

# CFD System

## Continuous Fire and Overheat Detection System



## Continuous Fire and Overheat Detection Systems for Industry

The Fenwal Continuous Fire Detection System stands alone in its field with the unique ability to detect specific overheat conditions at any point along the entire length of its sensing element run without regard for rate of temperature rise or average ambient temperature.

This discrete sensing capability offers greater sensitivity and response than systems relying upon the "averaging" technique. Further, it is the only system with a single control having the capability of connecting elements set at a variety of temperatures to provide simultaneous coverage for different alarm points in the several areas being protected.

The discrete sensing element of the Fenwal Continuous Fire Detection System is a slender Inconel tube packed with thermally sensitive eutectic salt and a nickel wire center conductor. Lengths of these sensing elements are connected in series to a control unit. The elements may be of equal or varying length and of the same or different temperature settings.

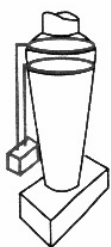
The control unit, operating directly from the power source, impresses a small voltage on the sensing elements. When an overheat condition occurs at any point along the element length; the resistance of the eutectic salt within the sensing element drops sharply; causing current to flow between the outer sheath and the center conductor. This current flow is sensed by the control unit, which produces a signal to actuate the output relay.

When the fire has been extinguished or the critical temperature lowered, the Fenwal CFD System automatically returns to standby alert, ready to detect any subsequent fire or overheat condition.

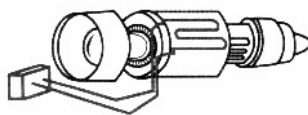
The Fenwal CFD System maybe wired to employ a "loop" circuit. In this case, should an open circuit occur, the system will still signal fire or overheat. If multiple open circuits occur, only that section between breaks becomes inoperative.

## Typical Installations

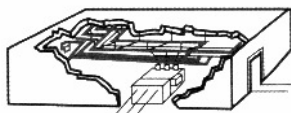
Fenwal Continuous Fire Detection Systems are already standard equipment in many industries. These systems could avert costly downtime and serious damage – even loss of life.



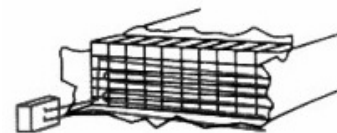
**Spray Dryers** – Continuous temperature monitoring of entire inner circumference, which often develops a buildup of combustible materials.



**Gas Turbine Power Plants** – Protection from excessive overheat and combustion chamber burn-through.



**Underground Transformer Vaults** – Monitoring for electrical faults or fire and overheat conditions. The secondary bus is particularly prone to electrical faults along its entire length. CFD elements make it possible to clear faults in fractions of seconds.



**Ventilation Filter Banks** – Accumulation of combustible materials can cause fire hazard and subsequent air pollution.

## Other Proven Applications

NUCLEAR – CHEMICAL PROCESSING – PETROLEUM REFINING – GRAIN PROCESSING – ELECTRIC GENERATORS – TRANSFORMER PROTECTION – ENGINE TEST CELL – DUST COLLECTORS – EXTRUDERS – HIGH POWER CONDUIT

## Advantages of the FENWAL Continuous Fire Detection System

### Discrete Sensing

The sensing element actuates the alarm when any portion exceeds its temperature setting without regard to temperatures of the remainder of the loop. The elements may be installed in ambient temperatures very close to the alarm temperature, since this temperature must be exceeded before the warning is actuated. It is free of the family of set point temperatures of systems based on the "averaging" principle in which a long length of element exposed to a low temperature provides the same alarm as a short length exposed to a high temperature.

The advantage of the Fenwal discrete sensing element is that the alarm point does not vary in relation to the length of the element. The alarm point on averaging systems is very flexible and is affected by the length of the element.

### Flexibility

Sensing elements of the Fenwal CFD System are stringable, coilable or can be formed to fit the contours of the areas they protect.

### Multi-Temperature Protection

Sensing elements of different alarm temperatures may be connected serially. Each of these elements will alarm at its fixed temperature without regard to the environmental conditions of any of the other elements connected in the same loop.

### Moisture Resistance

The very low impedance alarm setting of the Fenwal CFD System, made possible by the sharp drop of sensing element impedance at the critical temperature, prevents false alarm due to moisture. In addition, despite the insensitivity of the system to moisture, the connectors are mechanically self-sealing as an added protection.

### Long Length

With the sensing elements at room ambient, up to 400 feet of sensing element may be connected to a single control unit. However, greater lengths may be used for specific applications.

### Rugged

The sensing elements were designed to withstand the severe shock and vibration encountered in aircraft applications, far exceeding the levels encountered in normal industrial applications.

### Repeatable

Even after exposure to temperatures to 2000°F, when the fire or overheat condition is removed, the sensing element will "reset" itself to detect subsequent fire or overheat.

### Variable Environment

The sensing elements may be used for temperature detection in any environment; gas, liquid or solid. If a severe corrosive atmosphere exists, contact Fenwal for application engineering assistance.

### Continuous Monitoring

The sensing element is continuously monitored to detect an open circuit condition.

## Components of the FENWAL Industrial Continuous Fire Detection System

All of the CFD system components described in this brochure are standard items that are readily available. These components have all withstood the test of use in industrial and aerospace applications and meet both industry and Fenwal's own rigid quality standards.

### Control Unit

The control unit is an electrical device for detecting the change of impedance in a Fenwal sensing element. It provides electrical contacts with which an external circuit may be controlled.

The unit is designed for use in industrial environments and to operate on a variety of field selectable input voltages.

Design of the unit is such that it can be panel mounted or fit in a standard driptight or explosion proof enclosure. Fenwal offers such enclosures, as shown below.

### CAT. NO. 35003-38

#### Power Input:

Nominal: 120, 208, 240 VAC, 18 to 40 VDC, Field Selectable

#### Normal Operating Limits:

120, 208, 240 VAC, +10%, -20%, 50 to 60 Hz

#### Power Input:

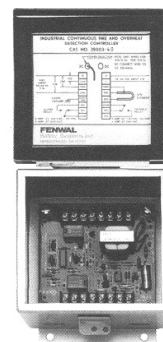
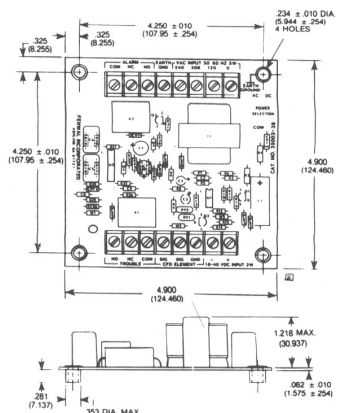
2 watts, 18 to 40 VDC,  
5 watts, 120, 208, 240

#### Load (resistive):

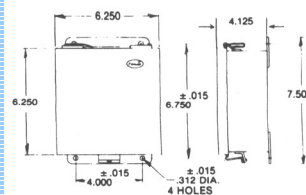
Isolated SPDT contacts rated at 5 amps @ 28 VDC and 120 VAC, 2.5 amps @ 208 and 240 VAC

#### Ambient Temperature:

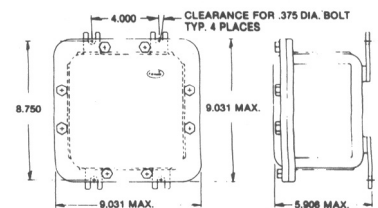
-65°F to +165°F  
-55°C to +75°C



### Driptight Box (NEMA 12 and 13)



### Explosion-Proof Box (NEMA 7, CLASS 1 GROUPD)



### CAT. NO. 35003-40

Includes 35003-38 Control Unit  
Cabinet material: #16 gauge steel,  
machine tool gray finish

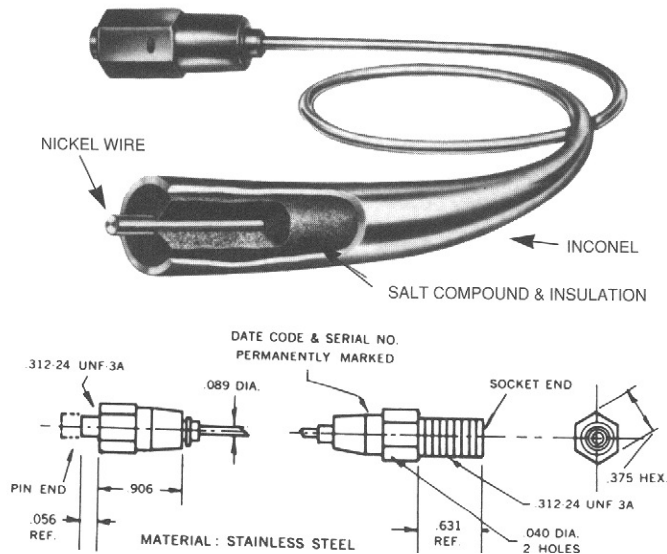
### CAT. NO. 35003-42

Includes 35003-38 Control Unit  
Box and cover material: Cast iron  
finish, hot dip galvanized

## Sensing Element

The Fenwal sensing element consists of a small (.089 inch OD), lightweight, flexible Inconel tube with a nickel wire center conductor. The tube is packed with insulation impregnated with a special salt compound and is hermetically sealed.

The picture below shows the sensing element with standard connectors.



### Length:

18 to 180 inches in increments of 1 inch

### Temperature Settings:

255°F, 310°F, 400°F, 575°F, 765°F

### Note:

Higher setpoint sensing elements are available for specially designed systems, consult factory.

## CAT. NO. 35XXX-2-XXX

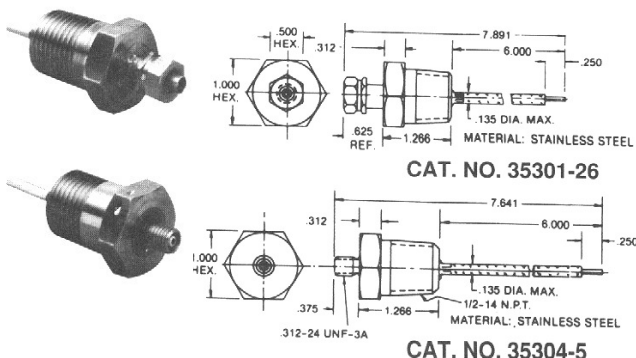
Example:  
35540-2-310 = 40 inch  
element at 310°F

Temperature setting

500 + length in inches

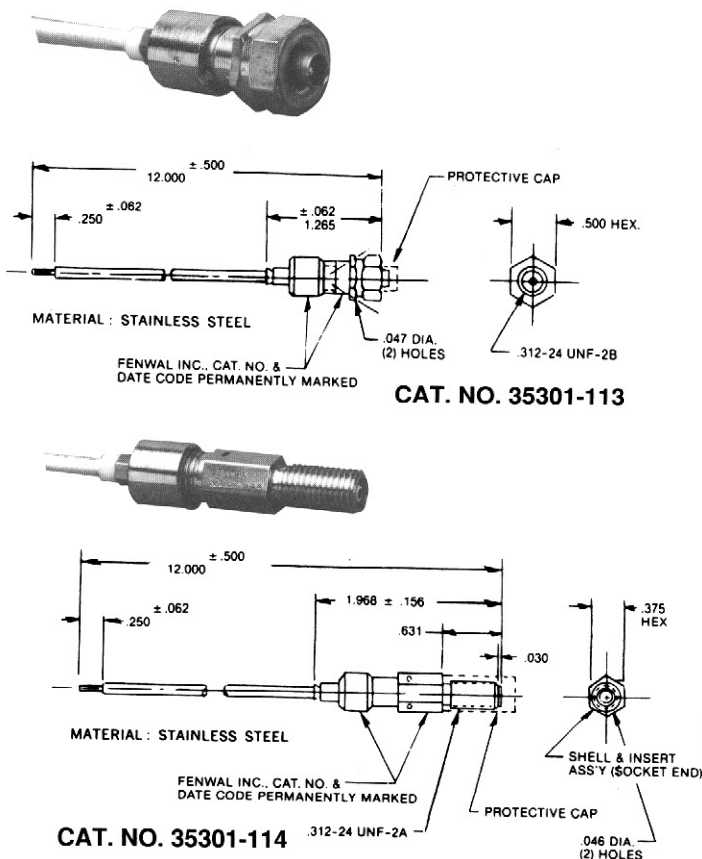
## Connector Plug Assemblies

Connector assemblies are available in male and female thread configuration to accommodate either end of the sensing element. The plug thread facilitates connection to a standard conduit box.



## Cable Assemblies

Cable assemblies are available in male and female thread configuration. They may be used singly to connect the sensing element termination to the control unit or in combination to connect sensing element sections through volumes not monitored by the elements.



## Flange and Nut Assemblies

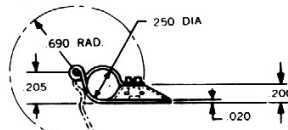
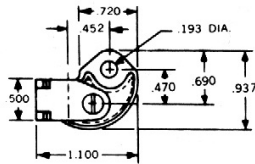
Flange and nut assemblies are used to support the connection of two sensing elements. They are used to support and separate the elements from the structure or as a bulkhead feed through supports. Flange and nut assemblies may be surface or bulkhead mounted.



## Mounting Clip

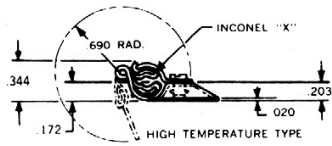
These specially designed mounting clips hold the detector elements securely in place. A silicone grommet is used with the standard clip while the high temperature clip has a built-in Inconel "X" clamping arrangement and requires no grommet. These clips feature:

- High Temperature Reliability – constructed of 321 or 347 stainless steel with Inconel "X" on clamping arrangement.
- Easy Installation – a single mounting screw installs each clip. A quarter turn of the locking stud locks in the element.



GENERAL PURPOSE TYPE (up to 575°F.)  
MATERIAL: STAINLESS STEEL

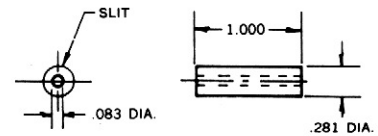
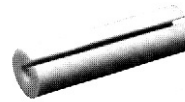
**CAT. NO. 35401-0**



**CAT. NO. 35402-0**

## Grommet

To insure secure, vibration resistant installation, silicone rubber grommets must be used with all standard mounting clips in applications not exceeding 500°F (260°C).



**CAT. NO. 35450-1** Silicone rubber

## Cap Nut

The Cap Nut is required to seal the end of a "Dead End" system. (A system that does not make a closed loop.) Dead End systems must always be terminated at the externally threaded end of a CFD sensing element.



MATERIAL: STAINLESS STEEL

**CAT. NO. 114088**

*All specifications subject to change without notice.*

Figure 1. Typical Closed Loop System Installation

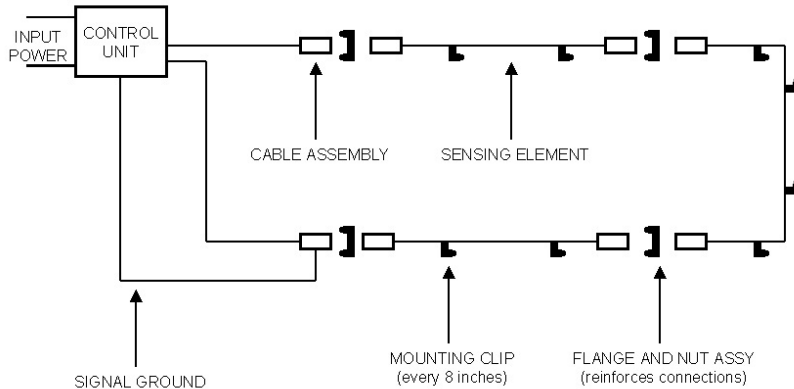
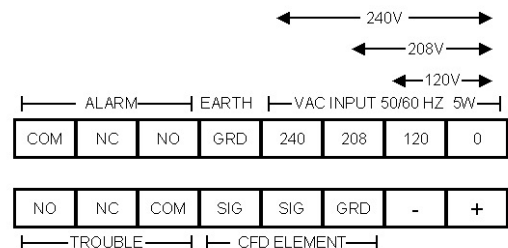


Figure 2. Wiring Diagram



## HOW TO ORDER

1. Select enclosure type and quantity of Control Units.
2. Select sensing element alarm temperature appropriate to application requirements. (Element temperature settings available: 255°F, 310°F, 400°F, 575°F, 765°F) Higher set point sensing elements are available for specially designed systems — consult factory.
3. Determine length of Sensing Element Loop noting that elements are available in any length from 18 inches to 15 feet in increments of 1 inch.
4. Determine the type and number of Flange and Nut Assemblies required. A Flange and Nut Assembly must be placed between sensing elements and at the terminal ends of the Sensing Element Loop.
5. A Cable Assembly is required from the connector at the terminal ends of the Sensing Element Loop to the Control Unit. Choose the Cable Assembly to mate with the sensing element termination.
6. Substitute Connector Plug Assemblies if connection is to be made directly to conduit box.
7. Order a mounting Clip and Grommet for every eight inches of Sensing Element Loop.