

Handheld Precision IR Thermometers

The Only **Certified Accurate NIST Traceable**
*Infrared Temperature Instruments in the World**

High Accuracy ⇒ High Speed *in Your Process*



DX501

| Common Surface Temperature Measurement Errors | DX-Series IR Thermometers | Conventional IR "Point and Shoot" guns and probes, including laser-aimed units | Conventional contact probes, thermocouples, RTDs, thermistors |
|---|---------------------------|--|---|
| Pre-set emissivity errors | no effect | very sensitive | no effect |
| Emissivity shift errors | no effect | very sensitive | no effect |
| User adjustment errors | no effect | very sensitive | no effect |
| Background errors | no effect | very sensitive | no effect |
| Contact errors | no effect | no effect | very sensitive |
| Friction heating errors | no effect | no effect | very sensitive |
| Heat sinking errors | no effect | no effect | very sensitive |
| Time-based errors | no effect | no effect | very sensitive |

A must for
ISO 9001
ISO 9002
ISO 9003
Traceability Programs

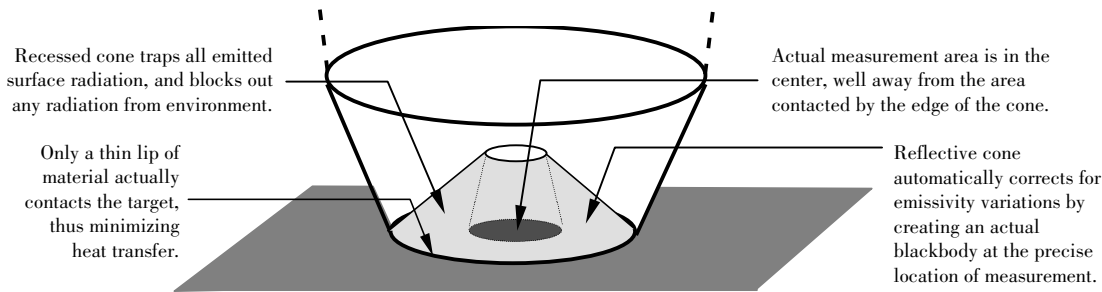
*All other IR devices are traceable only to blackbodies, with the exception of the Exergen D Series.

DX-Series Handheld Precision IR Thermometers

DX Infrared Scanners *from EXERGEN provide*

the Highest Accuracy available... anywhere!

The DX-Series is an entirely different type of instrument than conventional temperature measuring devices. Designed specifically for the highest possible accuracy, it is the only infrared instrument which 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.



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

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

8 reasons the DX Series of handheld infrared scanners

from EXERGEN are Superior to Conventional Devices

1. No emissivity errors

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 DX 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 this characteristic. The average value for non-metals for which the change in emissivity with respect to surface temperature has been reported is approximately - 2% per 100°F target temperature change (- 3% per 100°C).

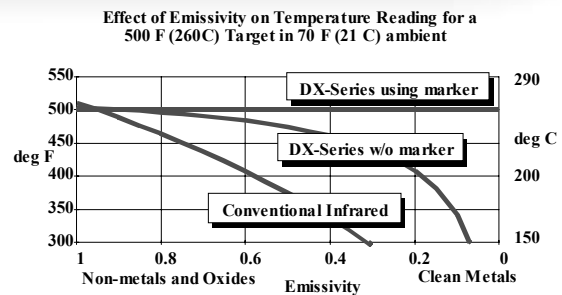
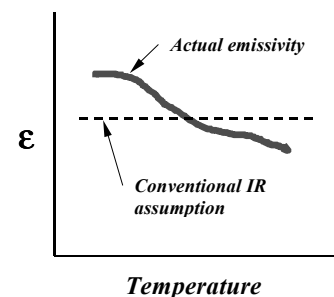


Figure 2. The DX-Series is accurate over a wide emissivity range, sufficient to include all non-metals. If a marker (or any other non-metal coating) is used, the DX-series is accurate on clean metals as well. Conventional IR devices have considerable inaccuracy on these surfaces.



High Accuracy \Rightarrow High Speed In Your Process

8 reasons the DX Series of handheld infrared scanners

from **EXERGEN** are Superior to Conventional Devices (continued)

3. No user adjustment errors

A setting of emissivity = 0.9 on an IR “gun” from one manufacturer will not necessarily match 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 wishes.

4. No background reflection errors

Even if emissivity were 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 will see. If the ambient temperature changes, the IR gun will display a different target temperature, even if the target remains at the same temperature. (See Figure 3.)

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 surfaces 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 is dependent 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 4.)

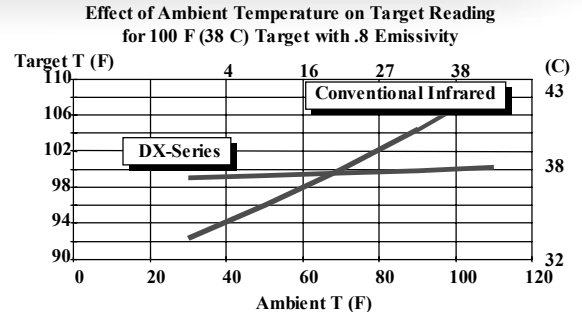


Figure 3. DX-Series scanners remain accurate even if the ambient temperature varies, while conventional IR devices have considerable inaccuracies.

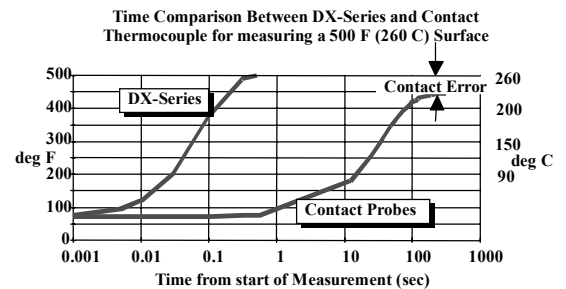
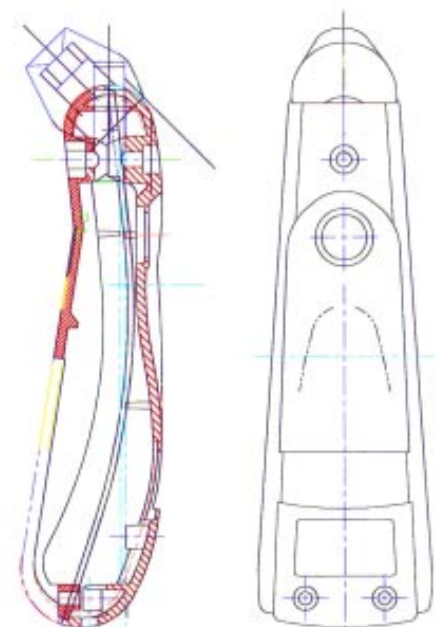


Figure 4. DX-Series scanners measure surface temperature in a fraction of a second, while contact probes (thermocouples, RTDs, thermistors, etc.) require several minutes to achieve equilibrium. In addition, contact probes always have a residual error due to imperfect heat transfer from the surface to the probe.

Schematic drawing of the DX501



DX-Series Handheld Precision IR Thermometers

Here Are Just a Few Examples of the Many

Real World Applications *of the* DX Scanner Series

The DX Infrared Thermometer is a necessary tool in any industry where accuracy in temperature measurement is required, particularly when the task speed or the process speed is important. This instrument will satisfy the most exacting demands, assuring quality, reliability and safety.



IRt/c Installation

Reference source to calibrate any IRt/c to a temperature readout/controller device



Product Inspection

Validate product temperature without shutting down the line.



Frozen Products

Measure frozen targets such as food, pharmaceutical and medical products.



Beverage Container

Use for inspection of food and beverages in the processing, packaging, grocery and restaurant industries.



NIST-Traceable Target

A standard calibration temperature reference, ISO certified



Engine Block

Use for engine tuning and maintenance in automotive and aerospace industries.



Electronics/Electrical

Inspection of components, switches, etc. for safety



Tire

Inspect tire temperature in production line for quality control. Also useful for driving performance.



Snow/Ice

Use for road conditioning, construction, ice rink inspections and avalanche warnings.



Water Pipe

Use for maintenance of HVAC, home improvement, fire safety, and energy conservation.



Rubber Roller

Measure roller, webs, ink and glue temperature in factory automation control processes.



Oven

Inspect product coming out of ovens, and also tune and calibrate ovens.

DX-Series Handheld Precision IR Thermometers

Specifications

| Model | DX501 | DX1001 | DX1201 | DX1601 |
|--------------------------------|--|-------------------------------|--------------------------------|--------------------------------|
| Temperature Range | -50 to 550 °F -45 to 287 °C | 0 to 1000 °F -18 to 540 °C | 186 to 1207 °F 86 to 653 °C | 186 to 1600 °F 86 to 871 °C |
| Emissivity Adjustment | Automatic Emissivity Compensation System | | | |
| Calibration Requirement | None | | | |
| Linearity Error (% of Reading) | - 1% | - 3% | - 3% | - 3% |
| Emissivity Error | - 1% maximum of difference between target temperature and instrument temperature when touching, for emissivity of 0.8 to 1.0 | | | |
| Repeatability | - 0.1°F (- 0.1°C) | | | |
| Resolution | 0.1°F (0.1°C) | | | |
| Response Time | approximately 0.1 seconds | | | |
| Field of View | 1:1 (approximately 53°) | | | |
| Minimum Spot Size | approximately 1/4 inch (6.4 mm) | | | |
| Spectral Sensitivity | 2 to 20 microns | | | |
| Digital Output* | RS232 (Optional) | | | |
| Analog Output** | 1 mV/°F (1 mV/°C) (Optional) | | | |
| °F/°C Conversion | Yes | | | |
| Remote Sensor*** | Available on all models; standard on DX1201 and 1601 | | | |
| Instrument Operating Temp. | 32 to 122 °F (0 to 50 °C) | | | |
| Battery Life | Approximately 5000 Readings from a 9V Alkaline Battery | | | |

*For Digital Output, specify "232" - example: DX501-232

**For Analog Output, specify "AO" - example: DX501-AO

***For Remote Sensor, specify "RS" - example: DX501-RS

Consult factory or distributor for special duty models with special accuracies and temperature ranges for OEM and volume applications.



DX501



DX501-RS



DX1001



**DX1201 & DX1601
Remote Sensor Head**

Also Manufactured by Exergen Industrial Division

Non-contact infrared temperature sensing:

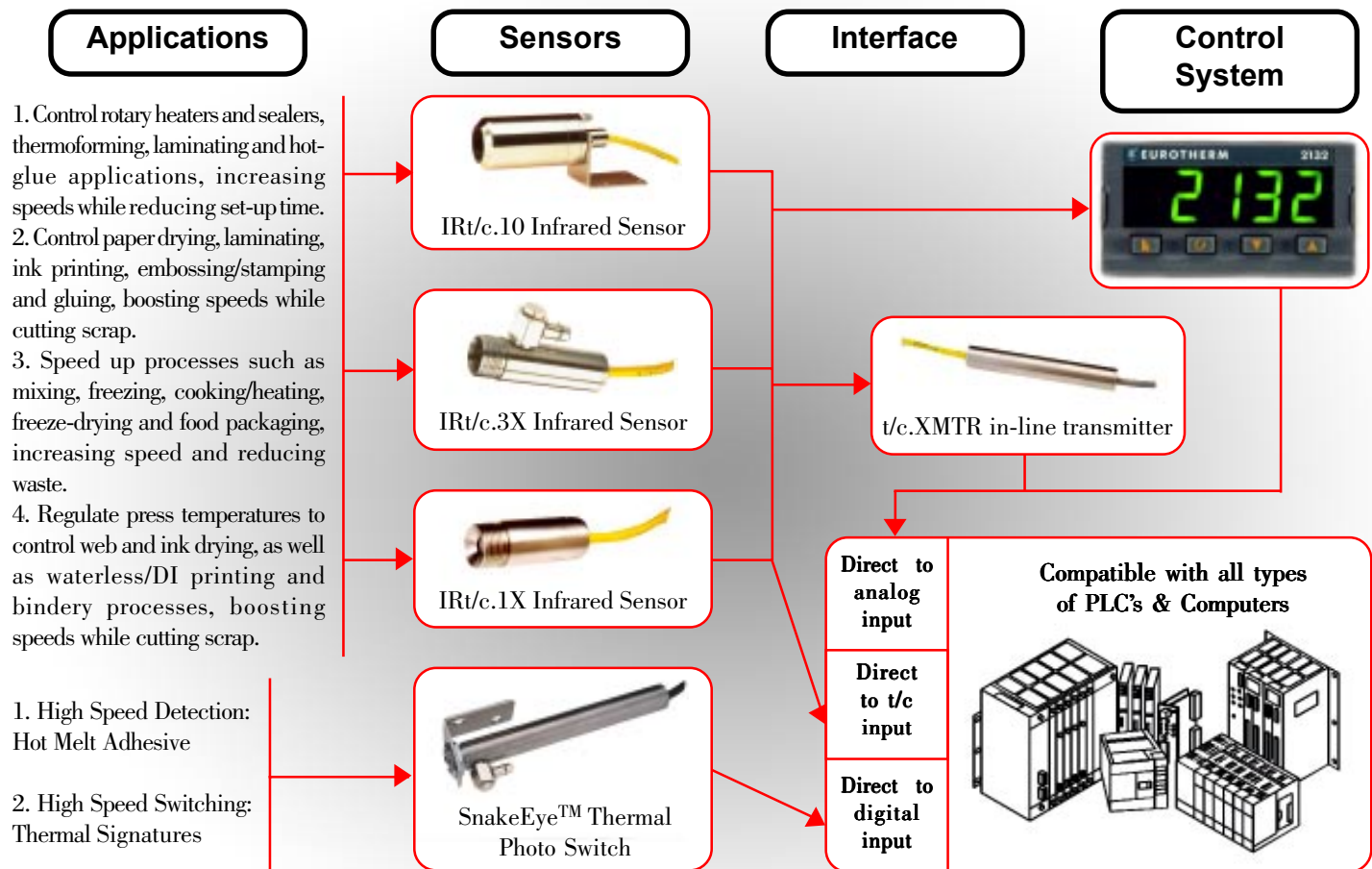
the right equipment for **High-Speed Production**

Exergen IRt/c™ non-contact temperature sensors can help push production line performance to record highs, with blazingly fast set-up and top production speed. IRt/c sensors measure the actual temperature and thermal signature of *every* product on the line with unprecedented speed and accuracy. That means reduced set-up time, less scrap, higher product quality, increased throughput and greater profitability, whatever the product or process.



Exergen IRt/c sensors are hermetically sealed and are available in a wide range of sizes and configurations. They are designed for years of trouble-free operation in the toughest of environments. IRt/c's need no power supply and can be connected to standard thermocouple devices to give an instant boost in speed.

Call 617.923.9900 now for more information and a free copy of *The IRt/c Book* (or download it from www.exergen.com) with case histories detailing increased production speeds, plus complete IRt/c specifications.



For more information on the innovative IRt/c approach to temperature measurement and control, contact your authorized **EXERGEN** Distributor or call **EXERGEN** at 617.923.9900. Be sure to ask for *The IRt/c Book: Handbook of Non-Contact Temperature Sensors* for complete specifications, operating principles, installation tips and application mini-case histories.

When your production speed is important, make sure we are there to help you.