

*Specialists in  
Temperature  
Measurement*



RdF Corporation's history goes back to 1939. MIT Professors Arthur C. Ruge and Alfred V. deForest formed Ruge-deForest, Inc. to develop and market the bonded resistance wire strain gage invented by Professor Ruge in 1938. Similar surface resistance temperature sensors were also developed. The strain gage business was sold to BLH in 1955. The temperature measurement division relocated to Hudson, NH in 1959 and was renamed RdF Corporation. RdF is still a closely held corporation with stockholders involved in daily operations.

#### Design and Manufacturing:

RdF products have a reputation for ruggedness, quality and reliability gained from many years of experience in actual operational service. This reputation and the success of RdF temperature sensors is the result of our adherence to time proven design principles, our ability to work closely with our customers to assure compliance with specific operational requirements, and close attention to details in robust manufacturing processes.

#### Quality Assurance System:

RdF received ISO 9001 certification in March 1996, and ISO 9001-2000 certification in April 2002. Prior to ISO, the RdF quality system met the requirements of Mil-I-45208A. It also incorporated several customer specific supplements, some of which carried requirements to higher quality specifications. Other approvals are to specific NASA requirements and Federal Aviation Regulations, in particular FAR Part 21.303 for aircraft parts.

RdF sensors have been qualified on many military and aerospace programs to the environmental requirements of MIL-STD-810. Qualification testing to the requirements contained in RTCA DO-160 has also been done. Test and calibration equipment used at RdF meet the standards of ANSI/NCSL-Z540.1-1994, and all calibrations supplied are traceable to National Institute of Standards and Technologies (NIST).

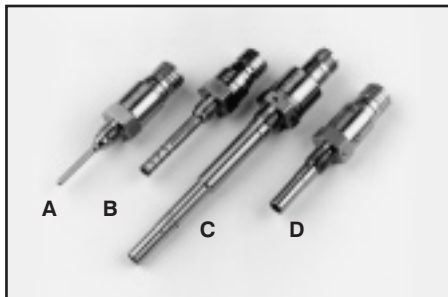
We meet 10CFR50 Appendix B, CSA-Z299.1 for nuclear programs. We are NUPLC Certified.

#### RdF Technology, Markets and Specialized Products:

The technologies utilized by RdF for use in its aircraft and aerospace products include fine wire-wound or thin film platinum RTD elements, other wire RTD elements and thermistors. Patented foil and small wire Stikon® surface thermocouples are an RdF exclusive. Complementing these sensor products are laminated etched foil heaters, Microfoil® heat flux sensors, radiometers/calorimeters, and fine etched foil resistive bridge networks.

The information and photos that follow show basic specifications, physical configurations and applications of RdF sensors. Custom sensors are assigned their own part number identifying the specific sensor characteristics meeting your needs.

## Cryogenic RTD Sensors



A. 1/8" Diameter LN<sub>2</sub> RTD  
 B. Hollow Annulus Exposed LH<sub>2</sub> RTD  
 C. Hollow Annulus LH<sub>2</sub> RTD  
 D. Cryogenic Hollow Annulus RTD

RdF's exclusive hollow annulus elements combine fast response with high pressure capability and ruggedness

## Specifications

### Temperature Range

-286 to 260°C (-450 to 500°F)

### Material

Stainless Steel, Inconel

### Element

Platinum fine wire:  
 0.003923 Ω/Ω/°C, required for LH<sub>2</sub>  
 0.00385 Ω/Ω/°C, applicable for LN<sub>2</sub>

Platinum thin film:  
 0.00385 Ω/Ω/°C, applicable for LN<sub>2</sub>

### Pressure Rating

Up to 20,000 psi

### Vibration

>50g, 20 to 2000 Hz

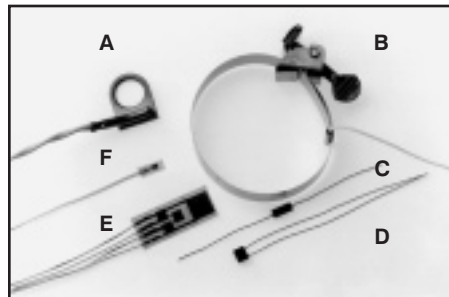
### Resistance @ 0°C

100, 1000, 1380, 2500Ω

### Time Constant

<0.5 seconds

## Platinum Surface Sensors



A. Thin Film Capsule Bolt-on RTD  
 B. Strap-on Thin Film Capsule RTD  
 C. Axial Lead Thin Film RTD  
 D. Thin Film Board Mount RTD  
 E. REF Grade Wire Wound Bridge RTD  
 F. Thin Film Surface RTD

RdF's unique thin film and flat wire surface RTD designs employ proprietary processes to provide sealed, fast, tough, small flexible sensors to conform to any specified surface configuration.

## Specifications

### Temperature Range

-200 to 340°C (-320 to 645°F)

### Material

Kapton® covers  
 Polyimide laminated  
 PFA Teflon® fused  
 FEP Teflon® fused

### Element

Platinum thin film  
 0.00385 Ω/Ω/°C

Platinum fine wire  
 0.003924 Ω/Ω/°C

### Vibration

>50g RMS, 20 to 2000 Hz

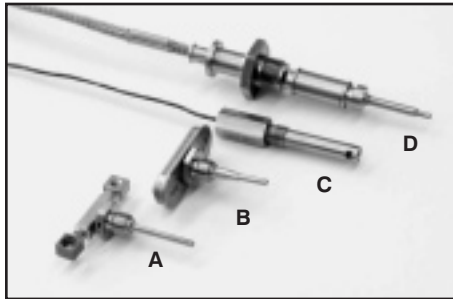
### Resistance @ 0°C

100, 500, 1000, 2000Ω

### Time Constant

<0.3 seconds on metal surfaces

## Thermocouple Probes



A. PT6 Turbine Engine Thermocouple  
 B. PT6 Turbine Engine Thermocouple  
 C. Hot Gas Fine Wire Sensor  
 D. PW100 Turbine Engine Thermocouple

### Specifications

**Temperature Range**  
 -54 to 1260°C (-65 to 2300°F)

#### Types

K Chromel-Alumel  
 T Copper-Constantan  
 E Chromel-Constantan  
 J Iron-Constantan

#### Material

Stainless Steel  
 Inconel  
 Hastelloy

#### Grounded, Ungrounded or Exposed junction

## Aircraft Sensors



A. Environmental System Sensor (Flange Mounted)  
 B. Environmental System Sensor (Thread Mount)  
 C. Turbine Engine Oil Temperature Sensor w/Full Bridge Circuit  
 D. Turbine Engine Oil Temperature Sensor

### Specifications

RTD/Thermistors: RdF packages these sensors for use in numerous aircraft applications.

#### Sensors

High purity platinum RTD or Thermistor

#### Pressure Rating

Up to 20,000 psi

#### Temperature Range

-54 to 316°C (-65 to 600°F)

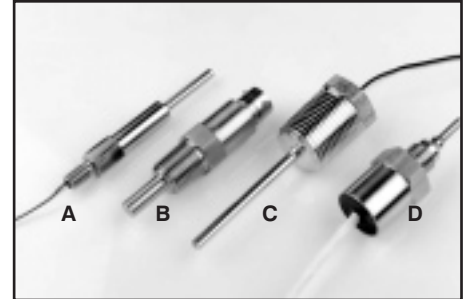
#### Case Materials

Aluminum  
 Stainless Steel  
 Inconel  
 Hastelloy

#### Vibration

50 g, 20 to 2000 Hz

## Special Applications



A. Logging Sensor  
 B. Military Vehicle Coolant RTD Sensor  
 C. Fast Response Appliance RTD  
 D. Hydraulic Fluid Sensor RTD

### Specifications

The applications for these sensors include Military vehicles, high pressure down hole logging, fast response food service machines and high pressure hydraulic line temperature.

#### Element

Platinum fine wire:  
 0.003923 Ω/Ω/°C  
 0.00385 Ω/Ω/°C

Platinum thin film:  
 0.00385 Ω/Ω/°C

#### Case Materials

Stainless Steel  
 Inconel  
 Hastelloy

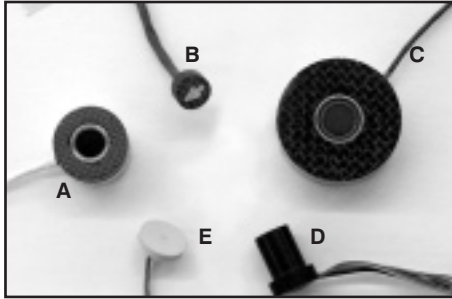
#### Pressure Rating

Up to 20,000 psi

#### Temperature Range

-54 to 316°C (-65 to 600°F)

## Thermal Sensors: Calorimeters, Radiometers & Heat Shield Plugs



A & C. Radiometers  
B, D & E. Heat Shield Plugs

### Specifications

#### Calorimeters, Radiometers: Sensor

RdF exclusive foil, thin thermopile

#### Heat sink material

OFHC Copper, Aluminum (water cooled)

#### Output

0 – 40 ± 10 mV nominal, typical flight channel

#### Range

0 – 60 Btu/ft<sup>2</sup> sec

#### Temperature Range

–185 to 260°C (–300 to 500°F)

#### Time Constant

0.02 seconds, typical

#### Heat Shield Plugs: Sensors

Tungsten-Rhenium Thermocouples with RdF proprietary thin insulation to 2200°C (4000°F)  
Chromel-Alumel insulated thermocouples

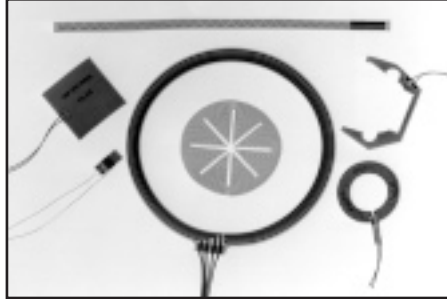
#### Body Materials

A variety of phenolics and other ablative materials



Proudly  
manufactured  
in USA

## Flex Heaters



### Specifications

#### Insulation

Kapton®/FEP construction  
Kapton®/Polyimide construction

#### Temperature Range

–100°C to 200°C (FEP)  
–100°C to 350°C (Polyimide)

#### Resistance Tolerance

±10%

#### Watt Density

up to 40 W/in<sup>2</sup>, typical  
up to 80 W/in<sup>2</sup>, Polyimide to 200°C

#### Thickness

0.010" maximum over heater

#### Flexibility

0.3" minimum bend radius

#### Out-gassing

TML <1%, CVCM <0.1%

#### Leadwire

Stranded nickel plated copper,  
TFE Teflon® insulation per MIL-W-16878  
Kapton® insulation or fiberglass.

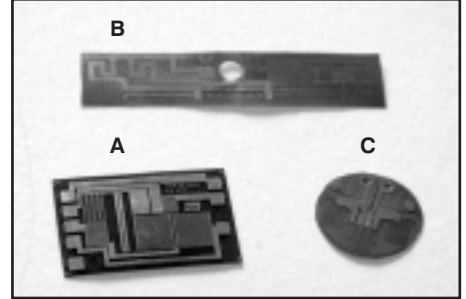
#### Dielectric Strength

1250 VAC

#### Maximum Size

6" x11"

## Foil Bridge Completion & Compensation Circuits



A. Bridge Completion  
B & C. Compensation circuits

### Specifications

#### Element Materials

Temperature Sensitive:  
Copper  
Nickel  
Nickel/iron

Non-Temperature Sensitive:  
Constantan

#### Laminate

Kapton® film with acrylic or polyimide appropriate for temperature range.

Small laminated foil circuits to provide bridge completion and load cell compensation capability.

Bridge Completion units can be provided for use with up to 3 active resistance sensors, strain and/or temperature. Load cell compensation for any or all of the following can be provided: Temperature, Young's Modulus, Bridge Balance and Sensitivity.

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