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**Powerplant Fire Detection Instruments - Thermal
and Flame Contact Types (Turbine)**

FOREWORD

This document has been declared "NONCURRENT". It is recommended, therefore, that this document not be specified for new designs. "NONCURRENT" refers to those documents which have previously been widely referenced and may continue to be required on some existing designs. "NONCURRENT" documents are available from SAE upon request.

1. PURPOSE:

To specify minimum requirements for powerplant fire detection instruments for use primarily in turbine powered civil transport aircraft, the operation of which may subject the instrument to environmental conditions specified in Para. 3.3.

2. SCOPE:

This Aeronautical Standard covers the following basic types of fire detection instruments, or combinations thereof, intended for use in protecting aircraft powerplant installation, auxiliary powerplants, combustion heaters and other installations where fuel, oil or similar fires may occur.

2.1 Basic Types:

Definition of

Type I Thermal - Fixed Temperature, an instrument which will actuate an alarm signal when exposed to any temperature above a definite pre-established level.

Type II Thermal - Rate of Rise, an instrument which will actuate an alarm signal when exposed to any rate of temperature change above a definite pre-established level.

Type III Flame - Contact, an instrument which will actuate an alarm signal when exposed to physical contact with flame.

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3. GENERAL REQUIREMENTS:

3.1 Materials and Workmanship:

- 3.1.1 Materials: Materials shall be of a quality which experience and/or tests have demonstrated to be suitable and dependable for use in aircraft instruments.
- 3.1.2 Workmanship: Workmanship shall be consistent with high-grade aircraft instrument manufacturing practice.

3.2 Identification:

The following information shall be legibly and permanently marked on the instrument or attached thereto:

- (a) Name of instrument (Powerplant Fire Detector)
- (b) SAE Aeronautical Standard AS 430
- (c) Manufacturer's Part Number
- (d) Manufacturer's Serial Number or Date of Manufacture
- (e) Manufacturer's Name and/or Trademark
- (f) Type Number
- (g) Alarm Temperature (Sensing element, where applicable)
- (h) Rating (Electrical, Vacuum, etc.)

3.3 Environmental Conditions:

The following conditions have been established as design minimum requirements. Tests shall be conducted as specified in Sections 5, 6 and 7.

- 3.3.1 Temperature: When installed in accordance with the manufacturer's recommendations, the instrument shall function over the range of ambient temperatures shown in Column A below and shall not be adversely affected by exposure to the temperatures shown in Column B below:

<u>Instrument Location</u>	<u>A</u>	<u>B</u>
Powerplant Compartments	-30 to 150C	-65 to 150C
Pressurized Areas	-30 to 50C	-65 to 70C
Nonpressurized or External Areas	-55 to 70C	-65 to 70C

If instrument is intended for use in compartments where maximum ambient is higher than 150°C, appropriate special limits shall be selected for Column A and B, and specified by the manufacturer.

- 3.3.2 Humidity: The instrument shall function and shall not be adversely affected when exposed to any relative humidity in the range from 0 to 95 percent at a temperature of approximately 32C.

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- 3.3.3 Altitude: When installed in accordance with the instrument manufacturer's instructions, the instruments shall function from sea level up to the altitudes and temperatures listed below. Altitude pressures are per NACA report 1235.

Instrument Location

Powerplant Accessory Compartment	50,000'	(80 C)
Pressurized Areas	15,000'	(50 C)
Nonpressurized Areas	50,000'	(20 C)

The instrument shall not be adversely affected following exposure to extremes in ambient pressure of 50 inches, and 3 inches, of mercury absolute, respectively.

- 3.3.4 Vibration: When installed in accordance with the instrument manufacturer's instructions, the instrument shall function and shall not be adversely affected when subjected to vibrations of the following characteristics:

	<u>Frequency Cycles Per. Sec.</u>	<u>Max. Double Amplitude - Inches</u>	<u>Maximum Acceleration</u>
Nacelle & Nacelle Mounts, Wings, Empennage & Wheel Wells	5-1000	0.036	10g
Fuselage			
Forward of Spar Area	5-500	0.036	2g
Center of Spar Area	5-1000	0.036	4g
Aft of Spar Area	5-500	0.036	7g
	500-1000	---	5g
Vibration Isolated	5-50	0.020	1.5g
Racks	50-500	---	0.5g
Instrument Panel	5-500	.030	1.0g

- 3.4 Radio Interference:

The instrument shall not be the source of objectionable interference under operating conditions at any frequencies used on aircraft, either by radiation or feed-back in electronic equipment installed in the same aircraft as the instrument.

- 3.5 Magnetic Effect:

The magnetic effect of the instrument shall not adversely affect the operation of other instruments in the same aircraft.

4. DETAIL REQUIREMENTS:

4.1 Indication Means:

The instrument shall be capable of actuating visual and/or aural alarm indicators.

4.2 Reliability:

The instrument shall be of such design to withstand the mechanical and thermal shocks, and stresses incident to its use in aircraft. False alarm signals shall not be produced by the instrument as the result of variations in voltage to be encountered during operation of the aircraft, abnormal attitudes, contaminating atmosphere, accelerations which could be encountered during flight, landing and takeoff.

4.3 Integrity Test Means:

The instrument shall be of such design to provide a means for testing the integrity of the instrument in flight.

4.4 Calibration Means:

The instrument design shall be such that all calibration means be provided with tamper-proof seals.

4.4.1 Adjustable Detector Systems: Instruments which incorporate means for adjustment shall be tested to prove compliance with this standard, particularly paragraphs 7.2.1, 7.2.2, 7.2.3 and 7.12, throughout the range of adjustability.

5. TEST CONDITIONS:

5.1 Atmospheric Conditions:

Unless otherwise specified, all tests required by this Aeronautical Standard shall be conducted at an atmospheric pressure of approximately 29.92 inches of mercury and at an ambient temperature of approximately 25 C and at a relative humidity of not greater than 85 percent. When tests are conducted with the atmospheric pressure or the temperature substantially different from these values, allowance shall be made for the variation from the specified conditions.

5.2 Vibration:

(To minimize friction) Unless otherwise specified, all tests for performance may be conducted with the instrument subjected to a vibration of 0.002 to 0.005 inch double amplitude at a frequency of 1500 to 2000 cycles per minute. The term double amplitude as used herein indicates the total displacement from positive maximum to negative maximum.

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5.3 Vibration Equipment:

Vibration equipment shall be such as to allow vibration to be applied along each of three mutually perpendicular axes of the instrument at frequencies and amplitudes consistent with the requirements of Paragraph 3.3.4.

5.4 Power Conditions:

Unless otherwise specified, all tests shall be conducted at a power rating recommended by the manufacturer.

5.5 Test Position:

Unless otherwise specified, the instrument shall be mounted and tested in its normal operating position.

5.6 Flame Temperature Measurement and Flame Size:

All flame temperatures shall be measured by using chromel-alumel thermocouples of 18 gauge wire. The thermocouple bead shall be at the center of the flame and the two wires leading to the bead shall be parallel and extend for a distance of 3 inches horizontally into the flame. The nature and size of the flame and the method of test shall be as specified in Figures 2-1, 2-2, 2-3 and 2-4. The thermocouple and the test article shall be the same distance from the burner face, to assure that the test article is exposed to the temperature measured.

6. INDIVIDUAL PERFORMANCE REQUIREMENTS:

All instruments or components of such shall be subjected to whatever tests the manufacturer deems necessary to demonstrate that production articles comply with this Aeronautical Standard including the following requirements where applicable.

6.1 Sensitivity and Calibration:

The sensor shall be tested as specified in Paragraph 7.1, or in an equivalent manner which will test the response sensitivity and calibration.

6.2 Dielectric:

Each instrument shall be tested by the methods of inspection listed in Paragraphs 6.2.1 and 6.2.2.

- 6.2.1 Insulation Resistance: The insulation resistance measured at 200 volts D.C. for five seconds between all electrical circuits connected together and the metallic case shall not be less than 5 megohms. Insulation resistance measurements shall not be made to circuits where the potential will appear across elements such as windings, resistors, capacitors, etc. since this measurement is intended only to determine adequacy of insulation.