

PRO SERIES

NONCONTACT TEMPERATURE SENSORS












Williamson

Innovators in Noncontact Temperature Measurement

GREATER ACCURACY, RELIABILITY AND REPEATABILITY

The PRO Series is a complete line of noncontact temperature sensors that offers high-performance capabilities for both traditional and difficult applications.

OVERVIEW OF PRO SERIES MODELS			
Sensor Model	Type of Sighting	Type of Sensor	Temperature Limits
40	 Visual	 Single Wavelength	125 to 4500°F 50 to 2500°C
50	 Fiber Optics		
80	 Visual	 Dual Wavelength	400 to 4500°F 200 to 2500°C
90	 Fiber Optics		
100	 Visual	 Multi Wavelength	
200	 Fiber Optics		

From advanced programming capabilities to an intuitive operator interface, the PRO Series sensors deliver innovations throughout to provide greater accuracy and reliability in a system that is easy to use. Some important innovations include:

Greater Accuracy

- **An Advanced Signal Sampling and Processing System** provides exceptionally accurate temperature measurements over broad temperature ranges and under adverse conditions.
- **Advanced Emissivity Compensation** techniques, such as Programmable ESP Algorithms, enable 'Aim and Read' capabilities for difficult to measure applications.




Greater Reliability

- **Advanced System Diagnostics and Status Messages** provide simple troubleshooting capabilities and useful information to verify the sensor's operation.
- **Rugged, Corrosion Resistant NEMA4X (IP65) Enclosure** survives hostile operating conditions.
- **Industry Leading Signal Dilution Factors** allow the dual- and multi-wavelength sensors to tolerate small or wandering targets, misalignment, obstructions, partially filled fields-of-view, and dirty lenses.

Easy To Use

- **An Intuitive Text-Based User Interface** simplifies installation and operation. No manual or special training is required to translate obscure codes or make sensor adjustments.
- **Programmable Outputs and Alarms** can be configured with 5 measured parameters, enabling a variety of process monitoring and control capabilities.
- **Through the lens or fiber optic sighted sensors** provide flexible and precise alignment options. Optional aim light and laser aiming systems also enable easy alignment verification.
- **An Interchangeable Interface Module** simplifies the setup and field calibration of multiple or spare sensors.
- **Bi-directional serial communications** permit remote system monitoring and configuration.
- **A Wide Selection of Accessories** simplifies sensor installation and operation and provides additional protection in hostile operating environments.

PROGRAMMABLE OUTPUTS AND ALARMS

Parameter	Description
Filtered Temperature	The measured target temperature with all of the signal conditioning filters applied is used for process monitoring and control.
Unfiltered Temperature	The measured target temperature with no signal conditioning filters applied is useful for troubleshooting procedures. It can be viewed simultaneously with the filtered temperature without interrupting process control.
Ambient Temperature	The measured ambient temperature is used to verify that the sensor is within its specified ambient operating limit.
Signal Dilution ( and  only)	A measurement of the remaining signal dilution that a sensor can tolerate. For example, a signal dilution factor of 500:1 indicates that the sensor has 500 times more infrared signal than is required for a valid measurement. An abnormally low signal dilution value can indicate a dirty lens or misalignment.
Signal Strength / Emissivity ( only)	A measurement of signal strength received by the sensor can be used to monitor the following: <ul style="list-style-type: none"> • Abnormally low readings can indicate misalignment or an excessively dirty lens. • Abnormally high readings can indicate background reflection interference. • When the field of view is full, variations represent changes in the target's surface quality.

ADVANCED CAPABILITIES THAT ARE EASY TO USE

With integrated processing electronics, each PRO Series sensor can operate as a **stand-alone sensor** or in a **system configuration** with a remote interface module. Each configuration provides access to the text-based menu system and offers a variety of analog and digital outputs.

Access to the wide range of system functions is provided through a text-based menu system that is organized into a **display mode** and a **setup mode**. The display mode is used for normal operation and allows view only access to the system parameters. The setup mode enables total access to the system parameters with view and edit capabilities.



The **stand-alone configuration** is ideal when local temperature indication is not needed or already exists via a computer or PLC. The stand-alone sensor operates in an analog or a digital mode to satisfy a variety of installation requirements.



The **system configuration** with a remote 1/4 DIN **interface module** is ideal for installations that require a local temperature display or when multiple outputs and alarms are desired. This configuration includes an advanced user interface that provides the greatest flexibility to operate the system.

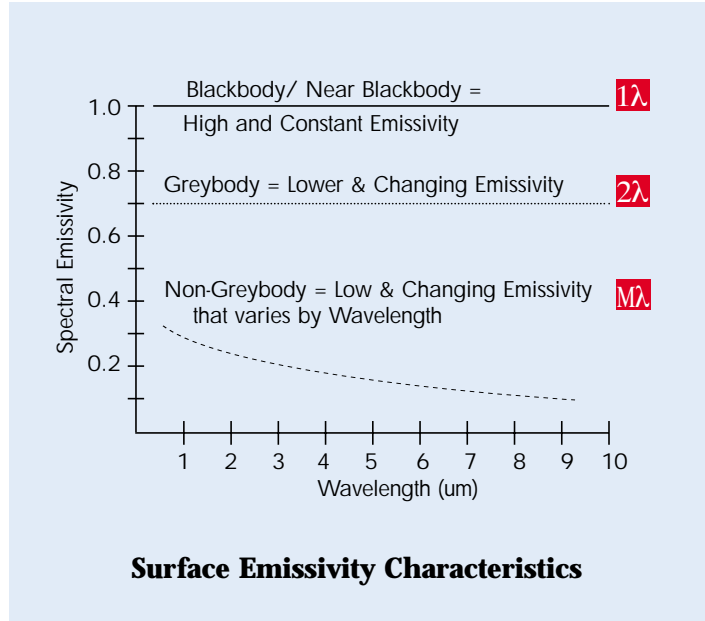
PRO SERIES MENU SYSTEM	
DISPLAY MODE: View Five Measured Parameters, Thirteen System Settings, and Four Status Messages	
Measured Parameters	<ul style="list-style-type: none"> • Filtered Target Temperature • Unfiltered Target Temperature • Ambient Temperature • Signal Dilution (2λ and $M\lambda$ only) • Signal Strength/Emissivity ($M\lambda$ only)
Status Messages	<ul style="list-style-type: none"> • Out of Temperature Range • High Ambient Warning • Check Sensor Cable • Aiming System Status
SETUP MODE: View and Edit all System Parameters	
Main Menu	Description
Signal Conditioning	<ul style="list-style-type: none"> • Average Time • Peak Hold Delay • Temperature Scale ($^{\circ}\text{F}/^{\circ}\text{C}$) • Emissivity / e-slope / ESP Offset • ESP Selection ($M\lambda$ only)
System Specifications	14 Menu Items Provide Detailed Sensor Specifications and Calibration History
Configure Outputs	<ul style="list-style-type: none"> • Select Measured Parameters • Select Scale (4-20mA or 0-20mA) • Configure Output Range
Configure Inputs	<ul style="list-style-type: none"> • Select Input Parameter (Emissivity, e-Slope, ESP Offset, Alarm Set Point) • Select Scale (4-20mA or 0-20mA) • Remote Peak Hold Reset • Remote Sample and Hold
Configure Alarms	<ul style="list-style-type: none"> • Select Measured Parameter • Select Set Point Value
Diagnostics	<ul style="list-style-type: none"> • System Test • Analog Output Test • Alarm Test • Menu Access

A SIMPLE SOLUTION TO COMPLEX PROBLEMS

Noncontact temperature sensors measure the amount of infrared energy that is emitted from an object's surface and convert that signal into a temperature value. Many factors affect a sensor's measurement accuracy. One important consideration to sensor selection is the emissivity characteristics of the measured surface.

Emissivity is a technical term used to quantify the amount of energy emitted from a surface relative to its theoretical maximum for a given temperature. In general, most applications can use a single-wavelength sensor because most materials exhibit a high and constant emissivity. However, for accurate and reliable measurements on most metal applications, where the surface emissivity is low or can vary, the dual and multi-wavelength sensors are recommended.

The PRO Series offers a complete selection of sensors to satisfy applications with various emissivity requirements. The table below provides some guidelines to help select the most appropriate sensor for each application.



Surface Emissivity Characteristics

SENSOR SELECTION GUIDE

SENSOR	APPLICATION CHARACTERISTICS
1λ SINGLE WAVELENGTH Above 125°F (50°C) PRO 40 (Visual) PRO 50 (Fiberoptic)	Single-wavelength sensors provide an average temperature measurement of the measured target area, and short wavelengths are recommended to reduce or eliminate errors due to emissivity variation. The Patented Auto Null Design eliminates noise and calibration drift often associated with this type of sensor. Advanced signal processing techniques allow for broad temperature ranges, operation at low temperatures, and long term calibration stability. These sensors are recommended for applications involving: <ul style="list-style-type: none"> • A constant emissivity with an unobstructed view of the target (all temperatures) • Low temperature measurements of low-emissivity materials
2λ DUAL WAVELENGTH Above 300°F (150°C) PRO 80 (Visual) PRO 90 (Fiberoptic)	Dual-wavelength sensors tend to measure the hottest temperature viewed in the target area, and they provide automatic compensation for emissivity variations of greybody materials. With a unique single-detector design and the industry's highest signal dilution factor, Williamson's dual-wavelength sensors outperform all other ratio sensors when demanding application issues exist. Typically difficult application issues include: <ul style="list-style-type: none"> • Low or varying emissivity • Intervening media such as dirty optics, scale, steam, dust, or water spray • A partially filled field of view caused by a mechanical obstruction or a small or wandering target
Mλ MULTI WAVELENGTH Above 300°F (150°C) PRO 100 (Visual) PRO 200 (Fiberoptic)	Multi-wavelength sensors utilize programmable ESP algorithms to provide 'aim and read' capabilities for non-greybody materials that are not accurately measured by single and dual wavelength sensors. Refer to 'The Advantages of Multi-Wavelength Pyrometers with ESP' for more details about these innovative algorithms. These sensors are recommended for applications involving: <ul style="list-style-type: none"> • Non-Greybody Materials such as aluminum, brass, chrome, copper, molybdenum, stainless steel, tin, titanium, tungsten, and zinc • Intervening media such as dirty optics, scale, steam, dust, or water spray • A partially filled field of view caused by a mechanical obstruction or a small or wandering target

A HIGHER SIGNAL DILUTION FACTOR FOR ACCURATE MEASUREMENTS UNDER ADVERSE CONDITIONS

Infrared sensors use an optical system to collect infrared energy from a measured target area. This energy is used to calculate the target surface temperature. In many industrial and laboratory settings, there are often application issues that interfere with the amount of energy that is collected by the sensor. These application issues include:

- Intervening media such as smoke, steam, dust, spray, scale, or dirty windows, or a mechanical interference that causes optical attenuation
- A partially filled field of view caused by a mechanical obstruction or an exceptionally small or wandering target

The ability of a sensor to compensate for these types of application interferences is measured as the signal dilution factor. The **signal dilution factor**, expressed as a ratio, represents the extent of signal dilution that a sensor can tolerate while still providing an accurate temperature reading. For example, a signal dilution factor of 500:1 indicates that the sensor has 500 times more infrared signal than is required for a valid measurement. The higher the signal dilution factor, the better the sensor is able to tolerate application interference.

TYPICAL MAXIMUM SIGNAL DILUTION VALUES	
SENSOR	VALUE
PRO 81 / 91 / 110 / 210	1500 : 1
PRO 82 / 92 / 120 / 220	500 : 1
Competitive 2-Color Sensors	100 : 1

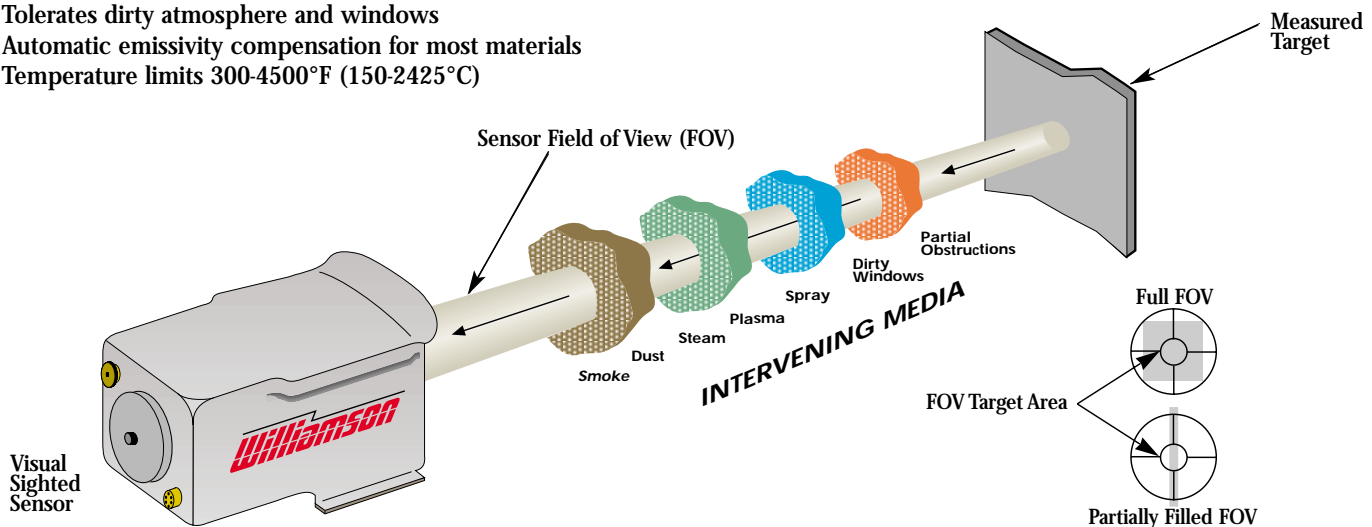
The exceptionally high signal dilution factor provided by the PRO Series dual- and multi-wavelength sensors has several benefits under adverse application conditions.

- **Improves Accuracy and Reduces Maintenance** in hostile environments where the target energy is diluted by intervening media.
- **Eliminates the need for precise alignment** when measuring exceptionally small or wandering targets.

To provide a 'live' verification of the sensor's signal dilution factor, the PRO Series dual- and multi-wavelength sensors indicate the signal dilution value as one of five measured parameters.

Dual and Multi Wavelength Features

- Accurate, reliable, and repeatable measurements
- Measures the hottest temperature viewed
- Views partially obstructed targets
- Tolerates dirty atmosphere and windows
- Automatic emissivity compensation for most materials
- Temperature limits 300-4500°F (150-2425°C)



MORE DURABLE SENSORS, EASIER INSTALLATION, AND LESS MAINTENANCE

With the versatile PRO Series design, each sensor can be easily customized to provide the optimal performance for each application. The standard PRO Series configuration includes a choice of:

- Single-, dual-, or multi-wavelength sensors
- Visual or fiber optic alignment options
- Stand-alone or system configurations
- A wide selection of temperature ranges, precision optics, and spectral responses

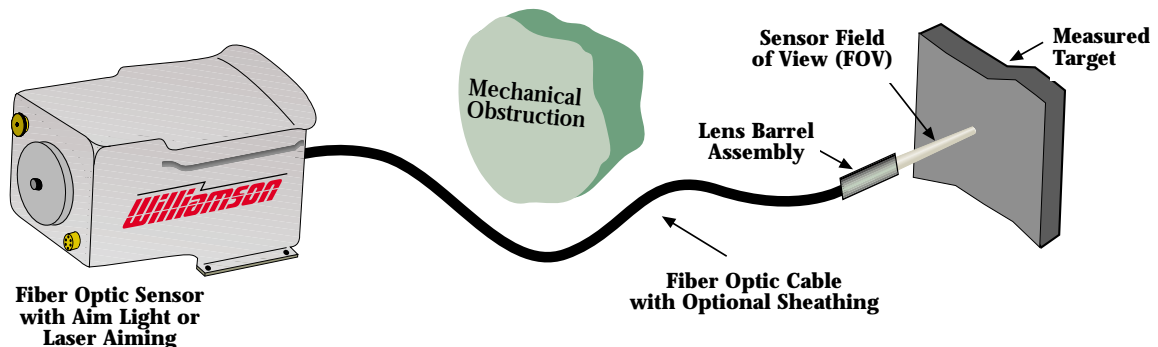
In addition to the many standard features, each sensor includes a wide selection of options and accessories that can simplify installation procedures and provide added protection for tough industrial environments.

PRO SERIES OPTIONS AND ACCESSORIES	
Code	Description
23S/23D/23M	Programmable Interface Module (see next page for details)
25/25S/25RS	PID Controllers with power supply, 4-20mA Output, and Signal Conditioning Options
PS	Power Supply for Stand Alone Sensors 90-260Vac (50/60Hz) to 24Vdc (700mA)
AP	Air Purge
WCAP	Water Cooling Air Purge
SB	Swivel Bracket
LA	Laser Aiming (visual and fiber optic sensors)
AL	Aim Light (fiber optic sensors only)

FIBER OPTIC SENSOR CAPABILITIES

The PRO Series fiber optic sensors (models 50, 90, and 200) use a small, sealed (S) fiber optic cable to view the target while the sensor is mounted in a remote or more convenient location. This provides greater durability and flexibility with sensor installations that involve confined spaces or severe environments. The fiber cables can range in length from 3 to 30 feet (1-9 m). Some unique fiber optic accessories include:

- **ArmorGuard System (AG)** - A heavy duty, flexible, stainless steel armored fiber optic cable conduit with two layers of insulation and an air purge for maximum protection against flame impingement and high ambient temperatures.
- **Stainless Steel Braid System (SSB)** - A flexible, lightweight fiber optic cable conduit with a durable inner Teflon sleeve and an air purge for general-purpose protection in industrial installations.
- **Gooseneck System (GN)** - A 3 ft (90 cm) semi-rigid fiber optic cable conduit (with an air purge) that allows quick and easy alignment adjustment.



MEET ANY REQUIREMENTS



PRO SERIES SPECIFICATIONS						
Accuracy	0.25% to 0.5% of Reading or 2°C which ever is greater (varies by model)					
Repeatability	Better than 1°C					
Response Time	4ms to 400ms to 98% of reading (varies by model)					
CE Certification	EMI / RFI for heavy industry LVD (Low Voltage Directive)					
Ambient Temperature Limit	<table border="0"> <tr> <td>Sensor Head (varies by model): 110 to 140°F (43 to 60°C)</td> <td>Fiber Optic Assembly: (Cable and Lens Barrel) 400°F (200°C)</td> </tr> <tr> <td>Sensor w/ Water Cooling: 200 to 350°F (95 to 175°C)</td> <td>Interface Module: 120°F (50°C)</td> </tr> </table>	Sensor Head (varies by model): 110 to 140°F (43 to 60°C)	Fiber Optic Assembly: (Cable and Lens Barrel) 400°F (200°C)	Sensor w/ Water Cooling: 200 to 350°F (95 to 175°C)	Interface Module: 120°F (50°C)	
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Input Power	<table border="0"> <tr> <td>Stand-alone Sensor: 24Vdc (300mA);</td> <td>With Interface Module: 90-260Vac 50/60 Hz</td> </tr> </table>	Stand-alone Sensor: 24Vdc (300mA);	With Interface Module: 90-260Vac 50/60 Hz			
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Input and Output Signals	Stand Alone Configuration: An internal jumper is used to select the analog or digital mode.					
	<table border="0"> <tr> <td> Analog Mode <ul style="list-style-type: none"> • 4-20 mA or 0-20 mA (1000ohm max. impedance. Shunt resistors produce voltage outputs.) • TTL Alarm with 2 mA at 5Vdc rating • External peak hold reset • Select parameter, scale and range to output and alarm </td> <td> Digital Mode <ul style="list-style-type: none"> • Bi-directional RS485 communications • RS232 w/ a converter </td> </tr> </table>	Analog Mode <ul style="list-style-type: none"> • 4-20 mA or 0-20 mA (1000ohm max. impedance. Shunt resistors produce voltage outputs.) • TTL Alarm with 2 mA at 5Vdc rating • External peak hold reset • Select parameter, scale and range to output and alarm 	Digital Mode <ul style="list-style-type: none"> • Bi-directional RS485 communications • RS232 w/ a converter 			
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	System Configuration with Interface Module					
<table border="0"> <tr> <td> 2 Programmable Analog Outputs <ul style="list-style-type: none"> • 4-20 mA or 0-20 mA (1000ohm max. impedance. Shunt resistors produce voltage outputs.) • Select parameter, scale, and range </td> <td> Bi-directional Serial Communications <ul style="list-style-type: none"> • RS232 and RS485 simultaneously </td> </tr> <tr> <td> 3 Analog Inputs <ul style="list-style-type: none"> • Sample and hold • External peak hold reset • Analog input for remote adjustments </td> <td> 2 Programmable Relay Alarms <ul style="list-style-type: none"> • Form C (4A at 250Vac or 2.5A at 30Vdc) • Select alarm parameter and set point </td> </tr> <tr> <td></td> <td> 1 Programmable TTL Alarm <ul style="list-style-type: none"> • TTL rating is 2 mA at 5Vdc • Select alarm parameter and set point </td> </tr> </table>	2 Programmable Analog Outputs <ul style="list-style-type: none"> • 4-20 mA or 0-20 mA (1000ohm max. impedance. Shunt resistors produce voltage outputs.) • Select parameter, scale, and range 	Bi-directional Serial Communications <ul style="list-style-type: none"> • RS232 and RS485 simultaneously 	3 Analog Inputs <ul style="list-style-type: none"> • Sample and hold • External peak hold reset • Analog input for remote adjustments 	2 Programmable Relay Alarms <ul style="list-style-type: none"> • Form C (4A at 250Vac or 2.5A at 30Vdc) • Select alarm parameter and set point 		1 Programmable TTL Alarm <ul style="list-style-type: none"> • TTL rating is 2 mA at 5Vdc • Select alarm parameter and set point
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Enclosure Rating	<table border="0"> <tr> <td>Sensor: NEMA 4X (IP65) - Aluminum Casting with Corrosion Resistant Coating</td> <td>Interface Module: NEMA 12X front panel and Anodized Aluminum Housing</td> </tr> </table>	Sensor: NEMA 4X (IP65) - Aluminum Casting with Corrosion Resistant Coating	Interface Module: NEMA 12X front panel and Anodized Aluminum Housing			
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Dimensions	<table border="0"> <tr> <td>Sensor: 8.50in x 5.25in x 6.00in (216mm x 133 mm x 152 mm)</td> <td>Interface Module: 7.0in x 3.78in x 3.78in (178 mm x 96 mm x 96 mm)</td> </tr> </table>	Sensor: 8.50in x 5.25in x 6.00in (216mm x 133 mm x 152 mm)	Interface Module: 7.0in x 3.78in x 3.78in (178 mm x 96 mm x 96 mm)			
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Weight	<table border="0"> <tr> <td>Sensor: 7.4 lbs. (3.4kg);</td> <td>Interface Module: 2.2 lbs. (1kg)</td> </tr> </table>	Sensor: 7.4 lbs. (3.4kg);	Interface Module: 2.2 lbs. (1kg)			
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IMPROVING QUALITY AND PRODUCTIVITY THROUGH NONCONTACT TEMPERATURE MEASUREMENT



Aluminum

Applications

- Extrusion Plants
- Continuous Caster
- Forge Plants
- Hot Rolling Mills
- Sheet Finishing
- Heat Treating
- Cold Rolling

Representative Users:

- ALCOA
- Commonwealth Aluminum
- Hydro Aluminum
- Pechiney
- Thermalex
- Universal Alloys

Applications

- Coke Ovens
- Blast Furnace
- Steel Making
- Continuous Caster
- Hot/Cold Rolling Mill
- Annealing/Coating Line
- Rod & Bar Mill
- Welded Tube

Representative Users:

- ABB
- AK Steel
- Bethlehem Steel
- Corus
- National Steel
- Nucor
- Stelco Steel
- US Steel



Steel

Applications

- Flat
- Pressed and Blown
- Containers
- Lighting
- Forming Molds
- Drawn and Spun Fibers
- Tempering

Representative Users:

- Anchor Hocking
- Ball-Foster
- BSN
- General Electric
- Philips
- Technoglas
- Thompson Consumer Products



Glass

Applications

- Batch Heating
- Continuous Heating
- Induction/Resistance & Flame Heating
- Wire Processing
- Vacuum Chambers
- Rotary Kilns

Representative Users:

- D. Chrysler
- Elva
- Ford
- General Motors
- Osram
- Ross Production
- Pillar



Industrial Heating

Applications

- Electronics
- Foundries
- Petrochemicals
- Pulp and Paper
- Plastics
- Utilities
- Incinerators
- Thermal Reactors

Representative Users:

- American Ref-Fuel
- DuPont
- International Paper
- John Zink/Koch
- Mobil
- Motorola
- Weyerhaeuser
- Amoco



...And Many More!