EXERGEN CORPORATION

Infrared Temperature Sensors

DATASHEET

D501-LN

Product Overview

The D501-LN features:

- Handheld Precision IR Thermometer
- High Accuracy
- High Speed
- NIST Traceable
- Interchangeability ± 1%
- Resolution 0.1°C
- Repeatability 0.1°C

Technical Data

Temperatue Range	-50 to 550°F (-45 to 287°C)
Field of View	1:1 (approx. 53°)
Operating Temperature	32 to 122°F (0 to 50°C)
Minimum Spot Size	.25" (6mm)
Spectral Response	2 to 20µm
Emissivity Error	± 1% maximum of difference between target temperature and instrument temperature when touching, for emissivity of 0.8 to 1.0
Linearity Error	± 1% (of reading)
Emissivity Adjustment	Automatic Emissivity Compensation System

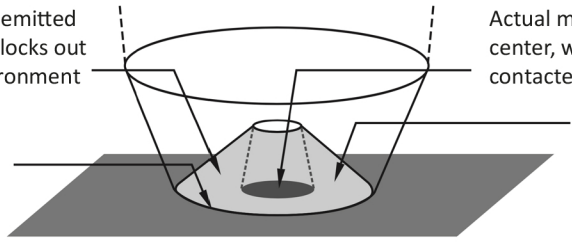
Dimensions	Main Case: 3 3/8" x 5" x 3/4" (8.5 x 12.5 x 2 cm)
Weight	8 oz. (0.23 kg)
Repeatability	± 0.1°F (0.1°C)
Resolution	0.1°F (0.1°C)
Calibration Requirement	None
Response time	80 msec
°F/°C Conversion	Yes
Power	9V Alkaline Battery
Length of Nose Piece	1.75" (44.45 mm)

Automatic Emissivity Compensation System

The D-Series is an entirely different type of instrument than conventional temperature measuring devices. Designed especially for the highest possible accuracy, it is the only infrared instrument, that can be certified with NIST-traceable accuracy on real surfaces of unknown emissivity, while remaining completely free of the contact errors and heat sinking errors of contact devices.

Recessed cone traps all emitted surface radiation, and blocks out any radiation from environment

Only a thin lip of material actually contacts the target, thus minimizing heat transfer



Actual measurement area is in the center, well away from the area contacted by the edge of the cone

Reflective cone automatically corrects for emissivity variations by creating an actual blackbody at the precise location of measurement

Figure 1. Unique Automatic Emissivity Compensation System (AECS) produces accurate temperatures everywhere the infrared probe is placed by creating its own blackbody

The sensing area of the D Scanner is equipped with a reflective surface to correct emissivity variations

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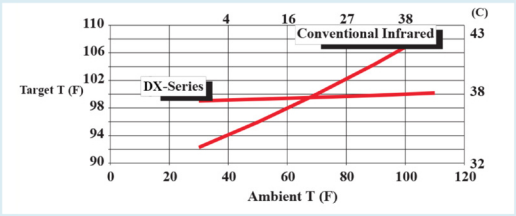
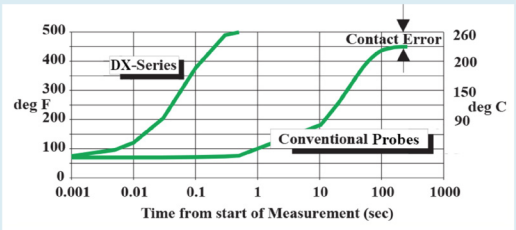
8 reasons the D-Series of handheld infrared scanners from EXERGEN are Superior to Conventional Devices

1. No emissivity	The true emissivity of a surface can never be accurately determined by conventional infrared devices. Without Exergen's Automatic Emissivity Compensation System, IR devices with a pre-set emissivity setting can only display an approximate temperature over their entire temperature range. The accuracy specifications given by most manufacturers are only for a "blackbody" calibration and do not hold outside laboratory conditions. Blackbody calibrations totally ignore emissivity shifts, ambient change effects on the target, and other phenomenon. Only Exergen's D-Series is unaffected by these distortions.
2. No emissivity shift errors	Even if an IR "gun" is set to the correct emissivity to read a surface accurately at a particular temperature, it does not mean that the gun will read the same target correctly at other temperatures. Emissivity of virtually all surfaces changes with temperature. A common assumption for conventional IR thermometry is that emissivity is constant with changes in target surface temperature. Real materials do not have these characterstics. The average value for non-metals for which the change in emissivity with respect to surface temperature has been reported is approximately - 3% per 100°C target temperature change.
3. No user adjustment errors	A setting of emissivity = 0.9 on an IR "gun" from one manufacturer will not necessarily match with that of a different gun from another manufacturer. No industry-wide standards exist for the precise use of emissivity in measurement. Therefore, Quality Assurance programs should not rely upon any instrument that allows users to alter the instrument settings and to let it display whatever the user whises.
4. No background reflection errors	Even if emissivity was constant at all temperatures (see Reason 2), there would still be errors induced by changing ambient temperatures. For example, with emissivity = 0.9, ambient reflections account for 10% of the signal that the IR gun sees. If the ambient temperature changes, the IR gun will display a different target temperature, even if the target remains at the same temperatures (see Figure 1).
	Figure 1: **Effect of Ambient Temperature on Target Reading for 100°F (38°C) Target with 0.8 Emissivity**  **D-Series scanners remain accurate even if the ambient temperature varies, while conventional IR devices have considerable inaccuracies.**
5. No contact errors	Thermocouples, RTDs, thermistors, and other contact devices only measure their own temperature. They do not measure surface temperature. Published "accuracy" specifications are for the probes only, not the surface they must measure. Users must guarantee that the probes are brought to the same temperature as the surface. Can you guarantee that your probes are brought to the same temperature as the targets to be measured?
6. No friction heating errors	For moving surfaces, a contact probe is prone to frictional heating. The size of the error depends on the roughness of the surface, the speed, the coating on the probe, and so on. It is impossible to control all the variables.
7. No heat sinking errors	For most non-metals, heat sinking errors can be quite large. The metal leads required on contact probes conduct heat faster than the target material can replace it, resulting in unknown and fairly sizeable errors. In general, the less thermally conductive the target material, the larger the heat sinking error with a contact probe.
8. No time-based errors	Contact temperature probes are slow. The temperature of a target can change more quickly than most probes can measure, resulting in errors in real-time measurement. (See Figure 2)
	Figure 2: **Time Comparison Between D-Series and Contact Thermocouple for measuring a 500°F (260°C) Surface**  **D-Series scanners measure surface temperature in a fraction of a second, while contact probes (thermocouples, RTD's, thermistors, etc.) require several minutes to achieve equilibrium. In addition, contacts always have a residual error due to imperfect heat transfer from the surface to the probe.**

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