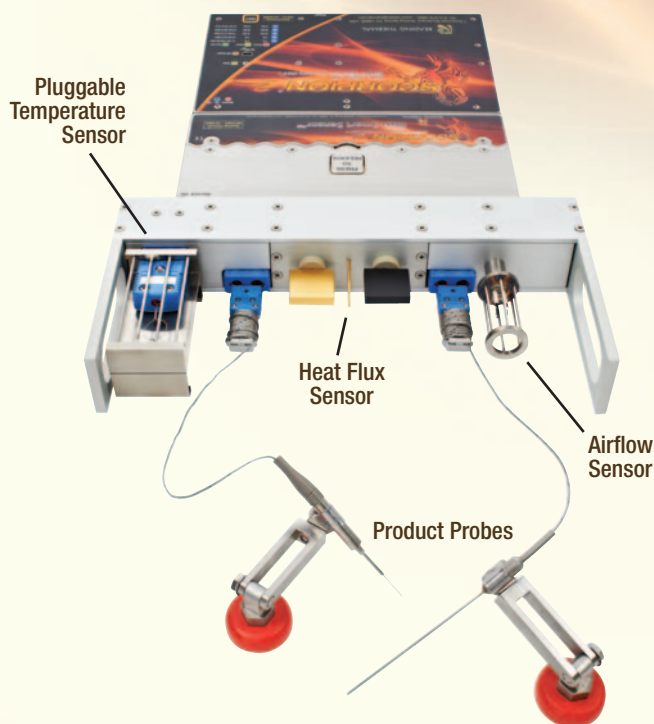
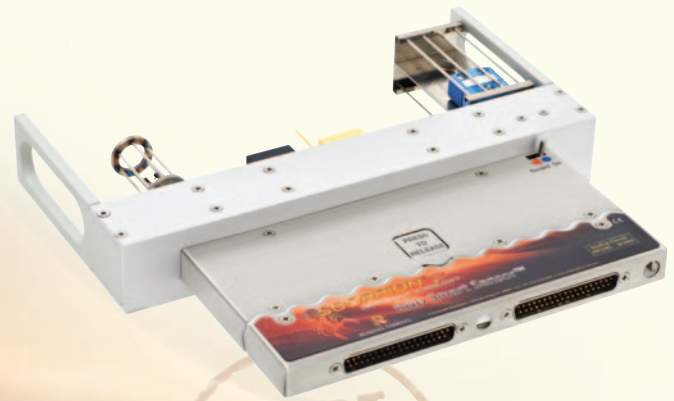




## R&D Smart Sensor™

**Faster ~ Easier ~ Smarter** the R&D Smart Sensor™ is a multi-element sensor enabling the collection of 4 key baking parameters in a single pass through a process. The user quickly gathers a complete set of profiles characterizing Environment Temp, Product Core Temp, Airflow and Energy Transfer. To collect this data using individual sensors would typically require four passes through an oven. With its very small footprint, only 254mm (10") wide and only 40mm (2") of headroom required, the R&D Smart Sensor™ will pass through virtually any process.



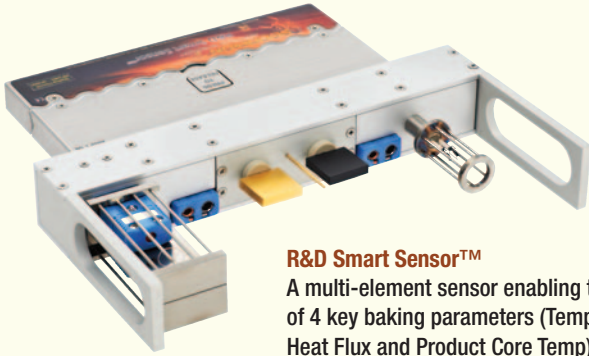
### The Process

The SCORPION® 2 R&D Smart Sensor is best used by the R&D/Corporate Engineer who needs the ability to quickly profile an oven. This person is **interested** in benchmarking an oven for R&D purposes, product development, product transfer and oven matching across the company's baking platforms. This person is **not interested** in studying side-to-side temperature or airflow variation which would require individual, much larger, temperature and air velocity sensor arrays to span the conveyor width.

**There are two types of Pluggable Temperature Sensors available:**

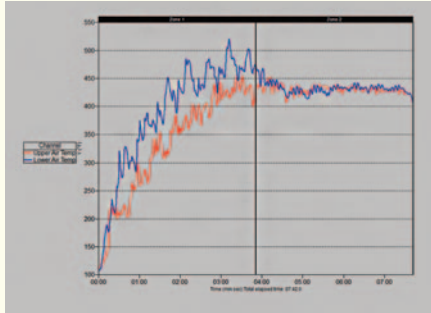
**Type A**, used on solid or tight mesh conveyors, is an Air/Band sensor designed to measure air temperature immediately above the conveyor, and surface temperature of the conveyor itself. *Type A can only be used with the THB40 & THB50 Thermal Barriers.*

**Type B**, used on open mesh conveyors, is an Air/Air sensor designed to measure upper air temperature immediately above the conveyor, and lower air temperature of the air rising through the conveyor. The upper and lower thermocouples are separated by a thin shield.

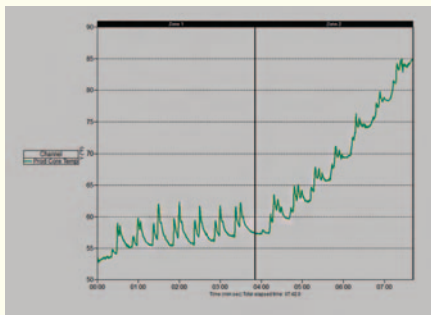


### R&D Smart Sensor™

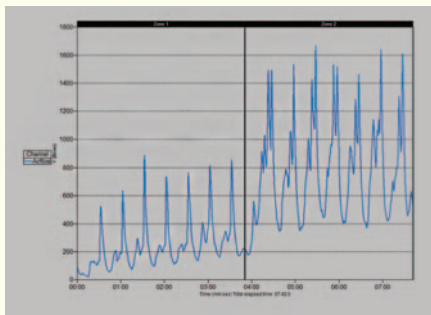
A multi-element sensor enabling the collection of 4 key baking parameters (Temp, Airflow, Heat Flux and Product Core Temp) in a single pass through an oven.



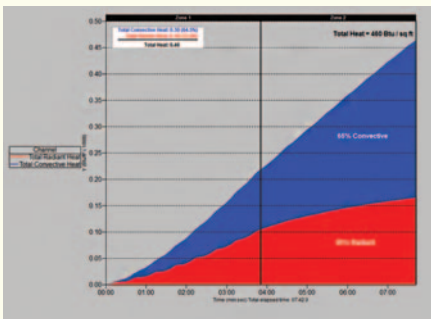
Upper & Lower Air Temperature



Product Core Temperature



Airflow



Energy Transfer

## Technical Summary\*:

### • Temperature Sensors

- Number of Temperature Sensor Elements (channels): 2
- Temperature Sensor Type: Type T thermocouple
- Response Time:  $t_{60} = 3.5\text{sec}$  in air at 1m/sec (200ft/min)
- Resolution:  $0.025^{\circ}\text{C}$  ( $0.045^{\circ}\text{F}$ )
- Accuracy:  $\pm 1.0^{\circ}\text{C}$  ( $\pm 1.8^{\circ}\text{F}$ )

### • Product Probe Interface

- Number of Product Probe Inputs (channels): 2
- Product Probe Sensor Type: Type T thermocouple (Type J&K optional)
- Resolution:  $0.025^{\circ}\text{C}$  ( $0.045^{\circ}\text{F}$ )
- Accuracy:  $\pm 1.0^{\circ}\text{C}$  ( $\pm 1.8^{\circ}\text{F}$ )



### • Air Velocity Sensor

- Number of Air Velocity Sensor Elements (channels): 1
- Sensor Type: Miniature hot-wire anemometer using Type T thermocouples
- Direction of measurement: Omnidirectional
- Range: 0-10 m/sec (0-1969 ft/min)
- Resolution:  $\sim 2\%$  of reading
- Accuracy:  $\pm 5\%$  of full scale
- Response Time:  $t_{60} = 3\text{sec}$  in air at 1 m/sec (200ft/min)

### • Heat Flux Sensor

- Number of Sensor elements: 3
- Number of Channels displayed: 8
- Radiation Heat Flux:  $Q_r$  (Btu/hr  $\text{ft}^2$  or  $\text{kW}/\text{m}^2$ )
- Convection Heat Flux:  $Q_c$  (Btu/hr  $\text{ft}^2$  or  $\text{kW}/\text{m}^2$ )
- Total Heat Flux:  $Q_t = Q_r + Q_c$  (Btu/hr  $\text{ft}^2$  or  $\text{kW}/\text{m}^2$ )
- Convective Heat Transfer Coefficient:  $H_c$  (Btu/hr  $\text{ft}^2$   $^{\circ}\text{F}$  or  $\text{kW}/\text{m}^2$   $^{\circ}\text{C}$ )
- Convective Air Temperature  $T_c$  ( $^{\circ}\text{F}$  or  $^{\circ}\text{C}$ )
- Perceived Radiation Temperature:  $T_r$  ( $^{\circ}\text{F}$  or  $^{\circ}\text{C}$ )
- Total Convective and Radiant Heat (Btu/ $\text{ft}^2$  or  $\text{kJ}/\text{m}^2$ )
- Sensor type: Type T thermocouples
- Accuracy:  $\pm 5\%$  of full scale
- Response Time:  $t_{60} = 3\text{sec}$  in air at 1 m/sec (200 ft/min)

### • System

- Operating Temperature Range:  $-50^{\circ}\text{C}$  ( $-58^{\circ}\text{F}$ ) to  $350^{\circ}\text{C}$  ( $662^{\circ}\text{F}$ )
- Battery running time: 7+ hrs.

\*Not rated for condensing environments



READING THERMAL