

VP-3

THERMINOL® VP-3

Heat Transfer Fluid by Solutia

Vapor Phase/
Liquid Phase
Heat Transfer Fluid

36 °F to
625 °F



+700 °F

+350 °C

+600 °F

+300 °C

+500 °F

+250 °C

+400 °F

+200 °C

+150 °C +300 °F

+100 °C

+200 °F

+50 °C

+100 °F

0 °C

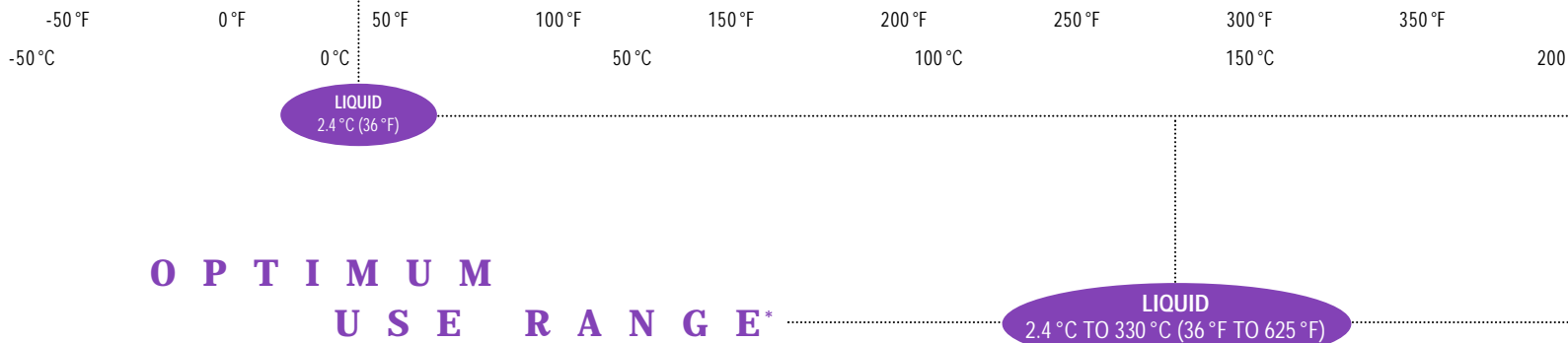
0 °F

-50 °C

-100 °F

VAPOR USE RANGE

LIQUID USE RANGE



OPTIMUM USE RANGE*

LIQUID
2.4 °C TO 330 °C (36 °F TO 625 °F)

Therminol VP-3 liquid/vapor phase heat transfer fluid was specially developed to allow vapor phase heat transfer at lower temperatures than are practical with traditional diphenyl oxide/biphenyl constituted fluids like Therminol® VP-1.

THERMINOL® VP-3**

Heat Transfer Fluid by Solutia

PHYSICAL AND CHEMICAL CHARACTERISTICS

Operating Range

Therminol VP-3 has a normal boiling point of 243 °C (469 °F), 14 °C (26 °F) below the normal boiling point of Therminol VP-1. Laboratory thermal stability testing suggests a maximum continuous operating temperature of 330 °C (625 °F) in the liquid or vapor phase. A crystallization point of 2.4 °C (36 °F) makes Therminol VP-3 easy to handle and may eliminate the need for costly heat tracing in moderate climates.

Composition

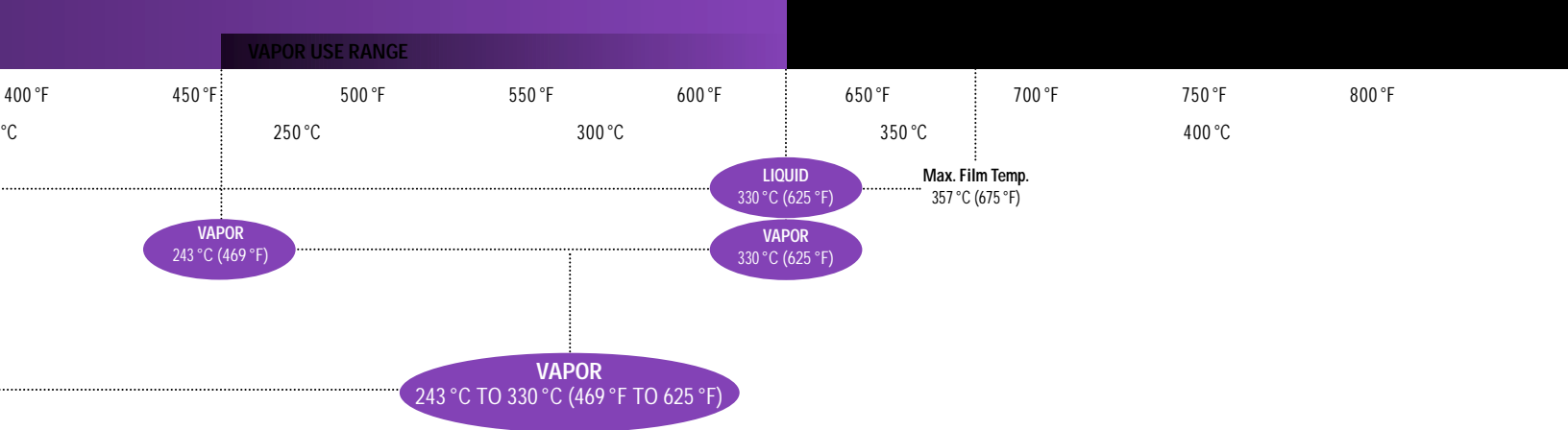
Therminol VP-3 is a mixture of approximately 90% phenylcyclohexane and 10% bicyclohexyl. It contains virtually no biphenyl. The odor of Therminol VP-3 is milder than other vapor phase organic heat transfer fluids.

Combustibility

With an open cup flash point of 104 °C (219 °F), Therminol VP-3 is a Class III b combustible fluid under the definitions of the NFPA (National Fire Prevention Association). As with any other combustible material, proper system design and operation are important to safe operation. Leaks of vapor could condense into a stable mist suspension that may be explosive in certain concentrations in air.

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TYPICAL PROPERTIES*

Composition		Phenylcyclohexane (90% min) + bicyclohexyl (<10%)
Appearance		Above 2.4 °C (36 °F) clear, sediment free liquid
Max. Bulk Temperature		330 °C (625 °F)
Max. Film Temperature		357 °C (675 °F)
Kinematic Viscosity @ 40 °C	ASTM D446	2.04 cSt (mm ² /s)
Density @ 40 °C		7.70 lb/gal (923 kg/m ³)
Flash Point, Open Cup	ASTM D-92	104 °C (219 °F)
Fire Point	ASTM D-92	113 °C (235 °F)
Autoignition Temperature	ASTM D-2155	351 °C (663 °F)
Crystallization Point		2.4 °C (36 °F)
Boiling Point @ 1 atm		243 °C (469 °F)
Coefficient of Thermal Expansion at 200 °C		0.001204/°C
Moisture Content	ASTM E203-75	<150 ppm
Average Molecular Weight		161
Specific Gravity (60 °F/60 °F)		0.936
Surface Tension @ 25 °C		43.2 dynes/cm
Pseudocritical Temperature		406 °C (764 °F)
Pseudocritical Pressure		38.5 bar (558.4 psia)
Pseudocritical Density		352 kg/m ³ (22.0 lb/ft ³)

Note: Values quoted are typical values obtained in the laboratory from production samples. Other samples might exhibit different data. Specifications are subject to change. Write to Solutia for current sales specification.

* Does not constitute an express warranty. See NOTICE on last page.

LIQUID PROPERTIES OF THERMINOL®

Temperature		Liquid Density			Liquid Heat Capacity		Liquid Enthalpy**	
°F	°C	lb/gal	lb/ft ³	kg/m ³	Btu/(lb·°F) [cal/(g·°C)]	kJ/(kg·K)	Btu/lb	kJ/kg
40	4	7.85	58.8	941	0.365	1.53	0	0
60	16	7.81	58.4	936	0.378	1.58	7.44	17.3
80	27	7.76	58.0	930	0.391	1.64	15.1	35.2
100	38	7.71	57.7	924	0.403	1.69	23.1	53.6
120	49	7.66	57.3	918	0.416	1.74	31.3	72.7
140	60	7.60	56.9	911	0.428	1.79	39.7	92.3
160	71	7.55	56.4	904	0.439	1.84	48.4	112.4
180	82	7.49	56.0	897	0.451	1.88	57.3	133.1
200	93	7.42	55.5	890	0.462	1.93	66.4	154.3
220	104	7.36	55.1	882	0.473	1.98	75.7	176.0
240	116	7.29	54.6	874	0.483	2.02	85.3	198.3
260	127	7.22	54.0	866	0.494	2.07	95.1	221.0
280	138	7.15	53.5	857	0.504	2.11	105.0	244.2
300	149	7.08	52.9	848	0.514	2.15	115.2	267.8
320	160	7.00	52.4	839	0.524	2.19	125.6	292.0
340	171	6.92	51.8	829	0.534	2.23	136.2	316.6
360	182	6.84	51.1	819	0.543	2.27	150.0	341.6
380	193	6.75	50.5	809	0.553	2.31	157.9	367.1
400	204	6.66	49.8	798	0.562	2.35	169.1	393.0
420	216	6.57	49.1	787	0.571	2.39	180.4	419.3
440	227	6.47	48.4	776	0.581	2.43	191.9	446.1
460	238	6.37	47.7	764	0.590	2.47	203.6	473.3
469 ^{t†}	243	6.33	47.3	758	0.595	2.49	209.1	486.0
480	249	6.27	46.9	751	0.600	2.51	215.5	501.1
500	260	6.16	46.1	738	0.611	2.56	227.6	529.2
520	271	6.05	45.3	725	0.622	2.60	240.0	557.8
540	282	5.93	44.4	711	0.634	2.65	252.5	587.0
560	293	5.81	43.5	696	0.647	2.71	265.3	616.8
580	304	5.68	42.5	681	0.663	2.78	278.4	647.2
600	316	5.54	41.5	664	0.683	2.86	291.9	678.5
620	327	5.40	40.4	647	0.708	2.96	305.8	710.8
625	329	5.36	40.1	642	0.715	2.99	309.3	719.0
640	338	5.24	39.2	628	0.741	3.10	320.2	744.4
660	349	5.07	38.0	608	0.791	3.31	335.5	779.9
680	360	4.89	36.6	586	0.869	3.63	352.1	818.3

* Maximum recommended bulk temperature is 330°C (625°F).

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

** The enthalpy basis is zero at 4.4°C (40°F).

t† The normal boiling temperature is 243°C (469°F).

VP - 3 HEAT TRANSFER FLUID * †

Liquid Thermal Conductivity			Liquid Viscosity			Vapor Pressure				Temperature	
Btu/ (ft·h·°F)	kcal/ (m·h·°C)	W/(m·K)	lb/(ft·h)	cSt [mm ² /s]	cP [mPa·s]	psia	mm Hg	kgf/cm ²	kPa	°F	°C
0.0690	0.1027	0.1194	11.3	4.96	4.67	0.0001	0.0057		0.0008	40	4
0.0682	0.1015	0.1180	8.03	3.55	3.32	0.0003	0.0157		0.0021	60	16
0.0674	0.1003	0.1166	6.03	2.68	2.49	0.0008	0.0397		0.0053	80	27
0.0666	0.0991	0.1152	4.73	2.12	1.96	0.0018	0.0936		0.0125	100	38
0.0658	0.0978	0.1137	3.85	1.73	1.59	0.0040	0.2075		0.0277	120	49
0.0649	0.0966	0.1123	3.22	1.46	1.33	0.0084	0.4350	0.0006	0.0580	140	60
0.0641	0.0954	0.1109	2.75	1.26	1.14	0.0168	0.8675	0.0012	0.116	160	71
0.0633	0.0941	0.1094	2.40	1.10	0.990	0.0320	1.654	0.0022	0.220	180	82
0.0624	0.0929	0.1080	2.12	0.984	0.876	0.0585	3.027	0.0041	0.404	200	93
0.0616	0.0917	0.1065	1.90	0.888	0.783	0.103	5.338	0.0073	0.712	220	104
0.0607	0.0904	0.1051	1.71	0.810	0.708	0.176	9.101	0.0124	1.21	240	116
0.0599	0.0891	0.1036	1.56	0.749	0.644	0.291	15.0	0.0205	2.01	260	127
0.0590	0.0879	0.1021	1.43	0.688	0.589	0.468	24.2	0.0329	3.22	280	138
0.0582	0.0866	0.1006	1.31	0.639	0.542	0.732	37.9	0.0515	5.05	300	149
0.0573	0.0853	0.0991	1.21	0.597	0.500	1.12	57.9	0.0787	7.72	320	160
0.0565	0.0840	0.0976	1.12	0.559	0.463	1.68	86.6	0.118	11.6	340	171
0.0556	0.0827	0.0962	1.04	0.525	0.430	2.46	127	0.173	16.9	360	182
0.0547	0.0814	0.0946	0.966	0.494	0.399	3.53	183	0.248	24.4	380	193
0.0538	0.0801	0.0931	0.898	0.465	0.371	4.99	258	0.351	34.4	400	204
0.0530	0.0788	0.0916	0.836	0.440	0.346	6.94	359	0.488	47.9	420	216
0.0521	0.0775	0.0901	0.778	0.415	0.322	9.51	492	0.669	65.6	440	227
0.0512	0.0762	0.0885	0.724	0.392	0.299	12.8	664	0.904	88.6	460	238
0.0508	0.0756	0.0878	0.701	0.382	0.290	14.7	760	1.03	101	469	243
0.0503	0.0748	0.0870	0.674	0.371	0.279	17.1	886	1.20	118	480	249
0.0494	0.0735	0.0854	0.627	0.351	0.259	22.6	1170	1.59	156	500	260
0.0485	0.0722	0.0839	0.583	0.333	0.241	29.4	1520	2.06	202	520	271
0.0476	0.0708	0.0823	0.542	0.315	0.224	37.8	1960	2.66	261	540	282
0.0467	0.0695	0.0807	0.504	0.299	0.208	48.2	2490	3.39	332	560	293
0.0458	0.0681	0.0792	0.468	0.284	0.193	60.8	3140	4.28	419	580	304
0.0448	0.0667	0.0776	0.434	0.270	0.179	76.1	3930	5.35	524	600	316
0.0439	0.0653	0.0760	0.402	0.257	0.166	94.4	4880	6.63	651	620	327
0.0437	0.0650	0.0756	0.395	0.254	0.163	99.5	5140	6.99	686	625	329
0.0430	0.0640	0.0743	0.372	0.245	0.154	116	6000	8.16	800	640	338
0.0420	0.0626	0.0727	0.345	0.234	0.142	142	7330	9.97	978	660	349
0.0411	0.0612	0.0711	0.319	0.225	0.132	172	8890	12.1	1180	680	360

3

TECHNICAL SERVICE HOTLINE (800) 433-6997



VAPOR PROPERTIES OF THERMINOL®

Temperature		Vapor Density		Vapor Heat Capacity		Heat of Vaporization		Vapor Enthalpy**	
°F	°C	lb/ft ³	kg/m ³	Btu/(lb·°F) [cal/(g·°C)]	kJ/(kg·K)	Btu/lb	kJ/kg	Btu/lb	kJ/kg
40	4	0.000003	0.00005	0.259	1.08	229.4	533.3	229.4	533.3
60	16	0.000009	0.00014	0.271	1.13	227.3	528.4	234.8	545.7
80	27	0.00002	0.00034	0.282	1.18	225.2	523.4	240.3	558.5
100	38	0.00005	0.00078	0.294	1.23	223.0	518.3	246.0	571.9
120	49	0.00010	0.00167	0.305	1.28	220.8	513.2	252.0	585.9
140	60	0.00021	0.00337	0.317	1.32	218.6	508.1	258.3	600.3
160	71	0.00041	0.00651	0.328	1.37	216.4	502.9	264.7	615.3
180	82	0.00075	0.0120	0.339	1.42	214.1	497.7	271.4	630.8
200	93	0.00133	0.0213	0.350	1.46	211.9	492.5	278.3	646.8
220	104	0.00228	0.0365	0.361	1.51	209.6	487.3	285.4	663.3
240	116	0.00378	0.0605	0.372	1.56	207.4	482.1	292.7	680.3
260	127	0.00607	0.0972	0.382	1.60	205.2	476.9	300.2	697.9
280	138	0.00950	0.152	0.393	1.64	202.9	471.7	308.0	715.9
300	149	0.0145	0.232	0.403	1.69	200.7	466.5	315.9	734.3
320	160	0.0216	0.346	0.414	1.73	198.5	461.3	324.1	753.3
340	171	0.0315	0.505	0.424	1.77	196.2	456.1	332.4	772.7
360	182	0.0452	0.723	0.434	1.82	194.0	450.9	341.0	792.5
380	193	0.0635	1.02	0.444	1.86	191.8	445.7	349.7	812.8
400	204	0.0879	1.41	0.454	1.90	189.5	440.5	358.6	833.5
420	216	0.120	1.92	0.463	1.94	187.3	435.3	367.7	854.6
440	227	0.161	2.58	0.473	1.98	185.0	430.0	376.9	876.1
460	238	0.213	3.42	0.482	2.02	182.7	424.6	386.3	897.9
469 ^{††}	243	0.242	3.88	0.486	2.04	181.6	422.1	390.7	908.1
480	249	0.280	4.48	0.491	2.06	180.3	419.1	395.9	920.1
500	260	0.363	5.81	0.500	2.09	177.9	413.5	405.6	942.7
520	271	0.466	7.46	0.510	2.13	175.4	407.7	415.4	965.5
540	282	0.592	9.49	0.518	2.17	172.8	401.6	425.3	988.6
560	293	0.747	12.0	0.527	2.21	170.0	395.2	435.4	1012
580	304	0.935	15.0	0.536	2.24	167.1	388.4	445.5	1036
600	316	1.16	18.6	0.545	2.28	163.8	380.9	455.7	1059
620	327	1.44	23.0	0.554	2.32	160.2	372.5	466.0	1083
625	329	1.51	24.3	0.556	2.33	159.3	370.2	468.6	1089
640	338	1.77	28.3	0.563	2.36	156.1	362.9	476.4	1107
660	349	2.16	34.7	0.572	2.39	151.2	351.4	486.7	1131
680	360	2.64	42.3	0.581	2.43	145.0	337.1	497.1	1156

* Maximum recommended bulk temperature is 330°C (625°F).

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

** The enthalpy basis is zero at 4.4°C (40°F).

†† The normal boiling temperature is 243°C (469°F).

VP - 3 HEAT TRANSFER FLUID * †

Vapor Thermal Conductivity			Vapor Viscosity			Temperature	
Btu/ (ft·h·°F)	kcal/ (m·h·°C)	W/(m·K)	lb/(ft·h)	cSt [mm ² /s]	cP [mPa·s]	°F	°C
0.0049	0.0073	0.0085	0.0163		0.00674	40	4
0.0054	0.0080	0.0094	0.0170		0.00702	60	16
0.0059	0.0088	0.0103	0.0176		0.00729	80	27
0.0065	0.0096	0.0112	0.0183		0.00757	100	38
0.0070	0.0104	0.0121	0.0190		0.00785	120	49
0.0075	0.0112	0.0130	0.0197		0.00813	140	60
0.0081	0.0120	0.0140	0.0203	1290	0.00841	160	71
0.0086	0.0129	0.0150	0.0210	723	0.00869	180	82
0.0092	0.0137	0.0159	0.0217	420	0.00897	200	93
0.0098	0.0146	0.0169	0.0224	253	0.00925	220	104
0.0104	0.0154	0.0179	0.0230	158	0.00953	240	116
0.0109	0.0163	0.0189	0.0237	101	0.00981	260	127
0.0115	0.0172	0.0199	0.0244	66.3	0.0101	280	138
0.0121	0.0180	0.0210	0.0251	44.7	0.0104	300	149
0.0127	0.0189	0.0220	0.0258	30.8	0.0106	320	160
0.0133	0.0198	0.0231	0.0264	21.6	0.0109	340	171
0.0140	0.0208	0.0241	0.0271	15.5	0.0112	360	182
0.0146	0.0217	0.0252	0.0278	11.3	0.0115	380	193
0.0152	0.0226	0.0263	0.0284	8.36	0.0118	400	204
0.0158	0.0236	0.0274	0.0291	6.28	0.0120	420	216
0.0165	0.0245	0.0285	0.0298	4.78	0.0123	440	227
0.0171	0.0255	0.0296	0.0304	3.68	0.0126	460	238
0.0174	0.0259	0.0301	0.0307	3.28	0.0127	469	243
0.0178	0.0264	0.0307	0.0311	2.87	0.0129	480	249
0.0184	0.0274	0.0319	0.0318	2.26	0.0131	500	260
0.0191	0.0284	0.0330	0.0324	1.80	0.0134	520	271
0.0198	0.0294	0.0342	0.0331	1.44	0.0137	540	282
0.0204	0.0304	0.0354	0.0337	1.16	0.0139	560	293
0.0211	0.0314	0.0366	0.0344	0.948	0.0142	580	304
0.0218	0.0325	0.0378	0.0350	0.776	0.0145	600	316
0.0225	0.0335	0.0390	0.0356	0.640	0.0147	620	327
0.0227	0.0338	0.0393	0.0358	0.610	0.0148	625	329
0.0232	0.0346	0.0402	0.0363	0.529	0.0150	640	338
0.0239	0.0356	0.0414	0.0369	0.440	0.0152	660	349
0.0247	0.0367	0.0426	0.0375	0.367	0.0155	680	360

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