

THERMINOL[®] 75

Heat Transfer Fluid by **Solutia**

Synthetic,
Aromatic,
High-temperature
Heat Transfer Fluid

175 °F to

725 °F



-50 °F 0 °F 50 °F 100 °F 150 °F 200 °F 250 °F 300 °F 350 °F
-50 °C 0 °C 50 °C 100 °C 150 °C 200 °C 250 °C 300 °C 350 °C

Min. Use Temp.
175 °F (80 °C)

U S E R A N G E *

175 °F TO 725 °F (80 °C TO 385 °C)

Therminol® 75 is a synthetic aromatic heat transfer fluid.

It has a liquid operating temperature range of 175 °F – 725 °F (80 °C – 385 °C).

Because of its high boiling point (649 °F), Therminol 75 heat transfer liquid generates very little vapor pressure above ambient pressure at 725 °F and can be used in low pressure systems. Under ambient conditions, Therminol 75 is a soft, solid material having a slurry point of about 165 °F – 175 °F (75 °C – 80 °C).

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TABLE OF CONTENTS

Typical Properties	1
Introduction	2
Applications	2
Fluid Parameters and Selection Criteria	2
Design Recommendations	2
Operation Procedures	3
General Design and Maintenance	3
Safe Handling and Disposal	3
Solutia Analytical Service	3
Properties of Therminol 75 Heat Transfer Fluid	4

Max. Bulk Temp.
725 °F (385 °C)

Max. Film Temp.
770 °F (410 °C)

TYPICAL PROPERTIES* †

Appearance	Soft solid melting to yellow liquid
Composition	Terphenyl/quarterphenyl
Moisture Content, Maximum	200 ppm
Flash Point, Open Cup (ASTM D-92)	185 °C (365 °F)
Fire Point (ASTM D-92)	227 °C (440 °F)
Autoignition Temperature (ASTM D-2155)	538 °C (1000 °F)
Kinematic Viscosity at 100 °C	3.75 mm ² /s (cSt)
Density at 80 °C	1041 kg/m ³ (8.69 lb/gal)
Coefficient of Thermal Expansion at 200 °C	0.000803/°C (0.000446/°F)
Average Molecular Weight	230
Slurry Point	75-80 °C (165-175 °F)
Normal Boiling Point	343 °C (649 °F)
Heat of Vaporization at Maximum Use Temperature, 385 °C	236 kJ/kg (101 Btu/lb)
Optimum Use Range	80-385 °C (175-725 °F)
Extended Maximum Use Temperature	400 °C (750 °F)
Maximum Film Temperature	410 °C (770 °F)
Pseudocritical Temperature	579 °C (1074 °F)
Pseudocritical Pressure	25.3 bar (367 psia)
Pseudocritical Density	323 kg/m ³ (20.2 lb/ft ³)

* These data are based upon samples tested in the laboratory and are not guaranteed for all samples.

Write us for complete sales specifications for Therminol 75 fluid.

† Does not constitute an express warranty. See NOTICE on the back page of this bulletin.

INTRODUCTION

Therminol® 75 heat transfer fluid is a high temperature liquid phase heat transfer fluid having excellent thermal stability. It was developed for use at temperatures up to 725 °F (385 °C) in typical liquid phase heat transfer systems which operate at low pressure. Static pressure of about one and one-half atmospheres should maintain the liquid phase at high temperatures. Therminol 75 is non-corrosive to typical heat transfer system materials of construction, has low odor and low mammalian toxicity.

Therminol 75 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.

APPLICATIONS

The design and properties of Therminol 75 make it ideally suited for high temperature heat recovery applications in process and refinery operations, such as providing indirect heat to chemical process, heat recovery from stack gases, as a coolant to remove heat from exothermic reactors and for indirect heating of distillation processes.

Use of Therminol 75 in high-temperature heat transfer systems can result in savings of capital investment, fluid makeup, utility and maintenance costs as compared with higher pressure systems using more volatile heat transfer media.

FLUID PARAMETERS AND SELECTION CRITERIA

In the selection of a heat transfer fluid for high temperature use, it is important that one consider the fluid properties and characteristics. Some of these are listed below:

Stability

Therminol 75 is an exceptionally heat stable fluid; however, care must be taken to avoid overheating the fluid, which could lead to decomposition products.

The stability of a fluid is one of the most important considerations in the selection of a heat transfer fluid. The fluid should be capable of withstanding severe thermal stress for long durations of time and provide desirable overall long service life. As such, the chemical makeup or composition of the fluid must resist thermal degradation.

Overheating and exposure of the heat transfer fluid to thermal conditions above the recommended operating range of the fluid can result in increased decomposition of the fluid to low-boiling and high-boiling products. The low-boiling products can result in pump cavitation and localized boiling in the heater. These low boilers should be vented through a pressure relief device on the expansion tank to a non-hazardous area away from personnel and sources of ignition. The high-boiling products are generally soluble in the fluid. High-boiling products may possibly separate as solids (coke, tar, etc.) and could be detrimental to the operation of the system. Thus, when detected, they should be removed.

Contamination may accelerate the thermal breakdown of a fluid; thus, it is recommended that new and used heat transfer systems be cleaned thoroughly before filling with Therminol 75 heat transfer fluid. It is also important that oxidation of the fluid be kept to a minimum during high temperature operation by use of a positive nitrogen pressure on the expansion tank to which a pressure relief device should always be provided.

Heat Transfer Coefficient

Therminol 75 heat transfer fluid has equivalent or higher heat transfer coefficients than other natural or synthetic liquids in the same boiling range. As with all thermal liquid heat transfer systems, the flow should be fully turbulent in the heater and users to effect efficient heat transfer and avoid hot-spot boiling which can lead to fluid decomposition and surface fouling or heat transfer surface burn-out.

DESIGN RECOMMENDATIONS

Besides the design and operation guidance given in Solutia Liquid Phase Design Guide (publication number 7239128C), Therminol 75 heat transfer fluid with its 75 °C – 80 °C slurry point will require:

- heat tracing of system components for thawing the heat transfer medium to the liquid state.
- continuous heat tracing of instrumentation and control lines, system vents and other components which during system operation are cold and would not be operable with solid heat transfer media.
- a heatable storage that can accommodate the heat transfer system volume in case of emergency shutdown of utilities or drum storage which could be thawed out at a later time.
- all system low spots to have drains to facilitate fluid discharge and system cleaning.

OPERATION PROCEDURES

Start-up

In addition to suggested start-up procedures in Liquid Phase Design Guide 7239158C, systems using Therminol® 75 heat transfer fluid must be preheated as must the Therminol 75 to a temperature above the 175 °F (80 °C) slurry point and not be allowed to fall below this temperature. While Therminol 75 is reluctant to crystallize, the best operating practice is to have the system start-up temperature above 175 °F (80 °C). Two methods or combinations have been employed for preheating the system. The first is to have all components heat traced and the system preheated by the tracing. A second method is to introduce low pressure steam into the expansion tank and allow internal steam heating with condensate and steam exiting the system through the system drains and vents. This is especially useful where heat tracing of large heaters and user components is impractical. All system component temperatures should be monitored to ensure complete heating. The Therminol 75 is charged at above 175 °F (80 °C) to the system from thermally heated bulk storage or heated drums. The continuous heat tracing of instrumentation lines, system vents and pump shaft seals must be in operation before the system pumps and heaters are started. The expansion tank vents should be open to allow moisture to exit the system from the hot fluid moving through the expansion tank. After the free moisture has left the system, the expansion tank should be inert gas blanketed and normal operation commenced.

Shut-down

For shut-downs for systems which are not totally heat traced and the minimum system temperature is less than 175 °F (80 °C), Therminol 75 heat transfer fluid must be removed from the system and placed in heatable storage. All low point drains must be opened to remove Therminol 75.

GENERAL DESIGN AND MAINTENANCE

A design, operating and maintenance guide for liquid phase, low pressure heat transfer fluids is separately available. This guide (7239128C) discusses many general aspects of heat transfer systems. It may be obtained by contacting your sales representative or the Therminol technical service hotline (800-433-6997).

SAFE HANDLING AND DISPOSAL

Both animal toxicity studies and manufacturing experience indicate that no special precautions are required in the handling of Therminol 75 heat transfer fluid at ambient temperatures. However, it is suggested that good industrial practice relating to the avoidance of repeated and prolonged skin contact to any industrial chemical, heat transfer fluids, or petroleum product be followed. Vapors on the other hand, while not dangerously toxic, normally can give rise to discomfort; systems should be made as leak tight as possible. Repairs to leaks of hot fluid should be carried out under well-ventilated conditions.

While it is believed that Therminol 75 heat transfer fluid posed no serious problems with respect to the environment, as a concerned supplier to industry, Solutia 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 employees comfortable, the working area clean and the system running smoothly. The most environmentally acceptable means of disposal of used fluids is incineration.

Material Safety Data Sheets and Sales Specifications may be obtained from Environmental Operations, Industrial Products Group, Solutia Inc.

SOLUTIA ANALYTICAL SERVICE

Should a system experience heat transfer fluid related problems, Solutia will evaluate the used Therminol or other fluids against in-use experience guidelines. In many instances, these analyses have resulted in modest system changes to eliminate problems and in identification of external contamination.

P R O P E R T I E S O F T H E R M I N O L [®] 7 5

Temperature		Liquid Density			Liquid Heat Capacity		Liquid Enthalpy**		Liquid Thermal Conductivity		
°F	°C	lb/gal	lb/ft ³	kg/m ³	Btu/ lb-°F	kJ/ kg-K	Btu/lb	kJ/kg	Btu/ ft-hr-°F	kcal/ m-hr-°C	W/m-K
160	71	8.74	65.4	1048	0.402	1.68	-6.0	-14.1	0.0760	0.1131	0.1314
175	79	8.69	65.0	1042	0.408	1.71	0.0	0.0	0.0756	0.1125	0.1308
180	82	8.68	64.9	1040	0.410	1.72	2.0	4.8	0.0755	0.1124	0.1306
200	93	8.61	64.4	1032	0.418	1.75	10.3	24.1	0.0750	0.1116	0.1297
220	104	8.54	63.9	1024	0.426	1.78	18.8	43.7	0.0745	0.1109	0.1289
240	116	8.48	63.4	1016	0.434	1.82	27.4	63.7	0.0740	0.1102	0.1281
260	127	8.41	62.9	1008	0.442	1.85	36.1	84.1	0.0736	0.1094	0.1272
280	138	8.34	62.4	1000	0.450	1.88	45.1	104.8	0.0730	0.1087	0.1263
300	149	8.27	61.9	991	0.457	1.91	54.1	125.9	0.0725	0.1080	0.1255
320	160	8.21	61.4	983	0.464	1.94	63.3	147.3	0.0720	0.1072	0.1246
340	171	8.14	60.9	975	0.472	1.97	72.7	169.0	0.0715	0.1064	0.1237
360	182	8.07	60.3	967	0.478	2.00	82.2	191.1	0.0710	0.1056	0.1228
380	193	8.00	59.8	958	0.485	2.03	91.8	213.5	0.0704	0.1048	0.1219
400	204	7.93	59.3	950	0.492	2.06	101.6	236.2	0.0699	0.1040	0.1209
420	216	7.85	58.8	941	0.499	2.09	111.5	259.3	0.0694	0.1032	0.1200
440	227	7.78	58.2	932	0.505	2.11	121.6	282.6	0.0688	0.1024	0.1190
460	238	7.71	57.7	924	0.512	2.14	131.7	306.2	0.0682	0.1016	0.1180
480	249	7.63	57.1	915	0.518	2.17	142.0	330.2	0.0677	0.1007	0.1171
500	260	7.56	56.6	906	0.524	2.19	152.4	354.4	0.0671	0.0999	0.1161
520	271	7.48	56.0	897	0.530	2.22	163.0	378.9	0.0665	0.0990	0.1150
540	282	7.41	55.4	888	0.536	2.24	173.6	403.6	0.0659	0.0981	0.1140
560	293	7.33	54.8	878	0.541	2.26	184.4	428.6	0.0653	0.0972	0.1129
580	304	7.25	54.2	869	0.547	2.29	195.3	453.9	0.0647	0.0963	0.1119
600	316	7.17	53.6	859	0.552	2.31	206.3	479.5	0.0640	0.0953	0.1108
620	327	7.09	53.0	849	0.558	2.33	217.4	505.3	0.0634	0.0943	0.1096
640	338	7.00	52.4	839	0.563	2.35	228.6	531.3	0.0627	0.0933	0.1085
649	343	6.96	52.1	834	0.565	2.36	233.7	543.2	0.0624	0.0929	0.1079
660	349	6.92	51.7	829	0.568	2.38	239.9	557.6	0.0620	0.0923	0.1073
680	360	6.83	51.1	818	0.573	2.40	251.3	584.1	0.0613	0.0913	0.1061
700	371	6.74	50.4	808	0.578	2.42	262.8	610.8	0.0606	0.0902	0.1048
720	382	6.65	49.7	797	0.583	2.44	274.4	637.8	0.0598	0.0891	0.1035
725	385	6.62	49.6	794	0.584	2.44	277.3	644.6	0.0596	0.0888	0.1032
740	393	6.55	49.0	785	0.588	2.46	286.1	665.0	0.0591	0.0879	0.1021
750	399	6.50	48.7	779	0.590	2.47	292.0	678.7	0.0586	0.0873	0.1014
760	404	6.46	48.3	774	0.593	2.48	297.9	692.5	0.0582	0.0867	0.1007

* Maximum recommended bulk temperature 725 °F (385 °C).

† These data are based upon samples tested in the laboratory and are not guaranteed for all samples. Write us for complete sales specifications for Therminol 75 fluid.

** The liquid enthalpy basis is zero at 175 °F (79.4 °C).

HEAT TRANSFER FLUID * †

Liquid Viscosity			Vapor Pressure				Temperature	
lb/ ft-hr	cSt [mm ² /s]	cP [mPa·s]	psia	mm Hg	kgf/cm ²	kPa	°F	°C
12.2	4.83	5.06	0.0020	0.103	0.00014	0.014	160	71
10.5	4.16	4.33	0.0032	0.163	0.00022	0.022	175	79
9.97	3.96	4.12	0.0037	0.189	0.00026	0.025	180	82
8.22	3.29	3.40	0.0065	0.337	0.00046	0.045	200	93
6.86	2.77	2.84	0.0112	0.581	0.00079	0.078	220	104
5.78	2.35	2.39	0.0188	0.974	0.00132	0.130	240	116
4.92	2.02	2.03	0.0307	1.59	0.00216	0.212	260	127
4.22	1.75	1.75	0.0489	2.53	0.00344	0.337	280	138
3.65	1.52	1.51	0.0762	3.94	0.00535	0.525	300	149
3.18	1.34	1.32	0.116	6.00	0.00815	0.800	320	160
2.80	1.19	1.16	0.173	8.96	0.0122	1.19	340	171
2.47	1.06	1.02	0.254	13.1	0.0179	1.75	360	182
2.19	0.946	0.907	0.366	18.9	0.0257	2.52	380	193
1.96	0.853	0.810	0.519	26.8	0.0365	3.58	400	204
1.76	0.773	0.728	0.725	37.5	0.0510	5.00	420	216
1.59	0.704	0.657	0.999	51.7	0.0702	6.89	440	227
1.44	0.644	0.595	1.36	70.2	0.0955	9.36	460	238
1.31	0.592	0.542	1.82	94.3	0.128	12.6	480	249
1.20	0.546	0.495	2.42	125	0.170	16.7	500	260
1.10	0.506	0.454	3.18	164	0.223	21.9	520	271
1.01	0.471	0.418	4.13	214	0.290	28.5	540	282
0.933	0.439	0.386	5.31	275	0.374	36.6	560	293
0.864	0.411	0.357	6.77	350	0.476	46.7	580	304
0.803	0.386	0.332	8.56	443	0.602	59.0	600	316
0.748	0.364	0.309	10.7	555	0.754	74.0	620	327
0.698	0.344	0.289	13.3	690	0.938	92.0	640	338
0.677	0.336	0.280	14.7	760	1.03	101	649	343
0.654	0.326	0.270	16.5	852	1.16	114	660	349
0.613	0.310	0.254	20.2	1040	1.42	139	680	360
0.577	0.295	0.238	24.6	1270	1.73	169	700	371
0.543	0.282	0.225	29.7	1540	2.09	205	720	382
0.536	0.279	0.221	31.1	1610	2.19	215	725	385
0.513	0.270	0.212	35.7	1850	2.51	246	740	393
0.499	0.265	0.206	39.1	2020	2.75	270	750	399
0.485	0.259	0.201	42.7	2210	3.00	295	760	404

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