li>■ Through lens sighting with adjustable attenuation filter for eye protection of bright targets &gt; 1800°C</li> <li>■ Laser targeting light (red, <math>\lambda = 650</math> nm, <math>P &lt; 1</math> mW, class II to IEC 60825-1)</li> </ul> |               |                              |
| Ambient temperature   | 0–50°C   |               |                              |
| Storage temperature   | -20–70°C   |               |                              |
| Relative humidity   | No condensing conditions   |               |                              |
| Housing / protection class  | Aluminum, IP65 to DIN 40 050 with connector  |               |                              |
| Weight  | 1300 g   |               |                              |
| CE label  | According to EU directives for electromagnetic immunity  |               |                              |

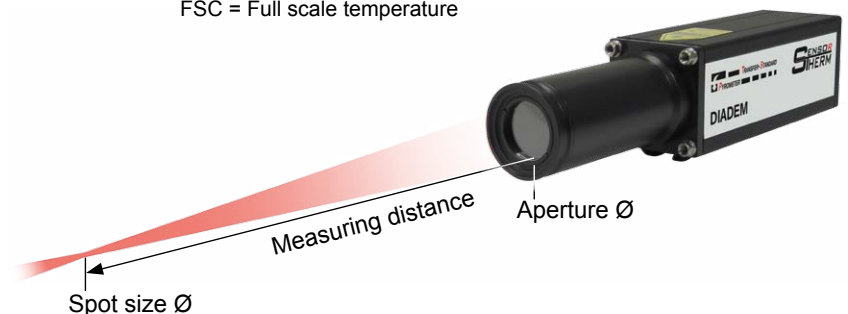
## Device versions / Optics

| Optics  | Measuring distance<br>a [mm] | Spot size diameter M [mm] |        |        | Aperture Ø<br>D [mm]                        |
|---------|------------------------------|---------------------------|--------|--------|---|
|         |                              | DS09                      | DI13   | DI16   |   |
| OD09-A0 | 600 mm                       | 1.1 mm                    | 1.4 mm | 1.6 mm | 15 mm (FSC < 1800°C)<br>8 mm (FSC ≥ 1800°C) |
| OD09-B0 | 800 mm                       | 1.5 mm                    | 1.9 mm | 2.2 mm |   |
| OD09-C0 | 1200 mm                      | 2.4 mm                    | 3.1 mm | 3.4 mm |   |

FSC = Full scale temperature

**Fixed focus optics** are factory set to a specific measurement distance to achieve the smallest possible spot size.

The pyrometer must be properly aligned to the measurement object to detect the temperature correctly. In the focus point of the lens (focal distance) the spot size diameter is smallest. Measurements out of the focus distance are also possible (in front of or behind the focus distance) to determine the average temperature of a bigger spot.



## Maintenance

Sensortherm pyrometers are designed to provide long and trouble-free operation. The selection of ultra-long-life components specifically for the Diadem models assures resilience and durability.

To comply with the narrow technical specifications, the pyrometer should be regularly checked by Sensortherm. Calibration and adjustment is recommended after 2 years.

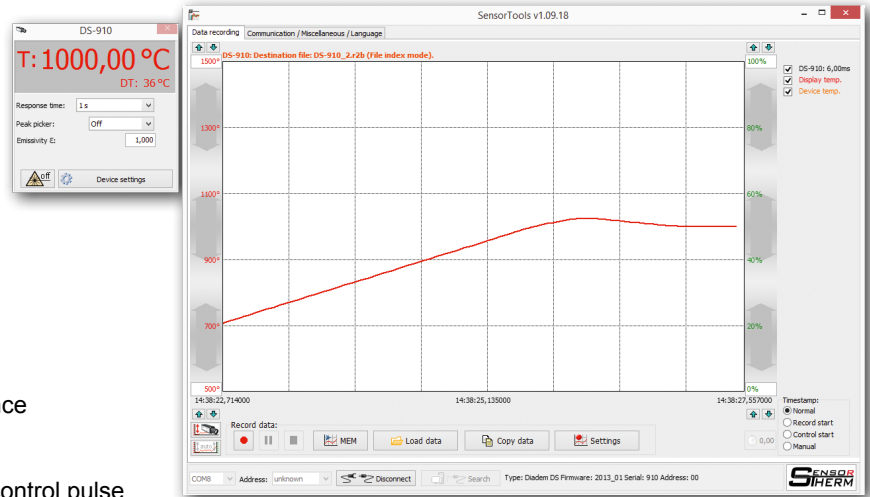
## Software *SensorTools*

The PC software *SensorTools* is our standard software for

- Measured value display
- Measured value recording
- Processing the results
- Display devices inside temperature
- Changing pyrometer parameters

Program functions:

- Change pyrometer parameters
- Playback of recorded data
- Adapted graphics mode to computer performance
- Export measured values in csv files
- Record interval setting for acceptable data size
- Back time recording of measured values after control pulse
- Devices with laser targeting light: switching on and off
- External start and stop of the recording measured values (via control input on the pyrometer)
- Create service files with settings for remote diagnostics

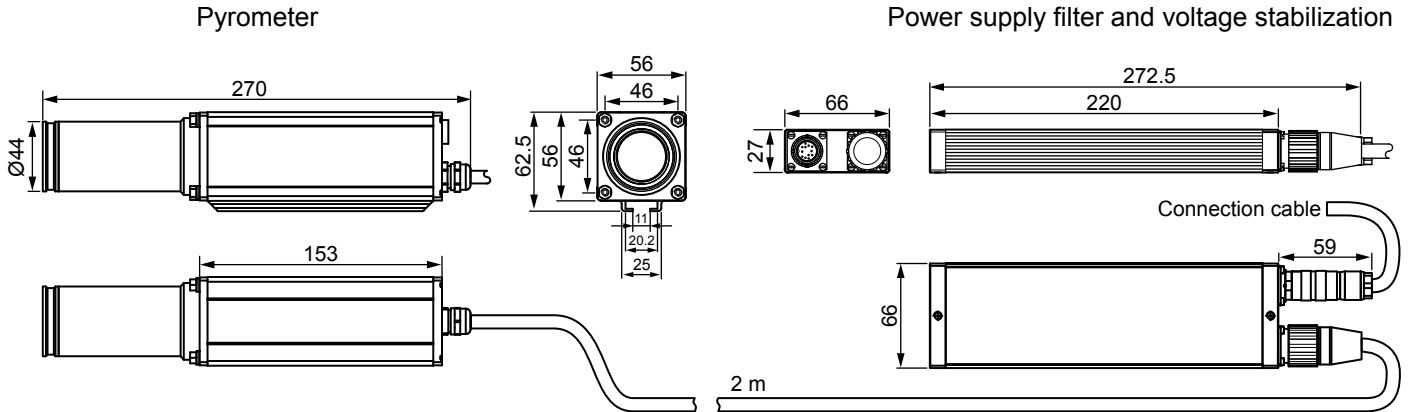


## Recommended Accessories

|             |   |
|-------------|---|
| HA10        | Mounting bracket  |
| KG20        | Aluminum cooling plate  |
| AL11 / AL43 | Connection cable (available in 5 m steps) with 12-pin right angle connector (AL11) / straight connector (AL43)                    |
| AV11 / AV43 | Connection cable, interface converter RS485↔USB, 12-pin right angle connector (AV11) / straight connector (AV43)                  |
| WB23-2-1-05 | Wiring-Box: ready-made connection kit with desktop power supply, 5 m pyrometer connection cable and interface converter RS485↔USB |
| NG12 / 15   | Power supply 24 VDC: DIN rail power supply 1.6 A / desktop power supply 2.5 A   |

## Dimensions

Dimensions in mm



## Reference Numbers

|             |  |
|-------------|--|
| Diadem DS09 | Specify with temperature range, sighting method and optics |
| Diadem DI13 | Specify with sighting method and optics                    |
| Diadem DI16 | Specify with temperature range, sighting method and optics |

**Note:** *SensorTools* software is included in scope of delivery,  
Connection cables are not included in scope of delivery and have to be ordered separately.

Sensortherm reserves the right to make changes in scope of technical progress or further developments.

Sensortherm-Datasheet\_Diadem\_DS09\_DI13\_DI16 (June 20, 2016)

### Sensortherm GmbH

Infrared Temperature Measurement and Control  
Hauptstr. 123 • D-65843 Sulzbach/Ts.  
Phone.: +49 6196 64065-80 • Fax: -89  
www.sensortherm.com • info@sensortherm.com

