Fire Resistance Test Methods For Heat Transfer Fluids



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Monsanto

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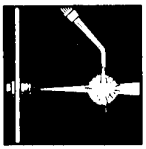
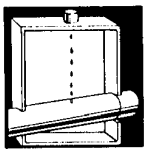
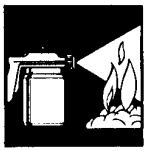


1 **High Temperature**
High Pressure Spray Test



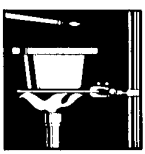
2 **Hot Manifold Test**



3 **Low Pressure Spray Test**



4 **Autoignition Temperature (AIT)**



5 **Flash and Fire Points**

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Know Your Heat Transfer Fluid's Fire Tests

Defining fire resistance in precise terms and numbers is extremely difficult and is best done in terms of *expected* fire hazards. Assessment of hazards should include consideration of all three components required for combustion—*fuel, oxidizer,* and *source of ignition*—as well as ways in which the three can combine into a fire. Simulative tests are considered most meaningful in assessing fire resistance. Since exposure conditions and sources of ignition vary widely, multiple tests are usually used in fire resistance evaluation. Test conditions should reflect two basic parameters of fire resistance—the ability to resist ignition and to prevent propagation of flame away from the source of ignition.

An ounce of prevention can be worth the cost of a plant or even the life of a worker. Hazardous plant operations can be isolated—fire walls can be built; sprinkler systems can be installed.

But the simplest and surest way to protect against heat transfer oil fires is to stop them before they start—with fire-resistant Therminol® FR fluids. Therminol FR will not support combustion.

When emergencies occur, Therminol FR minimizes the danger of local fires that can injure operators, spread to other locations, flash back to the break, or destroy equipment. By their very chemical nature, Therminol FR fluids are fire-resistant—from start-up through every hour of operation.

Know your system's fire hazards . . . know the tests and performance levels which are essential for assessing the fire resistance of any heat transfer fluid. The most widely accepted tests for measuring fire resistance are presented on the following pages.

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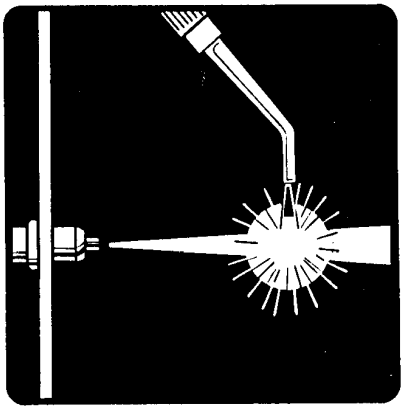
1

High Temperature High Pressure Spray Test

Procedure: AMS 3150C. The fluid, at 1000 psi, is sprayed through a 0.0145 in. diameter orifice passing through the flame of an oxyacetylene torch with a No. 1 Purox tip held perpendicular to the fluid stream. Attempts are made to ignite the fluid stream at varying distances from the orifice.

Performance: This test simulates the hazard of a spray from a heat transfer fluid leak coming in contact with a high temperature flame ignition source. Performance is evaluated based on the ease of ignition, and the distance the flame is carried from the source of ignition, if ignition occurs.

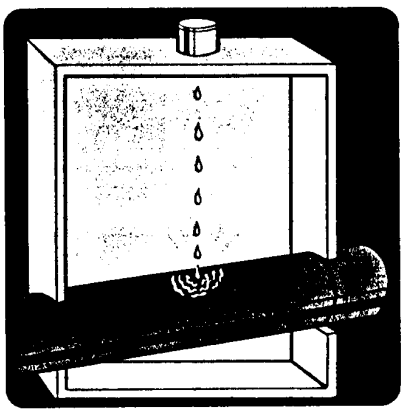


2

Hot Manifold Test

Procedure: AMS 3150C. Ten milliliters of fluid are dripped in 40 seconds onto a stainless steel simulated hot manifold held at 1300°F. (704°C.). Flashing or burning on contact with the tube, and carrying of flame to fluid collected in the bottom of the shield tube holder are observed.

Performance: This test simulates a fluid leak coming into contact with a hot surface. The heat transfer fluid should show only intermittent flashing or burning when dropped on the 1300°F. (704°C.) manifold and should not carry flame to the bottom of the shield.



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3

Low Pressure Spray Test

Procedure: AMS 3150C. The fluid is sprayed from a Binks Thor No. 7 paint spray gun (0.070 inch diameter orifice, 40 psi air) in bursts over the source of ignition, burning oil-soaked waste. Any increase or decrease in the flame caused by the fluid mist is observed.

Performance: This test is not commonly used, but is designed to simulate a line break spraying onto an open source of ignition. Criteria of performance is to observe for flame increase, no change, or decrease in intensity.



4

Autoignition Temperature (AIT)

Procedure: ASTM D 2155-66. A fluid sample is injected via hypodermic syringe into a heated glass flask. Autoignition is determined by appearance of visible flame.

Performance: This test measures autogenous ignition temperature in glass in air at one atmosphere pressure. Test conditions are critical and application of data to metal systems of irregular design is difficult.

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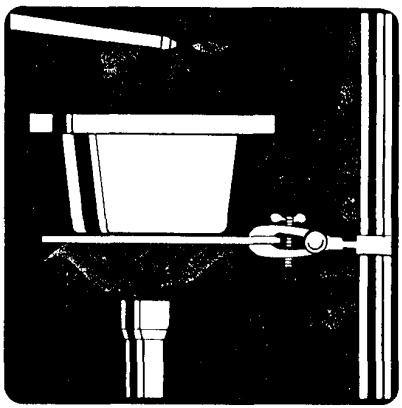
5

Flash and Fire Points

Procedure: ASTM D 92-66. The fluid is heated in an open test cup at a constant rate. A small test flame is passed over the surface at specified temperature intervals. The lowest temperature at which the vapors above the surface ignite is the flash point. The fire point is the temperature at which the fluid ignites and burns for at least five seconds.

Performance: This test measures the ignitability of heated fluid. Flash and fire test results are sometimes misleading since they are so directly related to the chemical nature of the product being tested.



The Test Described Here...

show some of the rigorous methods used to determine fire resistance. Tests like these have established Therminol FR fluids as the only heat transfer fluids rated for fire resistance by Underwriters' Laboratory, Inc. and approved by Factory Mutual.

Therminol FR fluids are chemically synthesized from materials that resist burning. Other fluids, such as the glycols, petroleum oils and liquid/vapor phase fluids, *will* burn and support combustion.

If you'd like to find out more about Therminol FR fluids, see the 16 mm full-color movie, "The House That Jack Built".

You can see for yourself—and demonstrate to others—

- Tests for fire resistance in Therminol FR fluids.
- Typical Therminol installations.
- A whole new concept in heat system design.

To receive a copy for showing, write or call the nearest Monsanto office on the following page.

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