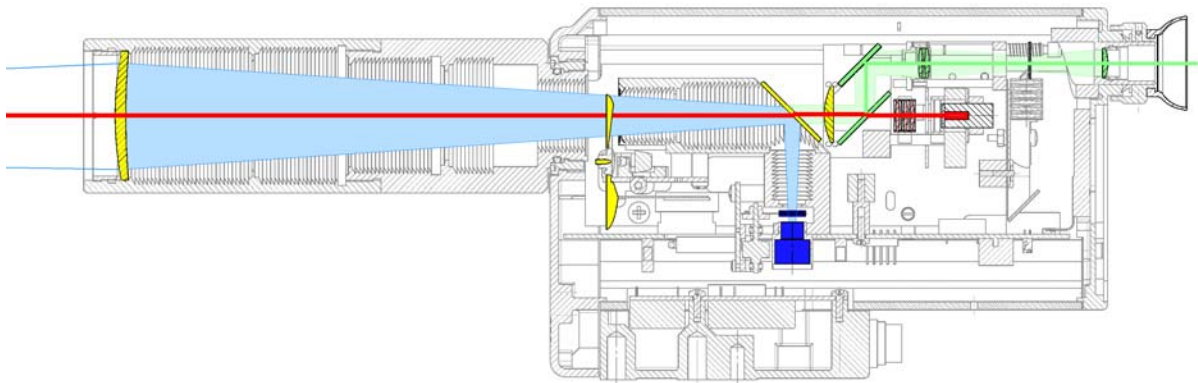


TRANSFER RADIATION THERMOMETER COVERING THE TEMPERATURE RANGE OF -50°C TO 1000°C



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General Information

The HEITRONICS Transfer Radiation Thermometer (TRT) is for use as a Transfer Standard from the highest level at NMI (National Metrological Institute), provides a high quality accurately transferring of temperatures between Black Body Radiators (BBRs), after the TRT is calibrated against fixed-point Black Body Radiators.

For convenient and scientific use at the TRT the user has access to the major features and values at the TRT by using PC-based software.

Temperature Ranges and Spectral Ranges

The HEITRONICS Transfer Radiation Thermometer covering the total temperature range of $-50\text{ }^{\circ}\text{C}$ to $1000\text{ }^{\circ}\text{C}$. It has 2 temperature ranges related to the spectral ranges. The low temperature range of $-50\text{ }^{\circ}\text{C}$ up to $300\text{ }^{\circ}\text{C}$ is related to the spectral response of $8 - 14\text{ }\mu\text{m}$. The medium temperature range from $150\text{ }^{\circ}\text{C}$ to $1000\text{ }^{\circ}\text{C}$ has a spectral response of $3.9\text{ }\mu\text{m}$. The spectral responses will be provided with the delivery and the manual of the instruments.

Field of Views and SSE

The TRT instrument has one objective with a ZnSe meniscus lens. The lens has a multi-layer anti reflection coating covering the range of $3 - 20\text{ }\mu\text{m}$. The nominal focus length is 390 mm . In respect to the refractive index of ZnSe it is shorter for the $3.9\text{ }\mu\text{m}$ band and longer for the $8 - 14\text{ }\mu\text{m}$ band. Typical diameter values are 5.6 and 7 mm in diameter. In terms of calibration it has been given respect to the Size of Source Effect (SSE) which describes the increase respectively decrease of the readout depends on the size of the Black Body. These values will be provided with the instrument and these are instrument related values. In terms of the use of the Transfer Radiation Thermometer for calibration with different diameters of sources the user might take respect to the different signal levels related to the diameter of the source. The Size of Source Effect is related to the spectral response and therefore differently for the two band.

NET_D and Response Times

The instrument provides a wide range of different response times that covers 30 ms up to 10 s . We recommend using the response time of 3 s for the measurement for a good NET_D. The given NET_D values are for the 2 sigma noise and are measured in front of stabilized Black Body Radiators (BBRs). As shorter the response times as higher the NET_D. Typically values are between 0.02 K to 0.06 K .



Environmental Compensation

The TRT is compensated for environmental influences. The operating temperature range for the laboratory is $23\text{ °C} \pm 3\text{ °C}$. The instrument has almost no drift influence for that temperature range.

The humidity compensation is not made but measured. There is almost no influence for the $3.9\text{ }\mu\text{m}$ band and a small influence on the $8 - 14\text{ }\mu\text{m}$ band. Unfortunately it is required to stabilize or have a humidity of $50\% \pm 20\%$ under laboratory condition when using the TRT for measurement.

Calibration

The TRT is adjusted by HEITRONICS in the local calibration laboratory especially in the terms of linearization for the radiation readout. It also provides standard laboratory calibration. This laboratory calibration is traceable to national German standard by using PT100 and thermocouple sensors.

For the highest level of accuracy we recommend to calibrate the unit against fix point Black Body Radiators by the National Metrological Institute by extra order from the customer. HEITRONICS can also offer calibration by the German NMI the 'Physikalisch Technische Bundesanstalt' (PTB) for extra charge. In case that the user of the HEITRONICS Transfer Radiation Thermometer will be an NMI by itself we suggest to make calibration and probably adjustment of the instrument by this NMI.

Basic Operation

The Transfer Radiation Thermometer of HEITRONICS is using the Chopped Radiation Method for high level of stability and accuracy. Therefore the built-in pyro-electric detector is modulated by a chopper wheel that provides alternately the measuring of the target against an internal reference. This detector signal is afterwards transferred into an arbitrary radiation output in respect to the reference temperature. From this radiation output the temperature is calculated by using a look-up-table with an accuracy of 0.02 °C .

The user has access to the following data by using the digital interface:

- Radiation proportional values by RAD-Command
- Temperature read out by TEMP-Command
- Detector output signal by DSIG-Command
- Reference temperature by REF-Command
- TRT temperature by HOU-Command.

The instrument also provides four analog outputs with a resolution of 12 Bit. These outputs can be used with the Span-function either as radiation proportional values or temperature values.

More details are found in the manual.



Data Access and Handling

For convenient data access the instrument has a display and keyboard operation for all settings and the display of the measured temperature. That also allows by the keyboard to change spectral band while the instrument is still operating. The most convenient way to use the instrument is by using the software package EASYTRT which provides all settings for the unit in terms of response time, temperature range for the analog output, use for radiation or temperature proportional analog output, laser marker switch on and off, the change of the spectral range without touching the instrument and provide the possibility to select the values that will be read out by the software. As standard this is set to temperature but in addition radiation detector signal, reference temperature and unit temperature can be chosen. This data will be stored in a software related file and can be exported to an ASCII-file. This file will record the number of the reading, the date, the time and the values. The program EASYTRT is part of the delivery.

Technical Specification

The table below is showing the general technical specification of the HEITRONICS TRT.

Individual data are the field of view which might slightly change from ± 10 mm in distance and will be determined after the instrument is built. All other specifications are valid for all TRTs.

A Transfer Radiation Thermometer Covering the Temperature Range of -50°C to 1000°C

Technical Specification

Technical Specification		
Value	Range I	Range II
Temperature measuring range	- 50 °C - 300 °C	150 °C - 1000 °C
Spectral sensitivity	8 - 14 µm	3.9 µm;
Field of view	7.4 @ 420 mm	5.8 @ 390 mm
Measuring field marking	Laser marker and through-the-lens-sighting	
Lens	S977 (Zinc Selenide)	
Detector	Pyroelectric	
Analog output (variable by programming)	0 ... 20 mA, 4 ... 20 mA, 0... 1 V, 0 ... 10 V The output signal is linearly to the measuring temperature or linearly to the measuring radiation, depends on setting	
Resolution of the analog output	12 bit	
Digital interface (RS232C)	9600 -115,200 bps	
Resolution of serial output	0.02 °C	
Response time (90 %) (variable by programming)	0.03, 0.1, 0.3, 1, 3 and 10 s	
Permissible ambient temperature	23 °C ± 3 °C	
Storage temperature	- 20 ... + 70 °C	
Operating voltages	24 VAC +/- 10 %, 48-400Hz, 22-30VDC	
Current consumption	200 mA RMS	
Housing dimensions	See above	
Weight	1.5 kg	
Type of protection	IP65 (NEMA4 equivalent)	