# THERMINOL® 77 HIGH-TEMPERATURE HEAT TRANSFER FLUID

TECHNICAL BULLETIN T-77

DSW 329502

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FUNCTIONAL FLUIDS Monsanto®

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Therminol 77 is a *liquid-phase* heat transfer fluid particularly suitable for continuous use for temperatures up to 700°F. It has been used for several years in commercial scale and pilot plant systems in a diversity of applications; e.g., paint and resin manufacture, high-temperature plastic extrusion, lamination of plastics, chemical processing, laboratory baths, and thermostatic devices.

Unlike Monsanto's Therminol FR line of fire-resistant heat transfer fluids (chlorinated hydrocarbons), Therminol 77 does not contain halogen and is not fire resistant. The recommended design considerations described in the Therminol FR Engineering Manual, such as flow rate, $\Delta T$, heat-flux density, etc., are also applicable to Therminol 77.

Although Therminol 77 does thermally degrade at temperatures above 700°F, it has been used in commercial heat transfer systems up to its atmospheric boiling point of 830°F. Degradation rate is very low at 700°F and increases progressively at increasing temperatures. Therminol 77 degradation products are predominantly polymers which are completely soluble in the bulk fluid and, therefore, do not form insulating deposits in the system. Degraded fluid is, however, more viscous than fresh fluid but can be reclaimed economically to essentially new-fluid condition.

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## THERMINOL® 77 FLUID PROPERTIES

| Temp °F | Vapor Pressure (mm Hg) | Viscosity (cs) | Viscosity (Lbs/Ft-Hr) | Density (g/cc) | Density (Lbs/Gal) |
|---|---|---|---|---|---|
| 100 | — | 181 | 505 | 1.152 | 9.60 |
| 210 | — | 7.78 | 20.8 | 1.106 | 9.26 |
| 300 | 0.27 | 2.65 | — | 1.070 | 8.94 |
| 400 | 1.03 | 1.50 | 3.74 | 1.029 | 8.58 |
| 500 | 9.2 | 0.96 | 2.28 | 0.981 | 8.16 |
| 600 | 44 | 0.66 | 1.49 | 0.931 | 7.76 |
| 700 | 168 | 0.46* | 0.99 | 0.885 | 7.38 |
| 800 | 530 | — | — | — | — |

*Extrapolation

## THERMAL CONDUCTIVITY

| Temp °F | Specific Heat (Btu/LB °F.) | Thermal Conductivity (Cal/cm, °C, sec) | Thermal Conductivity (BTU/°F, Ft-Hr) | Thermal Expansion, (cc/°F) |
|---|---|---|---|---|
| 100 | 0.350 | $32.25 \times 10^{-5}$ | 0.0781 | 0.00034 |
| 200 | 0.375 | $31.40 \times 10^{-5}$ | 0.0760 | — |
| 300 | 0.420 | $30.50 \times 10^{-5}$ | 0.0739 | 0.00037 |
| 400 | 0.455 | $29.65 \times 10^{-5}$ | 0.0719 | — |
| 500 | 0.495 | $28.80 \times 10^{-5}$ | 0.0698 | 0.00049 |
| 600 | 0.530 | — | — | — |
| 700 | 0.565 | — | — | 0.00062 |
| 800 | 0.600 | — | — | — |

| | | | |
|---|---|---|---|
| Pour Point | +45°F | Fire Point | 540°F |
| Flash Point | 460°F | A. I. T. | 1115°F |
| | | Thermal Decomposition** | 800°F |

**Thermal decomposition was determined by the isoteniscope method as described in the "Journal of Chemical and Engineering Data," January 1961, Vol. 6, No. 1. It is defined as the temperature at which dp/dt = 0.014 mm Hg per second, or 500 mm Hg per 10 hours.

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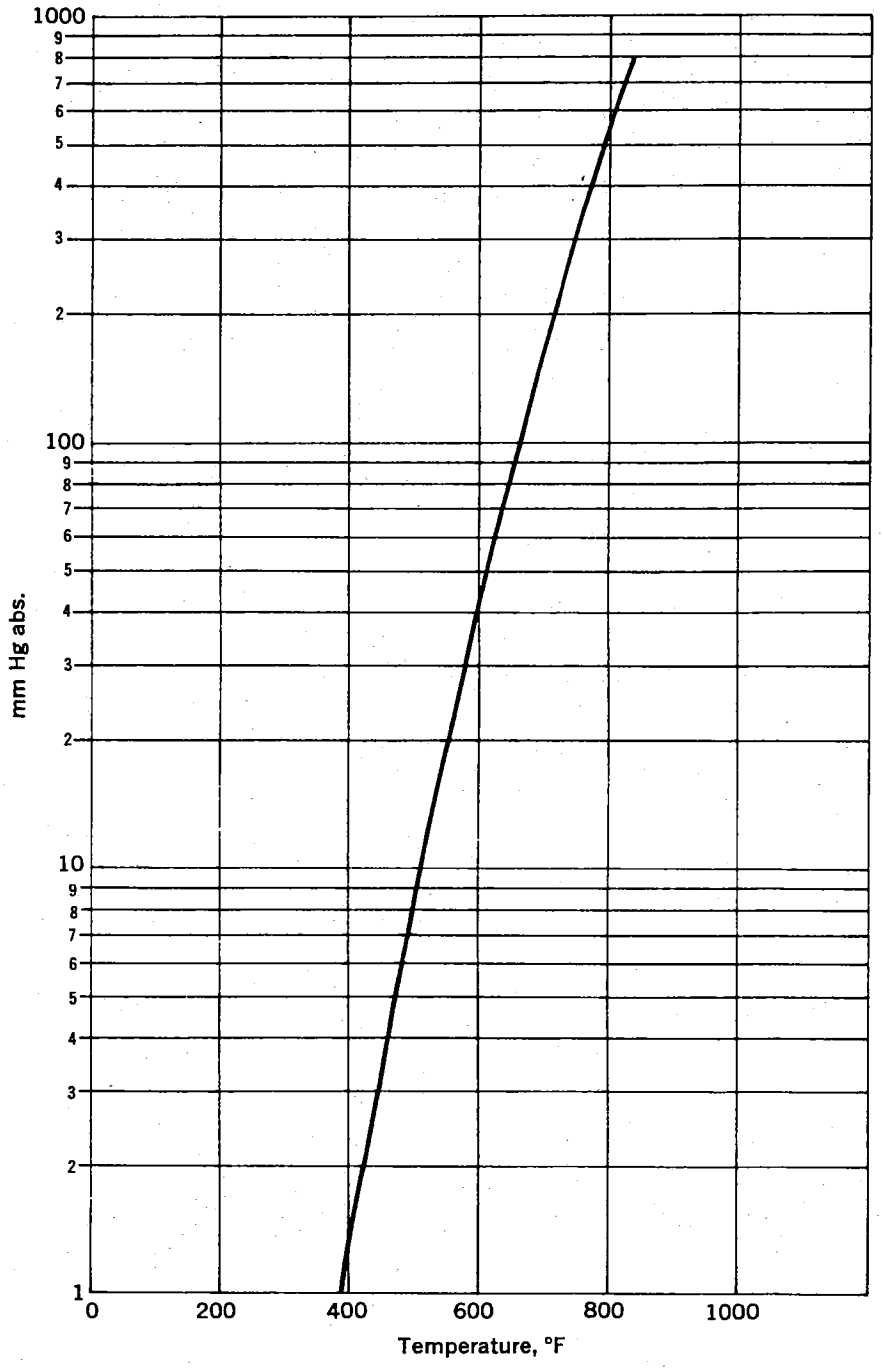
## VAPOR PRESSURE

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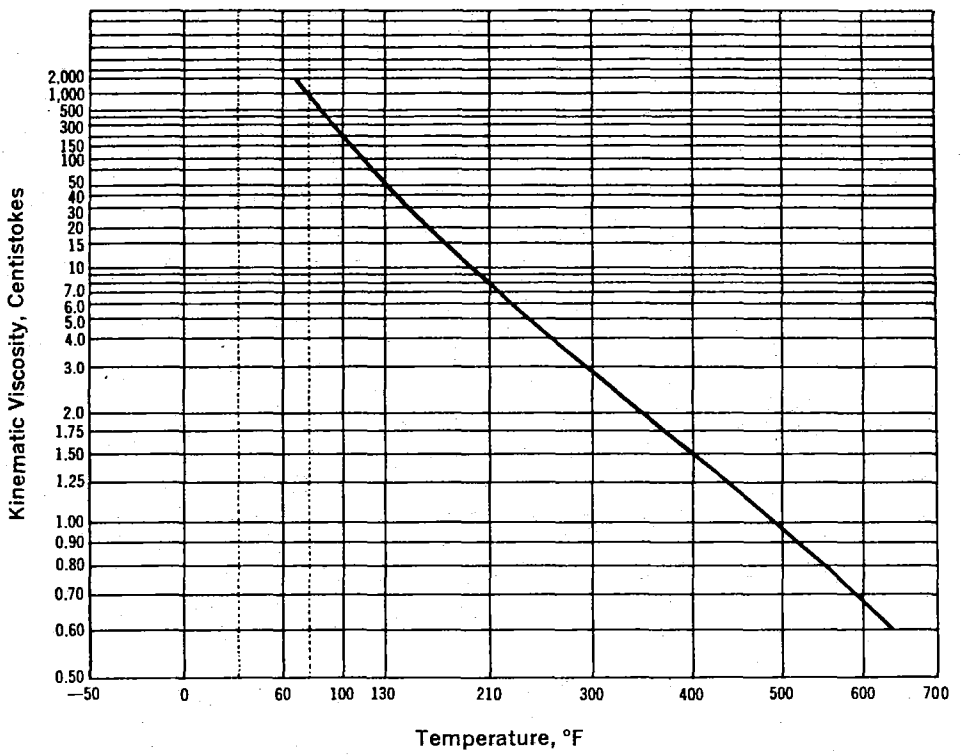
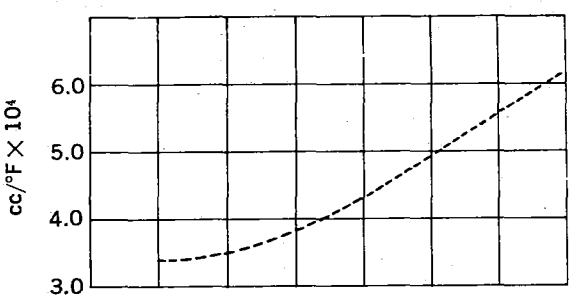
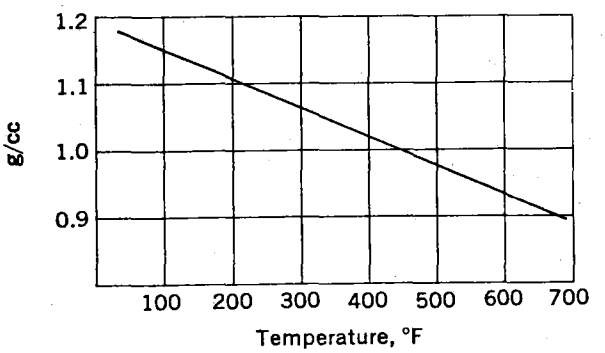
## KINEMATIC VISCOSITY




## COEFFICIENT OF THERMAL EXPANSION




## DENSITY

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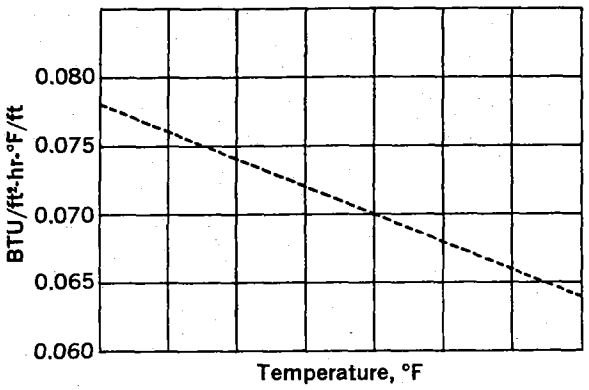
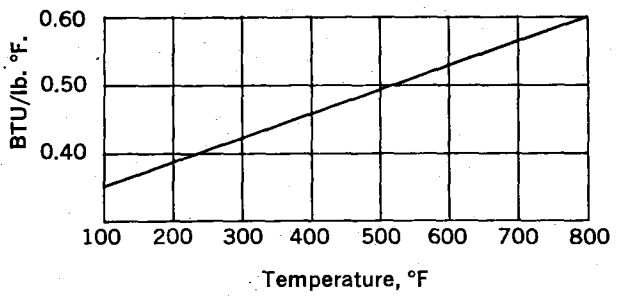
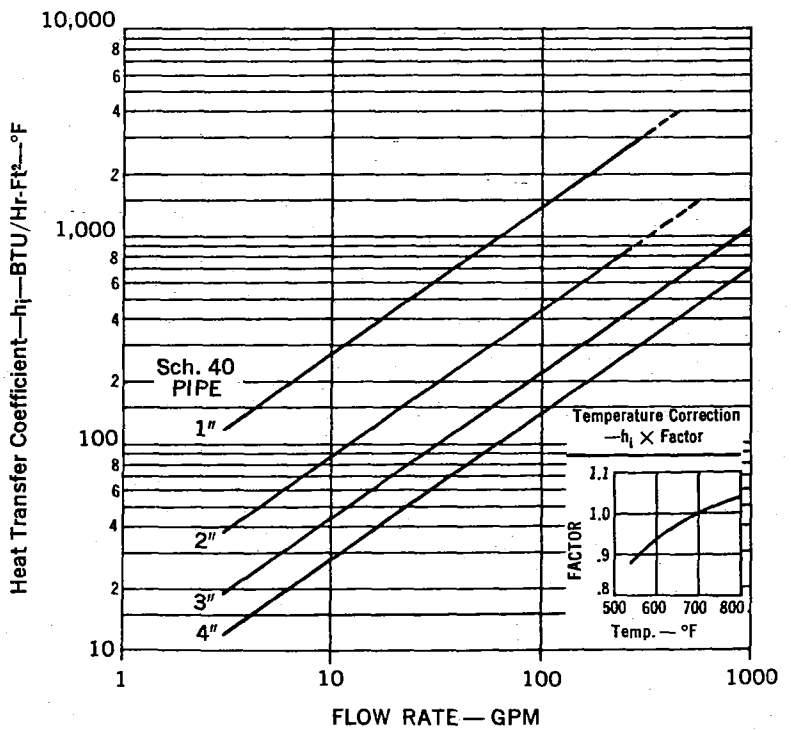
## THERMAL CONDUCTIVITY




## SPECIFIC HEAT




## Inside Film Heat Transfer Coefficient versus Flow Rate at 700°F

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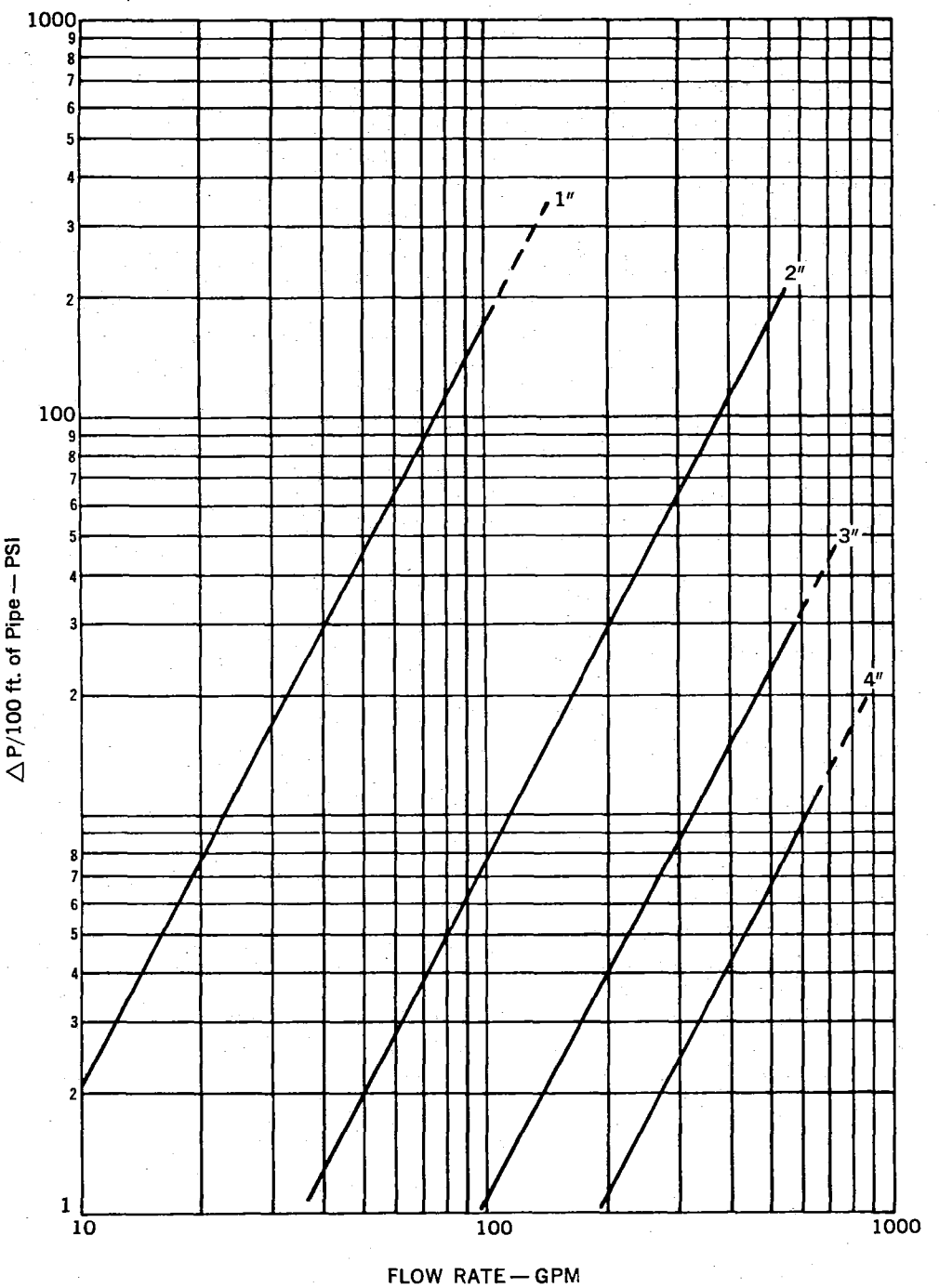
**Pressure Drop Per 100 Ft. of Pipe**

**versus**

**Flow Rate at 700°F**

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