Monsanto

THERMINOL® 88

HIGH TEMPERATURE
HEAT TRANSFER FLUID

...for use in liquid phase between 300° and 800°F

TYPICAL PROPERTIES OF THERMINOL® 88

Composition	Mixed terphenyls
Appearance	Crumbly wax-like flakes at room temperature. Light amber liquid above Melt Point.
Color	Yellow to light amber
Odor	Faint, pleasant
Melt Point begins to soften completely liquid	 140°F (60°C) 293°F (145°C)
Flash Point	375°F (191°C)
Flame Point	460°F (238°C)
Autoignition Temperature	>1000°F
Coefficient of Expansion	0.00047 cc/cc/°F
Latent Heat of Fusion	5.0-5.1 K Cal/mole
Molecular Weight	230
Boiling Range	687°-784°F (364°-418°C)

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PHYSICAL PROPERTIES - THERMINOL 88

Temp. °F	Density gm/cc	Kinematic Viscosity cs	Specific Heat BTU/# °F	Thermal Conductivity BTU/hr-ft-°F	Vapor Pressure mm Hg
77	1.133	-	-	-	-
200	-	-	-	-	-
300	1.01	1.57	0.467	0.0738	1.2
400	0.96	0.87	0.497	0.0712	11
500	0.92	0.55	0.525	0.0686	65
600	0.88	0.38	0.554	0.0660	260
700	0.83	0.29	0.584	0.0634	800
800	0.79	0.23	0.613	0.0608	1500
900	0.74	0.19	0.642	0.0581	3000

THERMAL DECOMPOSITION

Temperature, °F	% Polymerized/Hr.
700	0.000065
800	0.0048
900	0.32

Therminol 88 is usable with as much as 30% polymer content which affect properties as follows:

Melt Point	293° to 276°F
Flash & Flame Point, AIT	No appreciable change
Specific Gravity	+ 7% at 800°F
Viscosity	+35% at 800°F
Specific Heat	- 1% at 800°F
Thermal Conductivity	-13% at 800°F

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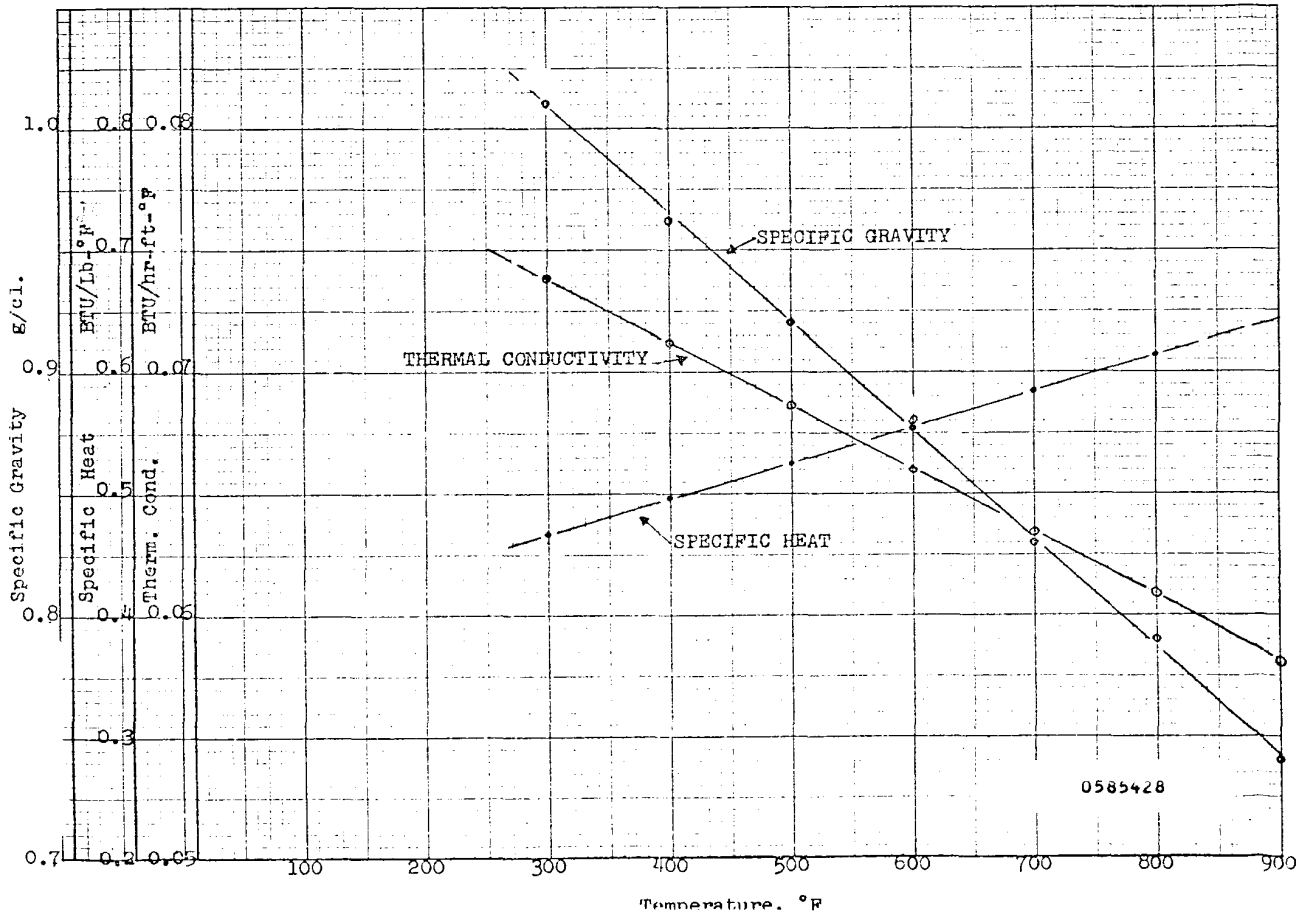

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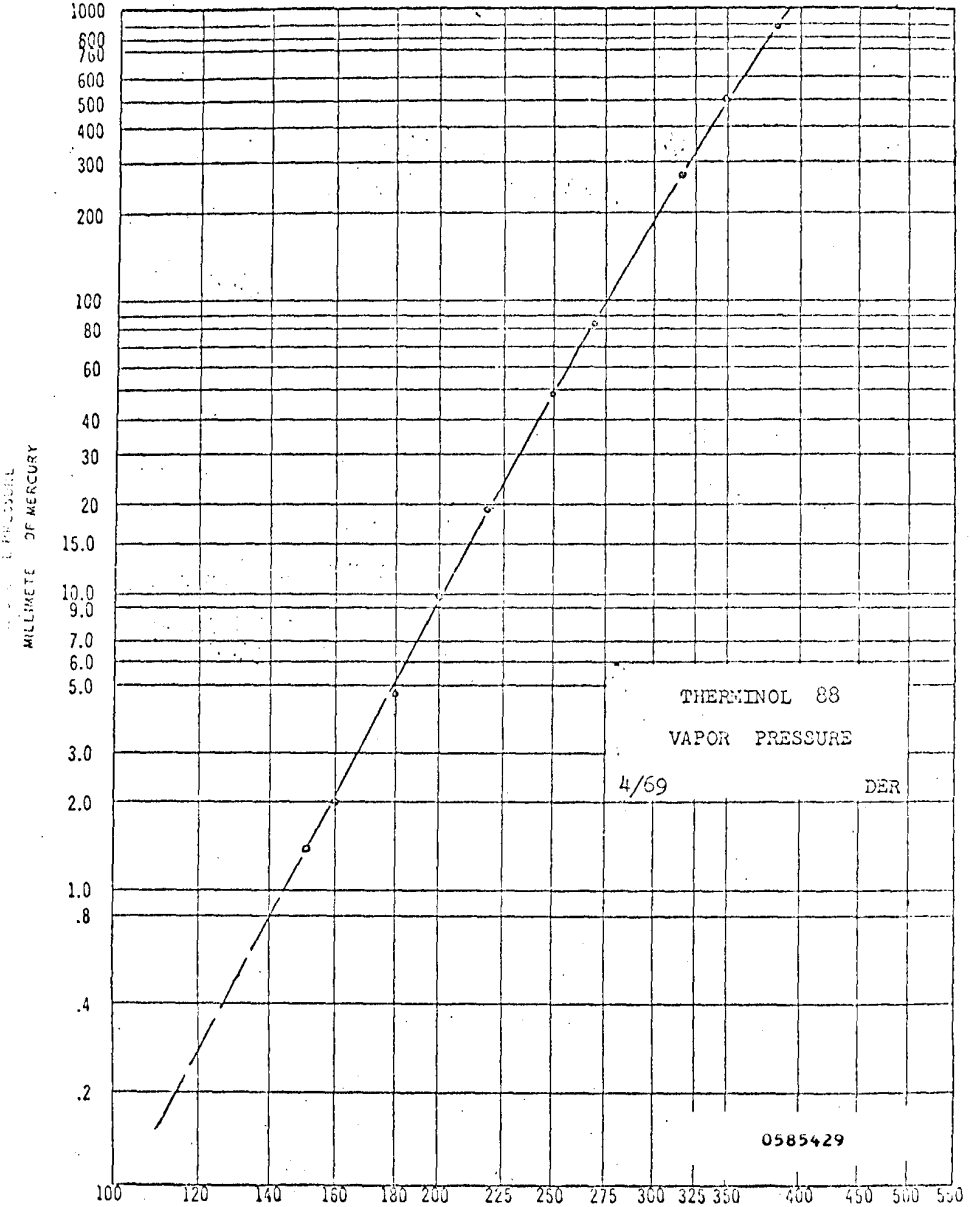

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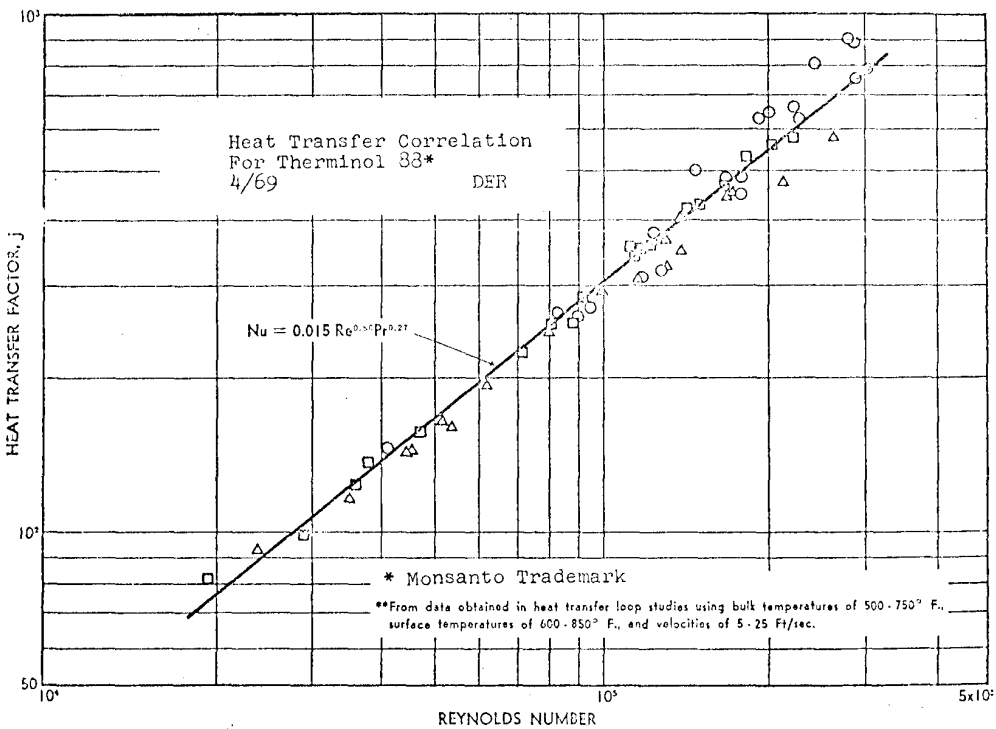
THERMINOL 88
Heat Transfer Correlation

This equation and j-factor plot is adequate to approximately plus/minus 7% and was developed for polyphenyls by A.I.



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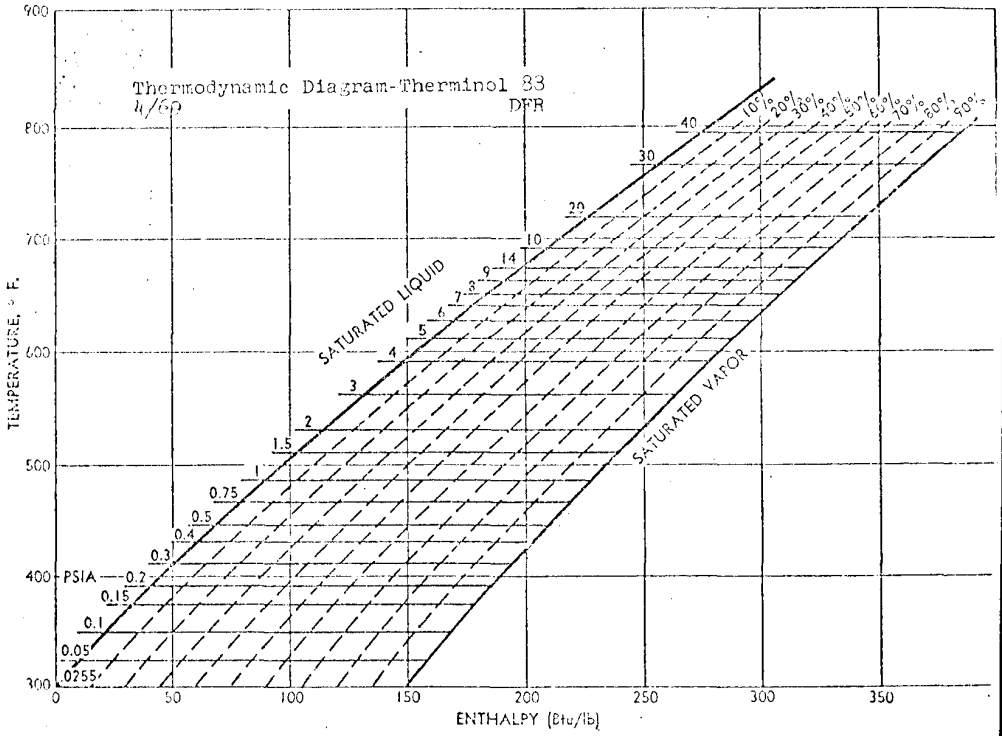
THERMINOL 88
Thermodynamic Diagram

While we do not propose that Therminol 88 be used as a vapor phase heat transfer medium, we often are requested to provide a thermodynamic network--which appears below.



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TYPICAL ELECTRICAL PROPERTIES THERMINOL 88

Dielectric Constant at 77°F	2.58 at 60 cps
Volume Resistivity	
at 212°F	140,000 x 10^9 ohm-cm
at 275°F	35,000 x 10^9 ohm-cm
at 311°F	550 x 10^9 ohm-cm

SOLUBILITY OF THERMINOL 88 IN MISCELLANEOUS SOLVENTS

Solvent	Grms. Therminol 88 per 100 ml. of solvent	
	25° C.	75° C.
3A Alcohol	0.008	0.6
Turpentine	1.2	9.0
Fuel Oil, API 36°, 38 S.U.S. at 100° F	1.66	8.4
Benzene	6.0	42.0
Trichlorobenzene	9.0	45.0
Stoddard's Solvent	0.7	8.0
Nitromethane	0.2	7.5
Nitroethane	2.0	15.0
1-Nitropropane	2.0	20.0
2-Nitropropane	2.0	20.0
(See also Figs. 1 and 2.)		

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SOLUBILITY OF THERMINOL 88 IN COMMON SOLVENTS

Fig. 1 - Solubility of Therminol 88 in Four Common Solvents

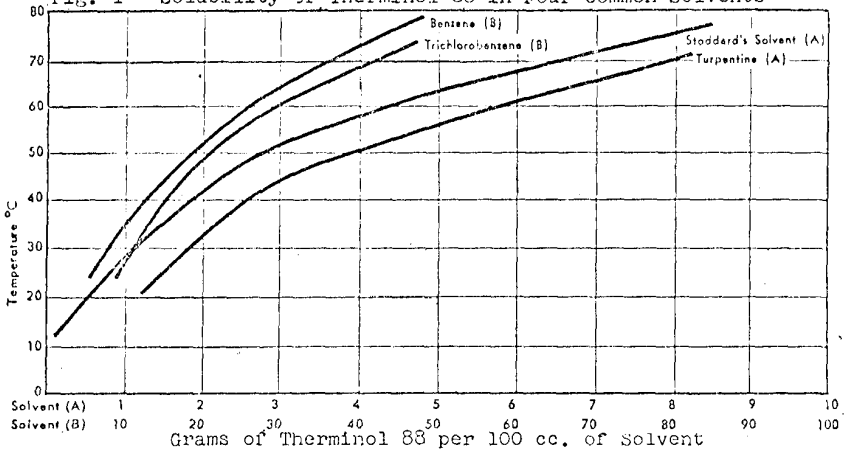
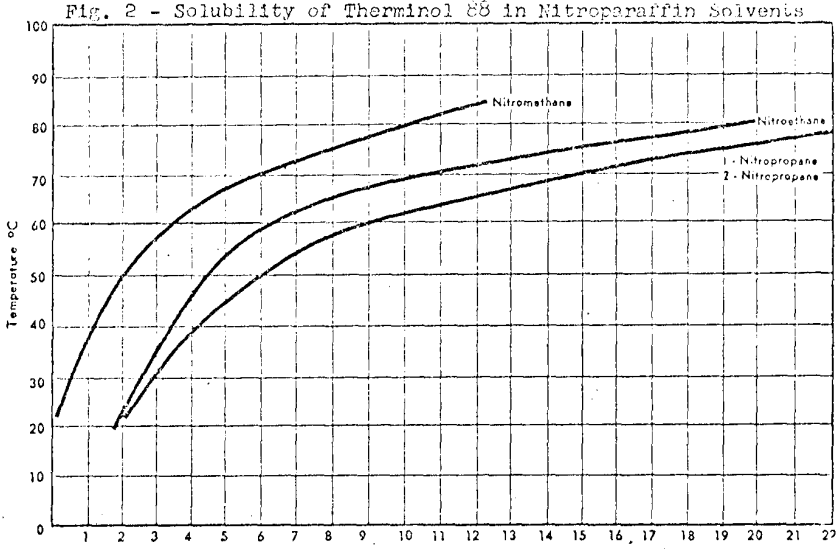


Fig. 2 - Solubility of Therminol 88 in Nitroparaffin Solvents



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THERMINOL 88

TYPICAL PHYSICAL, CHEMICAL AND THERMAL PROPERTIES

Composition	Mixed terphenyls
Appearance	Wax-like flakes at ambient temperature Light amber liquid above melting point.
Odor	Faint, pleasant
Coefficient of Expansion cc/cc/°C cc/cc/°F	 0.00085 0.00047
Density (lb/gal) 25°C (77°F) 149°C (300°F) 426°C (800°F)	 10.4 (solid) 8.38 (liquid) 6.56 (liquid)
Boiling Range °C °F	364 - 418 687 - 784
Melting Point begins to soften at..... completely liquid at.....	 60°C (140°F) 145°C (293°F)
Viscosity (cs) at 149°C (300°F) 204°C (400°F)	 1.57 .87
Flash Point, Pensky-Marten (ASTM-D93-46) °C °F	191 375
Fire Point, Pensky-Marten °C °F	238 460
Autoignition Temperature °C °F	above 538 above 1000
Latent Heat of Fusion kcal/kg BTU/lb	 21.7 - 22.2 39.1 - 40.0

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THERMINOL 88

VARIATION OF PROPERTIES WITH TEMPERATURE

Temperature		Density		Specific Heat		Thermal Conductivity		Viscosity		Vapor Pressure	
°F	°C	lb/gal	Kg/m^3	BTU/lb °F	Kcal/Kg °C	BTU/ft hr °F	Kcal/m hr °C	Cp	Cs	mmHg absolute	Kg/cm^2
300	149	8.38	1010	0.467	0.467	0.0738	0.1077	1.585	1.57	1.2	0.00163
400	204	7.96	960	0.497	0.497	0.0712	0.1060	0.835	0.87	11	0.0150
500	260	7.64	920	0.525	0.525	0.0686	0.1021	0.506	0.55	65	0.0885
600	316	7.31	880	0.554	0.554	0.0660	0.0982	0.335	0.38	260	0.354
700	371	6.90	830	0.584	0.584	0.0634	0.0943	0.241	0.29	800	1.087
800	427	6.56	790	0.613	0.613	0.0608	0.0905	0.1815	0.23	1500	2.04
900	482	6.13	740	0.642	0.642	0.0581	0.0865	0.1405	0.19	3000	4.08

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