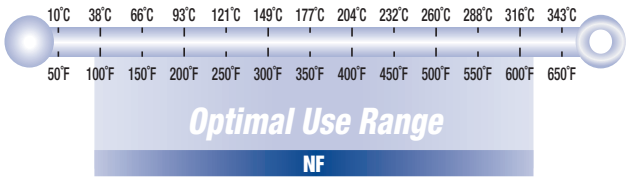
Paratherm-NF®

Heat Transfer Fluid



Food Grade *Low Viscosity for Easy Start Up*

ENGINEERING BULLETIN NF 613

The Paratherm NF® Heat Transfer Fluid is a food grade, mineral-oil based heat transfer fluid designed for extended trouble-free service in closed-loop liquid-phase systems up to 600°F in fuel-fired heaters and 630°F in electric immersion heaters.

Applications include:

- Chemical reactors
- Food processing
- Portable electric temperature control units
- Electric heaters

Food grade means less maintenance

The food grade level of quality is not only important for food processing, it also makes Paratherm NF Heat Transfer Fluid one of the lowest maintenance fluids on the market. Impurities that naturally occur in crude oil (such as asphaltenes and sulfur compounds) tend to break down first in the heater and, if severely overheated, can form coke deposits on the heater surfaces. The extensive refining process that makes Paratherm NF food grade removes these impurities so degradation-induced maintenance is reduced.

Low viscosity promotes fast startups

Liquid-phase systems should be brought up to temperature slowly until the fluid is in fully turbulent flow. This prevents localized fluid overheating. Once viscosity decreases enough that turbulent flow is achieved, the outlet temperature can be increased as fast as the equipment can handle. The lower the temperature when that transition occurs, the faster the system will reach operating temperature. Paratherm NF has the lowest viscosity range of any mineral-oil based fluid.

Typical Properties*

Chemical Name		Hydrotreated Mineral Oil
Appearance		Water White Liquid
Odor		Odorless
Maximum Recommended Film Temperature		650°F/343°C
Maximum Recommended Operating Temperature - Fired Heaters		600°F/316°C
Maximum Recommended Operating Temperature - All Others		630°F/332°C
Minimum Operating Temperature 20 cPs (20 mPa-s)		97°F/36°C
Minimum Start-up Temperature 300 cPs (300 mPa-s)		24°F/-4°C
Viscosity cSt:	40°C (104°F)	17
	100°C (212°F)	3.7
	316°C (600°F)	0.2
Density at 60°F/15.5°C lb/gal (kg/m³)		7.4 (887)
Flash Point Pensky-Martens Closed Cup (D93)		>300°F/149°C
Boiling Point (14.7 psia/101 kPa)		>700°F/371°C
Vapor Pressure @ maximum operating temperature psia (kPa)		2.5 (17)
% Volume expansion over recommended operating temperature per 100 °F (°C)		5.5 (9.9)
Average Molecular Weight		340
Dielectric Breakdown Voltage D1816-04 (kV, 0.1" gap)		34.37
Dielectric Constant (1 KHz) D924-04		2.183
Dissipation Factor (1 KHz) D924-04		0.000003
Volume Resistivity at 100V (Ω-cm) D257-07		$3.40X10^{14}$
Heat of Combustion (approximate) BTU/lb (kJ/kg)		20,000 (46,300)
Heat of Vaporization (approximate) BTU/lb (kJ/kg)		91 (210)

** These are typical laboratory values, and are not guaranteed for all samples.*

High heat transfer coefficients extend fluid life

In heat transfer fluids, the most important advantage of a high heat transfer coefficient is that it reduces the heater surface temperature required to achieve set-point temperature. Lower temperature means less thermal degradation which means longer life. Paratherm NF has the highest heat transfer coefficient of any mineral oil based fluid.

Fluid storage

Drums should be stored inside to prevent water from getting into the heat transfer fluid. If sealed drums must be left outdoors, they should be stored on their sides. While unopened totes are weatherproof, they should not be stacked if left outdoors. If the fluid is to be stored outside below its minimum pumpable temperature, the containers should be moved indoors to warm up before charging the fluid into the system.

Visit http://paracalc.paratherm.com/ for detailed properties in a choice of temperature increments.

Replacing existing fluid

In many cases, changing fluid involves a straightforward drain and fill. There are very few fluids that are so incompatible that 10-15% residue will affect the new Paratherm. If you have any questions, contact us.

Charging new systems

Unless required for product quality reasons, new systems do not need to be cleaned before Paratherm is charged. The amount of chemical coatings, oils, and other manufacturing residues are usually not enough to affect the fluid life. All that is necessary is to install a Y-strainer with a minimum 60 mesh screen up stream of the pump to catch any metal or welding residue. The screen can be removed once the system has been cycled twice through its operating temperature.

Fluid analysis

The fluid in new systems should be tested within 9 to 12 months of start-up. New fluid in existing systems should be tested within the first month of operation to establish a base line for future testing.

Paratherm
HEAT TRANSFER FLUIDS
31 Portland Road
West Conshohocken PA 19428 USA
Phone: 610-941-4900
Fax: 610-941-9191
800-222-3611
E-mail: info@paratherm.com
Web: www.paratherm.com

Paratherm NF® Heat Transfer Fluid

Physical Properties

Temperature °F	Temperature °C	Viscosity cPs	Viscosity cSt	Viscosity lb/ft-hr	Density g/cc	Density lb/gal	Density lb/ft^3	Thermal Conductivity BTU/hr-ft-°F	Specific Heat BTU/lb-°F	Vapor Pressure mmhg	Vapor Pressure psia
10	-12	574	631	1390	0.910	7.6	57.0	0.060	0.40		
25	-4	289	321	698	0.900	7.5	56.0	0.060	0.41		
50	10	92	103	222	0.890	7.4	56.0	0.060	0.42		
75	24	44	50	106	0.880	7.3	55.0	0.060	0.44		
100	38	18	21	43	0.870	7.3	54.0	0.060	0.46		
125	52	10	12	25	0.860	7.2	54.0	0.060	0.48		
150	66	6.6	7.8	16	0.850	7.1	53.0	0.060	0.49		
175	79	4.6	5.5	11	0.840	7.0	52.0	0.060	0.51		
200	93	3.5	4.1	8.4	0.840	7.0	52.0	0.060	0.53		
225	107	2.7	3.2	6.5	0.830	6.9	52.0	0.060	0.55		
250	121	2.2	2.7	5.4	0.820	6.8	51.0	0.060	0.56		
275	135	1.9	2.4	4.6	0.810	6.8	51.0	0.060	0.58		
300	149	1.6	2.0	4.0	0.800	6.7	50.0	0.060	0.60		
325	163	1.4	1.7	3.3	0.790	6.6	49.0	0.060	0.62		
350	177	1.20	1.5	2.8	0.780	6.5	49.0	0.060	0.63		
375	191	0.97	1.3	2.3	0.770	6.4	48.0	0.060	0.65		
400	204	0.78	1.00	1.9	0.760	6.3	47.0	0.060	0.67	22	0.40
425	218	0.63	0.84	1.5	0.750	6.3	47.0	0.050	0.69	28	0.50
450	232	0.52	0.70	1.3	0.740	6.2	46.0	0.050	0.70	35	0.70
475	246	0.43	0.59	1.00	0.730	6.1	46.0	0.050	0.72	43	0.80
500	260	0.35	0.48	0.85	0.730	6.1	46.0	0.050	0.74	52	1.00
525	274	0.28	0.39	0.68	0.720	6.0	45.0	0.050	0.76	63	1.20
550	288	0.23	0.32	0.56	0.710	5.9	44.0	0.050	0.77	76	1.50
575	302	0.19	0.27	0.46	0.700	5.8	44.0	0.050	0.79	90	1.70
600	316	0.15	0.22	0.36	0.690	5.8	43.0	0.050	0.81	106	2.10
625	329	0.13	0.19	0.31	0.680	5.7	42.0	0.050	0.83	124	2.40
650	343	0.11	0.16	0.27	0.670	5.6	42.0	0.050	0.84	144	2.80

Visit http://paracalc.paratherm.com/ for detailed properties in a choice of temperature increments.

Printed on recycled paper

Paratherm NF® Heat Transfer Fluid

Physical Properties

Temperature °F	Temperature °C	Viscosity cPs	Viscosity cSt	Viscosity lb/ft-hr	Density g/cc	Density lb/gal	Density lb/ft^3	Thermal Conductivity BTU/hr-ft-°F	Specific Heat BTU/lb-°F	Vapor Pressure mmhg	Vapor Pressure psia
10	-12	574	631	1390	0.910	7.6	57.0	0.060	0.40		
25	-4	289	321	698	0.900	7.5	56.0	0.060	0.41		
50	10	92	103	222	0.890	7.4	56.0	0.060	0.42		
75	24	44	50	106	0.880	7.3	55.0	0.060	0.44		
100	38	18	21	43	0.870	7.3	54.0	0.060	0.46		
125	52	10	12	25	0.860	7.2	54.0	0.060	0.48		
150	66	6.6	7.8	16	0.850	7.1	53.0	0.060	0.49		
175	79	4.6	5.5	11	0.840	7.0	52.0	0.060	0.51		
200	93	3.5	4.1	8.4	0.840	7.0	52.0	0.060	0.53		
225	107	2.7	3.2	6.5	0.830	6.9	52.0	0.060	0.55		
250	121	2.2	2.7	5.4	0.820	6.8	51.0	0.060	0.56		
275	135	1.9	2.4	4.6	0.810	6.8	51.0	0.060	0.58		
300	149	1.6	2.0	4.0	0.800	6.7	50.0	0.060	0.60		
325	163	1.4	1.7	3.3	0.790	6.6	49.0	0.060	0.62		
350	177	1.20	1.5	2.8	0.780	6.5	49.0	0.060	0.63		
375	191	0.97	1.3	2.3	0.770	6.4	48.0	0.060	0.65		
400	204	0.78	1.00	1.9	0.760	6.3	47.0	0.060	0.67	22	0.40
425	218	0.63	0.84	1.5	0.750	6.3	47.0	0.050	0.69	28	0.50
450	232	0.52	0.70	1.3	0.740	6.2	46.0	0.050	0.70	35	0.70
475	246	0.43	0.59	1.00	0.730	6.1	46.0	0.050	0.72	43	0.80
500	260	0.35	0.48	0.85	0.730	6.1	46.0	0.050	0.74	52	1.00
525	274	0.28	0.39	0.68	0.720	6.0	45.0	0.050	0.76	63	1.20
550	288	0.23	0.32	0.56	0.710	5.9	44.0	0.050	0.77	76	1.50
575	302	0.19	0.27	0.46	0.700	5.8	44.0	0.050	0.79	90	1.70
600	316	0.15	0.22	0.36	0.690	5.8	43.0	0.050	0.81	106	2.10
625	329	0.13	0.19	0.31	0.680	5.7	42.0	0.050	0.83	124	2.40
650	343	0.11	0.16	0.27	0.670	5.6	42.0	0.050	0.84	144	2.80

Visit http://paracalc.paratherm.com/ for detailed properties in a choice of temperature increments.