

SEAWATER THERMOPHYSICAL PROPERTIES LIBRARY

Authors: Kishor G. Nayar, Mostafa H. Sharqawy and John H. Lienhard V

Source: <http://web.mit.edu/seawater>

Email for contact: lienhard@mit.edu

Library Version: Version 3.1.3 (December 21, 2016).

UPDATED TABLES 6, 25, 26, 27, 28, 39 (Sept. 5, 2023. Thanks, Angélique Rouhan)

UPDATED TABLES 25,35,36,44 (Dec. 9, 2023)

About:

This document presents seawater property data from our library (web.mit.edu/seawater). Properties are listed as a function of temperature and salinity for the pressures, $P = P_0$, 7 MPa and 12 MPa. Here, $P_0 = 0.101325$ MPa for $t \leq 100^\circ\text{C}$ and for $t > 100^\circ\text{C}$ is the vapor pressure of seawater. For $P = 7$ MPa and 12 MPa, only the properties with pressure dependence are listed.

Request to users of this table:

While the seawater properties library routines are freely distributed, it is requested that users of this library please cite the following two journal articles which comprehensively present how correlations in the library were developed, the original data sources, the validity ranges, and the uncertainty in each property function.

1. K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," *Desalination*, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024
2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," *Desalination and Water Treatment*, Vol. 16, pp.354-380, April 2010.

Additionally, for each function, the original journal papers used to generate the functions are also mentioned. If they are different from the above two references, please cite them.

Acknowledgement:

The development of this package of correlations and codes was primarily sponsored through the Center for Clean Water and Clean Energy at MIT and KFUPM during the period 2009 through 2016.

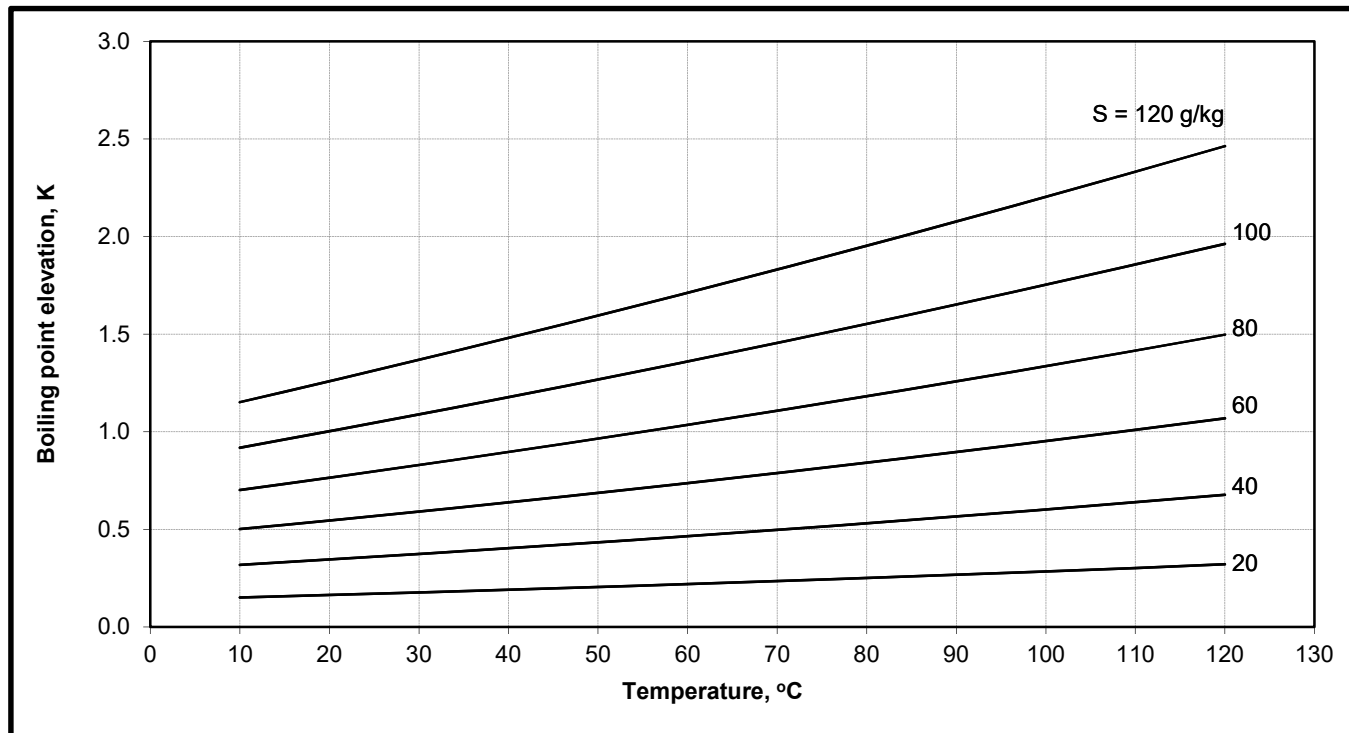
The authors wish to acknowledge Prof. Syed M. Zubair, Dr. Karan H. Mistry, Leonardo D. Banchik, Adam M. Wiener, Joanna Zhu and Alexis Dalessandro for their contributions to developing various aspects of this library.

TABLE OF CONTENTS

Sl. No.	Property	Pressure	Page number
1	Boiling point elevation of seawater	P0 (~ 1 atm or 0.10325 MPa)	1
2	Dynamic viscosity of seawater x 10 ³	P0 (~ 1 atm or 0.10325 MPa)	2
3	Kinematic viscosity of seawater x 10 ⁷	P0 (~ 1 atm or 0.10325 MPa)	3
4	Osmotic coefficient of seawater	P0 (~ 1 atm or 0.10325 MPa)	4
5	Osmotic pressure of seawater	P0 (~ 1 atm or 0.10325 MPa)	5
6	Prandtl number of seawater	P0 (~ 1 atm or 0.10325 MPa)	6
7	Thermal conductivity of seawater	P0 (~ 1 atm or 0.10325 MPa)	7
8	Surface Tension of seawater	P0 (~ 1 atm or 0.10325 MPa)	8
9	Latent Heat of Vaporization of seawater	P0 (~ 1 atm or 0.10325 MPa)	9
10	Thermal diffusivity of seawater, x10 ⁷ m ² /s	P0 (~ 1 atm or 0.10325 MPa)	10
11	Vapor (saturation) pressure of seawater	N/A	11
12	Specific enthalpy of seawater	P0 (~ 1 atm or 0.10325 MPa)	12
13	Specific entropy of seawater	P0 (~ 1 atm or 0.10325 MPa)	13
14	Specific flow exergy of seawater	P0 (~ 1 atm or 0.10325 MPa)	14
15	Gibbs free energy of seawater	P0 (~ 1 atm or 0.10325 MPa)	15
16	Specific heat capacity of seawater	P0 (~ 1 atm or 0.10325 MPa)	16
17	Specific internal energy of seawater	P0 (~ 1 atm or 0.10325 MPa)	17
18	Specific volume of seawater	P0 (~ 1 atm or 0.10325 MPa)	18
19	Chemical potential of salts in seawater	P0 (~ 1 atm or 0.10325 MPa)	19
20	Chemical potential of water in seawater	P0 (~ 1 atm or 0.10325 MPa)	20
21	Density of seawater	P0 (~ 1 atm or 0.10325 MPa)	21
22	Thermal conductivity of seawater (pressure dep.)	P0 (~ 1 atm or 0.10325 MPa)	22
23	Isobaric expansivity of seawater	P0 (~ 1 atm or 0.10325 MPa)	23
24	Isothermal compressibility of seawater	P0 (~ 1 atm or 0.10325 MPa)	24

25	Chemical potential of salts in seawater	7 MPa	25
26	Chemical potential of water in seawater	7 MPa	26
27	Specific internal energy of seawater	7 MPa	27
28	Density of seawater	7 MPa	28
29	Isobaric expansivity of seawater of seawater	7 MPa	29
30	Isothermal compressibility of seawater	7 MPa	30
31	Specific enthalpy of seawater	7 MPa	31
32	Specific entropy of seawater	7 MPa	32
33	Specific flow exergy of seawater	7 MPa	33
34	Gibbs free energy of seawater	7 MPa	34
35	Specific heat capacity of seawater	7 MPa	35
36	Specific volume of seawater	7 MPa	36
37	Thermal conductivity of seawater(pressure dep.)	7 MPa	37
38	Chemical potential of salts in seawater	12 MPa	38
39	Chemical potential of water in seawater	12 MPa	39
40	Specific internal energy of seawater	12 MPa	40
41	Density of seawater	12 MPa	41
42	Isobaric expansivity of seawater	12 MPa	42
43	Isothermal compressibility of seawater	12 MPa	43
44	Specific enthalpy of seawater	12 MPa	44
45	Specific entropy of seawater	12 MPa	45
46	Specific flow exergy of seawater	12 MPa	46
47	Gibbs free energy of seawater	12 MPa	47
48	Specific heat capacity of seawater	12 MPa	48
49	Specific volume of seawater	12 MPa	49
50	Thermal conductivity of seawater(pressure dep.)	12 MPa	50

Temp, °C	Salinity, g/kg											
	10	20	30	40	50	60	70	80	90	100	110	120
0	0.067	0.138	0.213	0.291	0.373	0.458	0.547	0.640	0.736	0.836	0.939	1.046
10	0.073	0.150	0.232	0.317	0.407	0.501	0.599	0.701	0.807	0.917	1.032	1.151
20	0.079	0.163	0.251	0.344	0.442	0.545	0.652	0.764	0.880	1.002	1.128	1.258
30	0.085	0.176	0.272	0.373	0.479	0.590	0.707	0.829	0.956	1.088	1.225	1.368
40	0.092	0.190	0.293	0.402	0.517	0.637	0.764	0.895	1.033	1.176	1.325	1.480
50	0.099	0.204	0.315	0.433	0.556	0.686	0.822	0.964	1.112	1.267	1.428	1.595
60	0.106	0.219	0.338	0.464	0.597	0.736	0.882	1.035	1.194	1.360	1.532	1.711
70	0.114	0.234	0.362	0.497	0.639	0.788	0.944	1.107	1.277	1.455	1.639	1.831
80	0.121	0.250	0.387	0.530	0.682	0.841	1.007	1.181	1.363	1.552	1.748	1.952
90	0.129	0.267	0.412	0.565	0.726	0.895	1.072	1.257	1.450	1.651	1.860	2.076
100	0.138	0.284	0.438	0.601	0.772	0.952	1.139	1.335	1.540	1.752	1.973	2.203
110	0.146	0.302	0.465	0.638	0.819	1.009	1.208	1.415	1.631	1.856	2.089	2.331
120	0.155	0.320	0.493	0.676	0.868	1.068	1.278	1.497	1.725	1.962	2.207	2.462

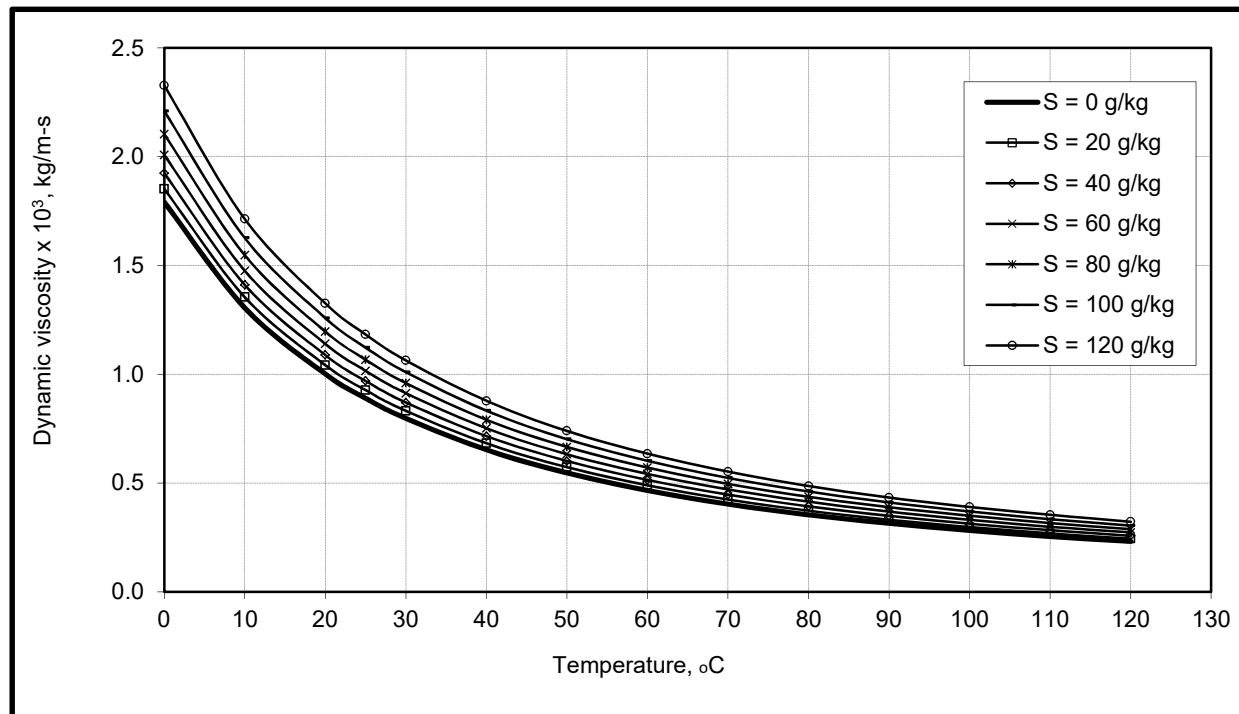


Accuracy ±0.081 K

References for Citation

1. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg													
	0	10	20	30	35	40	50	60	70	80	90	100	110	120
0	1.791	1.820	1.852	1.887	1.906	1.925	1.965	2.008	2.055	2.104	2.156	2.210	2.268	2.328
10	1.306	1.330	1.355	1.382	1.397	1.412	1.443	1.476	1.511	1.548	1.586	1.627	1.669	1.714
20	1.002	1.021	1.043	1.065	1.077	1.089	1.114	1.140	1.168	1.197	1.227	1.259	1.292	1.326
25	0.890	0.908	0.928	0.948	0.959	0.970	0.993	1.016	1.041	1.068	1.095	1.123	1.153	1.184
30	0.797	0.814	0.832	0.851	0.861	0.871	0.891	0.913	0.936	0.960	0.984	1.010	1.037	1.064
40	0.653	0.667	0.683	0.699	0.707	0.716	0.734	0.752	0.771	0.791	0.812	0.833	0.855	0.878
50	0.547	0.560	0.573	0.587	0.594	0.602	0.617	0.633	0.649	0.666	0.684	0.702	0.721	0.740
60	0.466	0.478	0.490	0.502	0.508	0.515	0.528	0.542	0.556	0.571	0.586	0.602	0.618	0.635
70	0.404	0.414	0.425	0.436	0.441	0.447	0.459	0.471	0.484	0.497	0.510	0.524	0.538	0.553
80	0.354	0.364	0.373	0.383	0.388	0.393	0.404	0.415	0.426	0.437	0.449	0.462	0.474	0.487
90	0.315	0.323	0.331	0.340	0.345	0.349	0.359	0.369	0.379	0.389	0.400	0.411	0.422	0.434
100	0.282	0.289	0.297	0.305	0.309	0.313	0.322	0.331	0.340	0.350	0.359	0.369	0.380	0.390
110	0.255	0.262	0.269	0.276	0.280	0.283	0.291	0.299	0.308	0.316	0.325	0.334	0.344	0.354
120	0.232	0.238	0.245	0.251	0.255	0.258	0.265	0.273	0.280	0.288	0.297	0.305	0.314	0.323



Accuracy ±1.5%

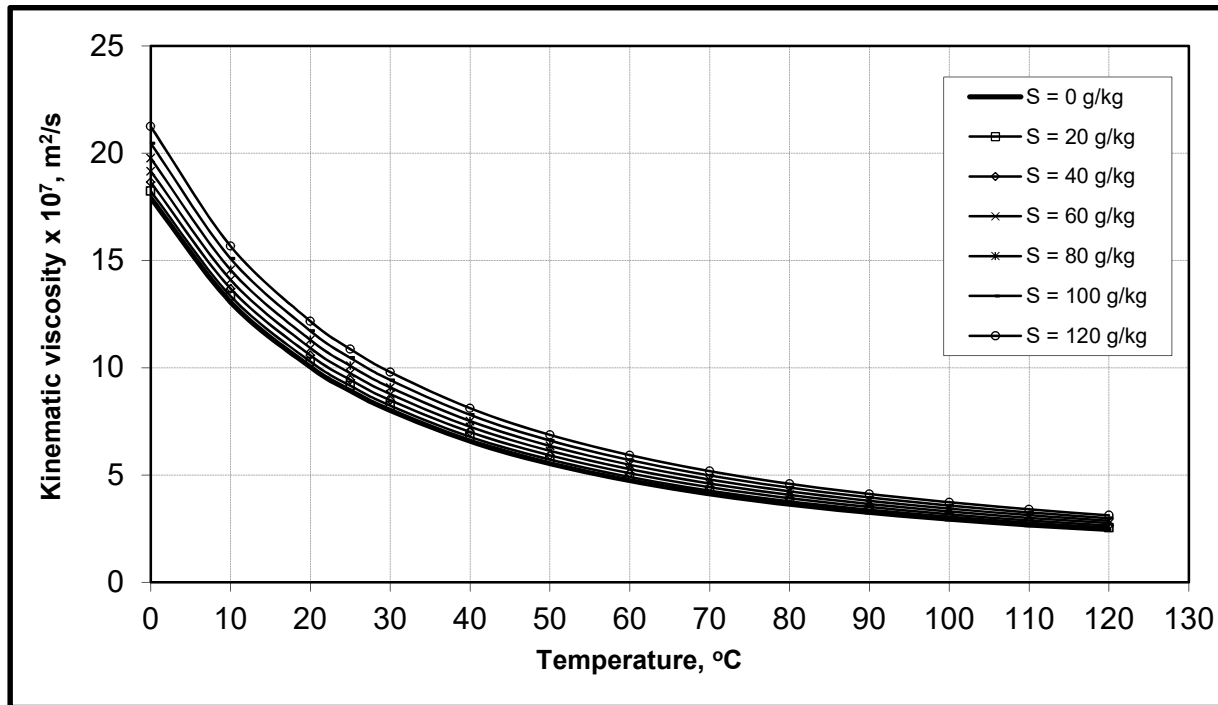
NB: The values in the table are dynamic viscosity x 10³ in units of kg/m-s. For example, a value of 1.791 corresponds to dynamic viscosity of 0.001791 kg/m-s.

References for Citation

1. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

2.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg													
	0	10	20	30	35	40	50	60	70	80	90	100	110	120
0	17.92	18.06	18.23	18.43	18.54	18.65	18.90	19.16	19.46	19.77	20.11	20.46	20.84	21.24
10	13.07	13.20	13.35	13.51	13.60	13.69	13.89	14.10	14.33	14.57	14.82	15.09	15.38	15.67
20	10.04	10.16	10.29	10.43	10.50	10.58	10.75	10.92	11.10	11.30	11.50	11.71	11.93	12.17
25	8.93	9.04	9.17	9.30	9.37	9.44	9.59	9.75	9.92	10.09	10.28	10.47	10.67	10.87
30	8.01	8.12	8.23	8.36	8.42	8.49	8.63	8.77	8.93	9.09	9.25	9.43	9.61	9.80
40	6.58	6.68	6.78	6.89	6.95	7.00	7.12	7.25	7.38	7.52	7.66	7.81	7.96	8.11
50	5.53	5.62	5.71	5.81	5.86	5.91	6.02	6.13	6.24	6.36	6.48	6.61	6.74	6.87
60	4.74	4.82	4.91	4.99	5.04	5.08	5.18	5.28	5.38	5.48	5.59	5.70	5.81	5.93
70	4.13	4.20	4.28	4.36	4.40	4.44	4.52	4.61	4.70	4.79	4.89	4.98	5.08	5.19
80	3.65	3.71	3.78	3.85	3.89	3.93	4.00	4.08	4.16	4.24	4.33	4.42	4.51	4.60
90	3.26	3.32	3.38	3.45	3.48	3.51	3.58	3.65	3.73	3.80	3.88	3.96	4.04	4.12
100	2.94	3.00	3.05	3.11	3.14	3.17	3.24	3.30	3.37	3.44	3.51	3.58	3.65	3.73
110	2.68	2.73	2.78	2.83	2.86	2.89	2.95	3.01	3.07	3.13	3.20	3.26	3.33	3.40
120	2.46	2.51	2.55	2.60	2.63	2.65	2.71	2.76	2.82	2.87	2.93	3.00	3.06	3.12



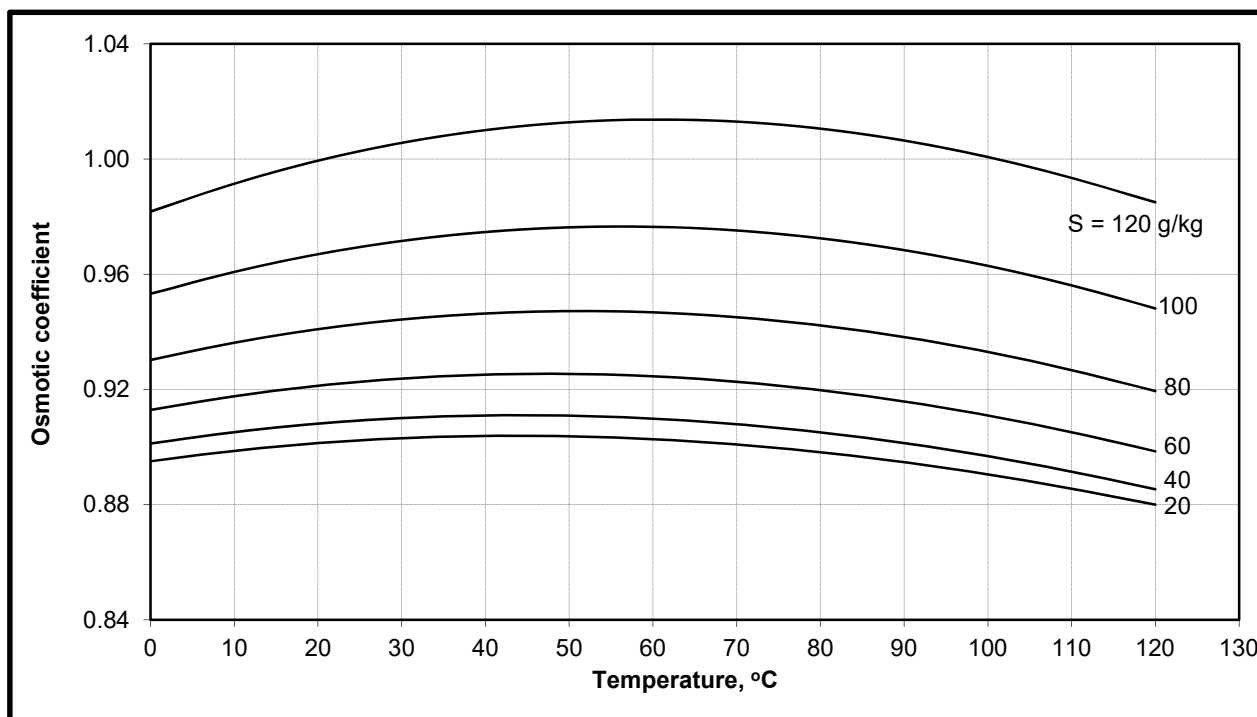
Accuracy ±1.5%

References for Citation

1. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," *Desalination and Water Treatment*, Vol. 16, pp.354-380, April 2010.

2.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," *Desalination*, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	1.000	0.894	0.895	0.897	0.901	0.906	0.913	0.921	0.930	0.941	0.953	0.967	0.982
10	1.000	0.898	0.899	0.901	0.905	0.911	0.918	0.926	0.936	0.948	0.961	0.975	0.991
20	1.000	0.900	0.901	0.904	0.908	0.914	0.921	0.930	0.941	0.953	0.967	0.982	0.999
30	1.000	0.902	0.903	0.906	0.910	0.916	0.924	0.933	0.944	0.957	0.972	0.988	1.006
40	1.000	0.903	0.904	0.907	0.911	0.917	0.925	0.935	0.946	0.960	0.975	0.992	1.010
50	1.000	0.903	0.904	0.906	0.911	0.917	0.925	0.935	0.947	0.961	0.976	0.994	1.013
60	1.000	0.902	0.903	0.905	0.910	0.916	0.925	0.935	0.947	0.961	0.976	0.994	1.014
70	1.000	0.900	0.901	0.903	0.908	0.914	0.923	0.933	0.945	0.959	0.975	0.993	1.013
80	1.000	0.898	0.898	0.901	0.905	0.911	0.920	0.930	0.942	0.956	0.972	0.991	1.011
90	1.000	0.894	0.895	0.897	0.901	0.908	0.916	0.926	0.938	0.952	0.968	0.986	1.006
100	1.000	0.890	0.890	0.893	0.897	0.903	0.911	0.921	0.933	0.947	0.963	0.981	1.001
110	1.000	0.886	0.886	0.888	0.891	0.897	0.905	0.915	0.927	0.940	0.956	0.974	0.993
120	1.000	0.880	0.880	0.882	0.885	0.891	0.898	0.908	0.919	0.933	0.948	0.965	0.985



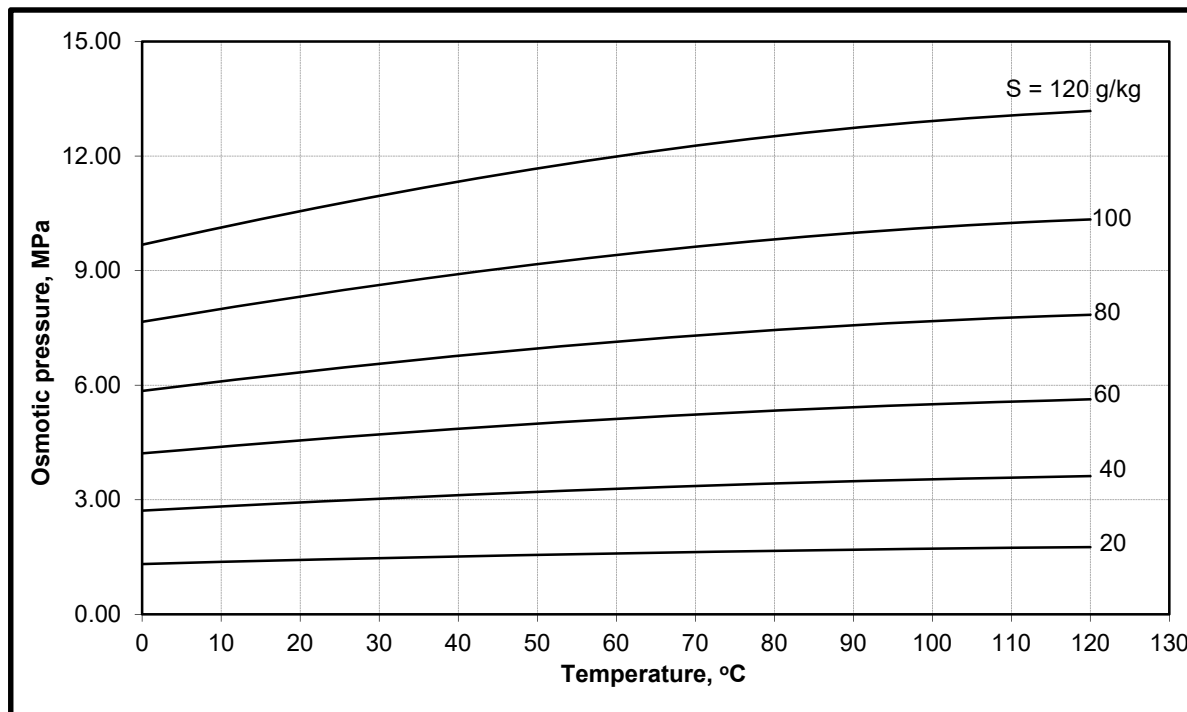
Accuracy $\pm 2.57\%$

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg											
	10	20	30	40	50	60	70	80	90	100	110	120
0	0.653	1.321	2.007	2.715	3.450	4.214	5.012	5.850	6.730	7.659	8.641	9.681
10	0.679	1.374	2.088	2.826	3.591	4.389	5.224	6.100	7.024	8.000	9.034	10.131
20	0.704	1.425	2.166	2.931	3.726	4.555	5.424	6.338	7.302	8.323	9.405	10.557
30	0.728	1.473	2.238	3.030	3.853	4.712	5.613	6.561	7.564	8.626	9.755	10.958
40	0.750	1.517	2.306	3.122	3.971	4.858	5.789	6.770	7.808	8.909	10.081	11.331
50	0.771	1.559	2.370	3.209	4.081	4.993	5.952	6.963	8.033	9.171	10.382	11.675
60	0.790	1.598	2.428	3.288	4.182	5.118	6.102	7.140	8.240	9.410	10.657	11.989
70	0.808	1.633	2.482	3.361	4.275	5.232	6.238	7.301	8.427	9.626	10.904	12.271
80	0.824	1.666	2.531	3.427	4.359	5.334	6.360	7.445	8.594	9.818	11.124	12.521
90	0.838	1.695	2.575	3.485	4.433	5.425	6.469	7.571	8.741	9.986	11.315	12.737
100	0.851	1.721	2.614	3.538	4.499	5.505	6.563	7.681	8.867	10.130	11.477	12.920
110	0.863	1.743	2.648	3.583	4.555	5.573	6.643	7.773	8.972	10.248	11.610	13.067
120	0.873	1.763	2.677	3.621	4.603	5.630	6.709	7.848	9.056	10.341	11.713	13.180



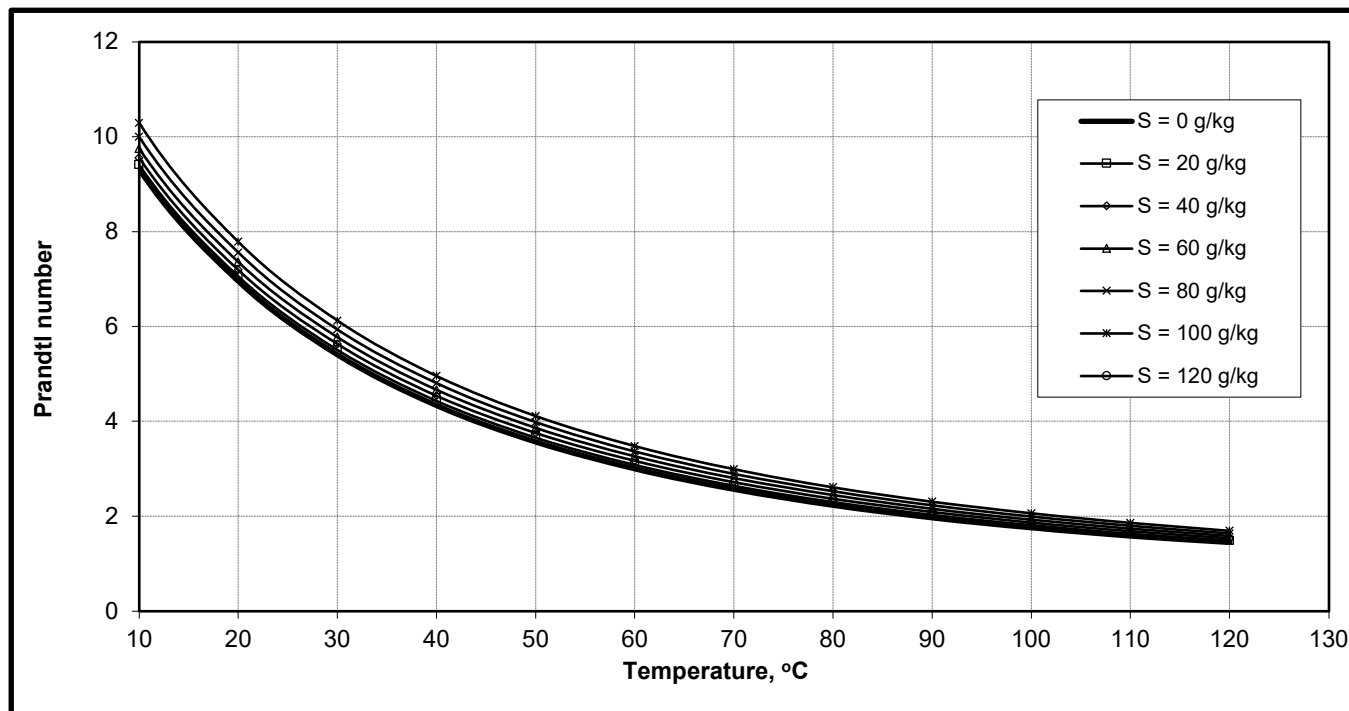
Accuracy $\pm 2.57\%$

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	13.18	13.20	13.25	13.31	13.39	13.50	13.63	13.77	13.94	14.12	14.33	14.56	14.81
10	9.32	9.36	9.41	9.48	9.56	9.65	9.75	9.87	10.00	10.14	10.29	10.46	10.63
20	6.95	7.00	7.06	7.12	7.19	7.27	7.36	7.46	7.56	7.67	7.79	7.91	8.05
30	5.40	5.45	5.51	5.57	5.63	5.70	5.77	5.85	5.94	6.03	6.12	6.22	6.33
40	4.34	4.38	4.43	4.49	4.54	4.60	4.67	4.74	4.81	4.88	4.96	5.04	5.12
50	3.57	3.61	3.66	3.71	3.76	3.81	3.87	3.92	3.98	4.05	4.11	4.18	4.25
60	3.00	3.04	3.08	3.12	3.17	3.22	3.27	3.32	3.37	3.42	3.48	3.54	3.60
70	2.57	2.60	2.64	2.68	2.72	2.76	2.81	2.85	2.90	2.94	2.99	3.04	3.09
80	2.23	2.27	2.30	2.33	2.37	2.41	2.45	2.49	2.53	2.57	2.61	2.66	2.70
90	1.97	2.00	2.03	2.06	2.09	2.13	2.16	2.20	2.23	2.27	2.31	2.35	2.39
100	1.76	1.78	1.81	1.84	1.87	1.90	1.93	1.96	1.99	2.03	2.06	2.10	2.13
110	1.59	1.61	1.63	1.66	1.69	1.71	1.74	1.77	1.80	1.83	1.86	1.89	1.93
120	1.45	1.47	1.49	1.51	1.53	1.56	1.58	1.61	1.64	1.67	1.70	1.73	1.76

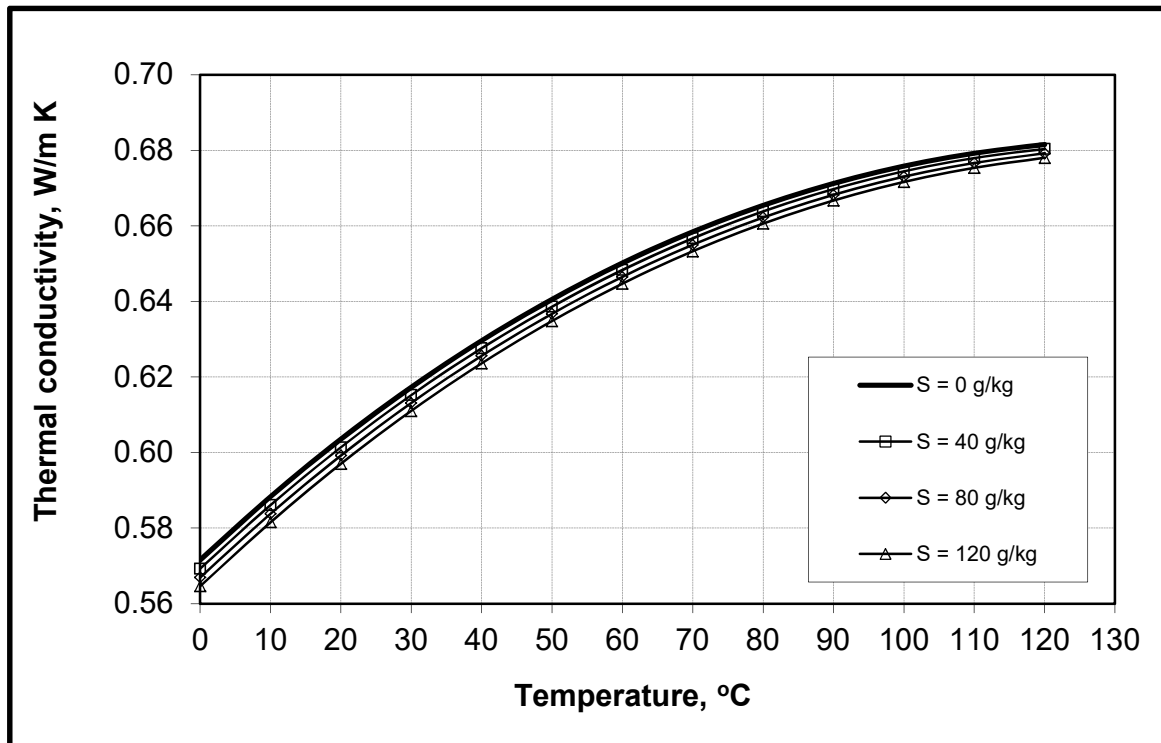


Accuracy ± 3.4%

References for Citation

1. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," *Desalination and Water Treatment*, Vol. 16, pp.354-380, April 2010.
2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," *Desalination and Water Treatment*, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	0.572	0.571	0.570	0.570	0.569	0.569	0.568	0.568	0.567	0.566	0.566	0.565	0.565
10	0.588	0.588	0.587	0.587	0.586	0.585	0.585	0.584	0.584	0.583	0.583	0.582	0.582
20	0.604	0.603	0.602	0.602	0.601	0.601	0.600	0.600	0.599	0.599	0.598	0.598	0.597
30	0.617	0.617	0.616	0.616	0.615	0.615	0.614	0.614	0.613	0.613	0.612	0.612	0.611
40	0.630	0.629	0.629	0.628	0.628	0.627	0.627	0.626	0.626	0.625	0.625	0.624	0.624
50	0.641	0.640	0.640	0.639	0.639	0.638	0.638	0.637	0.637	0.636	0.636	0.635	0.635
60	0.650	0.650	0.649	0.649	0.648	0.648	0.647	0.647	0.647	0.646	0.646	0.645	0.645
70	0.658	0.658	0.658	0.657	0.657	0.656	0.656	0.655	0.655	0.655	0.654	0.654	0.653
80	0.665	0.665	0.665	0.664	0.664	0.663	0.663	0.663	0.662	0.662	0.661	0.661	0.661
90	0.671	0.671	0.670	0.670	0.670	0.669	0.669	0.669	0.668	0.668	0.667	0.667	0.667
100	0.676	0.675	0.675	0.675	0.674	0.674	0.674	0.673	0.673	0.673	0.672	0.672	0.672
110	0.679	0.679	0.679	0.678	0.678	0.678	0.677	0.677	0.677	0.676	0.676	0.676	0.675
120	0.682	0.681	0.681	0.681	0.680	0.680	0.680	0.679	0.679	0.679	0.679	0.678	0.678

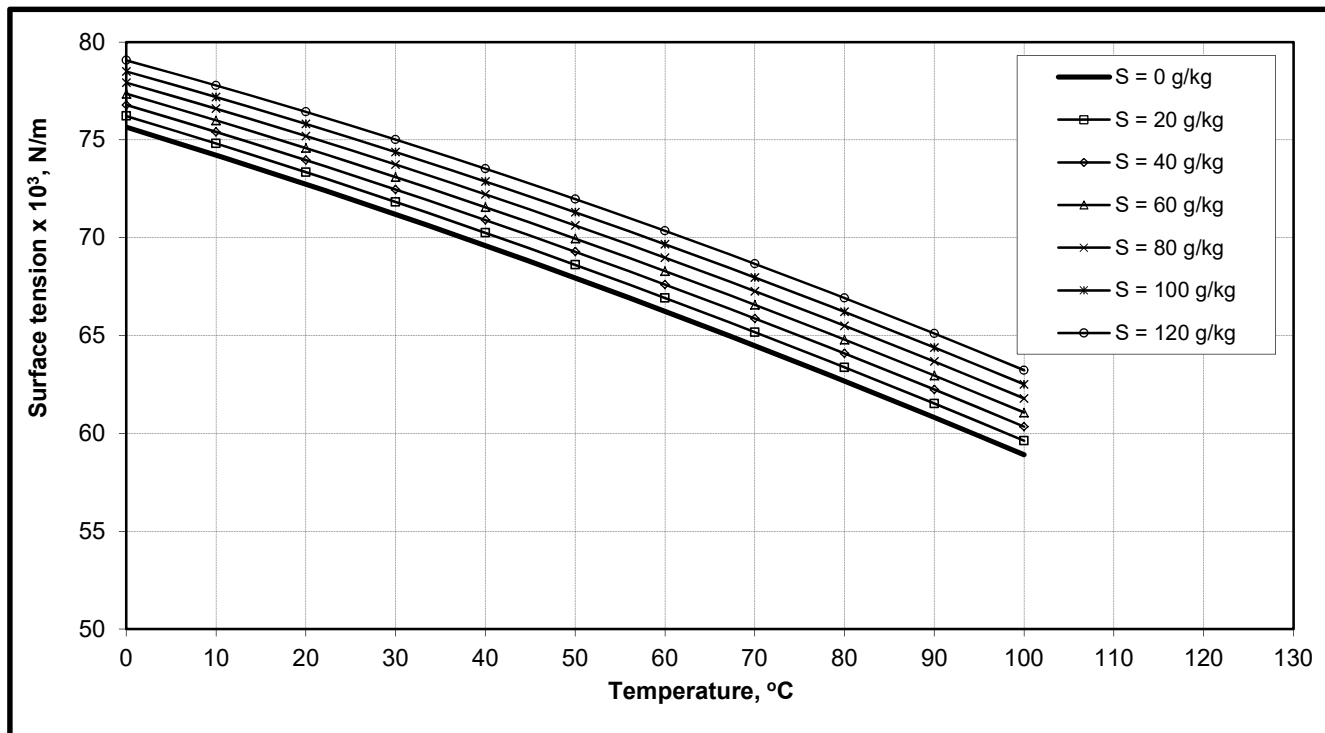


Accuracy ±3.0%

References for Citation

1. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	75.65	75.93	76.22	76.50	76.79	77.07	77.36	77.64	77.93	78.21	78.50	78.78	79.07
10	74.22	74.52	74.81	75.11	75.41	75.71	76.00	76.30	76.60	76.89	77.19	77.49	77.78
20	72.74	73.04	73.35	73.66	73.97	74.28	74.58	74.89	75.20	75.51	75.82	76.12	76.43
30	71.19	71.51	71.83	72.15	72.47	72.79	73.10	73.42	73.74	74.06	74.38	74.69	75.01
40	69.60	69.92	70.25	70.58	70.91	71.23	71.56	71.89	72.22	72.54	72.87	73.20	73.53
50	67.94	68.28	68.62	68.95	69.29	69.62	69.96	70.29	70.63	70.96	71.30	71.64	71.97
60	66.24	66.58	66.92	67.27	67.61	67.95	68.29	68.64	68.98	69.32	69.67	70.01	70.35
70	64.48	64.83	65.18	65.53	65.88	66.22	66.57	66.92	67.27	67.62	67.97	68.32	68.67
80	62.67	63.03	63.38	63.73	64.09	64.44	64.80	65.15	65.50	65.86	66.21	66.56	66.92
90	60.82	61.17	61.53	61.89	62.25	62.60	62.96	63.32	63.68	64.03	64.39	64.75	65.11
100	58.91	59.27	59.63	59.99	60.35	60.71	61.07	61.43	61.79	62.15	62.51	62.87	63.23



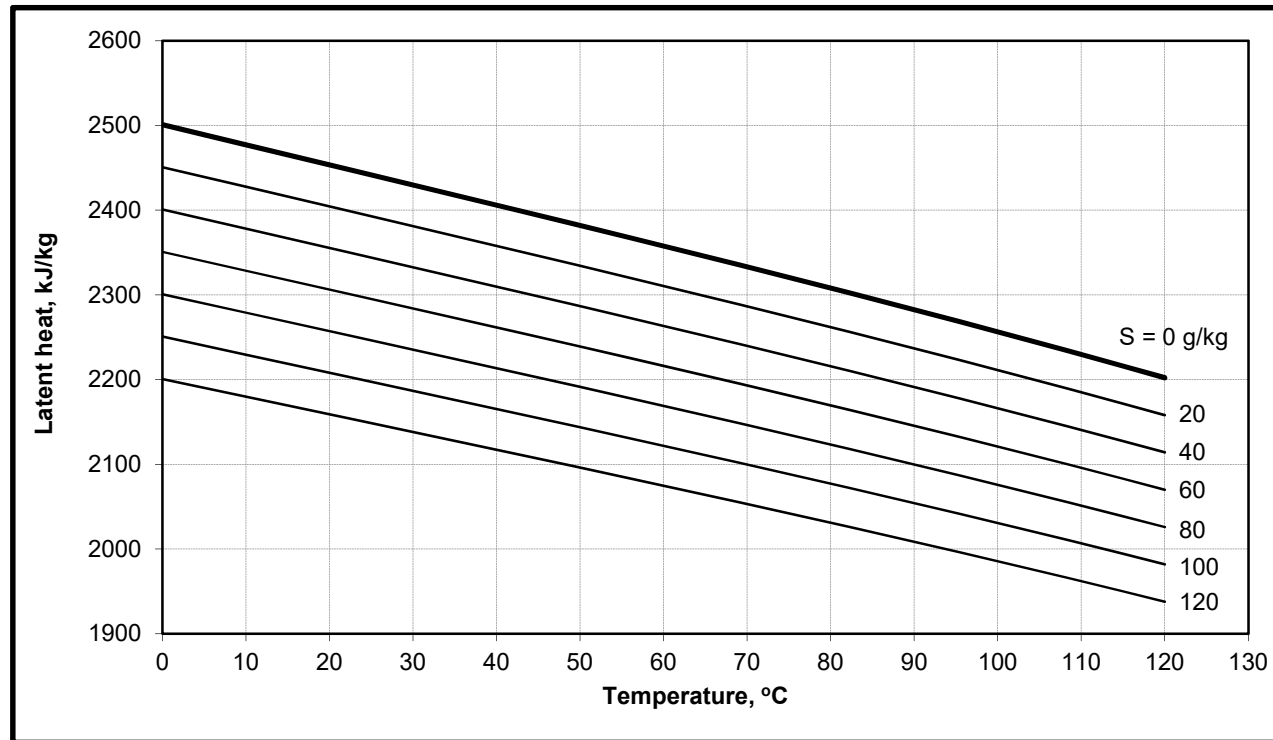
Accuracy ±0.60%

References for Citation

1. K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," *Desalination*, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. K.G. Nayar, D. Panchanathan, G.H. McKinley, J.H. Lienhard V, "Surface Tension of Seawater", *J. Phys. Chem. Ref. Data*. 43 (2014) 43103. doi:10.1063/1.4899037.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	2500.9	2475.9	2450.9	2425.9	2400.9	2375.9	2350.8	2325.8	2300.8	2275.8	2250.8	2225.8	2200.8
10	2477.2	2452.5	2427.7	2402.9	2378.1	2353.4	2328.6	2303.8	2279.0	2254.3	2229.5	2204.7	2180.0
20	2453.6	2429.0	2404.5	2379.9	2355.4	2330.9	2306.3	2281.8	2257.3	2232.7	2208.2	2183.7	2159.1
30	2429.8	2405.5	2381.2	2356.9	2332.6	2308.3	2284.0	2259.7	2235.4	2211.1	2186.8	2162.5	2138.2
40	2406.0	2381.9	2357.9	2333.8	2309.7	2285.7	2261.6	2237.6	2213.5	2189.4	2165.4	2141.3	2117.3
50	2382.0	2358.1	2334.3	2310.5	2286.7	2262.9	2239.0	2215.2	2191.4	2167.6	2143.8	2120.0	2096.1
60	2357.7	2334.1	2310.5	2287.0	2263.4	2239.8	2216.2	2192.7	2169.1	2145.5	2121.9	2098.3	2074.8
70	2333.1	2309.8	2286.4	2263.1	2239.8	2216.4	2193.1	2169.8	2146.4	2123.1	2099.8	2076.5	2053.1
80	2308.1	2285.0	2261.9	2238.8	2215.8	2192.7	2169.6	2146.5	2123.4	2100.4	2077.3	2054.2	2031.1
90	2282.6	2259.7	2236.9	2214.1	2191.3	2168.4	2145.6	2122.8	2100.0	2077.1	2054.3	2031.5	2008.7
100	2256.5	2233.9	2211.3	2188.8	2166.2	2143.7	2121.1	2098.5	2076.0	2053.4	2030.8	2008.3	1985.7
110	2229.7	2207.4	2185.1	2162.8	2140.5	2118.2	2095.9	2073.6	2051.3	2029.0	2006.7	1984.4	1962.1
120	2202.1	2180.1	2158.1	2136.1	2114.1	2092.0	2070.0	2048.0	2026.0	2003.9	1981.9	1959.9	1937.9

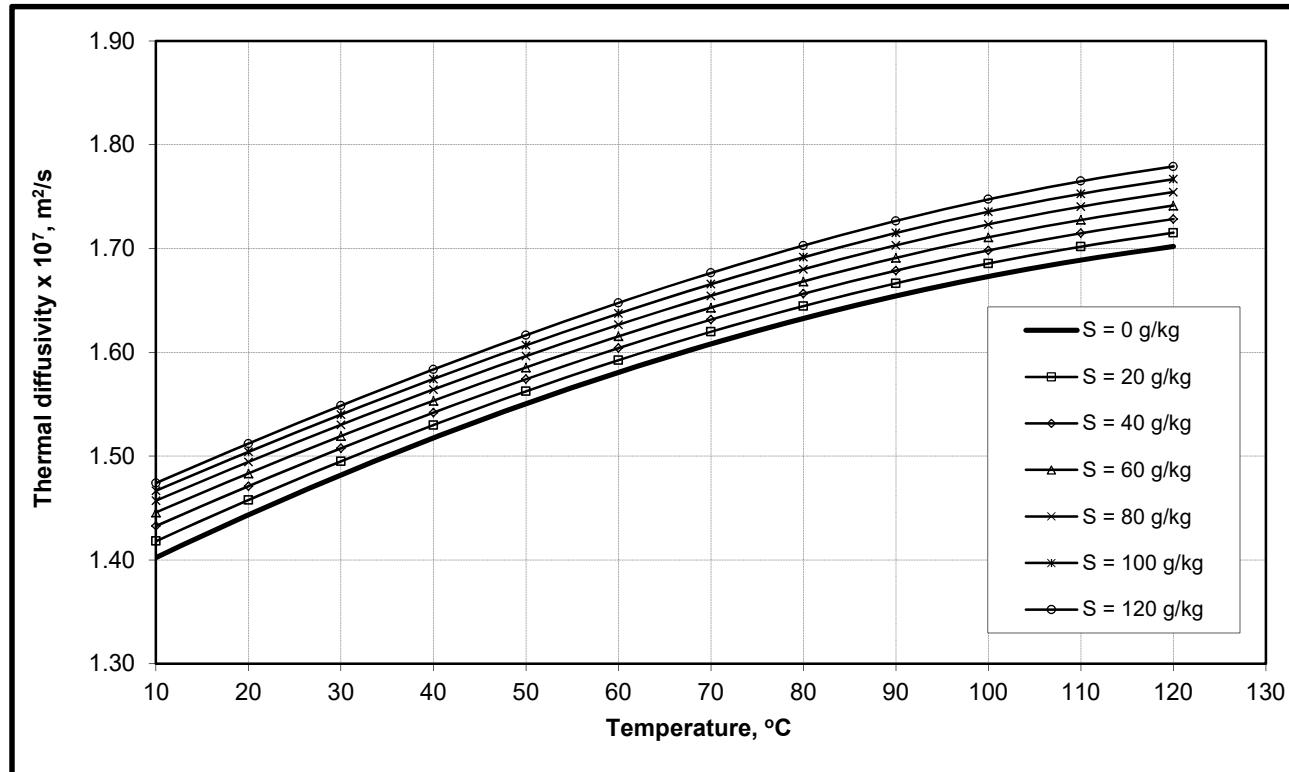


Accuracy ±0.01%

References for Citation

1. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	1.36	1.37	1.38	1.38	1.39	1.40	1.41	1.41	1.42	1.42	1.43	1.43	1.43
10	1.40	1.41	1.42	1.43	1.43	1.44	1.45	1.45	1.46	1.46	1.47	1.47	1.47
20	1.44	1.45	1.46	1.46	1.47	1.48	1.48	1.49	1.49	1.50	1.50	1.51	1.51
30	1.48	1.49	1.50	1.50	1.51	1.51	1.52	1.52	1.53	1.54	1.54	1.54	1.55
40	1.52	1.52	1.53	1.54	1.54	1.55	1.55	1.56	1.56	1.57	1.57	1.58	1.58
50	1.55	1.56	1.56	1.57	1.57	1.58	1.59	1.59	1.60	1.60	1.61	1.61	1.62
60	1.58	1.59	1.59	1.60	1.60	1.61	1.62	1.62	1.63	1.63	1.64	1.64	1.65
70	1.61	1.61	1.62	1.63	1.63	1.64	1.64	1.65	1.65	1.66	1.67	1.67	1.68
80	1.63	1.64	1.64	1.65	1.66	1.66	1.67	1.67	1.68	1.69	1.69	1.70	1.70
90	1.65	1.66	1.67	1.67	1.68	1.68	1.69	1.70	1.70	1.71	1.71	1.72	1.73
100	1.67	1.68	1.69	1.69	1.70	1.70	1.71	1.72	1.72	1.73	1.74	1.74	1.75
110	1.69	1.70	1.70	1.71	1.71	1.72	1.73	1.73	1.74	1.75	1.75	1.76	1.76
120	1.70	1.71	1.72	1.72	1.73	1.73	1.74	1.75	1.75	1.76	1.77	1.77	1.78

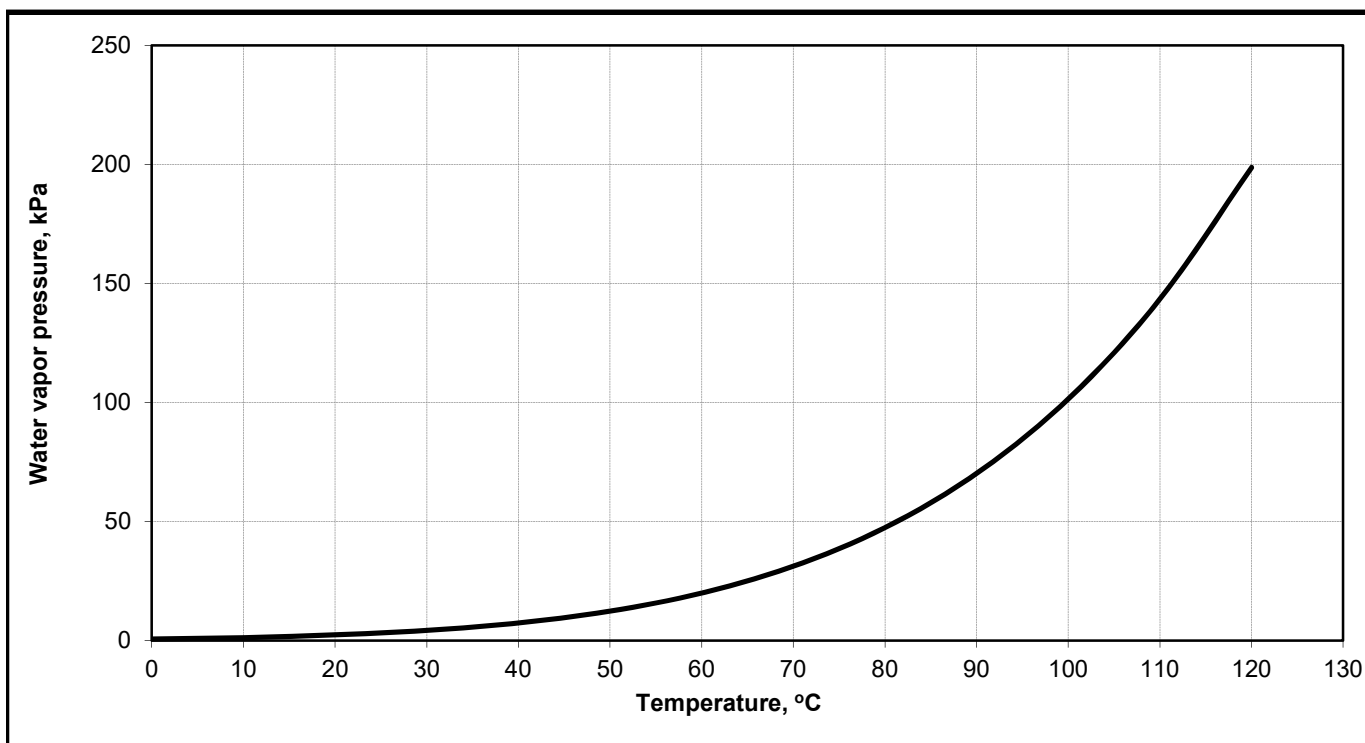


Accuracy $\pm 3.0\%$

References for Citation

1. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	0.611	0.608	0.605	0.602	0.598	0.594	0.590	0.586	0.582	0.577	0.572	0.567	0.562
10	1.228	1.222	1.216	1.209	1.202	1.194	1.186	1.177	1.168	1.159	1.149	1.139	1.129
20	2.339	2.328	2.316	2.303	2.289	2.274	2.259	2.242	2.225	2.207	2.189	2.170	2.149
30	4.246	4.226	4.204	4.180	4.155	4.129	4.101	4.071	4.040	4.008	3.974	3.939	3.902
40	7.383	7.348	7.310	7.269	7.226	7.179	7.131	7.079	7.025	6.969	6.910	6.849	6.786
50	12.350	12.291	12.227	12.159	12.086	12.009	11.927	11.841	11.751	11.656	11.558	11.456	11.350
60	19.944	19.849	19.746	19.635	19.518	19.393	19.261	19.122	18.976	18.824	18.665	18.500	18.329
70	31.198	31.049	30.888	30.715	30.531	30.336	30.129	29.912	29.684	29.446	29.198	28.940	28.672
80	47.412	47.185	46.941	46.678	46.399	46.102	45.788	45.457	45.111	44.749	44.372	43.980	43.573
90	70.180	69.845	69.483	69.095	68.681	68.241	67.776	67.287	66.775	66.239	65.681	65.100	64.499
100	101.419	100.934	100.411	99.850	99.252	98.616	97.945	97.239	96.498	95.723	94.916	94.078	93.208
110	143.384	142.699	141.960	141.166	140.320	139.422	138.473	137.474	136.426	135.332	134.191	133.005	131.776
120	198.685	197.736	196.712	195.613	194.440	193.195	191.880	190.496	189.045	187.528	185.947	184.304	182.601

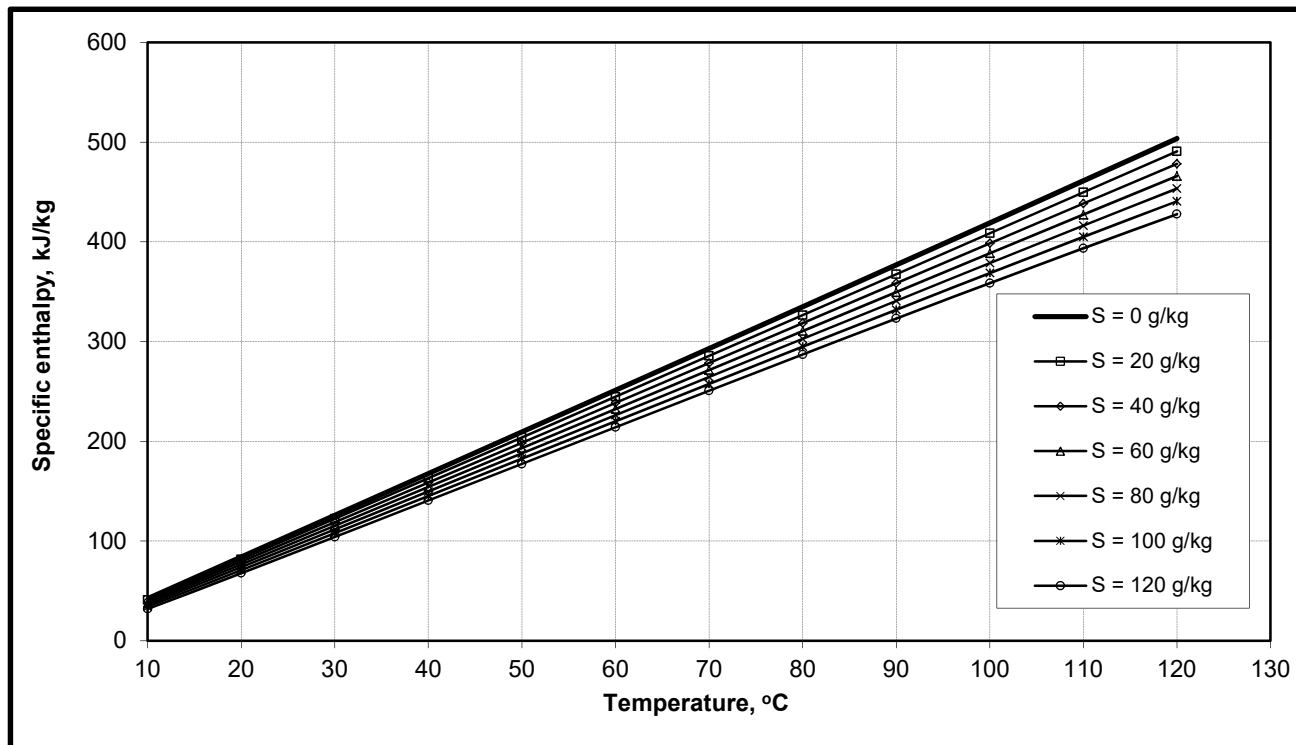


Accuracy ±0.91%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	42.1	41.6	41.0	40.4	39.7	39.0	38.1	37.2	36.3	35.2	34.2	33.0	31.9
20	84.0	82.8	81.7	80.4	79.2	77.9	76.6	75.2	73.8	72.3	70.8	69.3	67.8
30	125.8	124.1	122.3	120.6	118.9	117.1	115.3	113.5	111.6	109.7	107.9	106.0	104.1
40	167.6	165.3	163.1	160.8	158.6	156.4	154.2	151.9	149.7	147.4	145.2	142.9	140.6
50	209.4	206.6	203.9	201.2	198.5	195.9	193.2	190.6	187.9	185.3	182.6	180.0	177.4
60	251.2	247.9	244.7	241.6	238.5	235.4	232.3	229.3	226.2	223.2	220.1	217.1	214.1
70	293.0	289.3	285.6	282.0	278.5	275.0	271.5	268.0	264.5	261.1	257.6	254.2	250.7
80	334.9	330.7	326.6	322.5	318.5	314.6	310.6	306.7	302.8	298.9	295.0	291.0	287.1
90	376.9	372.2	367.6	363.0	358.5	354.1	349.7	345.3	340.9	336.5	332.0	327.6	323.2
100	419.0	413.8	408.6	403.6	398.6	393.6	388.6	383.7	378.7	373.8	368.8	363.8	358.7
110	461.2	455.4	449.7	444.1	438.5	432.9	427.4	421.8	416.3	410.7	405.0	399.3	393.6
120	503.6	497.2	490.8	484.6	478.4	472.1	465.9	459.7	453.4	447.1	440.7	434.3	427.8



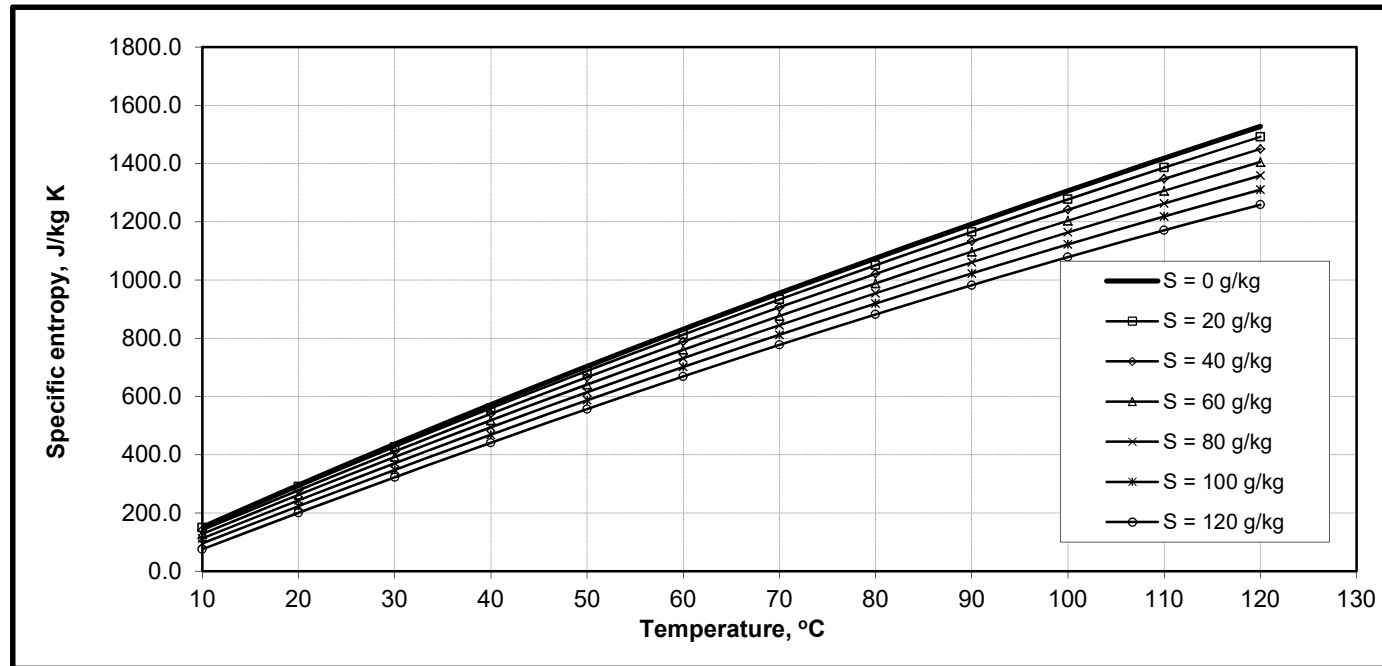
Accuracy ± 1.36%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	151.1	151.6	149.8	146.2	141.3	135.3	128.5	121.1	113.1	104.7	95.7	86.1	75.6
20	296.5	294.8	291.0	285.6	278.8	271.0	262.5	253.5	244.0	234.1	223.8	212.8	201.0
30	436.8	433.2	427.6	420.4	412.0	402.6	392.6	382.1	371.3	360.0	348.3	336.1	323.1
40	572.4	567.2	559.9	551.1	541.1	530.3	518.9	507.1	494.9	482.4	469.5	456.0	441.9
50	703.8	696.9	688.1	677.9	666.5	654.3	641.6	628.5	615.0	601.3	587.2	572.6	557.3
60	831.2	822.8	812.6	801.0	788.2	774.8	760.7	746.4	731.7	716.8	701.5	685.7	669.2
70	954.9	945.2	933.6	920.6	906.6	891.8	876.5	860.9	845.0	828.8	812.2	795.2	777.5
80	1075.3	1064.2	1051.3	1036.9	1021.6	1005.5	989.0	972.0	954.8	937.4	919.5	901.1	882.0
90	1192.6	1180.1	1165.8	1150.1	1133.5	1116.0	1098.1	1079.8	1061.3	1042.4	1023.1	1003.3	982.7
100	1307.0	1293.1	1277.4	1260.3	1242.2	1223.3	1204.0	1184.2	1164.1	1143.7	1122.9	1101.4	1079.2
110	1418.7	1403.3	1386.1	1367.5	1347.9	1327.5	1306.5	1285.1	1263.4	1241.3	1218.7	1195.5	1171.4
120	1527.8	1510.8	1492.0	1471.7	1450.4	1428.3	1405.6	1382.5	1358.9	1334.9	1310.3	1285.1	1258.9

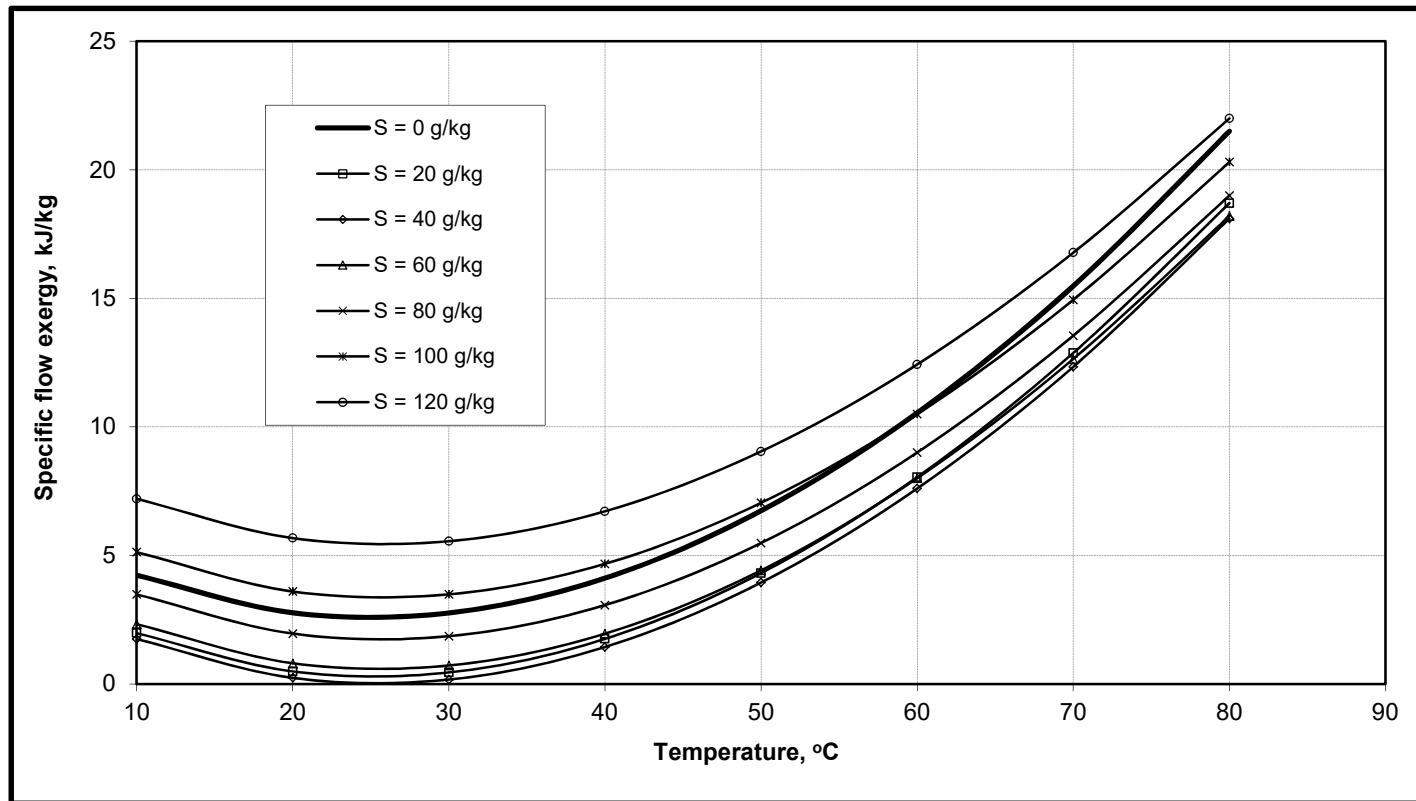


Accuracy ± .5%

References for Citation

- 1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024
2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	4.2	2.6	2.0	1.7	1.7	2.0	2.3	2.8	3.5	4.2	5.1	6.1	7.2
20	2.8	1.1	0.5	0.2	0.2	0.4	0.8	1.3	2.0	2.7	3.6	4.6	5.7
30	2.8	1.1	0.4	0.2	0.2	0.4	0.7	1.2	1.9	2.6	3.5	4.5	5.6
40	4.1	2.4	1.8	1.5	1.4	1.6	2.0	2.4	3.1	3.8	4.7	5.6	6.7
50	6.7	5.0	4.3	4.0	3.9	4.1	4.4	4.9	5.5	6.2	7.0	8.0	9.0
60	10.5	8.8	8.0	7.7	7.6	7.7	8.0	8.4	9.0	9.7	10.5	11.4	12.4
70	15.5	13.7	12.9	12.5	12.3	12.4	12.6	13.0	13.5	14.2	14.9	15.8	16.8
80	21.5	19.6	18.7	18.3	18.1	18.1	18.2	18.6	19.0	19.6	20.3	21.1	22.0



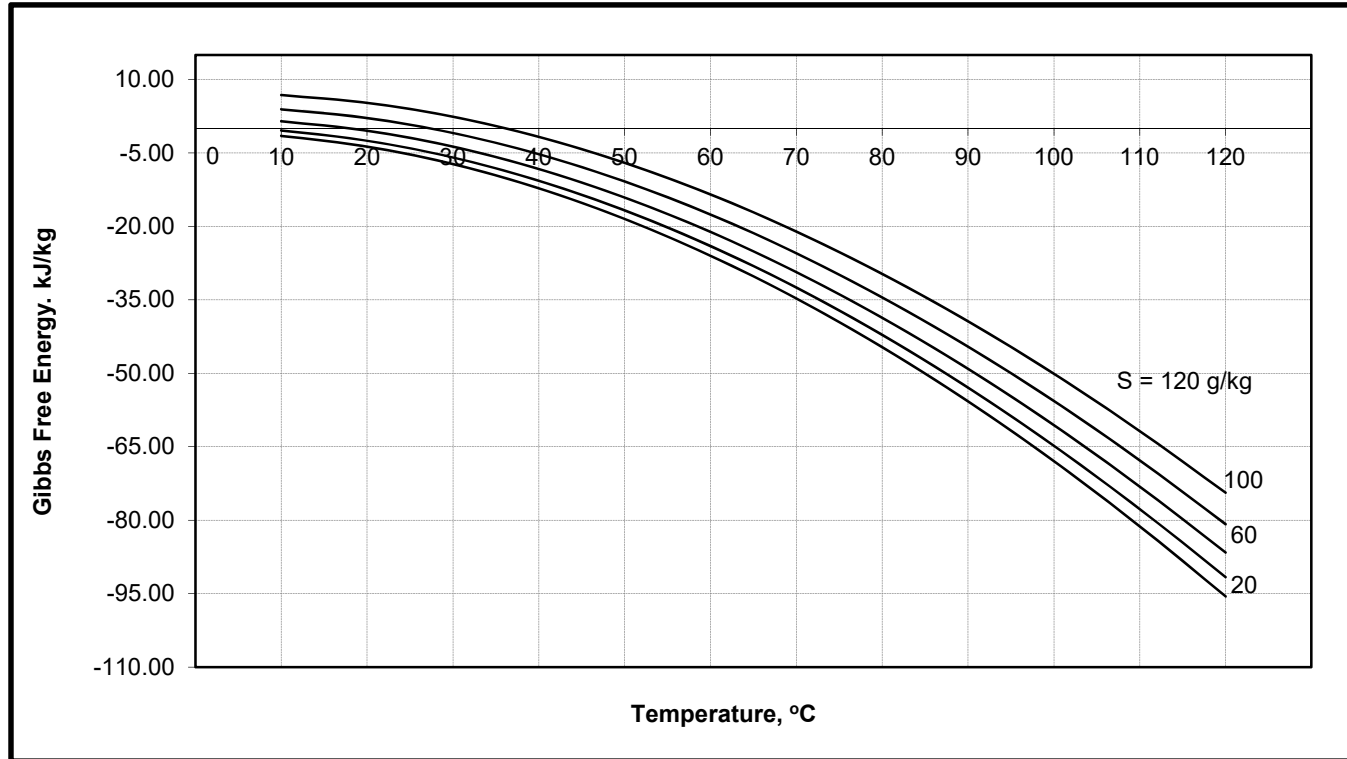
Accuracy ± 0.11 kJ/kg

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. M.H. Sharqawy, J.H. Lienhard V, "Formulation of seawater flow exergy using accurate thermodynamic data", in: ASME IMECE 2010, ASME, 2010: pp. 1–8.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	-0.7	-1.6	-1.5	-1.1	-0.4	0.5	1.5	2.7	3.9	5.3	6.8	8.4	10.1
20	-2.9	-3.8	-3.7	-3.2	-2.5	-1.5	-0.4	0.8	2.2	3.7	5.3	7.0	8.8
30	-6.6	-7.4	-7.3	-6.7	-5.9	-4.9	-3.7	-2.4	-0.9	0.7	2.4	4.2	6.1
40	-11.6	-12.4	-12.2	-11.6	-10.7	-9.6	-8.3	-6.8	-5.2	-3.5	-1.7	0.2	2.3
50	-18.0	-18.8	-18.5	-17.7	-16.7	-15.5	-14.1	-12.5	-10.8	-9.0	-7.0	-4.9	-2.7
60	-25.7	-26.4	-26.0	-25.1	-24.0	-22.7	-21.1	-19.4	-17.6	-15.6	-13.5	-11.2	-8.9
70	-34.6	-35.2	-34.7	-33.8	-32.5	-31.0	-29.3	-27.5	-25.5	-23.3	-21.0	-18.6	-16.1
80	-44.8	-45.3	-44.7	-43.5	-42.1	-40.5	-38.7	-36.6	-34.5	-32.1	-29.7	-27.1	-24.4
90	-56.1	-56.5	-55.7	-54.5	-52.9	-51.1	-49.1	-46.9	-44.5	-42.0	-39.4	-36.6	-33.7
100	-68.6	-68.9	-67.9	-66.5	-64.8	-62.8	-60.6	-58.2	-55.6	-52.9	-50.1	-47.1	-44.0
110	-82.2	-82.3	-81.2	-79.6	-77.7	-75.5	-73.1	-70.5	-67.8	-64.8	-61.8	-58.6	-55.2
120	-96.9	-96.9	-95.6	-93.8	-91.6	-89.2	-86.6	-83.8	-80.8	-77.7	-74.4	-71.0	-67.4

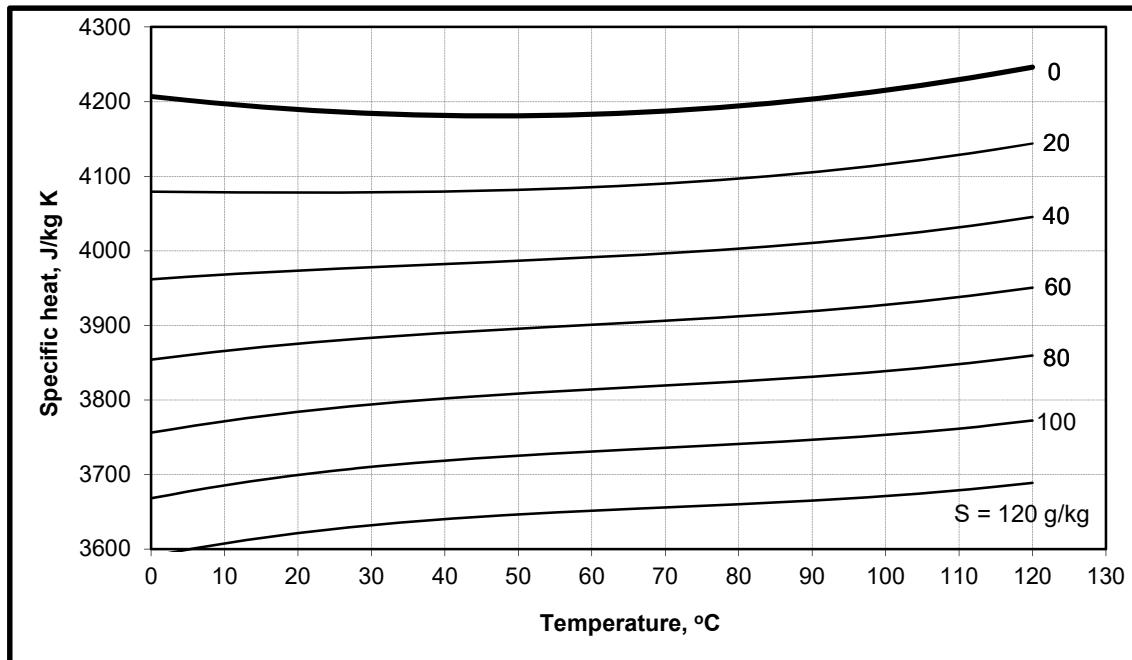


Accuracy ± 0.11 kJ/Kg

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg													
	0	10	20	30	35	40	50	60	70	80	90	100	110	120
0	4206.9	4141.8	4079.3	4019.2	3990.1	3961.7	3906.6	3853.9	3803.8	3756.1	3711.0	3668.3	3628.1	3590.3
10	4196.9	4136.7	4078.4	4022.2	3994.9	3968.1	3915.9	3865.8	3817.7	3771.6	3727.6	3685.6	3645.6	3607.7
20	4189.4	4132.9	4078.1	4024.9	3998.9	3973.4	3923.6	3875.4	3828.9	3784.1	3740.9	3699.4	3659.6	3621.4
25	4186.5	4131.5	4078.1	4026.2	4000.8	3975.8	3926.9	3879.5	3833.7	3789.3	3746.5	3705.2	3665.4	3627.1
30	4184.2	4130.6	4078.3	4027.5	4002.6	3978.0	3930.0	3883.3	3837.9	3794.0	3751.4	3710.3	3670.5	3632.1
40	4181.4	4129.8	4079.5	4030.3	4006.2	3982.3	3935.5	3889.8	3845.3	3801.9	3759.8	3718.8	3678.9	3640.2
50	4180.9	4130.8	4081.7	4033.7	4010.0	3986.6	3940.5	3895.5	3851.5	3808.5	3766.5	3725.5	3685.5	3646.5
60	4182.9	4133.6	4085.2	4037.8	4014.4	3991.2	3945.6	3900.8	3857.0	3814.1	3772.1	3731.0	3690.8	3651.6
70	4187.3	4138.3	4090.2	4042.9	4019.6	3996.5	3950.9	3906.2	3862.4	3819.4	3777.2	3736.0	3695.5	3656.0
80	4194.1	4145.0	4096.8	4049.4	4026.0	4002.8	3957.1	3912.2	3868.1	3824.9	3782.5	3740.9	3700.2	3660.3
90	4203.4	4153.9	4105.3	4057.5	4033.9	4010.5	3964.4	3919.1	3874.7	3831.1	3788.3	3746.4	3705.3	3665.1
100	4215.1	4165.0	4115.8	4067.4	4043.6	4019.9	3973.3	3927.5	3882.6	3838.6	3795.4	3753.1	3711.6	3671.1
110	4229.4	4178.5	4128.6	4079.5	4055.4	4031.4	3984.2	3937.8	3892.4	3847.9	3804.3	3761.5	3719.7	3678.8
120	4246.1	4194.5	4143.8	4094.1	4069.6	4045.3	3997.5	3950.5	3904.6	3859.5	3815.4	3772.3	3730.1	3688.8



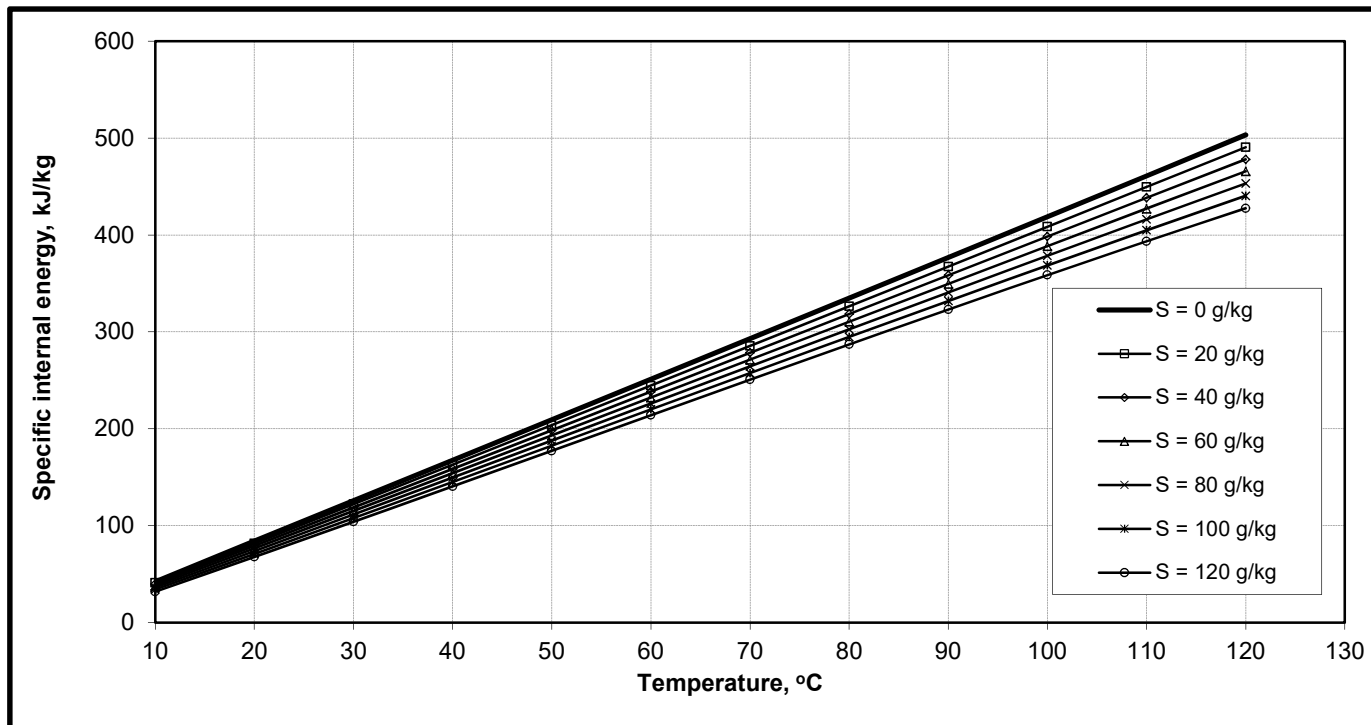
Accuracy ±1%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	42.01	41.49	40.93	40.31	39.63	38.88	38.05	37.15	36.18	35.15	34.07	32.95	31.81
20	83.90	82.73	81.55	80.35	79.11	77.83	76.50	75.12	73.69	72.23	70.73	69.21	67.69
30	125.73	123.97	122.23	120.50	118.75	116.99	115.20	113.37	111.52	109.65	107.76	105.86	103.98
40	167.52	165.23	162.97	160.75	158.53	156.31	154.09	151.85	149.59	147.33	145.06	142.79	140.55
50	209.30	206.50	203.77	201.08	198.41	195.76	193.12	190.47	187.82	185.17	182.52	179.89	177.27
60	251.10	247.82	244.61	241.47	238.37	235.30	232.24	229.18	226.14	223.09	220.05	217.02	214.01
70	292.93	289.18	285.51	281.92	278.38	274.87	271.39	267.92	264.45	260.99	257.53	254.08	250.65
80	334.83	330.59	326.46	322.41	318.42	314.46	310.53	306.61	302.69	298.78	294.86	290.95	287.05
90	376.81	372.08	367.46	362.93	358.45	354.01	349.59	345.18	340.77	336.36	331.94	327.51	323.08
100	418.88	413.65	408.51	403.45	398.45	393.48	388.53	383.59	378.63	373.66	368.67	363.66	358.63
110	461.05	455.24	449.54	443.91	438.33	432.78	427.24	421.69	416.12	410.51	404.87	399.20	393.48
120	503.39	496.96	490.63	484.37	478.15	471.94	465.73	459.50	453.23	446.91	440.53	434.09	427.60



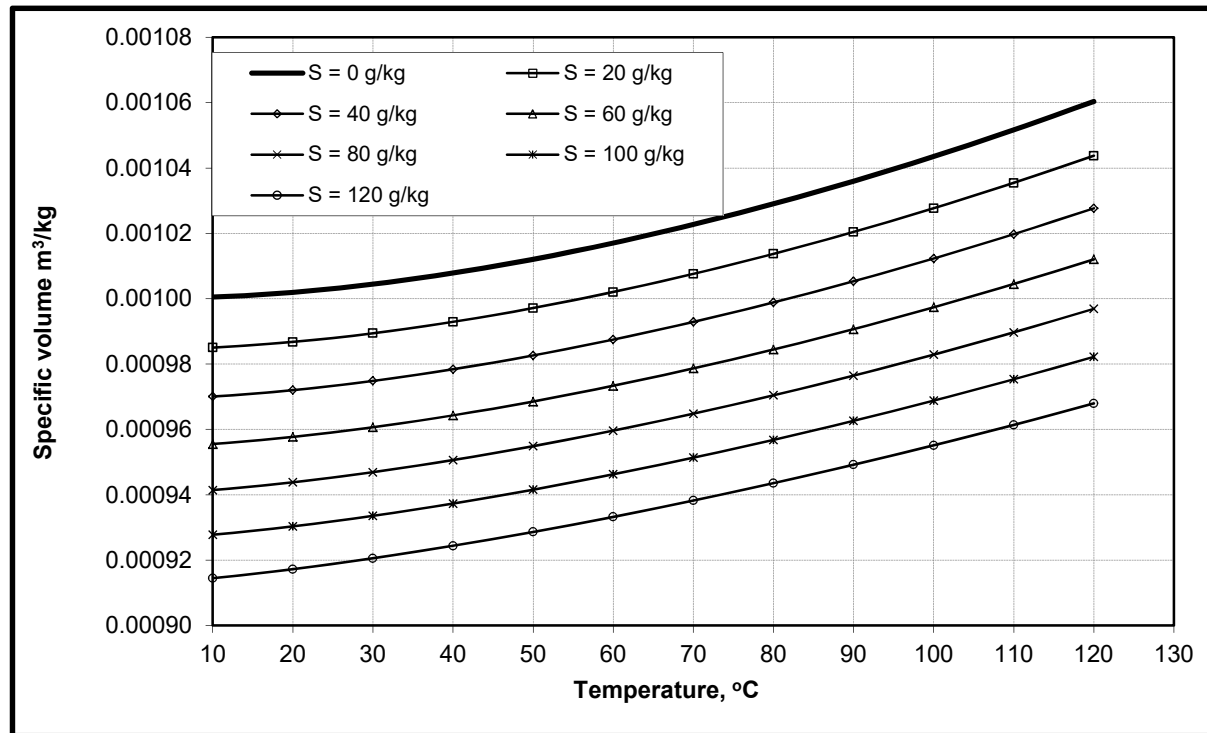
Accuracy ± 1.5%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096	0.00095	0.00095	0.00094	0.00093	0.00093	0.00092	0.00091
10	0.00100	0.00099	0.00099	0.00098	0.00097	0.00096	0.00096	0.00095	0.00094	0.00093	0.00093	0.00092	0.00091
20	0.00100	0.00099	0.00099	0.00098	0.00097	0.00096	0.00096	0.00095	0.00094	0.00094	0.00093	0.00092	0.00092
30	0.00100	0.00100	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00095	0.00094	0.00093	0.00093	0.00092
40	0.00101	0.00100	0.00099	0.00099	0.00098	0.00097	0.00096	0.00096	0.00095	0.00094	0.00094	0.00093	0.00092
50	0.00101	0.00100	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096	0.00095	0.00095	0.00094	0.00094	0.00093
60	0.00102	0.00101	0.00100	0.00099	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00095	0.00094	0.00093
70	0.00102	0.00102	0.00101	0.00100	0.00099	0.00099	0.00098	0.00097	0.00096	0.00096	0.00095	0.00094	0.00094
80	0.00103	0.00102	0.00101	0.00101	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096	0.00096	0.00095	0.00094
90	0.00104	0.00103	0.00102	0.00101	0.00101	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096	0.00096	0.00095
100	0.00104	0.00104	0.00103	0.00102	0.00101	0.00100	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096	0.00096
110	0.00105	0.00104	0.00104	0.00103	0.00102	0.00101	0.00100	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096
120	0.00106	0.00105	0.00104	0.00104	0.00103	0.00102	0.00101	0.00100	0.00100	0.00099	0.00098	0.00098	0.00097

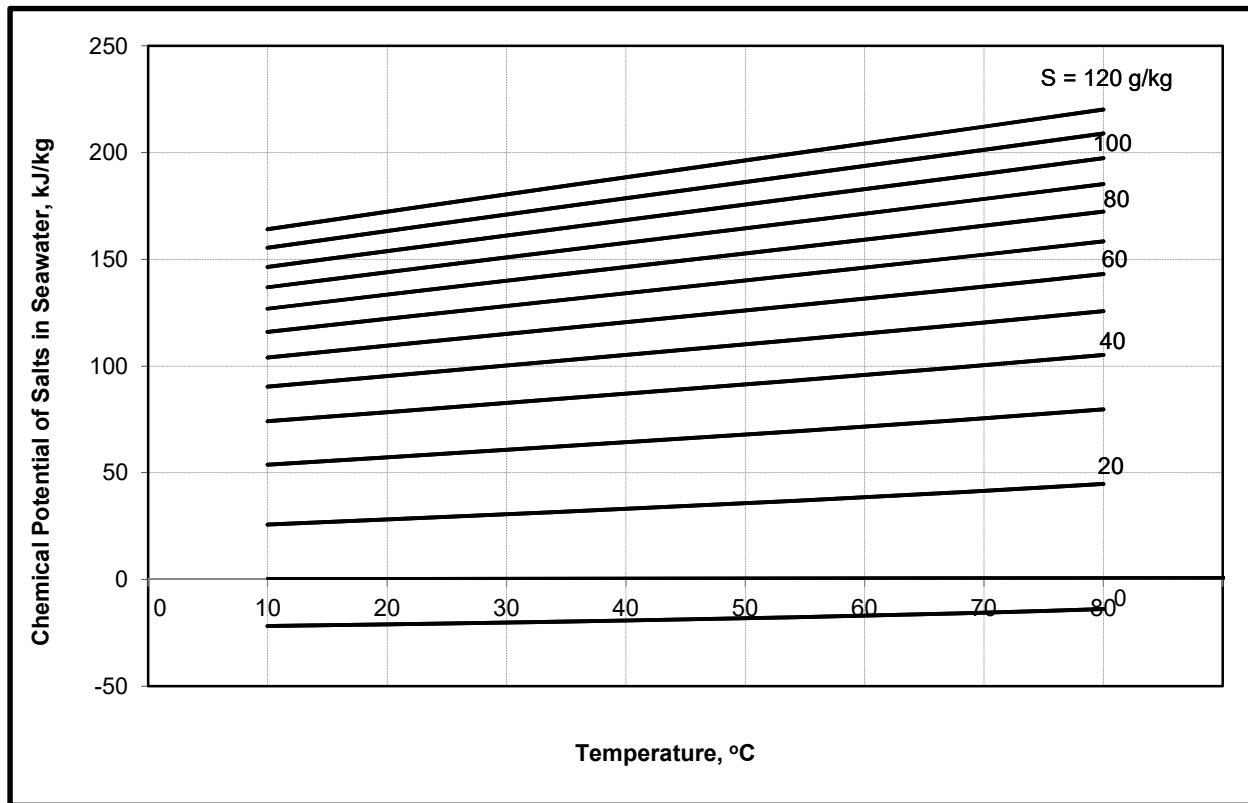


References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg											
	10	20	30	40	50	60	70	80	90	100	110	120
10	-21.907	25.621	53.735	74.070	90.268	103.948	115.970	126.845	136.902	146.361	155.378	164.069
20	-21.106	28.070	57.237	78.380	95.253	109.522	122.074	133.436	143.945	153.831	163.253	172.330
30	-20.262	30.537	60.733	82.664	100.190	115.029	128.093	139.925	150.872	161.170	170.985	180.436
40	-19.330	33.068	64.270	86.965	105.125	120.514	134.073	146.358	157.728	168.424	178.618	188.433
50	-18.267	35.706	67.891	91.329	110.101	126.022	140.057	152.779	164.556	175.636	186.196	196.363
60	-17.029	38.493	71.637	95.796	115.160	131.593	146.086	159.229	171.397	182.848	193.761	204.268
70	-15.579	41.468	75.549	100.406	120.342	137.268	152.202	165.748	178.293	190.100	201.354	212.189
80	-13.878	44.669	79.663	105.197	125.684	143.084	158.441	172.374	185.280	197.429	209.010	220.163

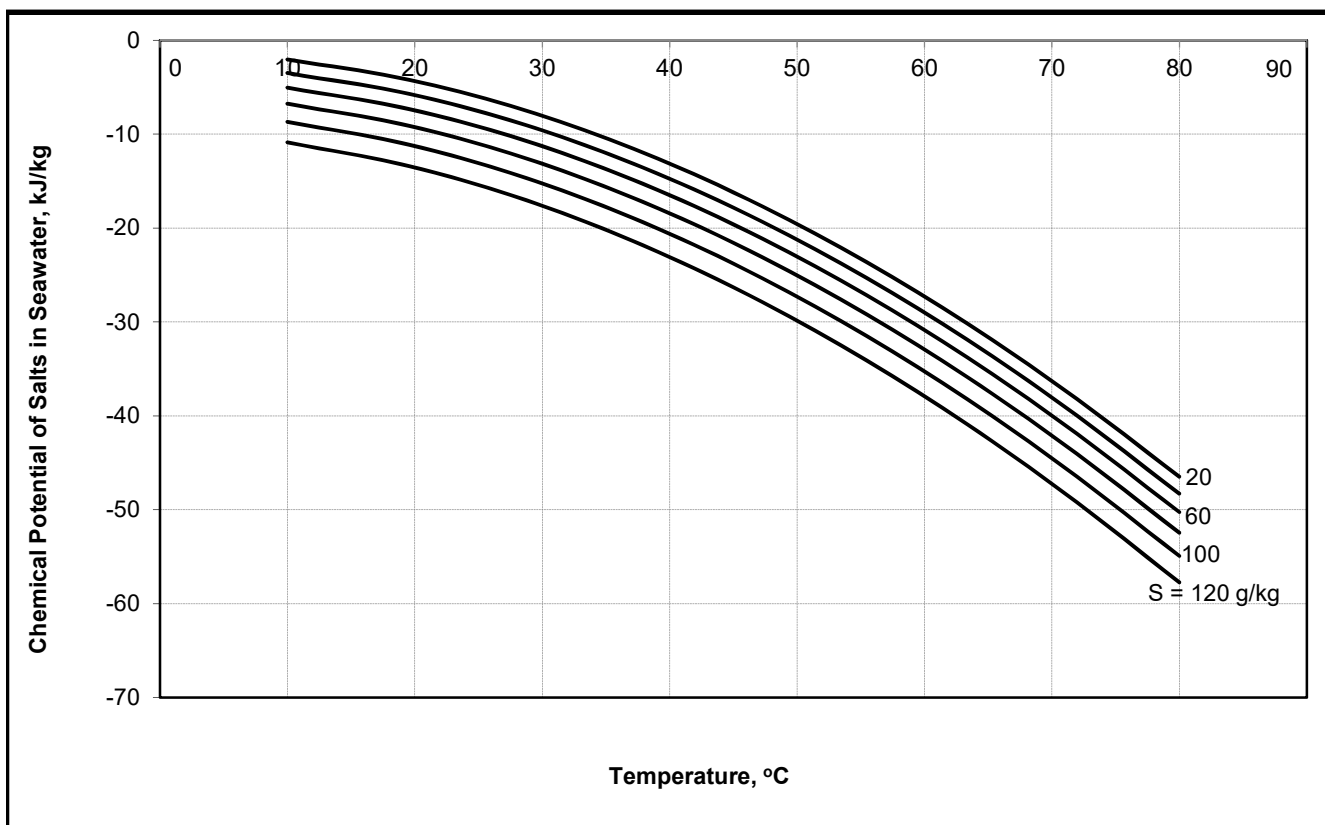


Accuracy ± 12.70 kJ/kg

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg											
	10	20	30	40	50	60	70	80	90	100	110	120
10	-1.348	-2.045	-2.756	-3.489	-4.250	-5.044	-5.879	-6.760	-7.693	-8.686	-9.743	-10.872
20	-3.611	-4.332	-5.070	-5.832	-6.624	-7.453	-8.324	-9.245	-10.221	-11.258	-12.363	-13.542
30	-7.300	-8.045	-8.809	-9.600	-10.423	-11.285	-12.191	-13.150	-14.166	-15.247	-16.398	-17.626
40	-12.370	-13.138	-13.928	-14.746	-15.599	-16.493	-17.434	-18.429	-19.485	-20.607	-21.803	-23.078
50	-18.778	-19.569	-20.384	-21.228	-22.110	-23.035	-24.009	-25.040	-26.133	-27.296	-28.534	-29.855
60	-26.480	-27.294	-28.133	-29.004	-29.914	-30.868	-31.874	-32.939	-34.069	-35.270	-36.550	-37.915
70	-35.439	-36.275	-37.138	-38.034	-38.970	-39.953	-40.990	-42.088	-43.252	-44.491	-45.811	-47.219
80	-45.615	-46.474	-47.360	-48.280	-49.242	-50.253	-51.319	-52.448	-53.646	-54.921	-56.279	-57.728

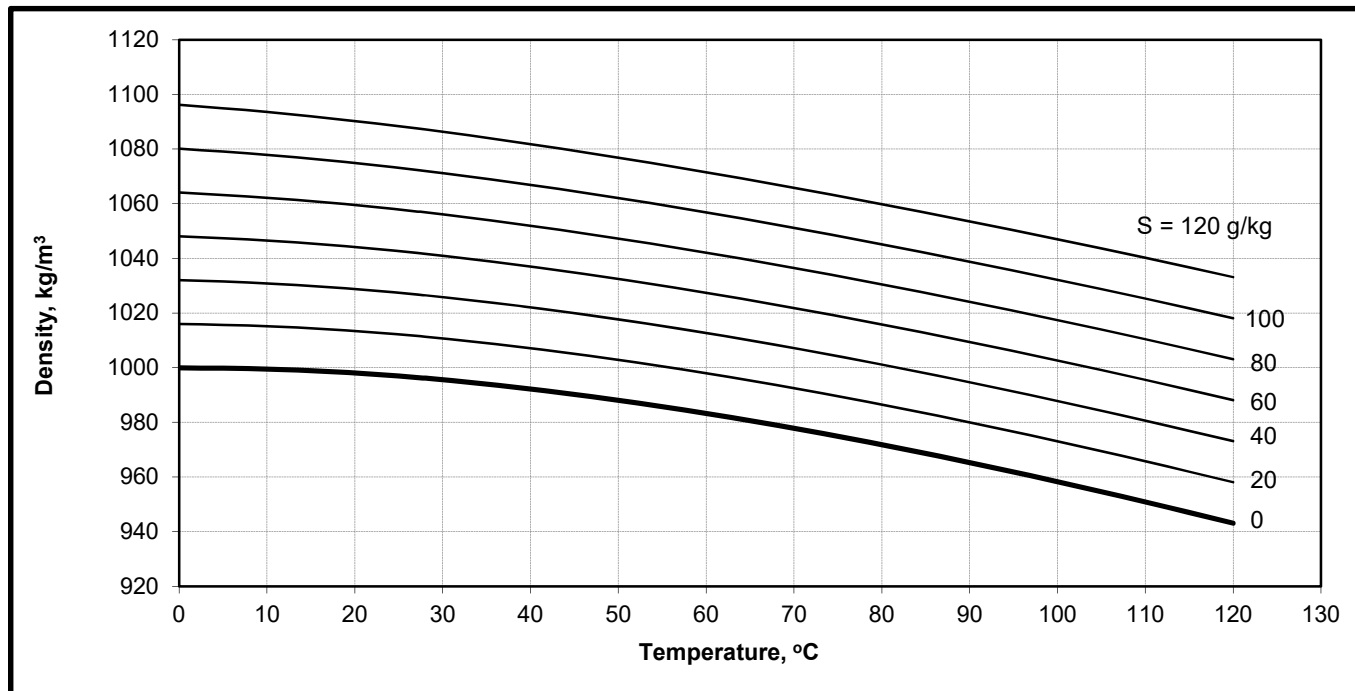


Accuracy ± 0.09 kJ/kg

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg													
	0	10	20	30	35	40	50	60	70	80	90	100	110	120
0	999.9	1007.9	1016.0	1024.0	1028.0	1032.0	1040.0	1048.0	1056.1	1064.1	1072.1	1080.1	1088.1	1096.2
10	999.5	1007.4	1015.2	1023.0	1027.0	1030.9	1038.7	1046.6	1054.4	1062.2	1070.1	1077.9	1085.7	1093.6
20	998.0	1005.7	1013.4	1021.1	1024.9	1028.8	1036.5	1044.1	1051.8	1059.5	1067.2	1074.9	1082.6	1090.3
25	996.9	1004.5	1012.2	1019.8	1023.6	1027.4	1035.0	1042.6	1050.3	1057.9	1065.5	1073.1	1080.7	1088.4
30	995.6	1003.1	1010.7	1018.2	1022.0	1025.8	1033.4	1040.9	1048.5	1056.1	1063.6	1071.2	1078.7	1086.3
40	992.2	999.7	1007.1	1014.6	1018.3	1022.1	1029.5	1037.0	1044.5	1052.0	1059.4	1066.9	1074.4	1081.8
50	988.1	995.5	1002.9	1010.3	1014.0	1017.7	1025.1	1032.5	1039.9	1047.3	1054.7	1062.1	1069.5	1076.9
60	983.2	990.6	998.0	1005.3	1009.0	1012.7	1020.0	1027.4	1034.7	1042.1	1049.5	1056.8	1064.2	1071.5
70	977.8	985.1	992.5	999.8	1003.5	1007.1	1014.5	1021.8	1029.1	1036.5	1043.8	1051.2	1058.5	1065.8
80	971.8	979.1	986.5	993.8	997.5	1001.1	1008.5	1015.8	1023.1	1030.5	1037.8	1045.1	1052.5	1059.8
90	965.3	972.6	980.0	987.3	991.0	994.7	1002.0	1009.4	1016.8	1024.1	1031.5	1038.8	1046.2	1053.5
100	958.3	965.7	973.1	980.5	984.2	987.9	995.2	1002.6	1010.0	1017.4	1024.8	1032.2	1039.6	1047.0
110	950.9	958.3	965.8	973.2	976.9	980.6	988.1	995.5	1003.0	1010.4	1017.8	1025.3	1032.7	1040.2
120	943.0	950.6	958.1	965.6	969.3	973.1	980.6	988.1	995.6	1003.1	1010.6	1018.1	1025.6	1033.1



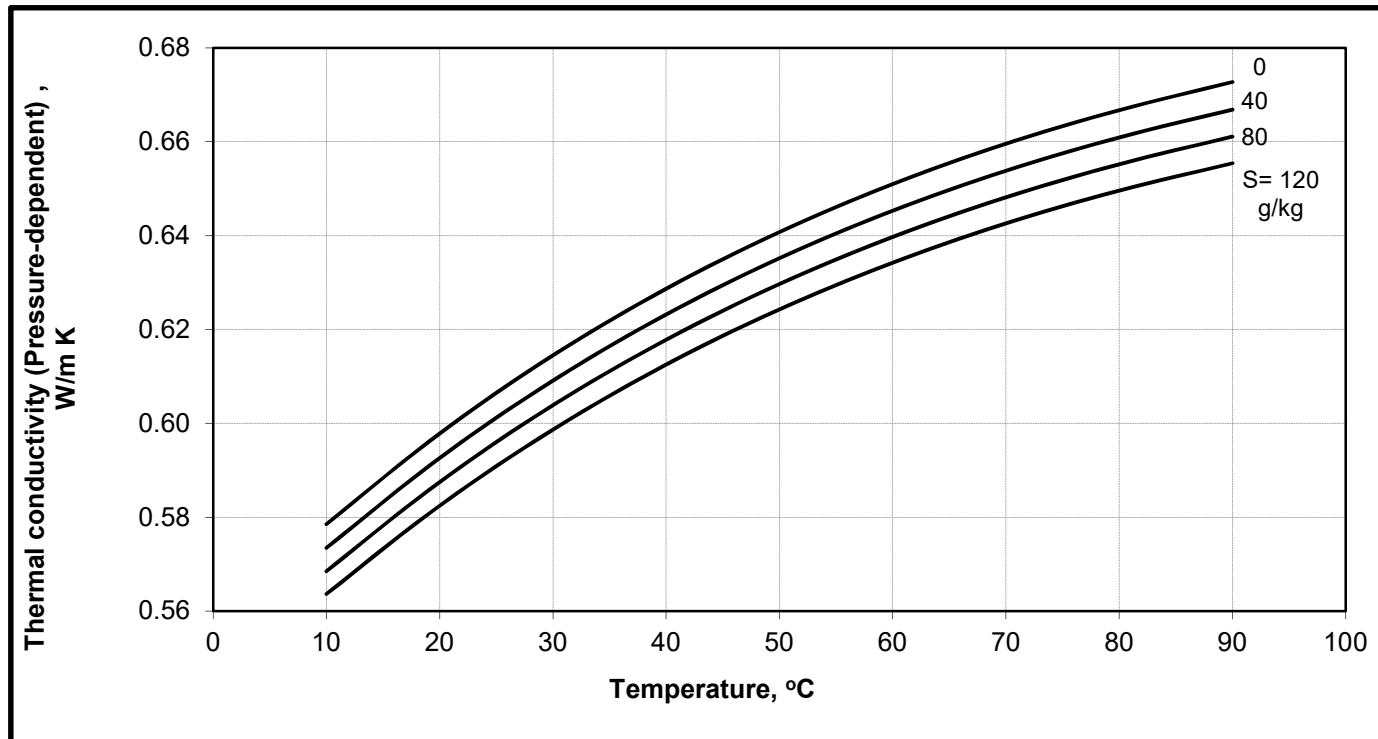
Accuracy ± 0.14%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	0.58	0.58	0.58	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.56	0.56
20	0.60	0.60	0.60	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.58	0.58	0.58
30	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.60	0.60	0.60	0.60	0.60
40	0.63	0.63	0.63	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.61	0.61
50	0.64	0.64	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.62
60	0.65	0.65	0.65	0.65	0.65	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.63
70	0.66	0.66	0.66	0.66	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.64	0.64
80	0.67	0.67	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.65	0.65	0.65	0.65
90	0.67	0.67	0.67	0.67	0.67	0.67	0.66	0.66	0.66	0.66	0.66	0.66	0.66

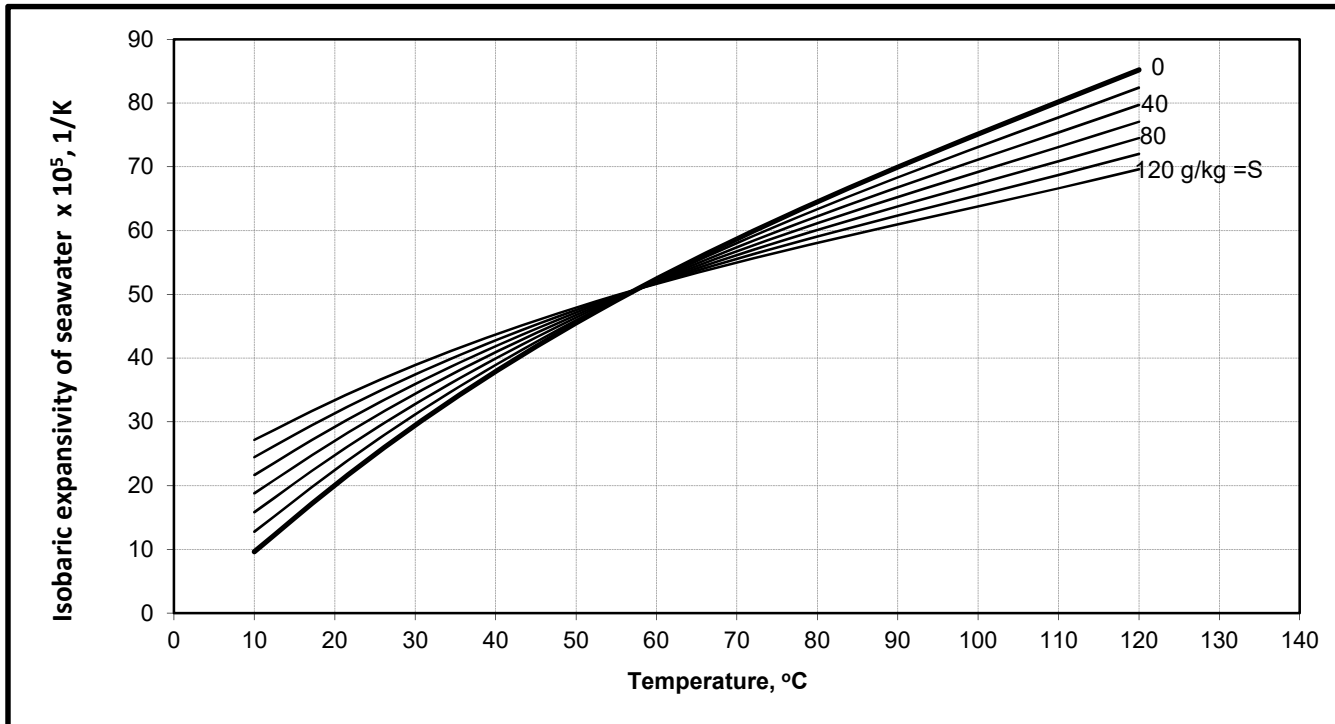


Accuracy ± 2.59 %

References for Citation

- 1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024
2. M.H. Sharqawy, "New correlations for seawater and pure water thermal conductivity at different temperatures and salinities", Desalination. 313 (2013) 97–104. doi:10.1016/j.desal.2012.12.010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	9.6	11.2	12.8	14.3	15.8	17.3	18.8	20.2	21.7	23.1	24.5	25.8	27.2
20	20.1	21.3	22.5	23.7	24.8	25.9	27.1	28.2	29.2	30.3	31.4	32.4	33.4
30	29.5	30.3	31.2	32.0	32.8	33.6	34.4	35.2	35.9	36.7	37.4	38.2	38.9
40	37.9	38.4	38.9	39.4	39.9	40.4	40.9	41.4	41.9	42.3	42.8	43.3	43.7
50	45.5	45.7	45.9	46.1	46.4	46.6	46.8	47.0	47.2	47.3	47.5	47.7	47.9
60	52.4	52.3	52.3	52.2	52.1	52.1	52.0	51.9	51.9	51.8	51.8	51.7	51.6
70	58.7	58.4	58.0	57.7	57.4	57.1	56.8	56.5	56.2	55.9	55.6	55.3	55.0
80	64.5	63.9	63.4	62.8	62.2	61.7	61.1	60.6	60.1	59.6	59.1	58.6	58.1
90	69.9	69.1	68.3	67.5	66.8	66.0	65.3	64.5	63.8	63.1	62.4	61.7	61.0
100	75.1	74.1	73.1	72.1	71.1	70.2	69.2	68.3	67.3	66.4	65.5	64.7	63.8
110	80.2	79.0	77.7	76.6	75.4	74.2	73.1	72.0	70.9	69.8	68.7	67.7	66.6
120	85.2	83.8	82.4	81.0	79.7	78.4	77.1	75.8	74.5	73.3	72.0	70.8	69.6

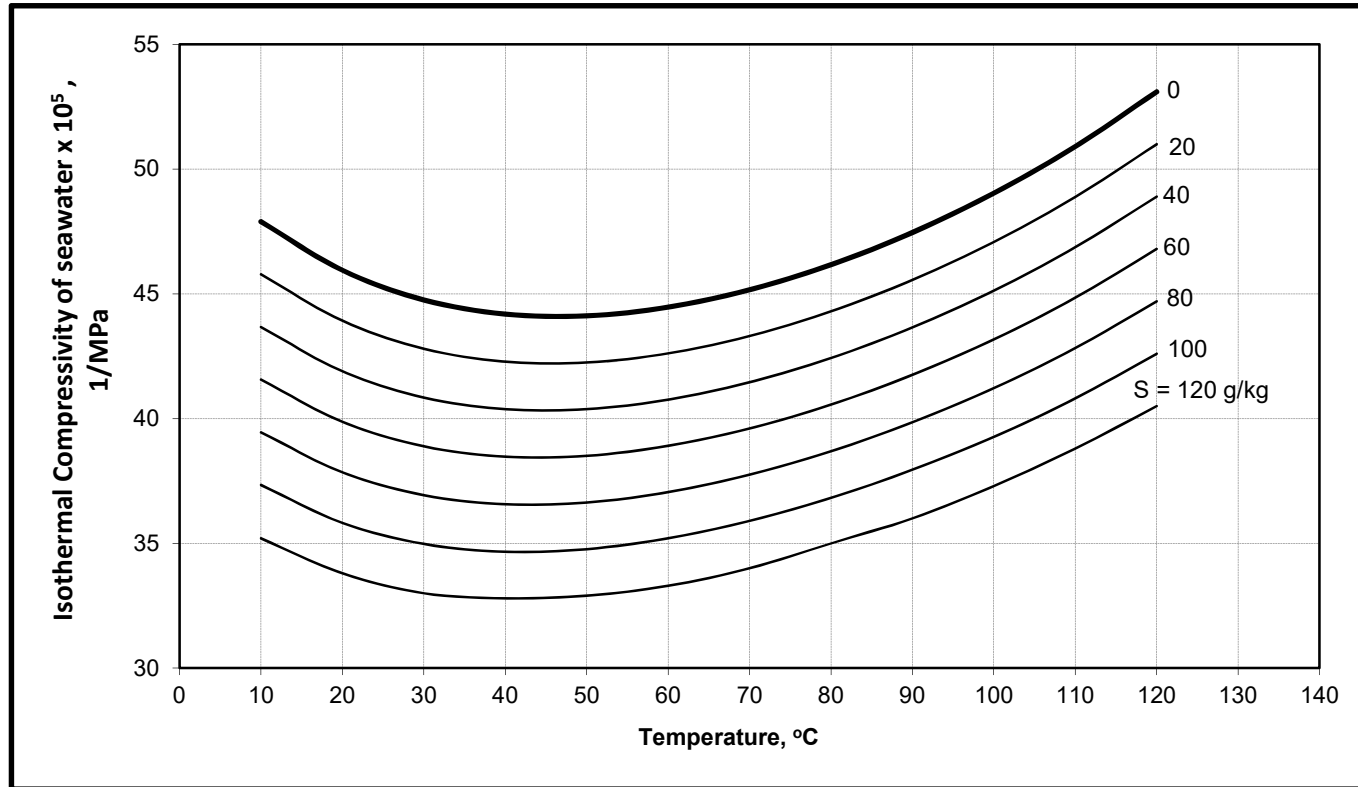


Accuracy ± 11.37%

References for Citation

- 1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024
2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	47.9	46.8	45.8	44.7	43.7	42.6	41.6	40.5	39.5	38.4	37.3	36.3	35.2
20	45.9	44.9	43.9	42.9	41.9	40.9	39.9	38.9	37.8	36.8	35.8	34.8	33.8
30	44.8	43.8	42.8	41.8	40.8	39.9	38.9	37.9	36.9	36.0	35.0	34.0	33.0
40	44.2	43.2	42.3	41.3	40.4	39.4	38.5	37.5	36.6	35.6	34.7	33.7	32.8
50	44.1	43.2	42.3	41.3	40.4	39.4	38.5	37.6	36.6	35.7	34.8	33.8	32.9
60	44.5	43.5	42.6	41.7	40.8	39.8	38.9	38.0	37.1	36.1	35.2	34.3	33.3
70	45.2	44.2	43.3	42.4	41.5	40.5	39.6	38.7	37.8	36.8	35.9	35.0	34.0
80	46.2	45.2	44.3	43.4	42.4	41.5	40.6	39.6	38.7	37.8	36.8	35.9	35.0
90	47.5	46.5	45.6	44.6	43.7	42.7	41.8	40.8	39.8	38.9	37.9	37.0	36.0
100	49.0	48.1	47.1	46.1	45.1	44.2	43.2	42.2	41.2	40.2	39.3	38.3	37.3
110	50.9	49.9	48.9	47.9	46.9	45.9	44.8	43.8	42.8	41.8	40.8	39.8	38.8
120	53.1	52.0	51.0	49.9	48.9	47.8	46.8	45.7	44.7	43.6	42.6	41.5	40.5

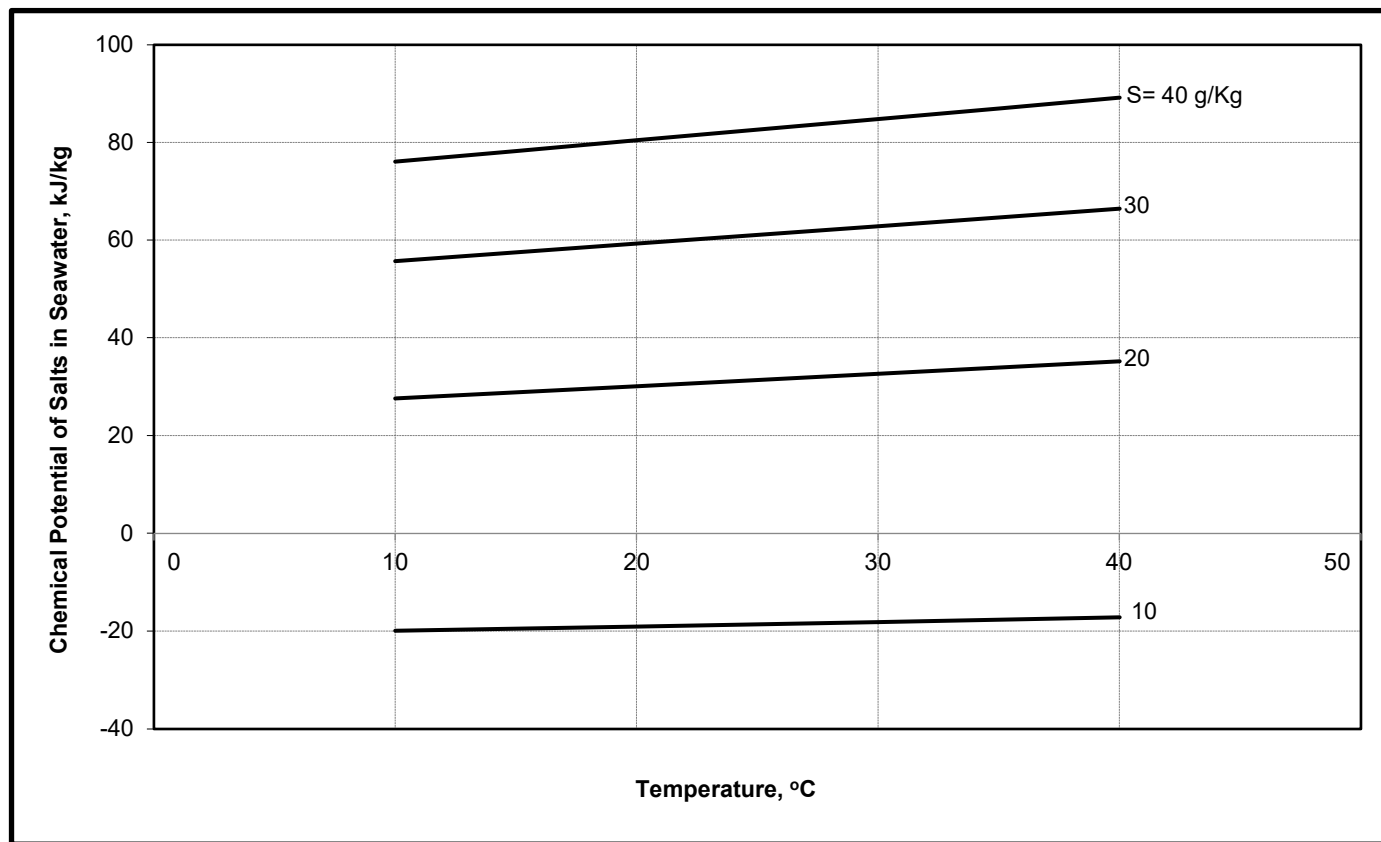


Accuracy ± 3.47%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Salinity				
Temp, °C	10	20	30	40
10	-19.930	27.597	55.711	76.047
20	-19.047	30.129	59.296	80.439
30	-18.139	32.661	62.857	84.787
40	-17.160	35.239	66.441	89.136

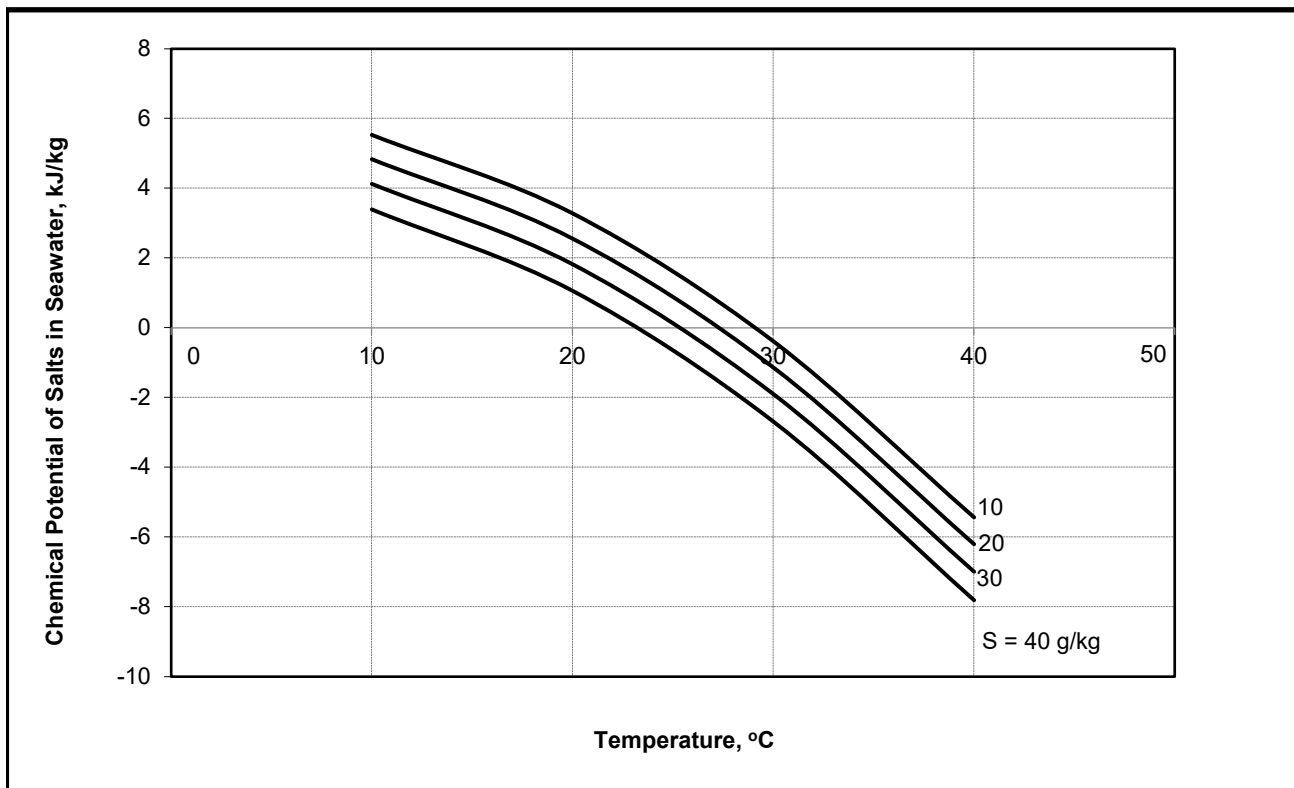


Accuracy ± 12.70 kJ/kg

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg			
	10	20	30	40
10	5.530	4.834	4.122	3.389
20	3.279	2.558	1.820	1.058
30	-0.393	-1.137	-1.902	-2.692
40	-5.439	-6.207	-6.997	-7.815

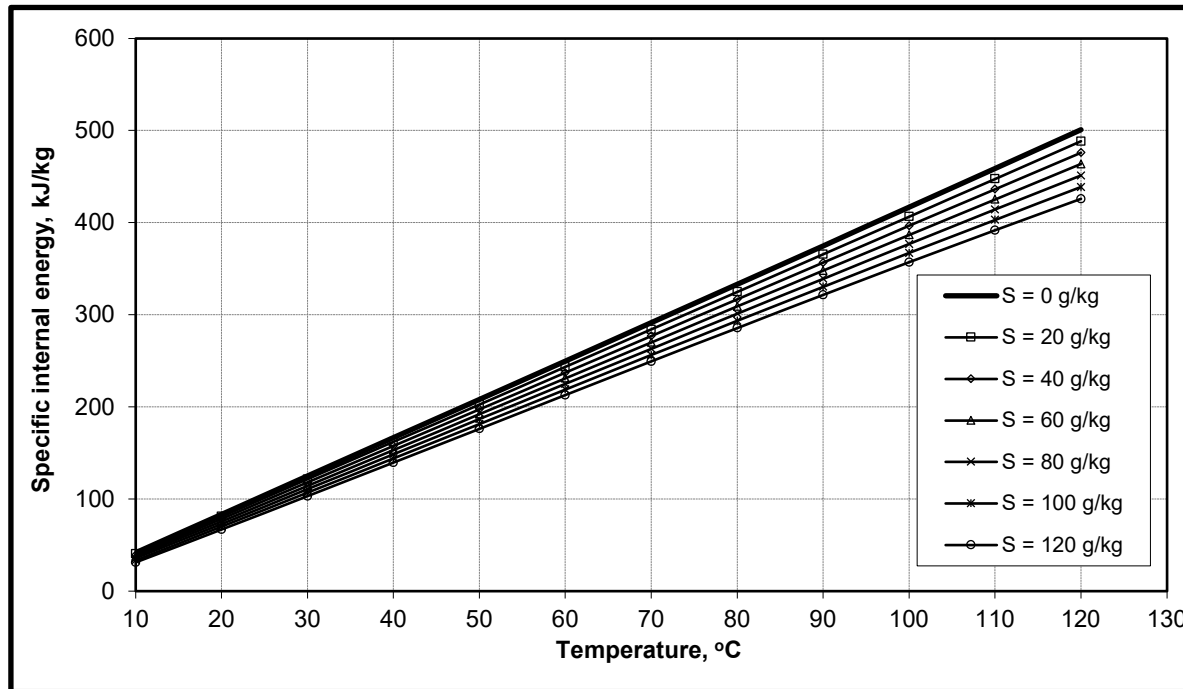


Accuracy ± 0.09 kJ/kg

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	41.79	41.25	40.67	40.03	39.33	38.55	37.70	36.78	35.78	34.72	33.61	32.47	31.31
20	83.47	82.29	81.10	79.88	78.62	77.33	75.98	74.58	73.14	71.65	70.13	68.59	67.05
30	125.10	123.33	121.59	119.84	118.09	116.31	114.51	112.68	110.82	108.93	107.03	105.12	103.22
40	166.69	164.40	162.14	159.91	157.69	155.47	153.24	151.00	148.74	146.47	144.20	141.92	139.67
50	208.28	205.49	202.76	200.07	197.41	194.76	192.12	189.48	186.83	184.18	181.54	178.90	176.28
60	249.89	246.62	243.43	240.29	237.20	234.14	231.09	228.05	225.01	221.97	218.94	215.91	212.91
70	291.53	287.79	284.15	280.58	277.05	273.56	270.09	266.64	263.19	259.74	256.29	252.86	249.44
80	333.23	329.02	324.92	320.89	316.92	312.99	309.08	305.18	301.29	297.40	293.50	289.61	285.73
90	375.02	370.32	365.74	361.24	356.79	352.38	347.99	343.61	339.23	334.85	330.46	326.06	321.65
100	416.91	411.70	406.60	401.58	396.62	391.69	386.78	381.87	376.95	372.01	367.05	362.08	357.08
110	458.89	453.13	447.47	441.89	436.36	430.85	425.35	419.84	414.31	408.75	403.15	397.51	391.84
120	501.02	494.64	488.37	482.16	475.99	469.84	463.68	457.49	451.27	445.00	438.67	432.28	425.83



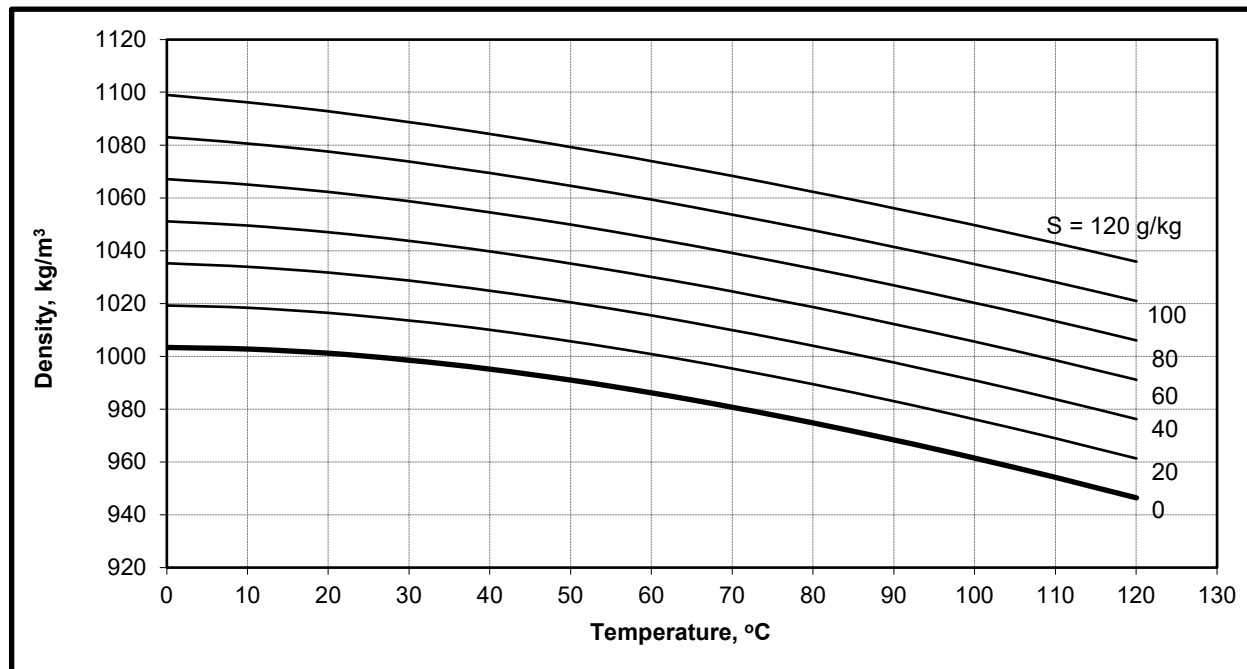
Accuracy ± 1.5%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	1003.4	1011.4	1019.3	1027.3	1035.3	1043.3	1051.2	1059.2	1067.1	1075.1	1083.1	1091.0	1099.0
10	1002.8	1010.6	1018.4	1026.2	1034.0	1041.8	1049.5	1057.3	1065.1	1072.9	1080.7	1088.4	1096.2
20	1001.2	1008.8	1016.5	1024.1	1031.7	1039.4	1047.0	1054.6	1062.3	1069.9	1077.5	1085.2	1092.8
30	998.6	1006.1	1013.6	1021.2	1028.7	1036.2	1043.7	1051.2	1058.7	1066.3	1073.8	1081.3	1088.8
40	995.2	1002.6	1010.1	1017.5	1024.9	1032.3	1039.8	1047.2	1054.6	1062.0	1069.4	1076.9	1084.3
50	991.1	998.4	1005.8	1013.1	1020.5	1027.8	1035.2	1042.6	1049.9	1057.3	1064.6	1072.0	1079.3
60	986.2	993.6	1000.9	1008.2	1015.5	1022.8	1030.1	1037.4	1044.8	1052.1	1059.4	1066.7	1074.0
70	980.8	988.1	995.4	1002.7	1010.0	1017.3	1024.6	1031.9	1039.2	1046.5	1053.8	1061.0	1068.3
80	974.9	982.1	989.4	996.7	1004.0	1011.3	1018.6	1025.9	1033.2	1040.5	1047.8	1055.1	1062.4
90	968.4	975.7	983.0	990.3	997.7	1005.0	1012.3	1019.6	1026.9	1034.2	1041.5	1048.8	1056.1
100	961.5	968.9	976.2	983.6	990.9	998.3	1005.6	1012.9	1020.3	1027.6	1035.0	1042.3	1049.7
110	954.2	961.6	969.0	976.4	983.8	991.2	998.6	1006.0	1013.4	1020.8	1028.1	1035.5	1042.9
120	946.4	953.9	961.3	968.8	976.3	983.7	991.2	998.7	1006.1	1013.6	1021.0	1028.5	1035.9

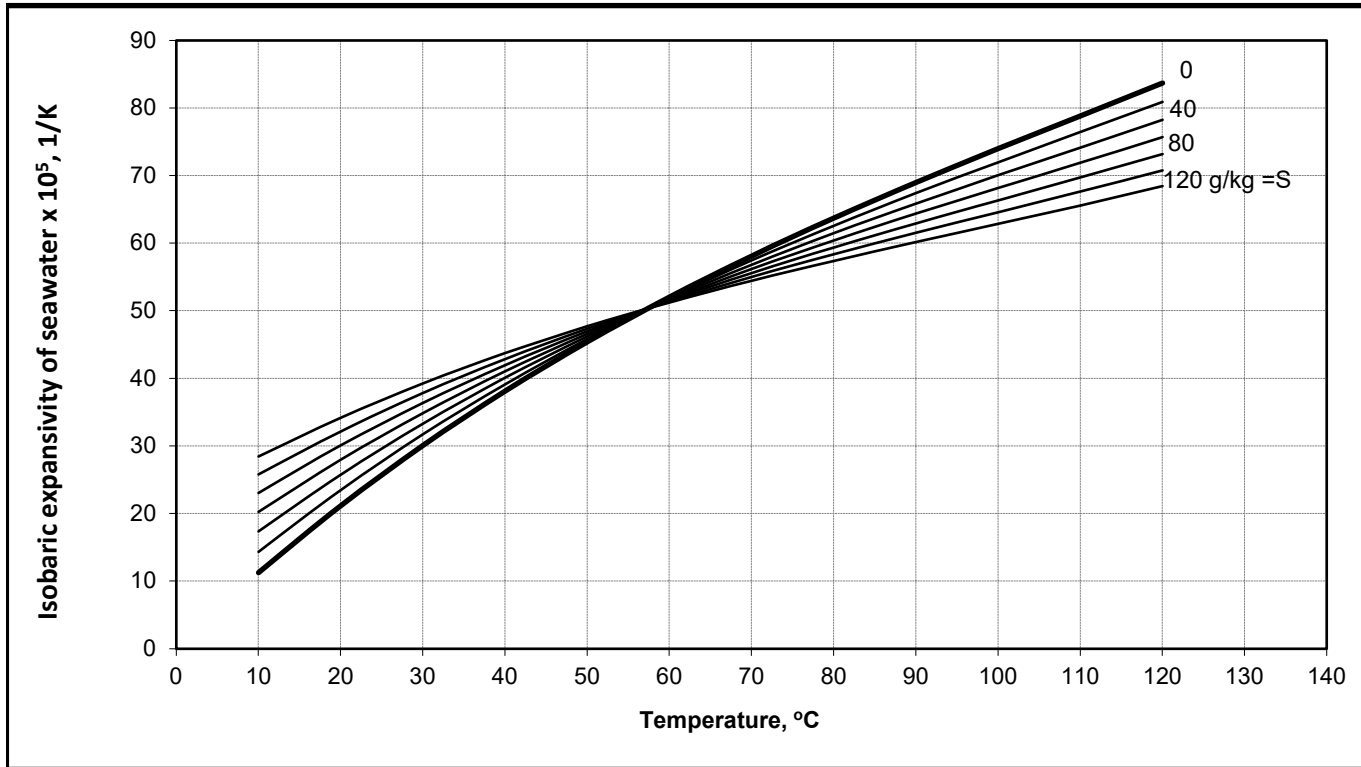


Accuracy ± 0.21%

References for Citation

- 1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024
2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	11.3	12.8	14.4	15.9	17.3	18.8	20.2	21.7	23.1	24.4	25.8	27.1	28.4
20	21.1	22.3	23.5	24.6	25.8	26.9	27.9	29.0	30.1	31.1	32.2	33.2	34.2
30	30.1	30.9	31.7	32.5	33.3	34.1	34.9	35.6	36.4	37.1	37.8	38.5	39.2
40	38.1	38.6	39.1	39.6	40.1	40.6	41.0	41.5	42.0	42.4	42.9	43.3	43.7
50	45.4	45.6	45.8	46.0	46.2	46.4	46.6	46.8	47.0	47.2	47.3	47.5	47.7
60	52.0	52.0	51.9	51.8	51.8	51.7	51.6	51.6	51.5	51.4	51.4	51.3	51.2
70	58.1	57.8	57.5	57.1	56.8	56.5	56.2	55.9	55.6	55.3	55.0	54.7	54.5
80	63.7	63.2	62.6	62.0	61.5	61.0	60.4	59.9	59.4	58.9	58.4	57.9	57.4
90	69.0	68.2	67.4	66.6	65.9	65.1	64.4	63.7	62.9	62.2	61.5	60.9	60.2
100	74.0	73.0	72.0	71.0	70.1	69.1	68.2	67.3	66.4	65.5	64.6	63.7	62.9
110	78.8	77.6	76.5	75.3	74.1	73.0	71.9	70.8	69.7	68.7	67.6	66.6	65.6
120	83.7	82.3	80.9	79.6	78.3	77.0	75.7	74.4	73.2	72.0	70.8	69.6	68.4

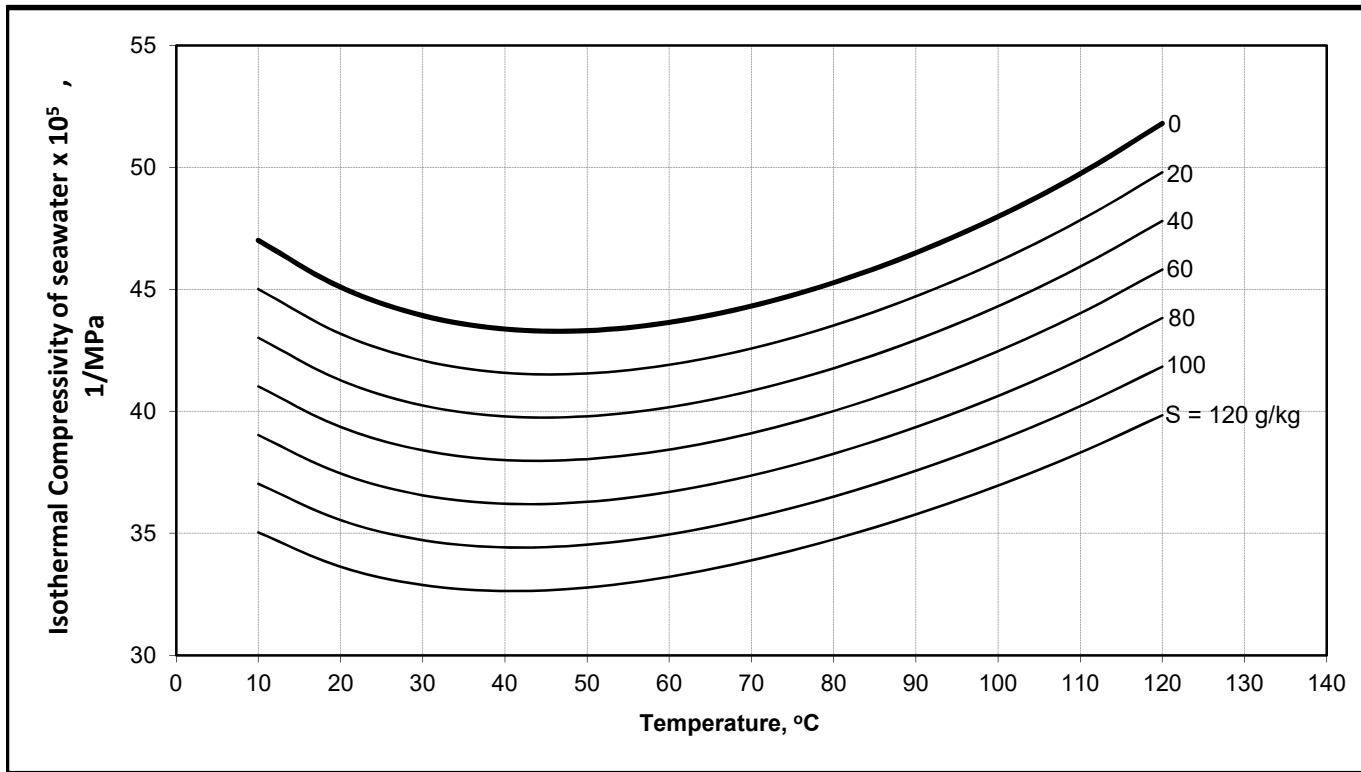


Accuracy ± 18.30%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	47.0	46.0	45.0	44.0	43.0	42.0	41.0	40.0	39.0	38.0	37.0	36.0	35.0
20	45.1	44.1	43.2	42.2	41.3	40.3	39.4	38.4	37.4	36.5	35.5	34.6	33.6
30	43.9	43.0	42.1	41.2	40.2	39.3	38.4	37.5	36.6	35.6	34.7	33.8	32.9
40	43.4	42.5	41.6	40.7	39.8	38.9	38.0	37.1	36.2	35.3	34.4	33.5	32.6
50	43.3	42.4	41.6	40.7	39.8	38.9	38.0	37.2	36.3	35.4	34.5	33.7	32.8
60	43.6	42.8	41.9	41.0	40.2	39.3	38.4	37.6	36.7	35.8	35.0	34.1	33.2
70	44.3	43.4	42.6	41.7	40.8	40.0	39.1	38.2	37.4	36.5	35.6	34.8	33.9
80	45.3	44.4	43.5	42.6	41.8	40.9	40.0	39.1	38.3	37.4	36.5	35.6	34.8
90	46.5	45.6	44.7	43.8	42.9	42.0	41.1	40.2	39.3	38.5	37.6	36.7	35.8
100	48.0	47.1	46.1	45.2	44.3	43.4	42.5	41.5	40.6	39.7	38.8	37.9	37.0
110	49.7	48.8	47.8	46.9	45.9	45.0	44.0	43.1	42.1	41.2	40.2	39.3	38.3
120	51.8	50.8	49.8	48.8	47.8	46.8	45.8	44.8	43.8	42.8	41.8	40.8	39.8

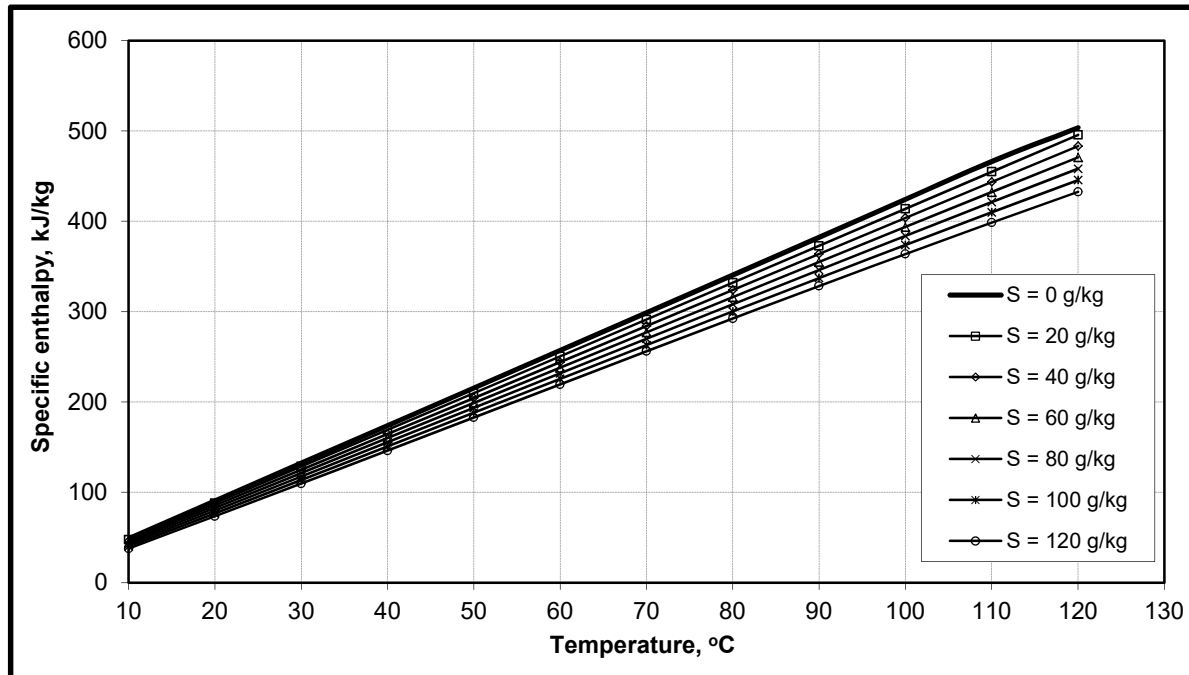


Accuracy ± 13.36%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

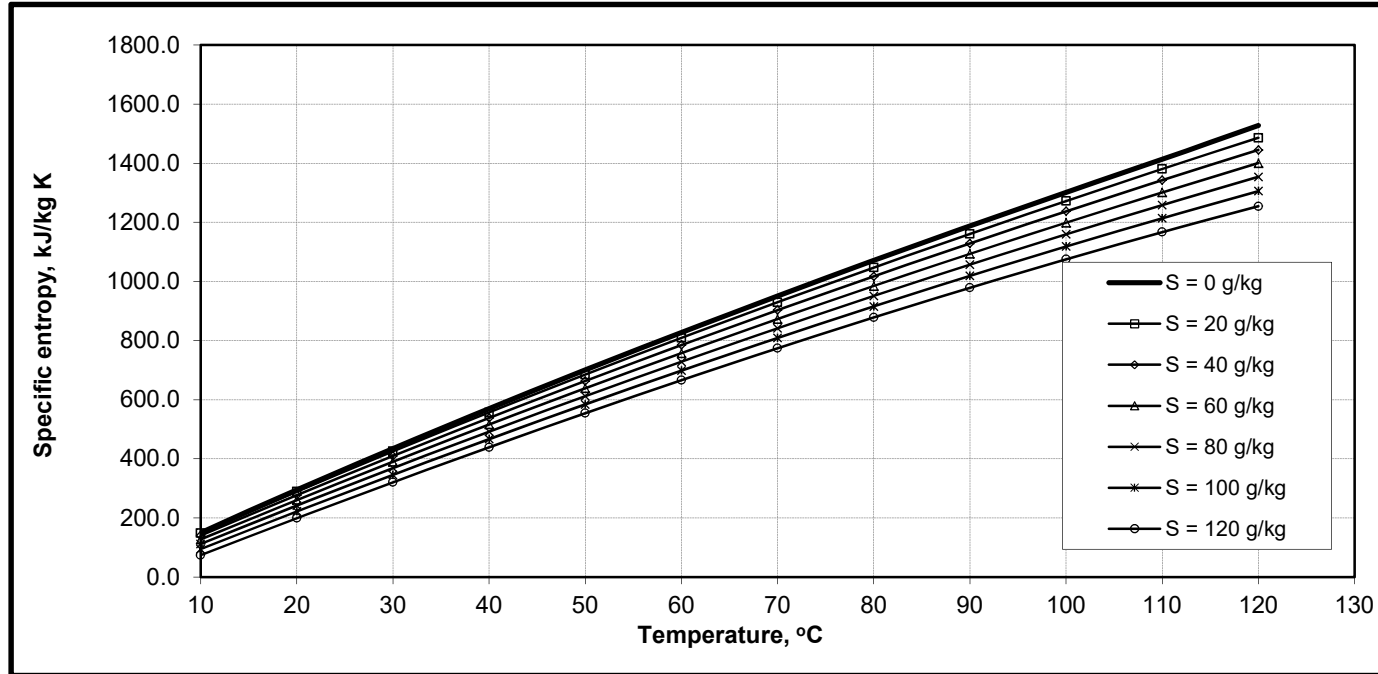
Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	48.8	48.2	47.5	46.9	46.1	45.3	44.4	43.4	42.4	41.2	40.1	38.9	37.7
20	90.5	89.2	88.0	86.7	85.4	84.1	82.7	81.2	79.7	78.2	76.6	75.0	73.5
30	132.1	130.3	128.5	126.7	124.9	123.1	121.2	119.3	117.4	115.5	113.5	111.6	109.6
40	173.7	171.4	169.1	166.8	164.5	162.3	160.0	157.7	155.4	153.1	150.7	148.4	146.1
50	215.3	212.5	209.7	207.0	204.3	201.6	198.9	196.2	193.5	190.8	188.1	185.4	182.8
60	257.0	253.7	250.4	247.2	244.1	241.0	237.9	234.8	231.7	228.6	225.5	222.5	219.4
70	298.7	294.9	291.2	287.6	284.0	280.4	276.9	273.4	269.9	266.4	262.9	259.5	256.0
80	340.4	336.2	332.0	327.9	323.9	319.9	316.0	312.0	308.1	304.1	300.2	296.2	292.3
90	382.2	377.5	372.9	368.3	363.8	359.3	354.9	350.5	346.1	341.6	337.2	332.7	328.3
100	424.2	418.9	413.8	408.7	403.7	398.7	393.7	388.8	383.8	378.8	373.8	368.8	363.7
110	466.2	460.4	454.7	449.1	443.5	437.9	432.4	426.8	421.2	415.6	410.0	404.3	398.6
120	503.6	502.0	495.7	489.4	483.2	477.0	470.7	464.5	458.2	451.9	445.5	439.1	432.6

Accuracy $\pm 1.47\%$ **References for Citation**

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	150.3	150.7	148.8	145.2	140.2	134.1	127.2	119.7	111.7	103.1	94.1	84.4	73.8
20	295.0	293.3	289.5	283.9	277.1	269.3	260.7	251.6	242.1	232.2	221.7	210.7	198.9
30	434.7	431.1	425.5	418.2	409.7	400.4	390.3	379.8	368.9	357.6	345.9	333.7	320.7
40	569.8	564.5	557.2	548.4	538.4	527.6	516.2	504.3	492.1	479.6	466.7	453.3	439.1
50	700.6	693.8	685.0	674.7	663.3	651.2	638.5	625.3	611.9	598.2	584.1	569.5	554.2
60	827.5	819.2	809.0	797.4	784.7	771.2	757.3	742.9	728.3	713.4	698.1	682.3	665.8
70	950.9	941.2	929.6	916.6	902.7	887.9	872.7	857.1	841.3	825.1	808.6	791.6	773.9
80	1070.8	1059.8	1046.9	1032.6	1017.4	1001.4	984.9	968.0	950.9	933.4	915.6	897.3	878.3
90	1187.7	1175.3	1161.1	1145.5	1128.9	1111.5	1093.7	1075.5	1057.0	1038.2	1019.0	999.2	978.7
100	1301.7	1287.9	1272.3	1255.3	1237.3	1218.5	1199.3	1179.6	1159.6	1139.3	1118.5	1097.2	1075.1
110	1413.1	1397.8	1380.7	1362.2	1342.6	1322.4	1301.5	1280.3	1258.6	1236.6	1214.1	1191.0	1167.0
120	1527.8	1504.9	1486.2	1466.1	1444.9	1423.0	1400.4	1377.3	1353.9	1330.0	1305.6	1280.4	1254.4



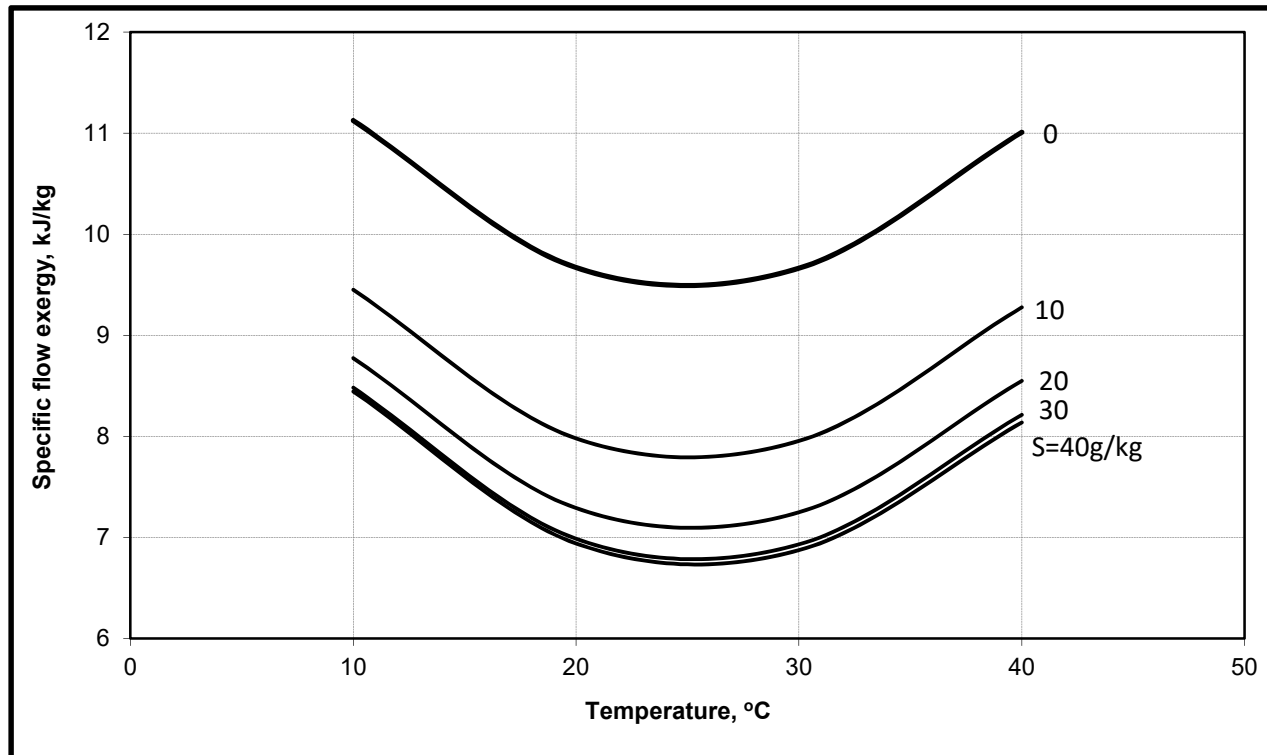
Accuracy ± 1.47%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg				
	0	10	20	30	40
10	11.1	9.5	8.8	8.5	8.4
20	9.7	8.0	7.3	7.0	6.9
30	9.7	8.0	7.2	6.9	6.9
40	11.0	9.3	8.6	8.2	8.1

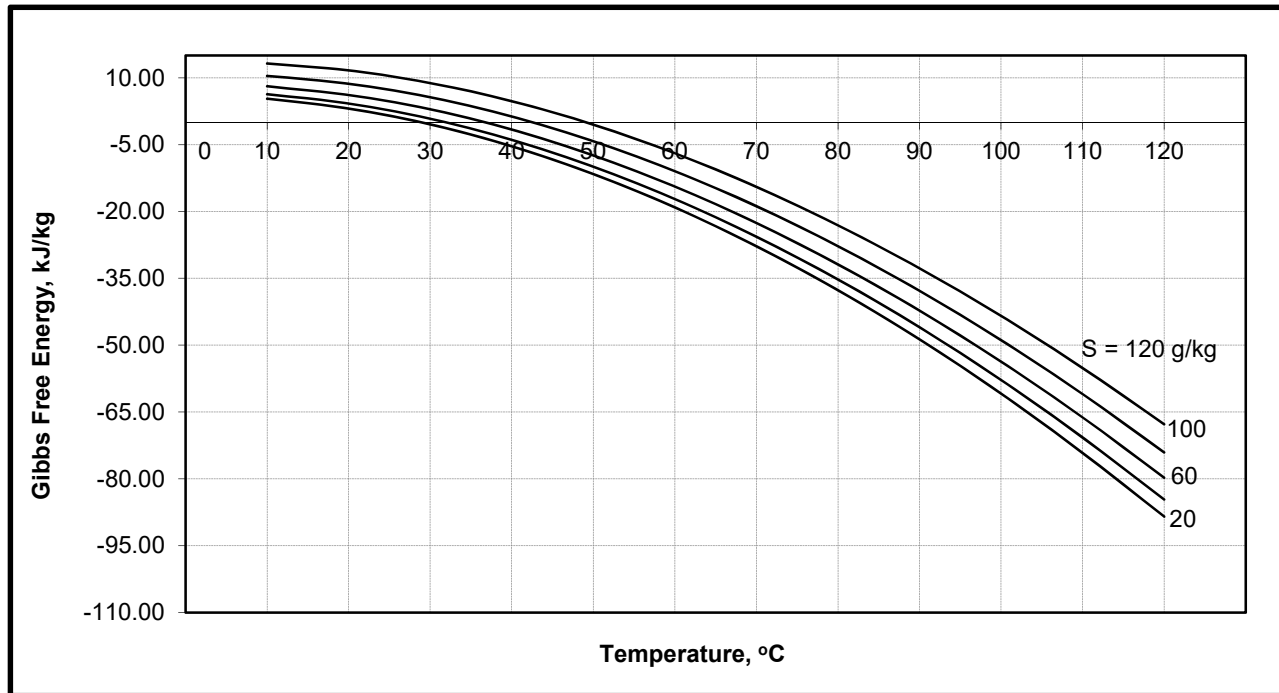


Accuracy ± 0.11 kJ/kg

References for Citation

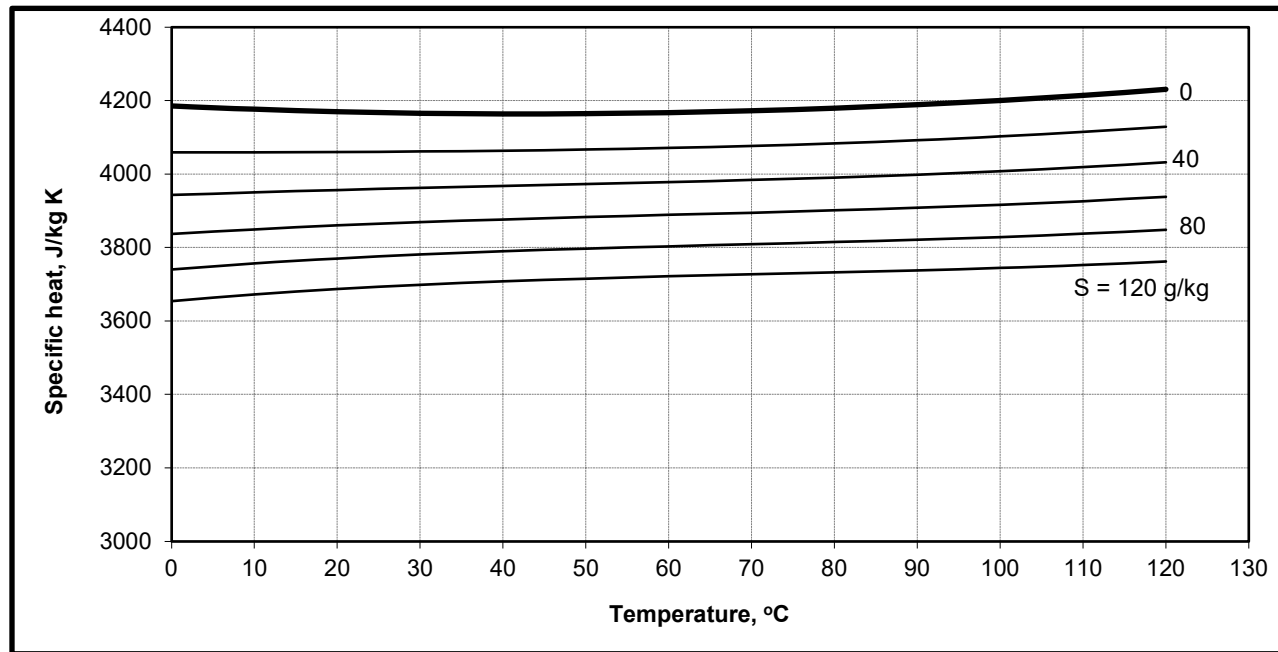
- 1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024
2. M.H. Sharqawy, J.H. Lienhard V, "Formulation of seawater flow exergy using accurate thermodynamic data", in: ASME IMECE 2010, ASME, 2010: pp. 1–8.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	6.2	5.3	5.3	5.7	6.3	7.1	8.1	9.2	10.4	11.8	13.2	14.8	16.4
20	4.0	3.1	3.1	3.5	4.2	5.1	6.2	7.4	8.7	10.1	11.7	13.3	15.1
30	0.3	-0.6	-0.5	0.0	0.8	1.8	2.9	4.2	5.6	7.2	8.8	10.6	12.5
40	-4.7	-5.6	-5.4	-4.8	-3.9	-2.9	-1.6	-0.2	1.3	3.0	4.8	6.7	8.7
50	-11.0	-11.9	-11.6	-10.9	-10.0	-8.8	-7.4	-5.9	-4.2	-2.4	-0.5	1.5	3.7
60	-18.7	-19.4	-19.1	-18.3	-17.2	-15.9	-14.4	-12.8	-11.0	-9.0	-6.9	-4.7	-2.4
70	-27.6	-28.3	-27.8	-26.9	-25.7	-24.2	-22.6	-20.8	-18.8	-16.7	-14.5	-12.1	-9.6
80	-37.7	-38.3	-37.7	-36.6	-35.3	-33.7	-31.9	-29.9	-27.8	-25.5	-23.1	-20.6	-17.9
90	-49.0	-49.4	-48.7	-47.5	-46.0	-44.2	-42.3	-40.1	-37.8	-35.4	-32.8	-30.0	-27.2
100	-61.4	-61.8	-60.9	-59.5	-57.8	-55.8	-53.7	-51.4	-48.9	-46.2	-43.4	-40.5	-37.4
110	-75.0	-75.2	-74.1	-72.6	-70.7	-68.6	-66.2	-63.7	-61.0	-58.1	-55.1	-51.9	-48.6
120	-96.9	-89.7	-88.5	-86.7	-84.6	-82.3	-79.7	-77.0	-74.1	-71.0	-67.7	-64.3	-60.8

Accuracy ± 0.11 kJ/Kg**References for Citation**

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	4185.4	4121.1	4059.3	4000.0	3943.1	3888.8	3836.9	3787.5	3740.6	3696.1	3654.2	3614.7	3577.7
10	4176.6	4117.0	4059.5	4004.0	3950.5	3899.1	3849.7	3802.3	3757.0	3713.6	3672.4	3633.1	3595.9
20	4170.2	4114.4	4060.2	4007.7	3956.9	3907.8	3860.3	3814.5	3770.3	3727.9	3687.0	3647.9	3610.4
30	4166.1	4113.1	4061.6	4011.4	3962.6	3915.2	3869.1	3824.5	3781.2	3739.3	3698.8	3659.6	3621.9
40	4164.3	4113.5	4063.8	4015.2	3967.8	3921.6	3876.6	3832.7	3790.0	3748.5	3708.1	3668.9	3630.8
50	4164.9	4115.4	4066.9	4019.4	3973.0	3927.6	3883.1	3839.7	3797.3	3755.9	3715.6	3676.2	3637.9
60	4167.7	4119.0	4071.2	4024.3	3978.4	3933.3	3889.2	3845.9	3803.6	3762.2	3721.8	3682.2	3643.5
70	4172.7	4124.3	4076.7	4030.1	3984.2	3939.2	3895.1	3851.8	3809.4	3767.9	3727.2	3687.3	3648.3
80	4179.9	4131.4	4083.7	4036.9	3990.9	3945.7	3901.4	3857.9	3815.2	3773.4	3732.4	3692.2	3652.9
90	4189.3	4140.4	4092.3	4045.1	3998.7	3953.1	3908.4	3864.5	3821.5	3779.3	3738.0	3697.5	3657.8
100	4200.9	4151.4	4102.7	4054.9	4007.9	3961.8	3916.6	3872.3	3828.8	3786.2	3744.4	3703.5	3663.5
110	4214.7	4164.4	4115.0	4066.5	4018.9	3972.3	3926.5	3881.6	3837.6	3794.6	3752.4	3711.1	3670.7
120	4230.6	4179.6	4129.5	4080.3	4032.1	3984.8	3938.4	3893.0	3848.5	3805.0	3762.4	3720.7	3680.0

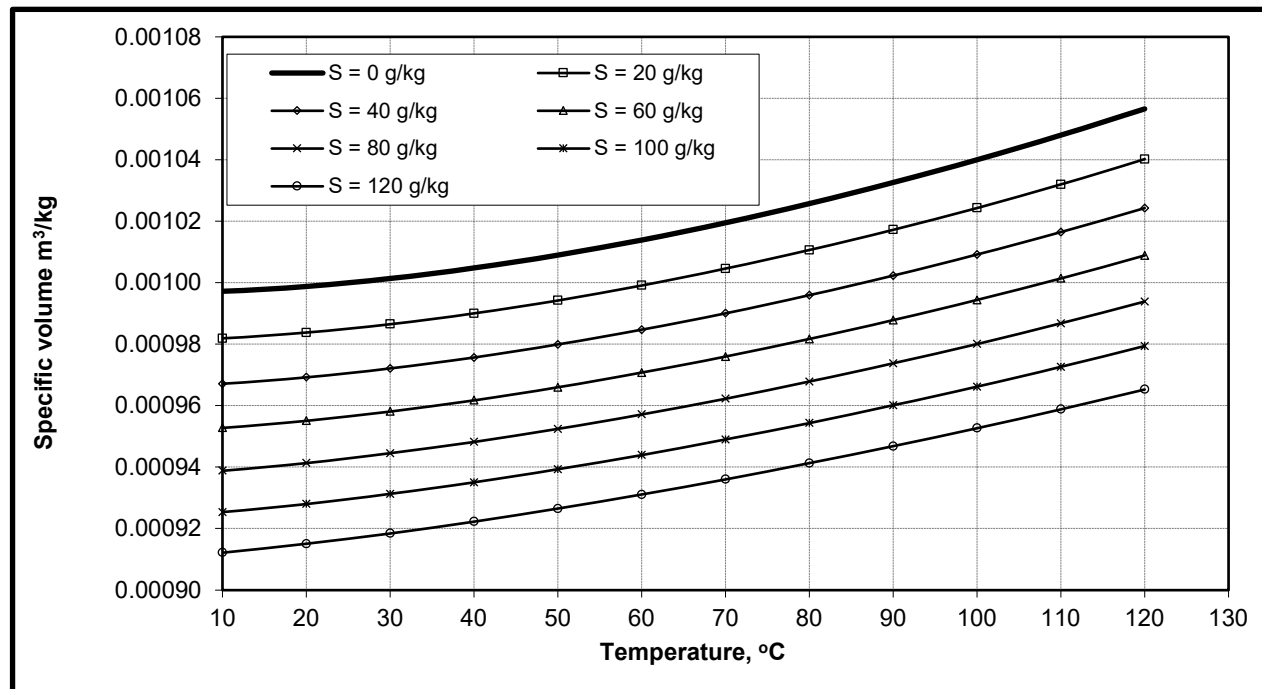


Accuracy ±1%

References for Citation

- 1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024
2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	0.00100	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00094	0.00094	0.00093	0.00092	0.00092	0.00091
10	0.00100	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00095	0.00094	0.00093	0.00093	0.00092	0.00091
20	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096	0.00096	0.00095	0.00094	0.00093	0.00093	0.00092	0.00092
30	0.00100	0.00099	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00094	0.00094	0.00093	0.00092	0.00092
40	0.00100	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096	0.00095	0.00095	0.00094	0.00094	0.00093	0.00092
50	0.00101	0.00100	0.00099	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00095	0.00094	0.00093	0.00093
60	0.00101	0.00101	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096	0.00096	0.00095	0.00094	0.00094	0.00093
70	0.00102	0.00101	0.00100	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096	0.00096	0.00095	0.00094	0.00094
80	0.00103	0.00102	0.00101	0.00100	0.00100	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00095	0.00094
90	0.00103	0.00102	0.00102	0.00101	0.00100	0.00100	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00095
100	0.00104	0.00103	0.00102	0.00102	0.00101	0.00100	0.00099	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095
110	0.00105	0.00104	0.00103	0.00102	0.00102	0.00101	0.00100	0.00099	0.00099	0.00098	0.00097	0.00097	0.00096
120	0.00106	0.00105	0.00104	0.00103	0.00102	0.00102	0.00101	0.00100	0.00099	0.00099	0.00098	0.00097	0.00097

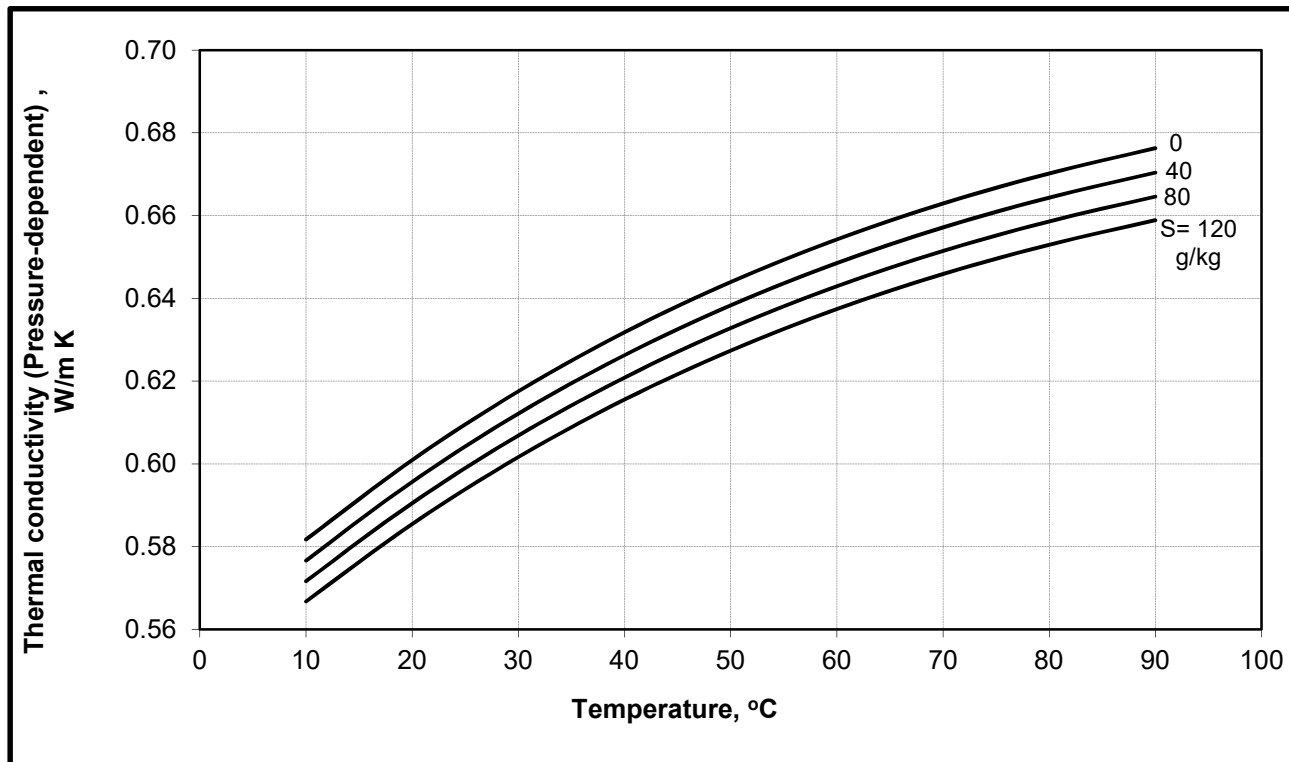


References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," *Desalination*, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

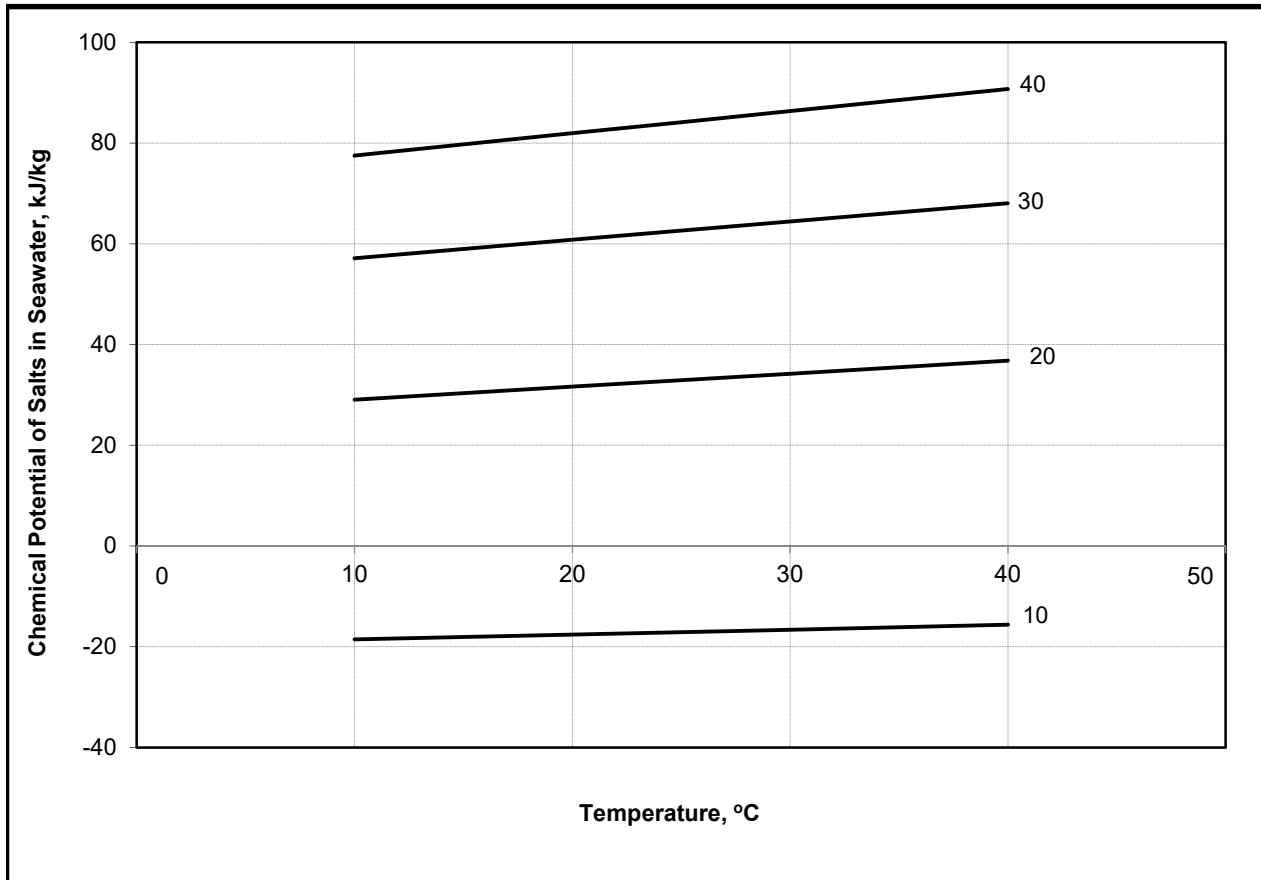
2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," *Desalination and Water Treatment*, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	0.58	0.58	0.58	0.58	0.58	0.58	0.57	0.57	0.57	0.57	0.57	0.57	0.57
20	0.60	0.60	0.60	0.60	0.60	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
30	0.62	0.62	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.60	0.60	0.60
40	0.63	0.63	0.63	0.63	0.63	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62
50	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.63	0.63
60	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.64	0.64	0.64	0.64	0.64	0.64
70	0.66	0.66	0.66	0.66	0.66	0.66	0.65	0.65	0.65	0.65	0.65	0.65	0.65
80	0.67	0.67	0.67	0.67	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.65	0.65
90	0.68	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.66	0.66	0.66	0.66	0.66

Accuracy $\pm 2.59\%$ **References for Citation**

- 1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024
2. M.H. Sharqawy, "New correlations for seawater and pure water thermal conductivity at different temperatures and salinities", Desalination. 313 (2013) 97–104. doi:10.1016/j.desal.2012.12.010.

Temp, °C	Salinity, g/kg			
	10	20	30	40
10	-18.497	29.030	57.144	77.479
20	-17.554	31.621	60.788	81.932
30	-16.600	34.200	64.396	86.326
40	-15.586	36.812	68.014	90.709

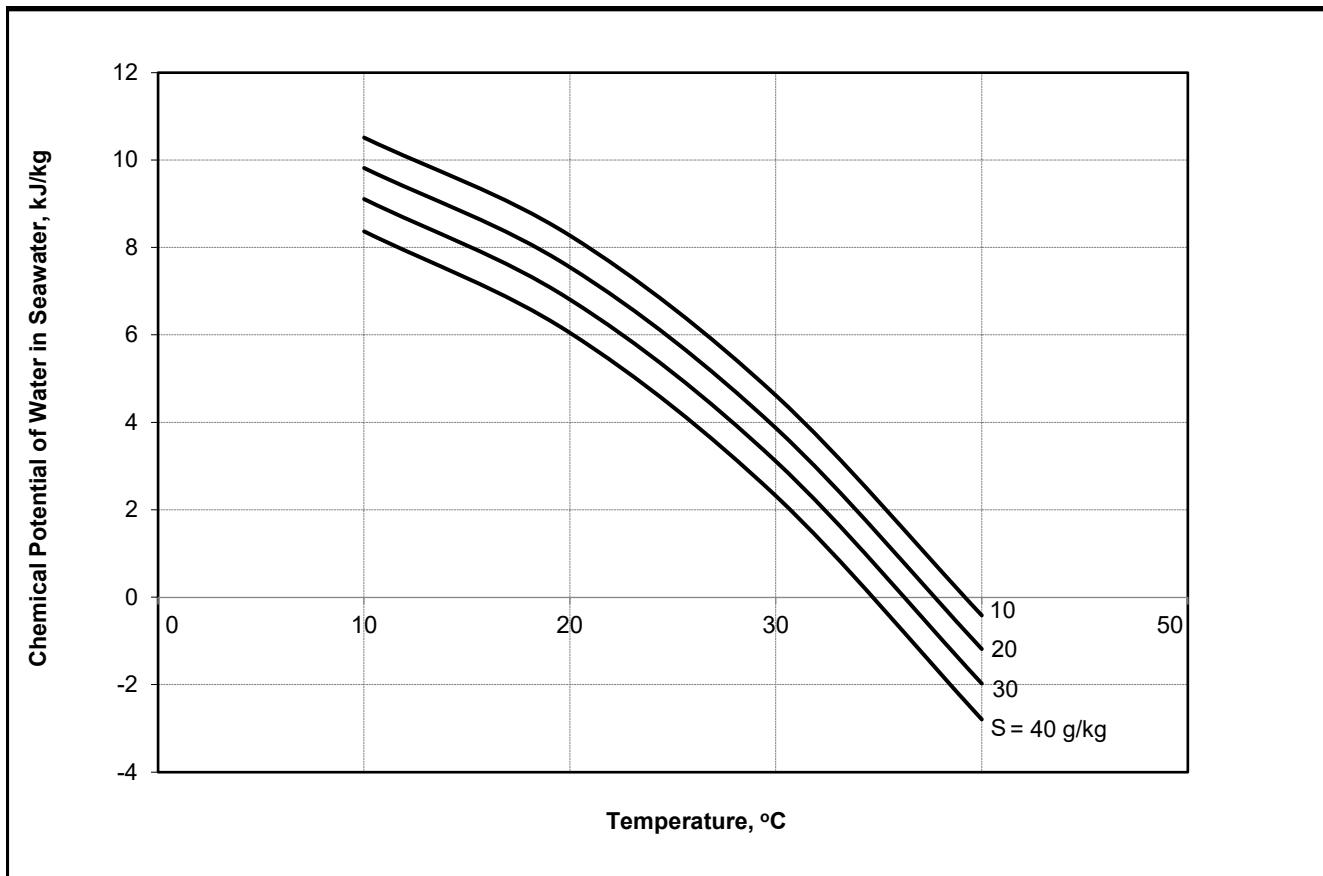


Accuracy ± 12.70 kJ/kg

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg			
	10	20	30	40
10	10.515	9.819	9.107	8.374
20	8.272	7.552	6.814	6.051
30	4.614	3.869	3.105	2.314
40	-0.416	-1.184	-1.974	-2.792

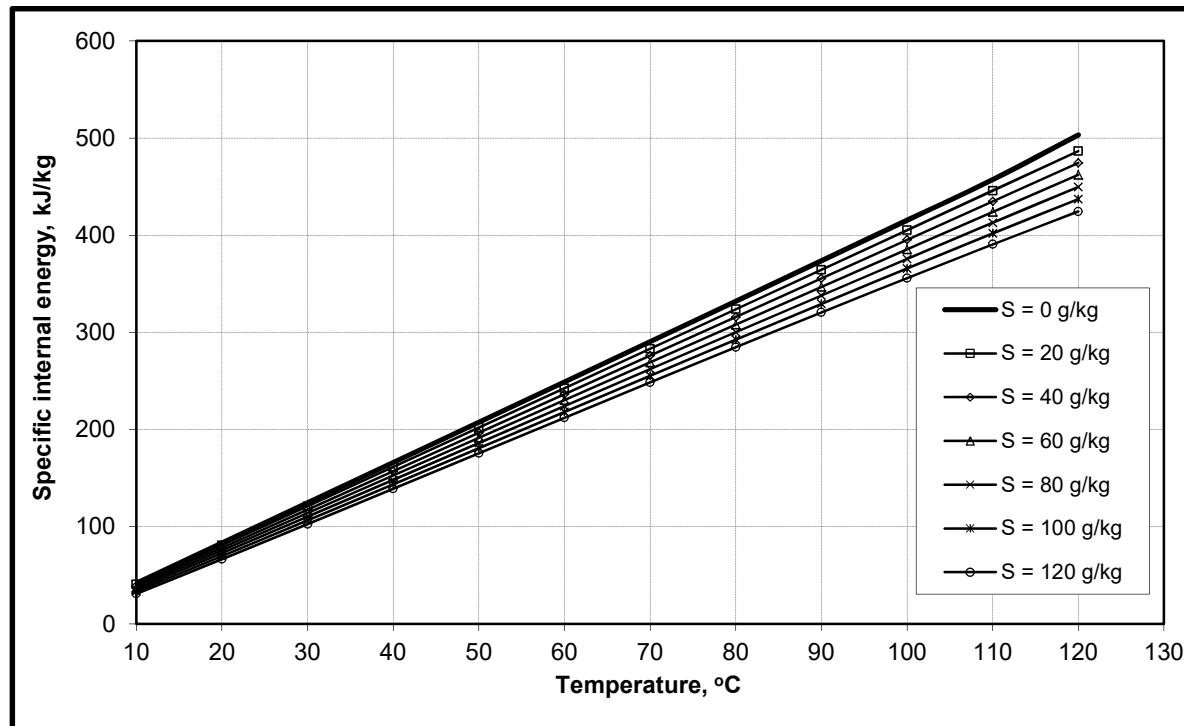


Accuracy ± 0.09 kJ/kg

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	41.66	41.11	40.51	39.85	39.13	38.34	37.47	36.53	35.51	34.43	33.31	32.14	30.95
20	83.19	81.99	80.79	79.56	78.30	76.98	75.62	74.21	72.75	71.25	69.72	68.16	66.61
30	124.66	122.89	121.14	119.39	117.63	115.85	114.04	112.20	110.33	108.43	106.52	104.59	102.68
40	166.12	163.82	161.56	159.33	157.11	154.89	152.66	150.41	148.15	145.87	143.59	141.31	139.05
50	207.56	204.77	202.05	199.36	196.71	194.06	191.42	188.78	186.14	183.49	180.84	178.20	175.58
60	249.03	245.77	242.59	239.47	236.38	233.32	230.28	227.24	224.21	221.18	218.15	215.13	212.13
70	290.54	286.81	283.18	279.62	276.11	272.63	269.18	265.73	262.29	258.85	255.42	251.99	248.58
80	332.10	327.91	323.83	319.82	315.87	311.95	308.06	304.17	300.29	296.42	292.54	288.66	284.79
90	373.75	369.08	364.52	360.04	355.61	351.22	346.86	342.50	338.14	333.78	329.40	325.02	320.63
100	415.50	410.32	405.25	400.26	395.32	390.42	385.53	380.65	375.75	370.84	365.91	360.95	355.98
110	457.33	451.61	445.98	440.43	434.93	429.46	423.99	418.51	413.01	407.48	401.91	396.30	390.65
120	503.39	492.97	486.74	480.57	474.44	468.32	462.19	456.05	449.86	443.62	437.32	430.97	424.55



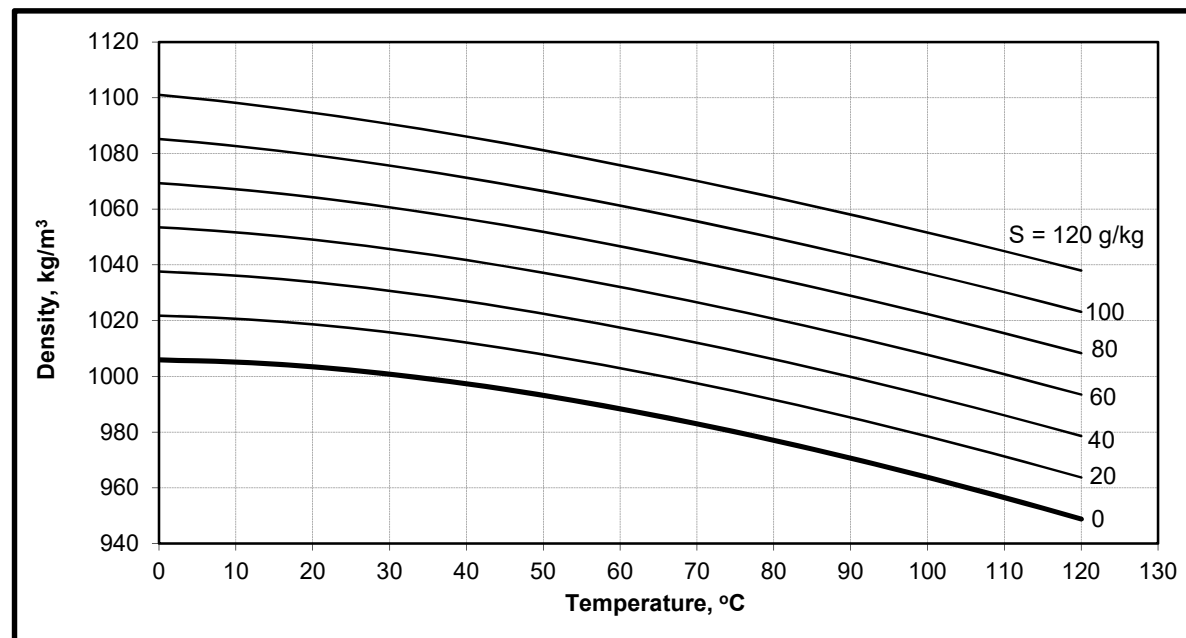
Accuracy ± 1.5%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	1005.9	1013.8	1021.8	1029.7	1037.6	1045.6	1053.5	1061.4	1069.4	1077.3	1085.2	1093.1	1101.0
10	1005.2	1012.9	1020.7	1028.4	1036.2	1043.9	1051.7	1059.4	1067.2	1074.9	1082.7	1090.4	1098.1
20	1003.4	1011.0	1018.6	1026.2	1033.9	1041.5	1049.1	1056.7	1064.3	1071.8	1079.4	1087.0	1094.6
30	1000.8	1008.3	1015.8	1023.3	1030.7	1038.2	1045.7	1053.2	1060.7	1068.1	1075.6	1083.1	1090.6
40	997.4	1004.8	1012.1	1019.5	1026.9	1034.3	1041.7	1049.1	1056.5	1063.9	1071.3	1078.7	1086.0
50	993.2	1000.5	1007.9	1015.2	1022.5	1029.8	1037.2	1044.5	1051.8	1059.1	1066.5	1073.8	1081.1
60	988.4	995.7	1003.0	1010.2	1017.5	1024.8	1032.1	1039.4	1046.7	1053.9	1061.2	1068.5	1075.8
70	983.0	990.2	997.5	1004.8	1012.1	1019.3	1026.6	1033.8	1041.1	1048.4	1055.6	1062.9	1070.1
80	977.0	984.3	991.6	998.9	1006.1	1013.4	1020.7	1027.9	1035.2	1042.4	1049.7	1057.0	1064.2
90	970.6	977.9	985.2	992.5	999.8	1007.1	1014.4	1021.6	1028.9	1036.2	1043.5	1050.8	1058.0
100	963.8	971.1	978.4	985.8	993.1	1000.4	1007.7	1015.0	1022.4	1029.7	1037.0	1044.3	1051.6
110	956.5	963.9	971.3	978.6	986.0	993.4	1000.7	1008.1	1015.5	1022.8	1030.2	1037.6	1044.9
120	948.8	956.3	963.7	971.2	978.6	986.0	993.5	1000.9	1008.3	1015.7	1023.2	1030.6	1038.0



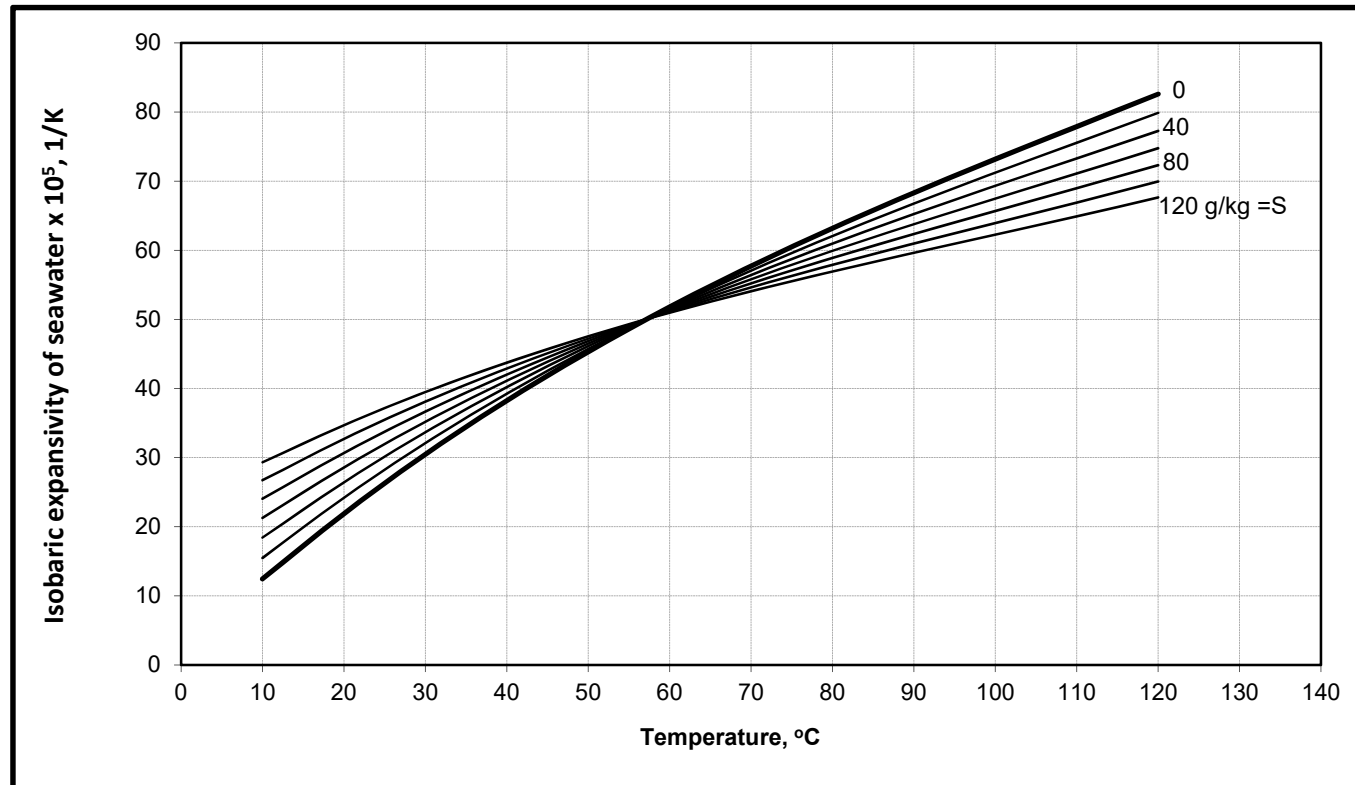
Accuracy ± 0.21%

References for Citation

1. K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," *Desalination*, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," *Desalination and Water Treatment*, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	12.4	14.0	15.5	17.0	18.4	19.9	21.3	22.7	24.0	25.4	26.7	28.0	29.3
20	21.9	23.1	24.2	25.3	26.4	27.5	28.6	29.6	30.7	31.7	32.7	33.7	34.7
30	30.5	31.3	32.1	32.9	33.7	34.4	35.2	35.9	36.7	37.4	38.1	38.8	39.5
40	38.2	38.7	39.2	39.7	40.2	40.7	41.1	41.6	42.0	42.5	42.9	43.3	43.7
50	45.3	45.5	45.7	45.9	46.1	46.3	46.5	46.7	46.9	47.0	47.2	47.4	47.5
60	51.8	51.7	51.6	51.6	51.5	51.4	51.4	51.3	51.2	51.2	51.1	51.0	51.0
70	57.7	57.4	57.1	56.7	56.4	56.1	55.8	55.5	55.2	54.9	54.6	54.4	54.1
80	63.2	62.6	62.1	61.5	61.0	60.4	59.9	59.4	58.9	58.4	57.9	57.4	56.9
90	68.3	67.5	66.8	66.0	65.3	64.5	63.8	63.1	62.4	61.7	61.0	60.3	59.6
100	73.2	72.2	71.2	70.3	69.3	68.4	67.5	66.6	65.7	64.8	63.9	63.1	62.3
110	77.9	76.7	75.6	74.4	73.3	72.2	71.1	70.0	69.0	67.9	66.9	65.9	64.9
120	82.6	81.2	79.9	78.6	77.3	76.0	74.8	73.5	72.3	71.1	69.9	68.8	67.7

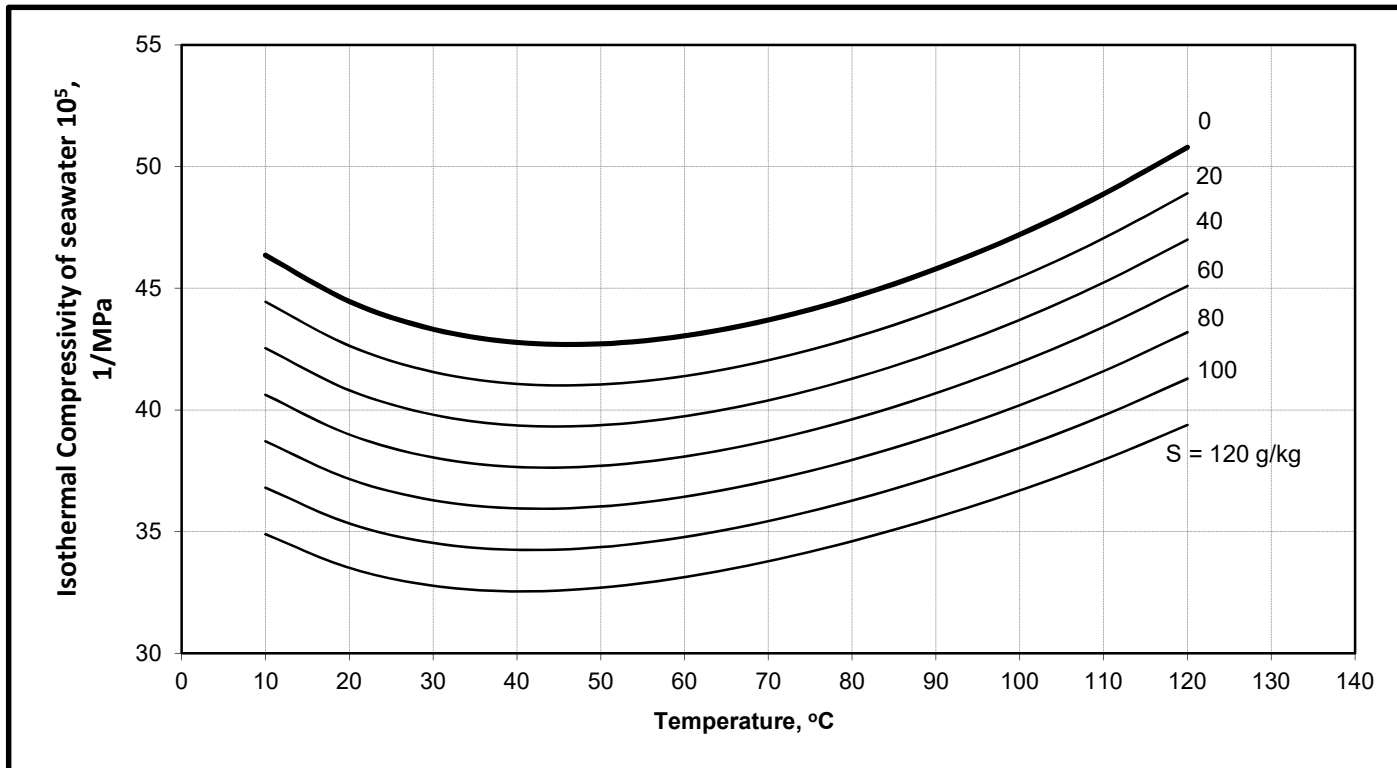


Accuracy ± 18.30%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	46.4	45.4	44.4	43.5	42.5	41.6	40.6	39.7	38.7	37.8	36.8	35.8	34.9
20	44.5	43.6	42.6	41.7	40.8	39.9	39.0	38.1	37.2	36.2	35.3	34.4	33.5
30	43.3	42.4	41.6	40.7	39.8	38.9	38.0	37.2	36.3	35.4	34.5	33.7	32.8
40	42.8	41.9	41.1	40.2	39.4	38.5	37.7	36.8	36.0	35.1	34.2	33.4	32.5
50	42.7	41.9	41.0	40.2	39.4	38.5	37.7	36.9	36.0	35.2	34.4	33.5	32.7
60	43.0	42.2	41.4	40.6	39.7	38.9	38.1	37.3	36.4	35.6	34.8	34.0	33.1
70	43.7	42.9	42.0	41.2	40.4	39.6	38.7	37.9	37.1	36.3	35.4	34.6	33.8
80	44.6	43.8	43.0	42.1	41.3	40.4	39.6	38.8	37.9	37.1	36.3	35.4	34.6
90	45.8	44.9	44.1	43.2	42.4	41.5	40.7	39.8	39.0	38.1	37.3	36.4	35.6
100	47.2	46.3	45.5	44.6	43.7	42.8	42.0	41.1	40.2	39.3	38.4	37.6	36.7
110	48.9	48.0	47.1	46.1	45.2	44.3	43.4	42.5	41.6	40.7	39.8	38.9	37.9
120	50.8	49.9	48.9	48.0	47.0	46.0	45.1	44.1	43.2	42.2	41.3	40.3	39.4



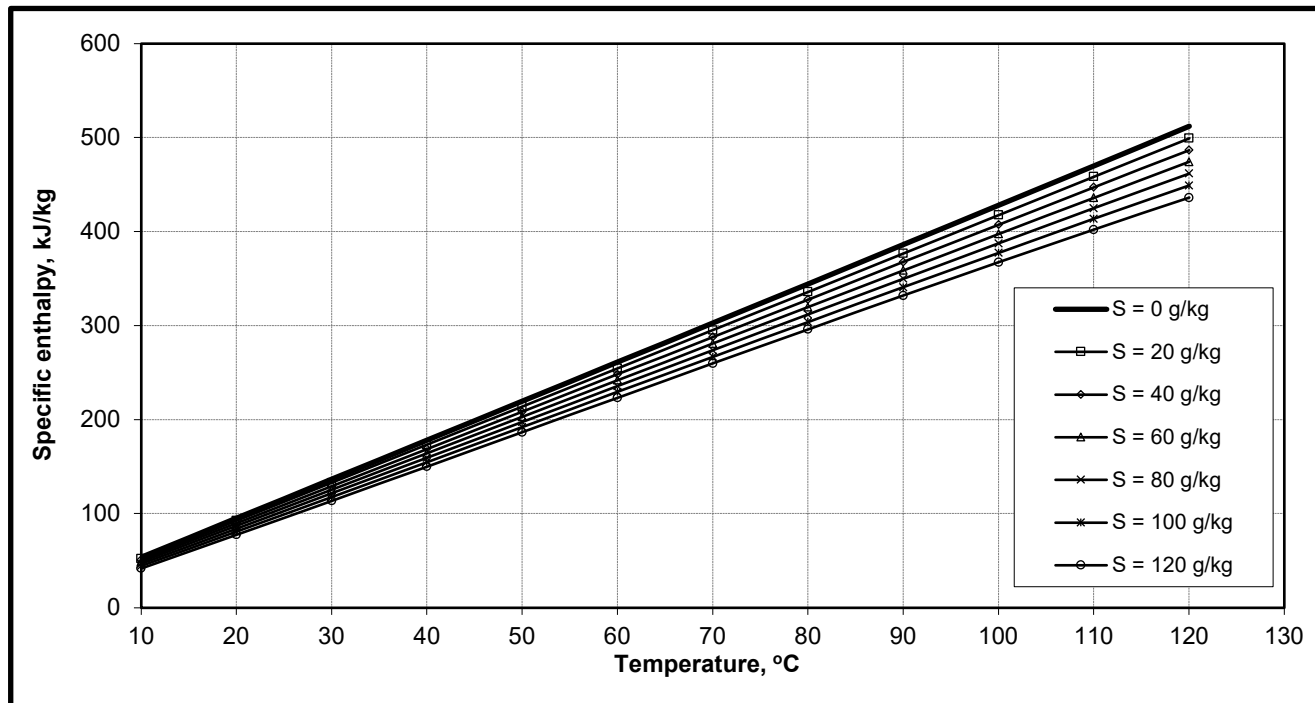
Accuracy ± 13.36%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	53.6	53.0	52.3	51.5	50.7	49.8	48.9	47.9	46.8	45.6	44.4	43.1	41.9
20	95.1	93.9	92.6	91.3	89.9	88.5	87.1	85.6	84.0	82.4	80.8	79.2	77.6
30	136.7	134.8	133.0	131.1	129.3	127.4	125.5	123.6	121.6	119.7	117.7	115.7	113.7
40	178.1	175.8	173.4	171.1	168.8	166.5	164.2	161.8	159.5	157.2	154.8	152.4	150.1
50	219.6	216.8	214.0	211.2	208.4	205.7	203.0	200.3	197.5	194.8	192.1	189.4	186.7
60	261.2	257.8	254.6	251.3	248.2	245.0	241.9	238.8	235.7	232.6	229.5	226.4	223.3
70	302.7	298.9	295.2	291.6	288.0	284.4	280.9	277.3	273.8	270.3	266.8	263.3	259.8
80	344.4	340.1	335.9	331.8	327.8	323.8	319.8	315.8	311.9	307.9	304.0	300.0	296.1
90	386.1	381.4	376.7	372.1	367.6	363.1	358.7	354.2	349.8	345.4	340.9	336.4	332.0
100	427.9	422.7	417.5	412.4	407.4	402.4	397.4	392.5	387.5	382.5	377.5	372.4	367.4
110	469.9	464.1	458.3	452.7	447.1	441.5	436.0	430.4	424.8	419.2	413.6	407.9	402.1
120	512.0	505.5	499.2	492.9	486.7	480.5	474.3	468.0	461.8	455.4	449.1	442.6	436.1



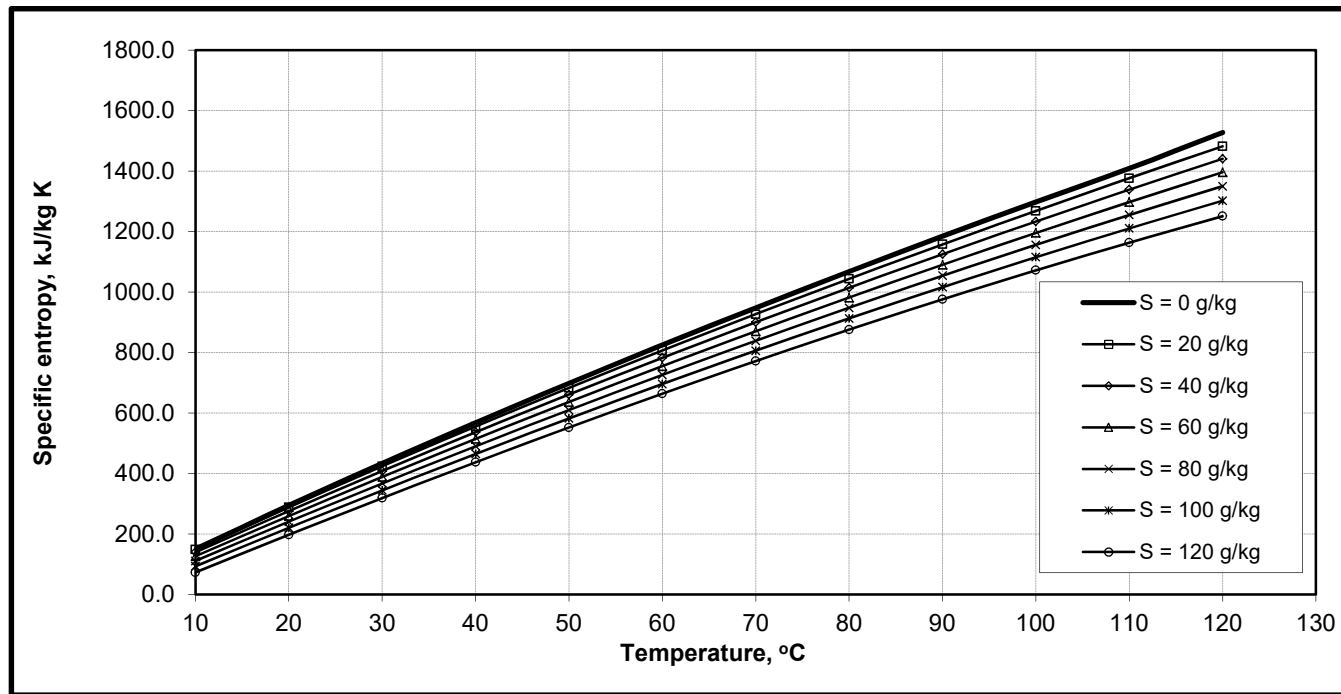
Accuracy ± 1.47%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	149.7	150.1	148.1	144.5	139.4	133.2	126.3	118.7	110.6	102.0	92.9	83.2	72.6
20	293.9	292.2	288.3	282.7	275.8	268.0	259.4	250.3	240.7	230.7	220.3	209.2	197.3
30	433.1	429.6	423.9	416.6	408.1	398.7	388.7	378.1	367.2	355.9	344.2	331.9	318.8
40	567.8	562.5	555.3	546.4	536.5	525.6	514.2	502.4	490.1	477.6	464.7	451.3	437.1
50	698.3	691.5	682.7	672.4	661.1	648.9	636.2	623.1	609.7	595.9	581.9	567.3	552.0
60	824.9	816.6	806.4	794.8	782.1	768.7	754.8	740.4	725.8	710.9	695.7	679.9	663.5
70	947.9	938.2	926.7	913.8	899.8	885.2	870.0	854.4	838.6	822.5	806.0	789.0	771.4
80	1067.6	1056.6	1043.7	1029.5	1014.3	998.3	981.9	965.1	948.0	930.6	912.8	894.6	875.6
90	1184.2	1171.8	1157.7	1142.1	1125.6	1108.3	1090.5	1072.4	1053.9	1035.2	1016.0	996.3	975.9
100	1297.9	1284.2	1268.6	1251.7	1233.7	1215.0	1195.8	1176.2	1156.3	1136.1	1115.4	1094.1	1072.0
110	1408.9	1393.7	1376.7	1358.3	1338.9	1318.6	1297.9	1276.7	1255.2	1233.2	1210.8	1187.8	1163.9
120	1527.8	1500.6	1482.0	1462.0	1440.9	1419.0	1396.5	1373.6	1350.2	1326.4	1302.1	1277.0	1251.0



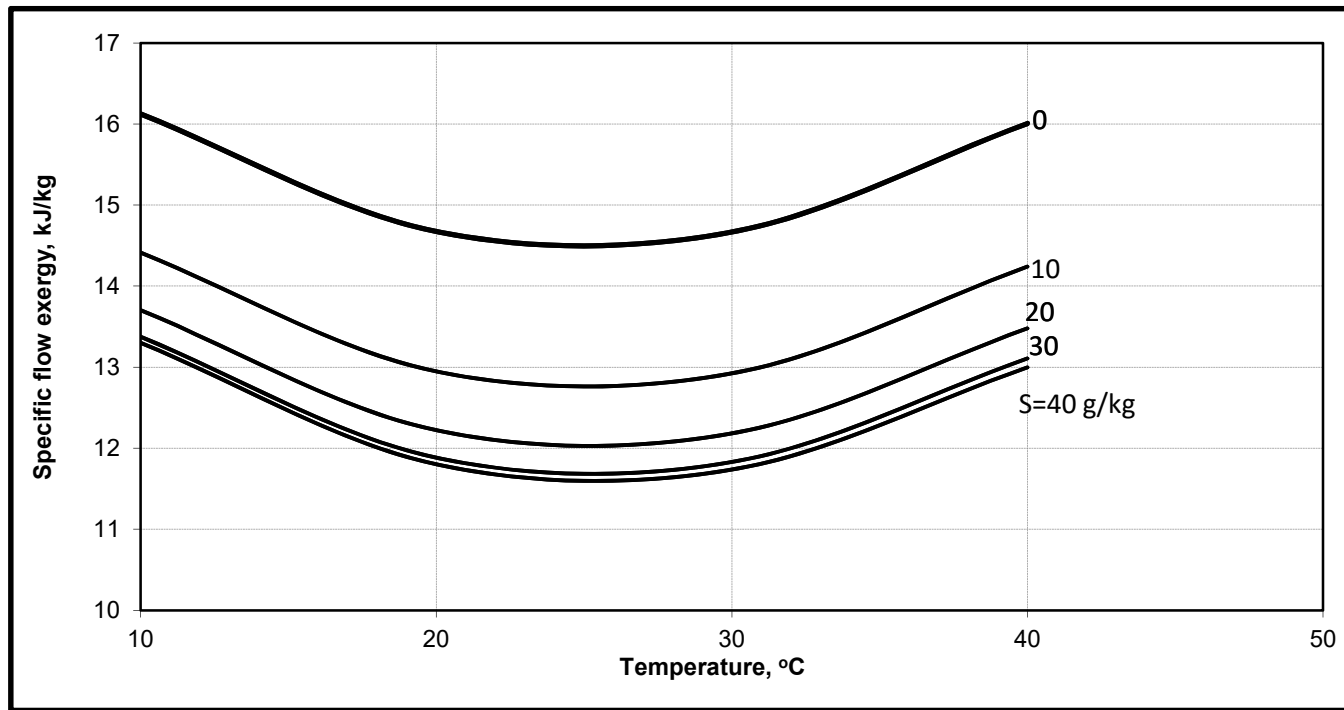
Accuracy ± 1.47%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg				
	0	10	20	30	40
10	16.1	14.4	13.7	13.4	13.3
20	14.7	12.9	12.2	11.9	11.8
30	14.7	12.9	12.2	11.8	11.7
40	16.0	14.2	13.5	13.1	13.0

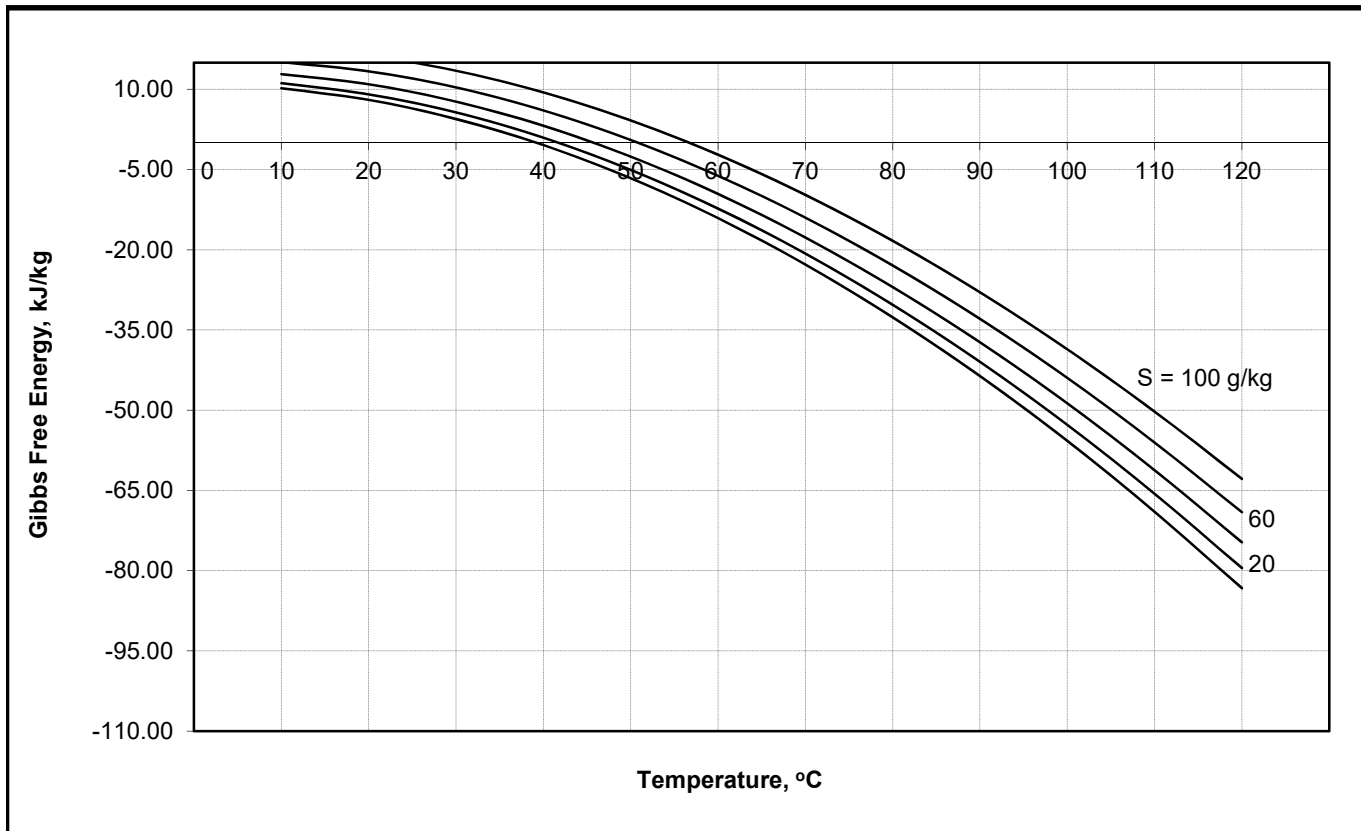


Accuracy ± 0.11 kJ/kg

References for Citation

- 1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024
2. M.H. Sharqawy, J.H. Lienhard V, "Formulation of seawater flow exergy using accurate thermodynamic data", in: ASME IMECE 2010, ASME, 2010: pp. 1–8.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
10	-0.7	10.2	10.2	10.5	11.1	11.9	12.9	13.9	15.1	16.4	17.8	19.4	21.0
20	-2.9	8.0	8.0	8.4	9.1	9.9	10.9	12.1	13.4	14.8	16.3	17.9	19.6
30	-6.6	4.4	4.5	4.9	5.7	6.6	7.7	9.0	10.4	11.9	13.5	15.2	17.1
40	-11.6	-0.6	-0.4	0.1	0.9	2.0	3.2	4.6	6.1	7.7	9.4	11.3	13.3
50	-18.0	-6.9	-6.6	-6.0	-5.1	-3.9	-2.6	-1.1	0.5	2.3	4.2	6.2	8.3
60	-25.7	-14.4	-14.1	-13.3	-12.3	-11.0	-9.6	-7.9	-6.2	-4.3	-2.2	-0.1	2.2
70	-34.6	-23.2	-22.8	-21.9	-20.7	-19.3	-17.7	-15.9	-14.0	-11.9	-9.7	-7.4	-5.0
80	-44.8	-33.2	-32.6	-31.6	-30.3	-28.7	-27.0	-25.0	-22.9	-20.7	-18.3	-15.8	-13.2
90	-56.1	-44.3	-43.6	-42.4	-41.0	-39.2	-37.3	-35.2	-32.9	-30.5	-28.0	-25.3	-22.4
100	-68.6	-56.6	-55.7	-54.4	-52.7	-50.8	-48.7	-46.4	-44.0	-41.3	-38.6	-35.7	-32.6
110	-82.2	-70.0	-69.0	-67.5	-65.6	-63.5	-61.2	-58.7	-56.0	-53.2	-50.2	-47.1	-43.9
120	-96.9	-84.5	-83.3	-81.6	-79.5	-77.2	-74.7	-72.0	-69.1	-66.0	-62.8	-59.5	-56.0

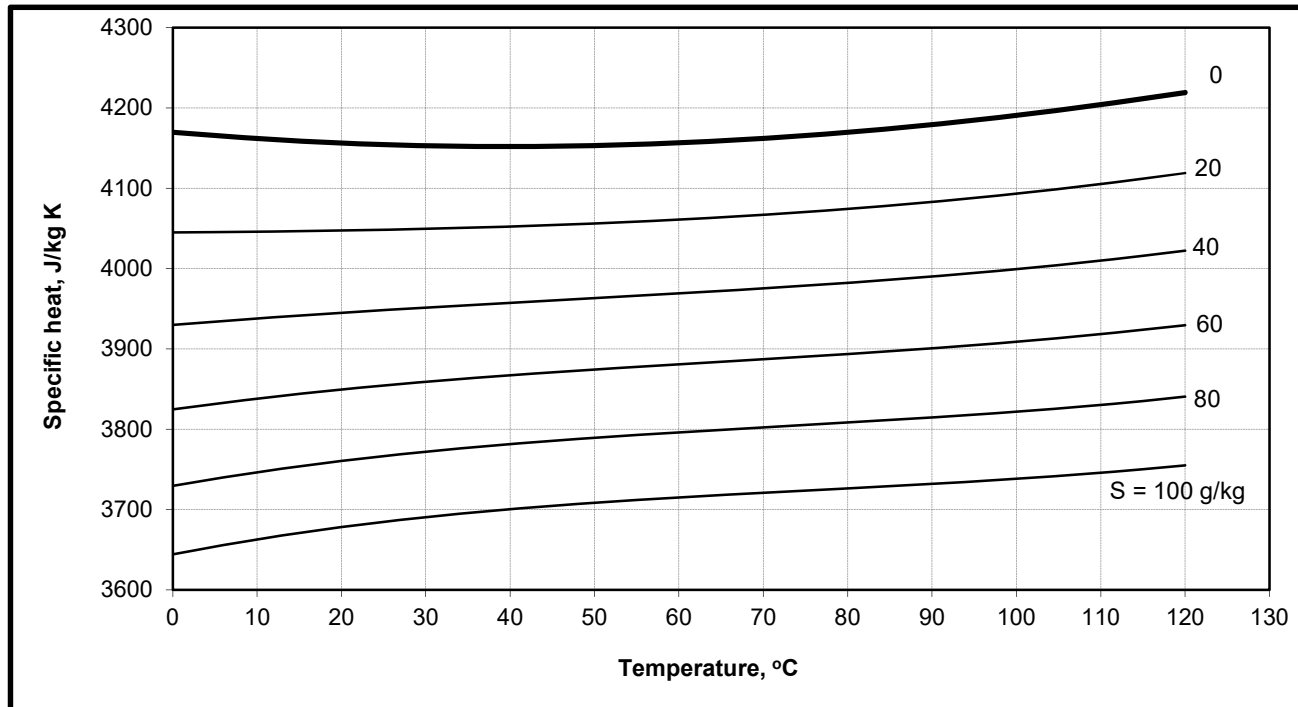


Accuracy ± 0.11 kJ/Kg

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	4169.8	4106.1	4044.8	3986.0	3929.7	3875.9	3824.6	3775.7	3729.3	3685.4	3644.0	3605.0	3568.6
10	4161.8	4102.8	4045.8	3990.8	3937.8	3886.9	3838.0	3791.2	3746.3	3703.5	3662.8	3624.0	3587.3
20	4156.2	4100.9	4047.3	3995.3	3945.0	3896.3	3849.3	3804.0	3760.4	3718.4	3678.1	3639.4	3602.4
30	4153.0	4100.5	4049.4	3999.7	3951.4	3904.4	3858.9	3814.7	3771.9	3730.5	3690.4	3651.8	3614.5
40	4152.0	4101.6	4052.3	4004.3	3957.3	3911.6	3867.0	3823.6	3781.4	3740.3	3700.4	3661.6	3624.0
50	4153.2	4104.2	4056.2	4009.1	3963.1	3918.2	3874.2	3831.2	3789.3	3748.3	3708.4	3669.5	3631.6
60	4156.6	4108.4	4061.0	4014.6	3969.0	3924.4	3880.7	3837.9	3796.1	3755.1	3715.0	3675.9	3637.7
70	4162.1	4114.1	4067.0	4020.7	3975.3	3930.8	3887.1	3844.2	3802.2	3761.1	3720.8	3681.4	3642.8
80	4169.6	4121.5	4074.3	4027.9	3982.3	3937.5	3893.6	3850.5	3808.2	3766.8	3726.2	3686.5	3647.6
90	4179.2	4130.6	4083.0	4036.1	3990.1	3945.0	3900.7	3857.2	3814.6	3772.8	3731.8	3691.7	3652.5
100	4190.6	4141.5	4093.2	4045.8	3999.2	3953.5	3908.7	3864.8	3821.7	3779.5	3738.1	3697.7	3658.1
110	4204.0	4154.1	4105.1	4057.1	4009.9	3963.6	3918.2	3873.7	3830.2	3787.5	3745.7	3704.9	3664.9
120	4219.3	4168.6	4118.9	4070.1	4022.3	3975.4	3929.5	3884.5	3840.4	3797.3	3755.1	3713.8	3673.5



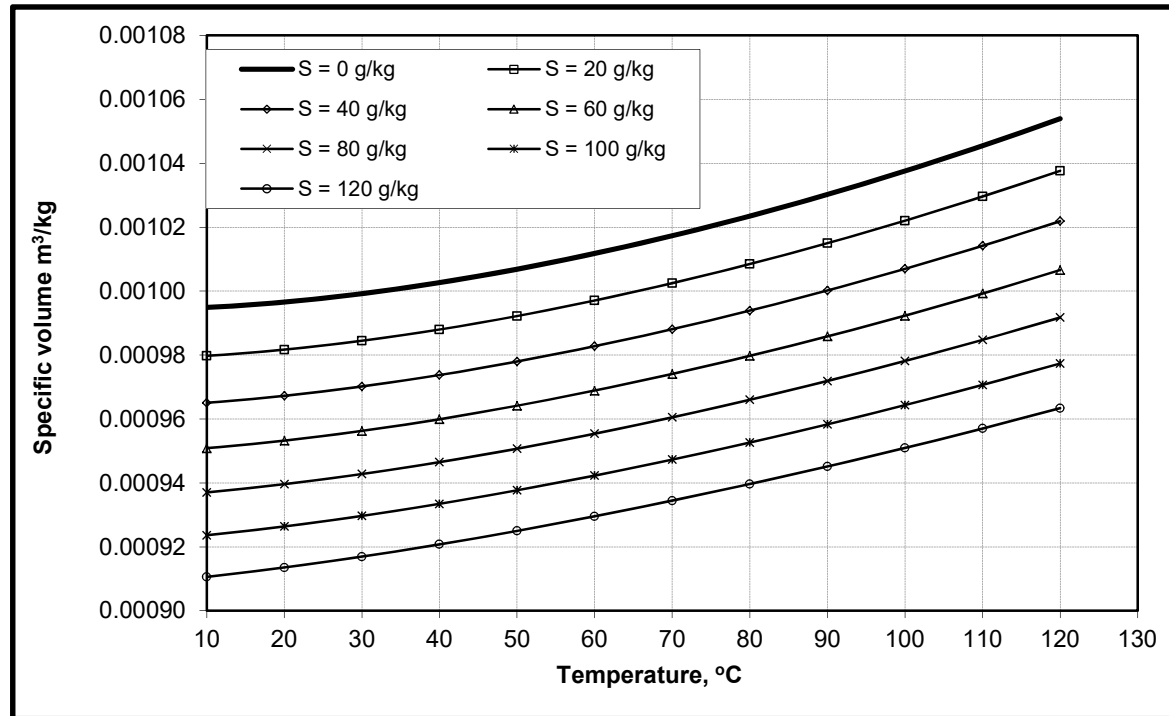
Accuracy ±1%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	70	80	90	100	110	120
0	0.00099	0.00099	0.00098	0.00097	0.00096	0.00096	0.00095	0.00094	0.00094	0.00093	0.00092	0.00091	0.00091
10	0.00099	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00094	0.00094	0.00093	0.00092	0.00092	0.00091
20	0.00100	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00095	0.00094	0.00093	0.00093	0.00092	0.00091
30	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096	0.00096	0.00095	0.00094	0.00094	0.00093	0.00092	0.00092
40	0.00100	0.00100	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00095	0.00094	0.00093	0.00093	0.00092
50	0.00101	0.00100	0.00099	0.00099	0.00098	0.00097	0.00096	0.00096	0.00095	0.00094	0.00094	0.00093	0.00092
60	0.00101	0.00100	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096	0.00096	0.00095	0.00094	0.00094	0.00093
70	0.00102	0.00101	0.00100	0.00100	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00095	0.00094	0.00093
80	0.00102	0.00102	0.00101	0.00100	0.00099	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00095	0.00094
90	0.00103	0.00102	0.00102	0.00101	0.00100	0.00099	0.00099	0.00098	0.00097	0.00097	0.00096	0.00095	0.00095
100	0.00104	0.00103	0.00102	0.00101	0.00101	0.00100	0.00099	0.00099	0.00098	0.00097	0.00096	0.00096	0.00095
110	0.00105	0.00104	0.00103	0.00102	0.00101	0.00101	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096	0.00096
120	0.00105	0.00105	0.00104	0.00103	0.00102	0.00101	0.00101	0.00100	0.00099	0.00098	0.00098	0.00097	0.00096



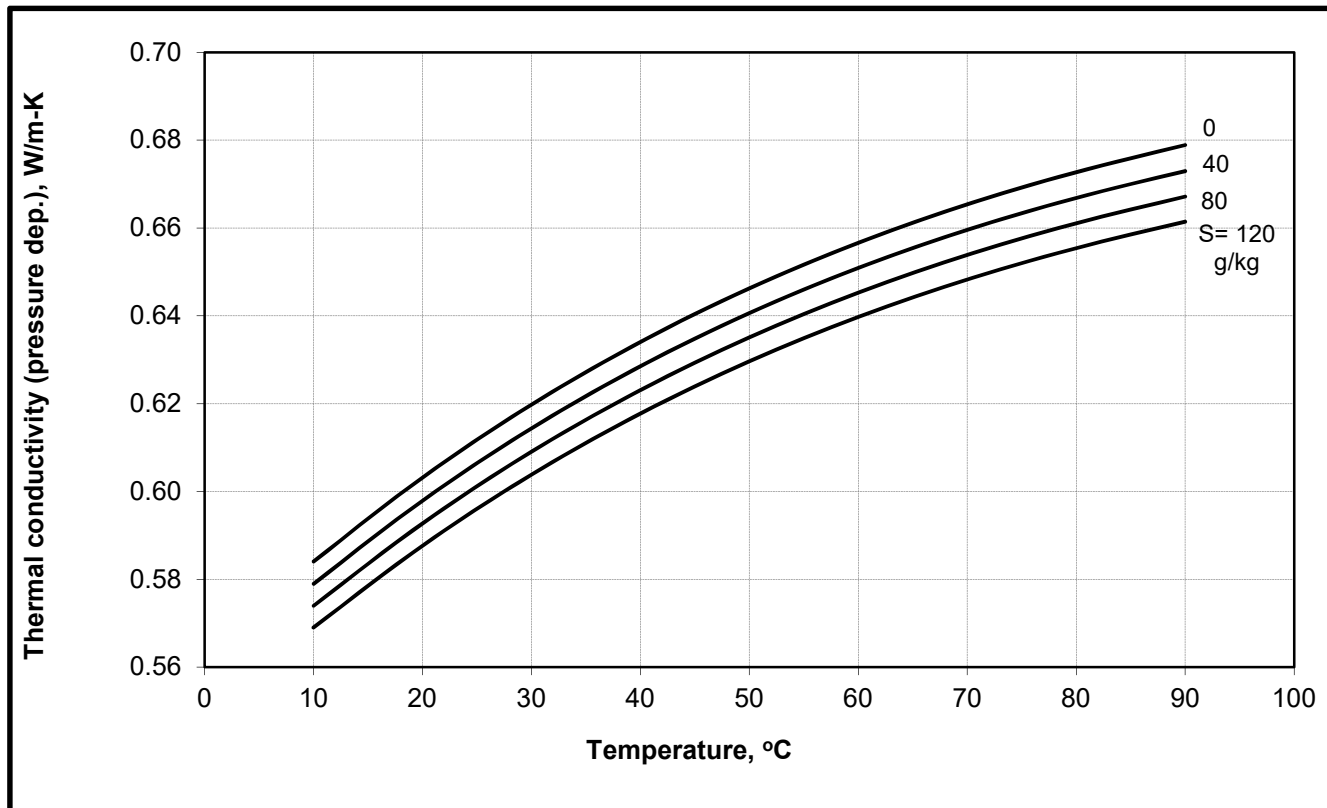
Accuracy ±0.1%

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. Mostafa H. Sharqawy, John H. Lienhard V, and Syed M. Zubair, "Thermophysical properties of seawater: A review of existing correlations and data," Desalination and Water Treatment, Vol. 16, pp.354-380, April 2010.

Temp, °C	Salinity, g/kg												
	0	10	20	30	40	50	60	50	80	90	100	110	120
10	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.57	0.57	0.57	0.57	0.57
20	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.59	0.59	0.59	0.59	0.59	0.59
30	0.62	0.62	0.62	0.62	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.60
40	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.62	0.62	0.62	0.62	0.62	0.62
50	0.65	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.63	0.63	0.63	0.63
60	0.66	0.66	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.64	0.64	0.64	0.64
70	0.67	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.65	0.65	0.65	0.65	0.65
80	0.67	0.67	0.67	0.67	0.67	0.67	0.66	0.66	0.66	0.66	0.66	0.66	0.66
90	0.68	0.68	0.68	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.66	0.66	0.66



Accuracy ± 2.59 %

References for Citation

1.K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review and new correlations that include pressure dependence," Desalination, Vol. 390, pp.1-24, 2016. doi:10.1016/j.desal.2016.02.024

2. M.H. Sharqawy, "New correlations for seawater and pure water thermal conductivity at different temperatures and salinities", Desalination. 313 (2013) 97–104. doi:10.1016/j.desal.2012.12.010.