Klea® 32 Data Sheet – SI Units

Physical Property Data for Klea® 32

Property		Units	Value
Molecular Weight			52.024
Density (LIQ)	(25°C)	kg/l	0.9588
Boiling Point	(1 atm)	°C	-51.7
Viscosity (LIQ)	(20°C)	cP	0.121
Surface Tension	(25°C)	mN/m	7.0
Vapour Pressure	(25°C)	bar	16.897
Specific Heat - liquid	(25°C)	kJ/kg.K	1.884
Specific Heat - ideal gas	(25°C)	kJ/kg.K	0.82633
Critical Temperature		°C	78.35
Critical Pressure		bar	58.16
Latent Heat Vaporisation	(25°C)	kJ/kg	270.22
Thermal Conductivity (LIQ)	(20°C)	W/m.K	0.1366
Trouton's Constant		kJ/kg.K	1.7216
Acentric Factor			0.2757
Coeff. Vol. Therm. Exp	(LIQ @ 20°C)		0.003609
Melting Point		°C	-136
Viscosity (VAP)	(20°C)	cP	0.01238
Thermal Cond (SAT VAPOUR)	(20°C)	W/m.K	0.01431
Critical Density		kg/l	0.429756
Density (SAT VAPOUR) at n Bpt		kg/m^3	
Standard States	Enthalpy (0°C, Liquid = 100kJ/kg)	Enthalpy (0°C, Liquid = 1kJ/kg.K)	

Equation of State (Martin-Hou)

$$Pr = \frac{RT_r}{V_r - B} + \sum_{i=1,4} \frac{(A_i + B_i T_r + C_i \exp(-KT_r))}{(V_r - B)^{(i+1)}}$$

Where :

Tr = T/T_c, $P_r = P/P_c$, $V_r = V/V_c$

R = 4.1509476

B = 0.01192297

K = 5.31739894

T_c, P_c, V_c = 351.5(K), 58.16(bara), 2.3269002(l/kg)

A_1, B_1, C_1 = -10.47170476, 4.895856639, -233.2634214

A_2, B_2, C_2 = 3.127688966, 0.2564391307, 398.4680176

A_3, B_3, C_3 = -1.0511293328, -0.885886076954, - 23.142277902

A_4, B_4, C_4 = 1.256535631, -0.32839756434, -131.77719294

Extended Antoine Equation

$$LnP = A + \frac{B}{C + T} + DT + ELn(T)$$

A = 92.68113
B = -4461.955
C = 0
D = 0.0251695
E = -14.46098

P = Vapour pressure bara
T = Temperature K

Latent Heat of Vaporisation

$$DH_{vap} = A + Bx + Cx^2 + Dx^3 + Ex^4$$

Where $x = (1-(T/T_c))^{(1/3)}$

A = 0
B = 460.599
C = -264.095
D = 1096.477
E = -824.465

T = Temperature K
T_c = Critical Temperature K

DH_{vap} = kJ/kg

Ideal Gas Heat Capacity

$$C_p(ideal) = A + BT + CT^2 + DT^3 + E/T^2$$

A = 0
B = 3.03038E-3
C = -1.85301E-6
D = 4.25732E-10
E = 6779.01

T = Temperature K
C_p (ideal) kJ/kg.K

Saturated Liquid Enthalpy

$$H_{liq} = A + Bx + Cx^2 + Dx^3 + Ex^4$$

where $x = (1-(T/T_c))^{(1/3)}$

A = 298.64037
B = -48.8867
C = -447.832
D = 128.8216
E = -244.749

T = Temperature K
T_c = Critical Temperature K

H_{liq} kJ/kg

Liquid Density

$d_{liq} = A + Bx + Cx^2 + Dx^3 + Ex^4$
Where $x = (1 - (T/T_c))^{(1/3)}$

A = 0.42976
B = 0.610355
C = 1.372037
D = -1.96264
E = 1.370341

T = Temperature K
T_c = Critical Temperature K

d_{liq} kg/l

Liquid Viscosity

$Ln\ (\mu)_{liq} = A + B/T + CT^2 + D/T^2$

A = -12.45463
B = 5476.52
C = -864518.5
D = 43341140

T = Temperature K

μ_{liq} cP

Liquid Thermal Conductivity

$K_{liq} = A + Bx + Cx^2 + Dx^3$

where $x = (1- (T/T_c))^{(1/3)}$

A = -4.238406E-2
B = 0.6534304
C = -1.030478
D = 0.7898551

T = Temperature K
T_c = Critical Temperature K

K_{liq} W/m.K

Saturated Vapour Density

$d_{vap} = A + Bx + Cx^2 + Dx^3 + Ex^4$

Where $x = (1-(T/Tc))^{(1/3)}$

-50° TO Tc
A = 315.804
B = 134.076
C = 3124.34
D = 4689.73
E = -2010.48

T = Temperature K
T_c = Critical Temperature K

d_{vap} kg/m^3

Vapour Viscosity (Saturated Vapour)

$\mu_{vap} = A + BT + CT^2 + DT^3$

A = -.0538923
B = 7.67120E-4
C = -3.117805E-6
D = 4.339438E-9

T = Temperature K

μ_{vap} cP

Vapour Thermal Conductivity (Saturated Vapour)

$K_{gas} = A + BT + CT^2 + DT^3$

A = -.832941
B = 9.61477E-3
C = -3.66827E-5
D = 4.688257E-8

T = Temperature K

K_{gas} W/m.K

TEMP °C	LIQUID ENTH kj/kg	LATENT HEAT kj/kg	SAT.VAP ENTH kj/kg	LIQUID Cp kJ/kgK	ID.GAS Cp kJ/kgK
-50.00	18.0743	379.4949	397.5692	1.576175	0.724823
-40.00	33.9329	368.6787	402.6115	1.596085	0.735909
-30.00	50.0081	356.9426	406.9507	1.619624	0.748064
-20.00	66.3405	344.1939	410.5344	1.647726	0.761078
-10.00	82.9821	330.3168	413.2988	1.681691	0.774779
0.00	100	315.163	415.163	1.723382	0.789027
10.00	117.4846	298.5371	416.0217	1.775587	0.803707
20.00	135.5611	280.1704	415.7315	1.8427	0.818722
25.00	144.8753	270.2193	415.0945	1.883981	0.82633
30.00	154.4124	259.6732	414.0856	1.932146	0.833993
40.00	174.3229	236.4383	410.7612	2.05771	0.849454
50.00	195.7808	209.4111	405.1918	2.248854	0.865048
60.00	219.7651	176.4104	396.1756	2.585014	0.880727
70.00	248.9685	130.9997	379.9682	3.416089	0.896451

TEMP °C	VAPOUR PRESS bara	LIQUID DENSITY kg/l	LIQUID VISCOSITY cP	LIQ.THERM COND W/m.K	SAT VAP DENSITY kg/m^3
-50.00	1.104795	1.207943	0.253199	0.186629	3.2242
-40.00	1.777189	1.178582	0.234683	0.179411	5.05747
-30.00	2.735984	1.148509	0.21457	0.172263	7.65058
-20.00	4.056203	1.117546	0.194026	0.165169	11.19025
-10.00	5.821121	1.085465	0.173914	0.158105	15.91441
0.00	8.122142	1.051959	0.154818	0.151033	22.13294
10.00	11.05899	1.016615	0.137098	0.143896	30.26079
20.00	14.74025	0.978844	0.120934	0.136598	40.87335
25.00	16.89662	0.958791	0.113457	0.132842	47.35794
30.00	19.28434	0.937770	0.106382	0.128977	54.80572
40.00	24.8208	0.891995	0.093413	0.120738	73.34823
50.00	31.49205	0.839051	0.081942	0.111277	98.68494
60.00	39.45547	0.773801	0.071854	135.0995	
70.00	48.88591	0.681332	0.063019	193.8373	

TEMP °C	C SAT. VAP VISCOSITY cP	SAT.VAP THERM COND W/m.K
-50.00	0.010256	
-40.00	0.010478	0.00889
-30.00	0.010684	0.010098
-20.00	0.010899	0.01081
-10.00	0.01115	0.011306
0.00	0.011462	0.011868
10.00	0.011862	0.012777
20.00	0.012375	0.014314
25.00	0.012683	0.015407
30.00	0.013028	0.016761
40.00	0.013847	0.020399
50.00	0.014858	0.02551
60.00	0.016087	0.032373
70.00	0.017559	

The correlations contained in this data sheet are based on a best fit to the full thermodynamic data tables and there may be slight differences at specific points arising from this correlation. In cases of doubt the preference value is that contained in the full thermodynamic tables.

The correlations in this data sheet should not be used outside the applicable ranges quoted. Contact Mexichem for further advice.

Mexichem Refrigerants

Mexichem UK Limited, The Heath Business & Technical Park, Runcorn, Cheshire, WA7 4QX
Tel: +44 (0)1928 518880 E-mail: info@mexichem.com www.mexichemfluor.com