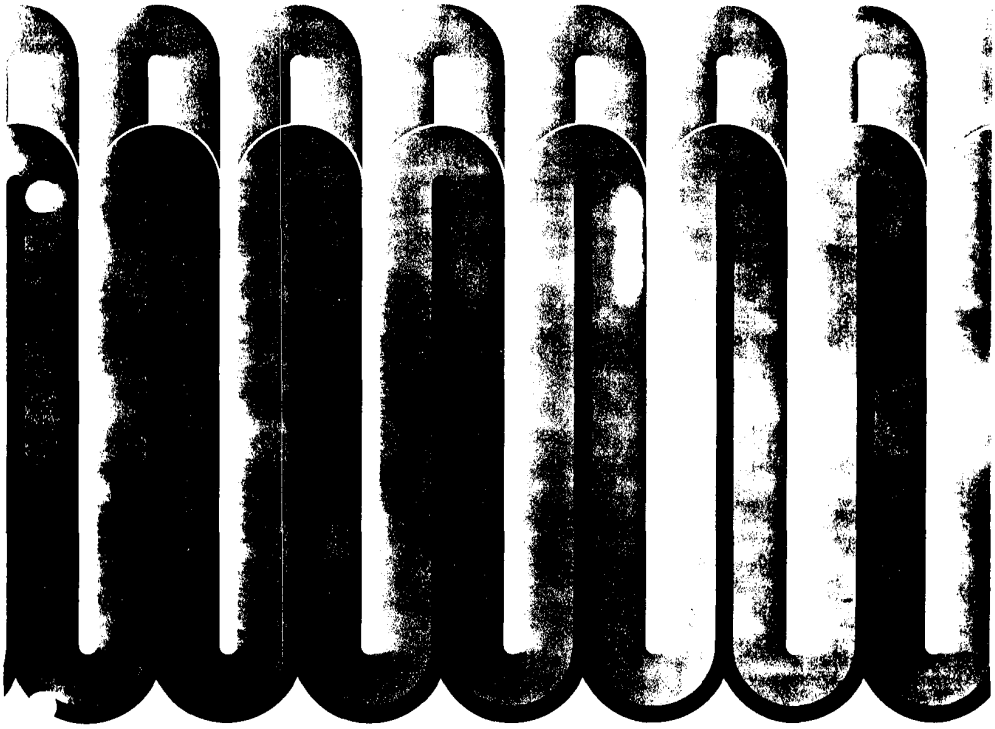
IC/ETP-88

THERMINOL 88

HIGH TEMPERATURE • LIQUID PHASE • HEAT TRANSFER FLUID • 300°F. TO 750°F.

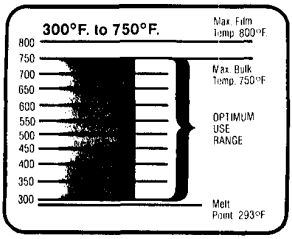


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Heat transfer fluids are intended only for *indirect* heating purposes. Under no circumstances should this product contact or in any way contaminate food, animal feed, food products, food packaging materials, food chemicals, pharmaceuticals or *any items which may directly or indirectly be ultimately ingested by humans.* Any contact may contaminate these items to the extent that their destruction may be required. Precautions against ignitions and fires should be taken with this product.

NOTICE: Nothing contained herein is to be construed as a recommendation to use any product in conflict with any patent. MONSANTO MAKES NO WARRANTIES AS TO THE FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY OF ANY PRODUCT REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations, and disclaims all liability for any resulting loss or damage.

In certain countries of Western Europe and the Far East, Monsanto sells Therminol Heat Transfer Fluids under the brand name "Santotherm* heat transfer fluids." Corresponding Therminol and Santotherm fluids are identical in composition.

Therminol* 88 synthetic heat transfer fluid offers outstanding high temperature heat transfer properties along with high temperature pumpability. Up to 750°F., Therminol 88 fluid is ideally suited as an alternative to hard-to-handle inorganic salts.

Therminol 88 fluid is designed for use in non-pressurized indirect heating systems. It delivers efficient, dependable process heat with no need for high pressures or costly venting equipment.

Therminol 88 is not classified as a fire-resistant heat transfer fluid. Consequently, the use of protective devices may be required to minimize fire risk. The insurer of your property should be consulted relative to this matter.

To minimize fluid oxidation, systems utilizing Therminol 88 fluid should be blanketed with an inert atmosphere. A system relief valve should also be provided.

Therminol 88 offers long service life within its recommended operating temperature range, and is non-corrosive to metals commonly used in the design of heat transfer systems.

TYPICAL PROPERTIES*

Composition	Mixed Terphenyls
Appearance	Crumbly wax-like flakes at room temperature. Light amber liquid above Melt Point
Odor	Faint, pleasant
Moisture Content	500 ppm
Melt Point	
Begins to soften	140°F. (60°C.)
Completely liquid	293°F. (145°C.)
Flash Point, COC	375°F. (191°C.)
Fire Point, COC	460°F. (238°C.)
Autogenous ignition temperature (ASTM)	>1000°F. (>538°C.)
Coefficient of Thermal Expansion	0.00047°F.$^{-1}$ (0.00085°C.$^{-1}$)
Boiling Range	
10%	687°F. (364°C.)
90%	784°F. (418°C.)
Molecular Weight	230
Kinematic Viscosity @ 600°F.	0.38 cSt
Heat of Vaporization (Calculated)	108 BTU/LB. (60 cal/g.)

*This data is based upon samples tested in our laboratory and is not guaranteed for all samples. Write us for complete sales specifications for Therminol 88 fluid.

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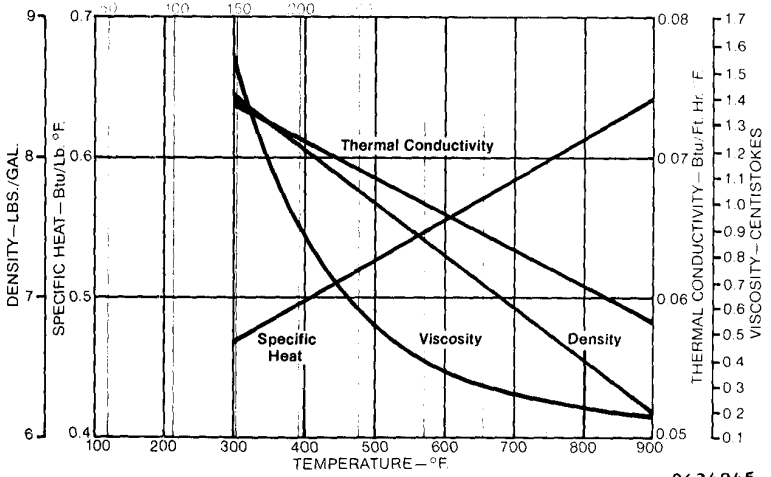
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VARIATIONS OF PROPERTIES WITH TEMPERATURE

Temperature		Density			Specific Heat		Thermal Conductivity		Viscosity		Vapor Pressure	
°F.	°C.	lb/gal	lb/ft³	g/ml	BTU/ lb. °F.	cal/g °C.	BTU/ hr-ft°F.	kcal/ hr-m°C.	Absolute lb/hr-ft	Kinematic cSt	torr (mm Hg)	g/cm²
77	25	9.43	70.55	1.133	—	—	—	—	—	—	—	—
200	93	—	—	—	—	—	—	—	—	—	—	—
250	121	—	—	—	—	—	—	—	—	—	—	—
300	149	8.42	63.05	1.01	0.467	0.467	0.0738	.1099	0.38	1.57	1.2	.002
350	177	8.25	61.80	0.99	0.482	0.482	0.0725	.1079	0.28	1.16	4.5	.006
400	204	8.01	59.93	0.96	0.497	0.497	0.0712	.1060	0.20	0.87	11	.015
450	232	7.84	58.68	0.94	0.511	0.511	0.0699	.1041	0.16	0.70	28	.038
500	260	7.67	57.44	0.92	0.525	0.525	0.0686	.1021	0.12	0.55	65	.088
550	288	7.50	56.18	0.90	0.540	0.540	0.0673	.1002	0.10	0.46	175	0.238
600	316	7.34	54.94	0.88	0.554	0.554	0.0660	.0983	0.08	0.38	260	0.354
650	343	7.09	53.06	0.85	0.569	0.569	0.0647	.0963	0.07	0.33	450	0.612
700	371	6.92	51.82	0.83	0.584	0.584	0.0634	.0944	0.06	0.29	800	1.088
750†	399	6.75	50.57	0.81	0.599	0.599	0.0621	.0925	0.05	0.25	1100	1.496
800	427	6.59	49.32	0.79	0.613	0.613	0.0608	.0905	0.04	0.23	1500	2.040
850	454	6.25	46.82	0.75	0.628	0.628	0.0595	.0886	0.04	0.20	2250	3.060
900	482	6.17	46.20	0.74	0.642	0.642	0.0581	.0865	0.04	0.19	3000	4.080

† Maximum recommended bulk temperature: 750°F (399°C)

PHYSICAL PROPERTIES*



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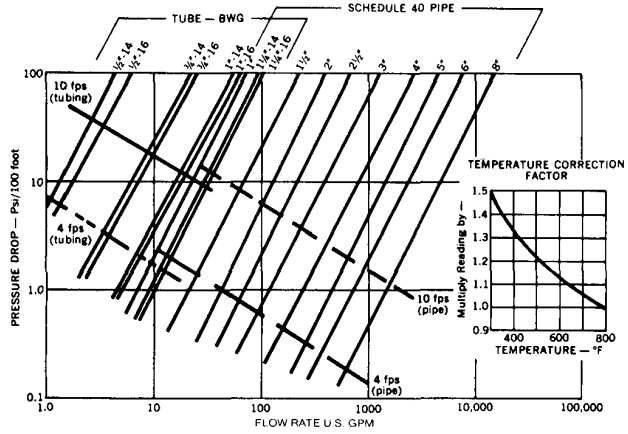
SAFETY AND [illegible]

Therminol 88 heat transfer fluid is practically non-toxic by ingestion in single doses and by single dermal applications. It is a slight eye irritant and it is not irritating to skin. Although no special handling precautions appear necessary, as with any industrial chemical good industrial practices and personal hygiene should be observed in handling to minimize exposure. In case of contact, remove chemical by flushing eyes or skin with plenty of water. Fluid-soiled clothing should be laundered before reuse.

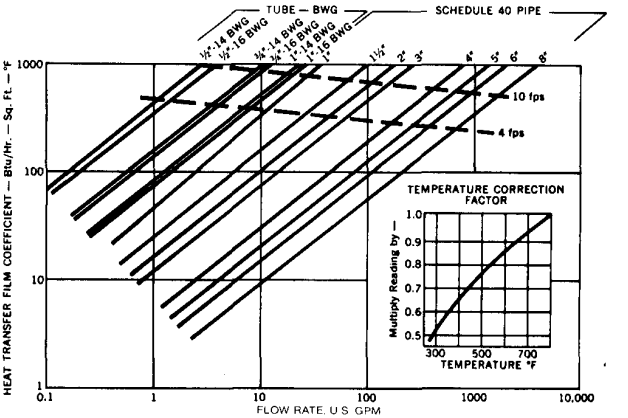
There is no vapor exposure problem when transferring Therminol 88 from its shipping container to the heat transfer system. On the other hand, vapors emitted by Therminol 88 heated to elevated temperatures may be mildly irritating and cause discomfort on prolonged exposure. In heat transfer installations, the fluid is used in a closed, non-pressurized system free from leaks and with the expansion tank vent trapped so as to condense any vapors. Consequently, there should be little or no opportunity for workers to come in contact with vapors.

While Therminol 88 poses no serious problems with respect to the environment, as a concerned supplier to industry, Monsanto urges the user to maintain a tight system, to correct leakage promptly, and to exercise care in the handling and disposal of this and all other such products. A tight maintenance program not only protects the environment, but keeps employes comfortable, the working area clean, and the system running smoothly.

THERMINOL® 88—PRESSURE DROP*
TURBULENT FLOW INSIDE CLEAN, ROUND TUBING AND PIPING



THERMINOL® 88—HEAT TRANSFER COEFFICIENTS*
TURBULENT FLOW INSIDE CLEAN, ROUND TUBING AND PIPING



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Monsanto

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