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L A M P I R A N

Lampiran 1. *Brochure* Mesin Utama Kapal.

QSK50

Marine Propulsion and Auxiliary Engines for Commercial and Recreational Applications

General Specifications

Configuration	V-16 cylinder, 4-stroke diesel
Aspiration	Turbocharged / Aftercooled
Displacement	50 L (3068 in³)
Bore & Stroke	159 X 159 mm (6.25 X 6.25 in)
Rotation	Counterclockwise facing flywheel
Fuel System	High Pressure Common Rail

Product Dimensions and Weight

Overall Length	mm (in)	2780.2	(109.46)
Length of Block	mm (in)	2044.7	(80.50)
Overall Width	mm (in)	1573.4	(61.95)
Overall Height	mm (in)	2231.6	(87.86)
Weight	kg (lb)	6270	(13,823)

Dimensions and weight may vary based on selected engine configuration.

Power Ratings

Engine Model	Output Power kW	MHP	BHP	Engine Speed RPM	Rating Definition	Fuel Consumption Rated Speed L/hr (gal/hr)	ISO* L/hr (gal/hr)	Emissions IMO	EPA	EU	RCD
Variable Speed											
QSK50-M1	1268	1724	1700	1600	Continuous	320.7 (84.7)	231.8 (61.2)	2	3	–	–
QSK50-M1	1268	1724	1700	1600	Continuous	311.5 (82.3)	220.5 (58.2)	2	–	3a	–
QSK50-M1	1268	1724	1700	1800	Continuous	324.3 (85.7)	223.9 (59.1)	2	–	3a	–
QSK50-M1	1342	1825	1800	1600	Heavy Duty	335.3 (88.6)	238.2 (62.9)	2	–	3a	–
QSK50-M1	1342	1825	1800	1800	Heavy Duty	350.5 (92.6)	248.2 (65.6)	2	3	–	–
QSK50-M1	1342	1825	1800	1800	Heavy Duty	346.6 (91.6)	235.8 (62.3)	2	–	3a	–
QSK50-M1	1342	1825	1800	1900	Heavy Duty	353.3 (93.3)	253.3 (66.9)	2	3	–	–
QSK50-M1	1342	1825	1800	1900	Heavy Duty	353.3 (93.3)	240.0 (63.4)	2	–	3a	–
QSK50-M1	1529	2079	2050	1800	Medium Continuous	388.2 (102.6)	271.0 (71.6)	2	–	3a	–
QSK50-DM1	1629**	2214	2183	1800	Diesel Electric	413.8 (109.3)	209.7 (55.4)	2	–	3a	–
QSK50-M1	1641	2231	2200	1900	Medium Continuous	426.7 (112.7)	287.6 (76.0)	2	–	3a	–
Fixed Speed											
QSK50-DM1	1200	1608	1730	1500 (50 Hz)	Prime Power	308.0 (81.4)	162.5 (42.9)	2	–	3a	–
QSK50-DM1	1342	1861	1800	1800 (60 Hz)	Prime Power	339.3 (89.6)	184.2 (48.7)	2	3	–	–
QSK50-DM1	1342	1861	1800	1800 (60 Hz)	Prime Power	332.3 (87.8)	177.3 (46.8)	2	–	3a	–
QSK50-DM1	1629**	1651	2183	1800 (60 Hz)	Prime Power	413.8 (109.3)	209.7 (55.4)	2	–	3a	–

* Average fuel consumption based on ISO 8178 E3 Standard Test Cycle (variable speed models) and ISO 8178 D2 Standard Test Cycle (fixed speed models)
** Contact your local Cummins distributor to discuss product details and availability

TECHNOLOGY THAT TRANSFORMS

QSK50

Marine Propulsion and Auxiliary Engines
for Commercial and Recreational Applications

Features and Benefits

Engine Design – Reliable base engine uses common components from the proven K19, K38 and K50 engines. A new cast-iron, ductile single-piece piston with nitride-coated rings and hardened cylinder liner provides excellent durability and long life

Fuel System – Modular Common Rail Fuel System features a simplified design which provides constant high injection pressure regardless of engine speed or load condition. Benefits include low noise and vibration for quiet operation, idle stability and low-end torque

Cooling System – Two-pump, two-loop, low temperature aftercooling maximizes efficiency and improves performance. Engine-mounted titanium plate heat exchanger provides superior durability with minimal maintenance requirements

Exhaust System – Dry-shielded exhaust manifold and turbocharger. Vertical or horizontal exhaust connections available for installation flexibility

Air System – Turbocharger optimized for vessel operating conditions and safety. Mounted or remote marine grade air cleaner with replaceable canister reduces maintenance cost

Lubrication System – Standard capacity 151 L (40 gal) and high capacity 204 L (54 gal) marine grade oil pan. Handed Cummins spin-on oil filters available for easy accessibility and servicing

Electronics – 24v Quantum System electronics feature an ECM to monitor operating parameters, while providing diagnostics, prognostics and complete engine protection. Simplified electrical customer interface box for all vessel connections to reduce installation complexity

Certifications – Complies with IMO Tier II, EPA Tier 3 and EU Stage IIIa emissions regulations. Designed to meet the International Association of Classification Societies (IACS) and SOLAS requirements. Consult your local Cummins professional for a complete listing of available class approvals

Optional Equipment

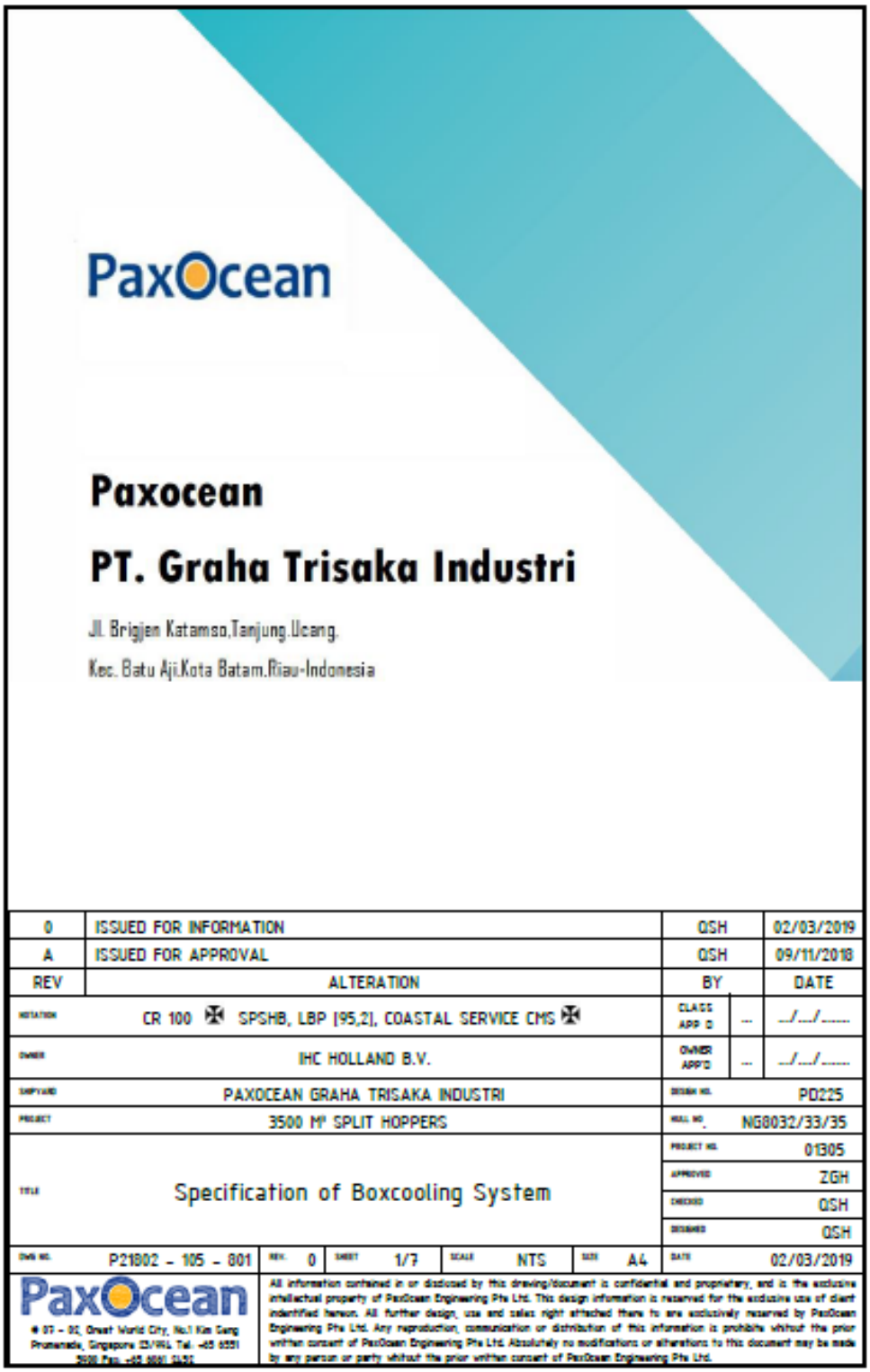
- C Command panels
- ELIMINATOR™ oil filtration system
- Premium coolant hose connections
- Duplex lube oil and fuel filtration
- SAE A or B (keel cooled only) accessory drives
- Front PTO adaptor
- CENTINEL oil management system
- Pre-Lube with QuickEvac
- Air or electric starter
- Rigid or flexible mounting arrangements

Cummins Inc.
4500 Leeds Avenue – Suite 301
Charleston, SC 29405-8539
U.S.A.

Internet: marine.cummins.com

Bulletin 4007439 11/15

Lampiran 2. *Brochure Box Cooler*



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PT. Graha Trisaka Industri

Jl. Brigjen Katamso,Tanjung Ucang,
Kec. Batu Aji,Kota Batam,Riau-Indonesia

0	ISSUED FOR INFORMATION	QSH	02/03/2019
A	ISSUED FOR APPROVAL	QSH	09/11/2018
REV	ALTERATION	BY	DATE

NOTATION	CR 100 ✠ SPSHB, LBP [95,2], COASTAL SERVICE CMS ✠	CLASS APP'D ...	.../.../.....
OWNER	IHC HOLLAND B.V.	OWNER APP'D ...	.../.../.....
SHIPYARD	PAXOCEAN GRAHA TRISAKA INDUSTRI	DESIGN NO.	PD225
PROJECT	3500 M³ SPLIT HOPPERS	HULL NO.	NG8032/33/35
TITLE	Specification of Boxcooling System	PROJECT NO.	01305
		APPROVED	ZGH
		CHECKED	QSH
		DESIGNED	QSH

DWG NO.	P21802 - 105 - 801	REV. 0	SHEET 1/7	SCALE NTS	SIZE A4	DATE 02/03/2019

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07 - 02, Great World City, No.1 Kim Seng Promenade, Singapore 237994, Tel. +65 6551 5500, Fax. +65 6881 0432

Blokland

Custom Engineered Cooling

Calculation boxcooler double circuit

Date: 9-11-2018

Customer	: IHC Holland BV
Project	: 01305 – Propulsion Engine PS/SB 2236-001-01/002-01

Engine Specification

Engine	: Cummins QSK50 MCRS
Type	: V-16 Cylinder, 4 Stroke Diesel
Output	: 1268 kW / 1700 HP
Speed	: 1800 rpm
Application	: Sea Going Speed
Boxcooler type	: 1200A10-1200-(300-4"DIN-2K/900-3"DIN-6K)

Materials

Cover	: S235JRG2
Tubeplate	: CuZn38SnAl
Tubes	: CuZn20Al2 ø12x0.8
Coating	: Red Phenol based
Welding frame	: S235JRG2
Flanges	: S235JRG2
Class	: BV

Data	HT
Inlet temperature boxcooler	: 95.00 °C
Flow coolant through boxcooler	: 64,62 m³/h
Coolant	: Glykol 50%
Density (ρ)	: 1115.00 kg/m³
Spec. heat capacity (cp)	: 3.29 kJ/kgK
Ship speed	: 11,8 knots
Rawwater temperature	: 30.00 °C
Connections	: 4 inch
Heatrejection	: 499.00 kW
Cooling surface	: 29.842 m²
Coolant speed in boxcooler	: 0.661 m/s
Extra surface	: 51.70 %
Pressure drop	: 0.08 bar
Content boxcooler	: 36.76 dm³
Weight (empty)	: According to drawing

Blokland

Custom Engineered Cooling

Calculation boxcooler double circuit

Date 9-11-2018

Customer	: IHC Holland BV
Project	: 01305 – Propulsion Engine PS/SB 2236-001-01/002-01

Engine Specification

Engine	: Cummins QSK50 MCRS
Type	: V-16 Cylinder, 4 Stroke Diesel
Output	: 1268 kW / 1700 HP
Speed	: 1800 rpm
Application	: Sea Going Speed
Boxcooler type	: 1200A10-1200-(300-4"DIN-2K/900-3"DIN-6K)

Materials

Cover	: S235JRG2
Tubeplate	: CuZn38SnAl
Tubes	: CuZn20Al2 ø12x0.8
Coating	: Red Phenol based
Welding frame	: S235JRG2
Flanges	: S235JRG2
Class	: BV

Data	HT
Inlet temperature boxcooler	: 90.00 °C
Flow coolant through boxcooler	: 56,31 m³/h
Coolant	: Glykol 50%
Density (ρ)	: 1040.2 kg/m³
Spec. heat capacity (cp)	: 3.524 kJ/kgK
Ship speed	: 10,3 knots
Rawwater temperature	: 30.00 °C
Connections	: 4 Inch
Heatrejection	: 499.00 kW
Cooling surface	: 29.842 m²
Coolant speed in boxcooler	: 0.576 m/s
Extra surface	: 51.70 %
Pressure drop	: 0.08 bar
Content boxcooler	: 36.76 dm³
Weight (empty)	: According to drawing

Blokland

Custom Engineered Cooling

Calculation boxcooler double circuit

Date 9-11-2018

Customer	: IHC Holland BV
Project	: 01305 – Propulsion Engine PS/SB 2236-001-01/002-01

Engine

Engine	: Cummins QSK50 MCRS
Type	: V-16 Cylinder, 4 Stroke Diesel
Output	: 1268 kW / 1700 HP
Speed	: 1800 rpm

Application	: Sea Going Speed
Boxcooler type	: 1200A10-1200-(300-4"DIN-2K/900-3"DIN-6K)

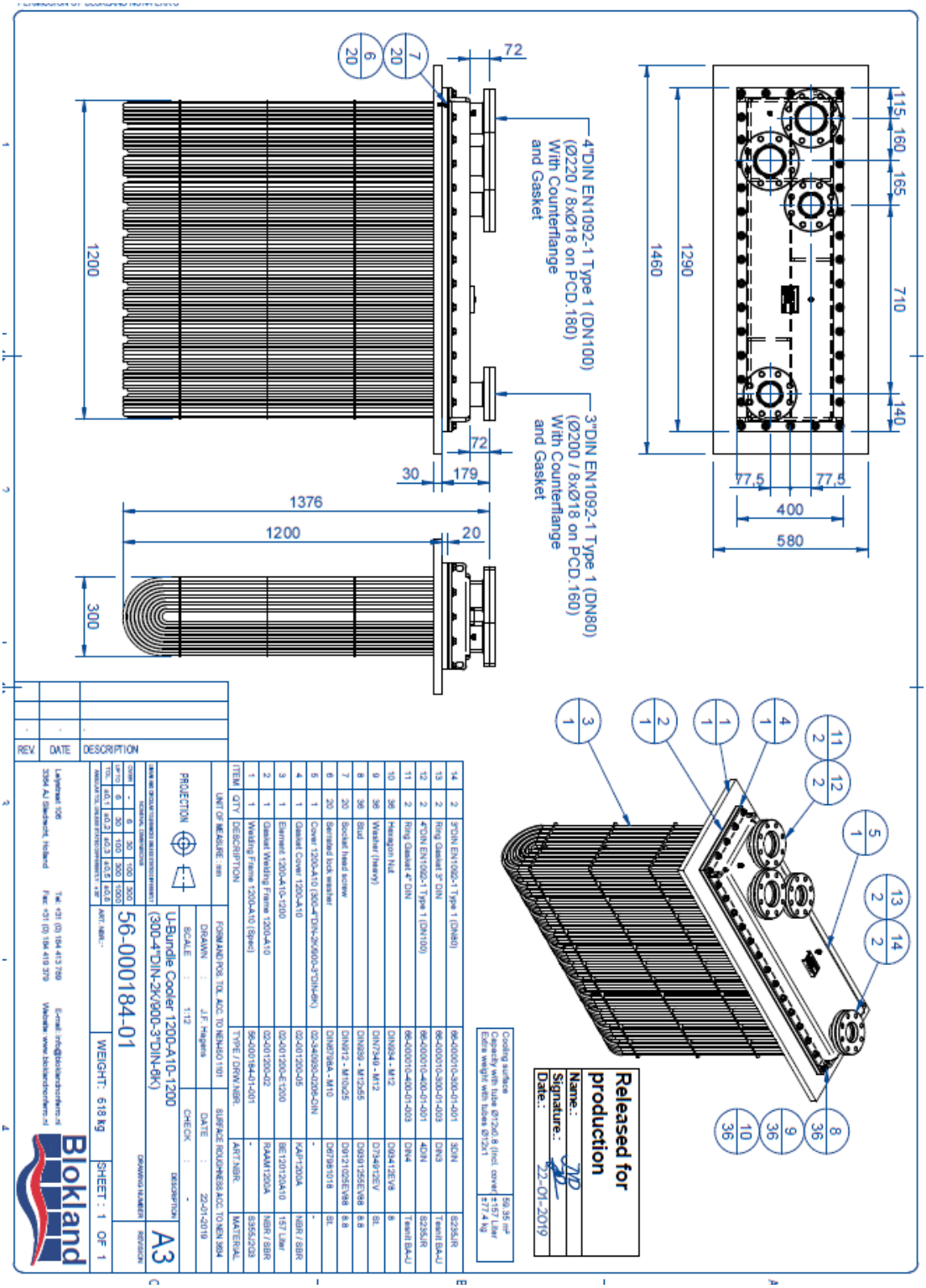
Materials

Cover	: S235JRG2
Tubeplate	: CuZn38SnAl
Tubes	: CuZn20Al2 ø12x0.8
Coating	: Red Phenol based
Welding frame	: S235JRG2
Flanges	: S235JRG2
Class	: BV

Data	HT
Inlet temperature boxcooler	: 84.34 °C
Flow coolant through boxcooler	: 48.00 m³/h
Coolant	: Glykol 50%
Density (ρ)	: 1043.1 kg/m³
Spec. heat capacity (cp)	: 3.502 kJ/kgK
Ship speed	: 8,9 knots
Rawwater temperature	: 30.00 °C
Connections	: 4 inch
Heatrejection	: 499.00 kW

Cooling surface	: 29.842 m²
Coolant speed in boxcooler	: 0.491 m/s
Extra surface	: 51.70 %
Pressure drop	: 0.08 bar
Content boxcooler	: 36.76 dm³
Weight (empty)	: According to drawing

Lampiran 3. Desain Model *Box Cooler*



Lampiran 4. *Brochure Etylen Glikol* 50%

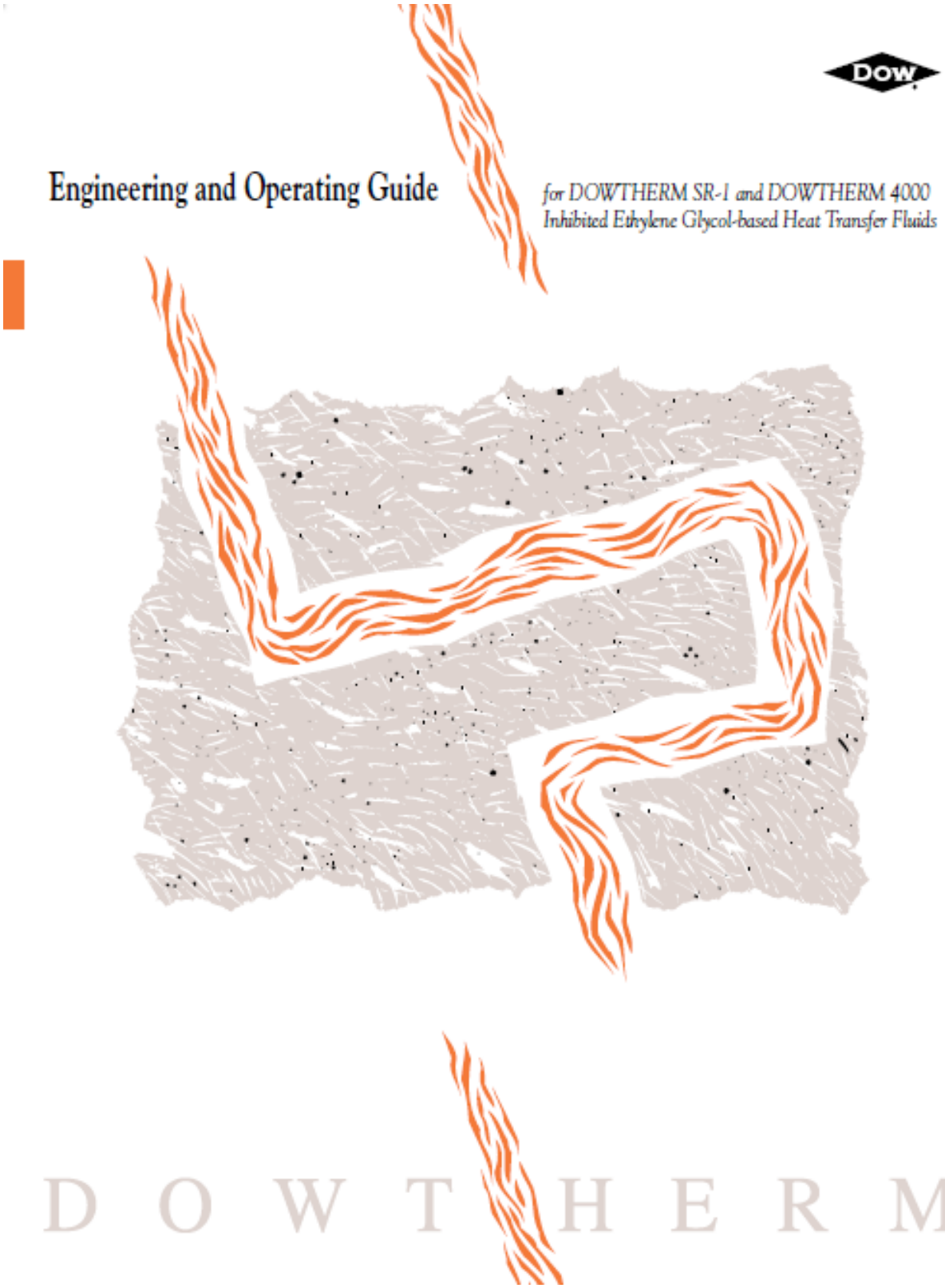


Table 13 — Densities (kg/m³) of Aqueous Solutions of DOWTHERM 4000 Fluid–SI Units

Temp.	Volume Percent Ethylene Glycol									
°C	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%
-35							1128.0	1142.8	1156.6	
-30						1109.9	1125.8	1140.5	1154.2	1167.0
-25					1090.9	1107.9	1123.6	1138.2	1151.7	1164.3
-20					1089.0	1105.8	1121.3	1135.8	1149.2	1161.7
-15				1069.2	1087.0	1103.6	1119.0	1133.3	1146.6	1158.9
-10				1067.3	1084.9	1101.3	1116.6	1130.7	1143.9	1156.1
-5			1046.3	1065.3	1082.8	1099.0	1114.1	1128.0	1141.1	1153.3
0		1024.3	1044.5	1063.3	1080.5	1096.6	1111.5	1125.3	1138.3	1150.3
5	1006.7	1022.7	1042.6	1061.2	1078.2	1094.1	1108.9	1122.6	1135.4	1147.3
10	1004.3	1021.0	1040.6	1059.0	1075.8	1091.5	1106.1	1119.7	1132.4	1144.2
15	1001.9	1019.2	1038.6	1056.8	1073.4	1088.9	1103.3	1116.8	1129.3	1141.1
20	999.4	1017.4	1036.5	1054.4	1070.8	1086.2	1100.5	1113.8	1126.2	1137.9
25	996.9	1015.4	1034.3	1052.0	1068.2	1083.4	1097.5	1110.7	1123.1	1134.6
30	994.3	1013.4	1032.0	1049.5	1065.5	1080.5	1094.5	1107.6	1119.8	1131.3
35	991.7	1011.3	1029.7	1046.9	1062.7	1077.6	1091.4	1104.3	1116.5	1127.9
40	989.0	1009.1	1027.2	1044.2	1059.9	1074.6	1088.3	1101.1	1113.1	1124.4
45	986.3	1006.8	1024.7	1041.5	1057.0	1071.5	1085.0	1097.7	1109.6	1120.9
50	983.5	1004.5	1022.1	1038.7	1054.0	1068.3	1081.7	1094.3	1106.1	1117.3
55	980.7	1002.0	1019.4	1035.8	1050.9	1065.0	1078.3	1090.8	1102.5	1113.6
60	977.8	999.5	1016.7	1032.8	1047.7	1061.7	1074.9	1087.2	1098.8	1109.8
65	974.9	997.0	1013.8	1029.8	1044.5	1058.3	1071.3	1083.5	1095.1	1106.0
70	971.9	994.3	1010.9	1026.6	1041.2	1054.8	1067.7	1079.8	1091.3	1102.2
75	968.8	991.5	1007.9	1023.4	1037.8	1051.3	1064.0	1076.0	1087.4	1098.2
80	965.7	988.7	1004.9	1020.1	1034.3	1047.7	1060.3	1072.2	1083.5	1094.2
85	962.6	985.8	1001.7	1016.8	1030.7	1044.0	1056.4	1068.2	1079.5	1090.1
90	959.3	982.8	998.5	1013.3	1027.1	1040.2	1052.5	1064.2	1075.4	1086.0
95	956.0	979.7	995.2	1009.8	1023.4	1036.3	1048.6	1060.1	1071.2	1081.8
100	952.6	976.6	991.8	1006.2	1019.6	1032.4	1044.5	1056.0	1067.0	1077.5
105	949.2	973.4	988.3	1002.5	1015.8	1028.4	1040.4	1051.8	1062.7	1073.2
110	945.7	970.0	984.7	998.7	1011.8	1024.3	1036.2	1047.5	1058.3	1068.8
115	942.1	966.7	981.1	994.9	1007.8	1020.1	1031.9	1043.1	1053.9	1064.3
120	938.5	963.2	977.4	991.0	1003.7	1015.9	1027.6	1038.7	1049.4	1059.8
125	934.7	959.6	973.6	987.0	999.6	1011.6	1023.1	1034.2	1044.8	1055.1
130	930.9	956.0	969.7	982.9	995.3	1007.2	1018.6	1029.6	1040.2	1050.5
135	927.1	952.3	965.8	978.7	991.0	1002.7	1014.1	1024.9	1035.5	1045.7
140	923.1	948.5	961.7	974.5	986.6	998.2	1009.4	1020.2	1030.7	1040.9
145	919.1	944.6	957.6	970.2	982.1	993.6	1004.7	1015.4	1025.9	1036.0
150	914.9	940.7	953.4	965.8	977.5	988.9	999.9	1010.5	1020.9	1031.1
155	910.7	936.6	949.2	961.3	972.9	984.1	995.0	1005.6	1015.9	1026.1
160	906.4	932.5	944.8	956.8	968.2	979.3	990.1	1000.6	1010.9	1021.0
165	902.0	928.3	940.4	952.1	963.4	974.4	985.1	995.5	1005.8	1015.9
170	897.5	924.0	935.9	947.4	958.5	969.4	980.0	990.3	1000.6	1010.7
175	892.9	919.7	931.3	942.7	953.6	964.3	974.8	985.1	995.3	1005.4

= At or above atmospheric boiling point

NOTE: To determine specific gravity, divide the density of the fluid by the density of water at 20°C.

Table 16 — Viscosities (cps) of Aqueous Solutions of DOWTHERM 4000 Fluid – English Units

Temp.	Volume Percent Ethylene Glycol									
°F	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%
-30							89.67	128.79	185.22	
-20						40.38	60.46	89.93	131.32	284.48
-10						27.27	42.05	63.50	91.88	169.83
0					13.76	19.34	30.08	45.58	65.04	107.77
10				6.83	10.13	14.26	22.06	33.31	46.89	71.87
20			3.90	5.38	7.74	10.85	16.56	24.79	34.48	49.94
30		2.16	3.14	4.33	6.09	8.48	12.68	18.77	25.84	35.91
40	1.53	1.82	2.59	3.54	4.91	6.77	9.90	14.45	19.71	26.59
50	1.30	1.56	2.18	2.95	4.04	5.50	7.85	11.31	15.29	20.18
60	1.12	1.35	1.86	2.49	3.38	4.55	6.33	8.97	12.05	15.65
70	0.98	1.18	1.61	2.13	2.87	3.81	5.17	7.22	9.62	12.37
80	0.86	1.04	1.41	1.84	2.46	3.23	4.28	5.88	7.79	9.93
90	0.76	0.93	1.24	1.60	2.13	2.76	3.58	4.85	6.38	8.10
100	0.68	0.83	1.11	1.41	1.87	2.39	3.03	4.04	5.28	6.68
110	0.61	0.75	0.99	1.25	1.64	2.08	2.58	3.40	4.41	5.58
120	0.55	0.68	0.90	1.11	1.46	1.82	2.23	2.88	3.73	4.71
130	0.51	0.62	0.81	1.00	1.30	1.61	1.93	2.47	3.17	4.01
140	0.46	0.57	0.74	0.90	1.17	1.43	1.69	2.13	2.72	3.45
150	0.43	0.53	0.68	0.82	1.05	1.28	1.49	1.86	2.35	2.98
160	0.39	0.49	0.63	0.75	0.95	1.15	1.32	1.63	2.05	2.60
170	0.37	0.46	0.58	0.68	0.87	1.04	1.18	1.43	1.80	2.28
180	0.34	0.43	0.54	0.63	0.79	0.94	1.06	1.27	1.58	2.01
190	0.32	0.40	0.50	0.58	0.73	0.85	0.95	1.14	1.40	1.79
200	0.30	0.37	0.47	0.54	0.67	0.78	0.86	1.02	1.25	1.60
210	0.28	0.35	0.43	0.50	0.61	0.71	0.78	0.92	1.12	1.43
220	0.26	0.33	0.41	0.46	0.57	0.66	0.72	0.83	1.01	1.29
230	0.25	0.32	0.38	0.43	0.53	0.60	0.66	0.76	0.91	1.16
240	0.24	0.30	0.36	0.40	0.49	0.56	0.61	0.69	0.83	1.06
250	0.23	0.29	0.34	0.38	0.45	0.52	0.56	0.63	0.75	0.96
260	0.22	0.27	0.32	0.36	0.42	0.48	0.52	0.58	0.69	0.88
270	0.21	0.26	0.30	0.34	0.40	0.45	0.48	0.54	0.63	0.81
280	0.20	0.25	0.29	0.32	0.37	0.42	0.45	0.50	0.58	0.74
290	0.19	0.24	0.27	0.30	0.35	0.39	0.42	0.46	0.53	0.69
300	0.18	0.23	0.26	0.29	0.33	0.37	0.39	0.43	0.50	0.63
310	0.18	0.22	0.25	0.27	0.31	0.34	0.37	0.40	0.46	0.59
320	0.17	0.21	0.23	0.26	0.29	0.32	0.35	0.38	0.43	0.55
330	0.16	0.21	0.22	0.25	0.28	0.30	0.33	0.35	0.40	0.51
340	0.16	0.20	0.21	0.24	0.26	0.29	0.31	0.33	0.37	0.48
350	0.15	0.19	0.20	0.23	0.25	0.27	0.29	0.31	0.35	0.45

= Above atmospheric boiling point

NOTE: *To determine specific gravity, divide the density of the fluid by the density of water at 68°F.*

Table 21 — Thermal Conductivity (W/mK) of Aqueous Solutions of DOWTHERM 4000 – SI Units

Temp.	Volume Percent Ethylene Glycol									
°C	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%
-35							0.300	0.279	0.262	
-30						0.328	0.303	0.282	0.264	0.250
-25					0.361	0.332	0.306	0.284	0.266	0.252
-20					0.366	0.336	0.310	0.287	0.268	0.253
-15				0.405	0.371	0.340	0.313	0.289	0.270	0.255
-10				0.411	0.376	0.344	0.316	0.292	0.272	0.256
-5			0.458	0.417	0.381	0.348	0.319	0.294	0.273	0.257
0		0.512	0.466	0.423	0.386	0.352	0.322	0.297	0.275	0.259
5	0.572	0.520	0.472	0.429	0.391	0.356	0.325	0.299	0.277	0.260
10	0.582	0.528	0.479	0.435	0.395	0.360	0.328	0.301	0.278	0.261
15	0.591	0.535	0.486	0.440	0.400	0.363	0.331	0.303	0.280	0.262
20	0.599	0.543	0.492	0.445	0.404	0.367	0.334	0.305	0.281	0.263
25	0.608	0.550	0.498	0.450	0.408	0.370	0.336	0.307	0.283	0.264
30	0.615	0.556	0.503	0.455	0.412	0.373	0.338	0.309	0.284	0.265
35	0.623	0.563	0.509	0.459	0.415	0.376	0.341	0.311	0.285	0.266
40	0.630	0.569	0.514	0.463	0.419	0.378	0.343	0.312	0.286	0.267
45	0.636	0.574	0.518	0.467	0.422	0.381	0.345	0.314	0.288	0.268
50	0.642	0.579	0.523	0.471	0.425	0.383	0.347	0.315	0.289	0.268
55	0.648	0.584	0.527	0.474	0.427	0.385	0.348	0.316	0.289	0.269
60	0.653	0.588	0.530	0.477	0.430	0.387	0.350	0.317	0.290	0.270
65	0.657	0.592	0.534	0.480	0.432	0.389	0.351	0.318	0.291	0.270
70	0.662	0.596	0.537	0.483	0.434	0.391	0.352	0.319	0.292	0.271
75	0.666	0.599	0.539	0.485	0.436	0.392	0.354	0.320	0.292	0.271
80	0.669	0.602	0.542	0.487	0.438	0.394	0.355	0.321	0.293	0.271
85	0.672	0.605	0.544	0.489	0.439	0.395	0.355	0.322	0.293	0.271
90	0.675	0.607	0.546	0.490	0.440	0.396	0.356	0.322	0.294	0.272
95	0.677	0.609	0.548	0.491	0.441	0.396	0.357	0.322	0.294	0.272
100	0.679	0.610	0.549	0.493	0.442	0.397	0.357	0.323	0.294	0.272
105	0.681	0.612	0.550	0.493	0.443	0.398	0.358	0.323	0.294	0.272
110	0.682	0.613	0.551	0.494	0.443	0.398	0.358	0.323	0.294	0.272
115	0.683	0.614	0.552	0.495	0.444	0.398	0.358	0.323	0.294	0.272
120	0.684	0.614	0.552	0.495	0.444	0.398	0.358	0.323	0.294	0.272
125	0.684	0.615	0.552	0.495	0.444	0.398	0.358	0.323	0.294	0.271
130	0.684	0.615	0.552	0.495	0.444	0.398	0.358	0.323	0.293	0.271
135	0.684	0.615	0.552	0.495	0.444	0.398	0.357	0.322	0.293	0.271
140	0.684	0.614	0.552	0.494	0.443	0.397	0.357	0.322	0.293	0.270
145	0.684	0.614	0.551	0.494	0.443	0.397	0.356	0.321	0.292	0.270
150	0.683	0.613	0.551	0.493	0.442	0.396	0.356	0.321	0.291	0.269
155	0.682	0.612	0.550	0.492	0.441	0.395	0.355	0.320	0.291	0.268
160	0.681	0.611	0.549	0.491	0.440	0.395	0.354	0.319	0.290	0.268
165	0.679	0.610	0.547	0.490	0.439	0.394	0.353	0.318	0.289	0.267
170	0.678	0.608	0.546	0.489	0.438	0.392	0.352	0.317	0.288	0.266
175	0.676	0.607	0.545	0.488	0.437	0.391	0.351	0.316	0.287	0.265

= At or above atmospheric boiling point

Table 25 — Specific Heat (kJ/kg K) of Aqueous Solutions of DOWTHERM 4000 Fluid – SI Units

Temp.	Volume Percent Ethylene Glycol									
°C	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%
-35							2.795	2.552	2.299	
-30						3.050	2.818	2.577	2.326	2.065
-25					3.289	3.069	2.840	2.602	2.353	2.095
-20					3.306	3.089	2.862	2.627	2.381	2.124
-15				3.527	3.323	3.109	2.885	2.652	2.408	2.154
-10				3.542	3.341	3.129	2.907	2.677	2.435	2.184
-5			3.747	3.556	3.358	3.149	2.929	2.702	2.463	2.214
0		3.933	3.758	3.571	3.375	3.168	2.952	2.726	2.490	2.244
5	4.229	3.942	3.770	3.585	3.392	3.188	2.974	2.751	2.518	2.274
10	4.195	3.951	3.782	3.600	3.409	3.208	2.997	2.776	2.545	2.303
15	4.168	3.959	3.793	3.614	3.426	3.228	3.019	2.801	2.572	2.333
20	4.147	3.968	3.805	3.629	3.443	3.247	3.041	2.826	2.600	2.363
25	4.132	3.977	3.817	3.643	3.461	3.267	3.064	2.851	2.627	2.393
30	4.121	3.986	3.828	3.658	3.478	3.287	3.086	2.876	2.654	2.423
35	4.115	3.995	3.840	3.672	3.495	3.307	3.108	2.900	2.682	2.452
40	4.114	4.004	3.852	3.686	3.512	3.326	3.131	2.925	2.709	2.482
45	4.115	4.012	3.864	3.701	3.529	3.346	3.153	2.950	2.736	2.512
50	4.120	4.021	3.875	3.715	3.546	3.366	3.175	2.975	2.764	2.542
55	4.128	4.030	3.887	3.730	3.563	3.386	3.198	3.000	2.791	2.572
60	4.138	4.039	3.899	3.744	3.581	3.406	3.220	3.025	2.818	2.602
65	4.150	4.048	3.910	3.759	3.598	3.425	3.242	3.050	2.846	2.631
70	4.164	4.057	3.922	3.773	3.615	3.445	3.265	3.074	2.873	2.661
75	4.179	4.066	3.934	3.788	3.632	3.465	3.287	3.099	2.900	2.691
80	4.196	4.074	3.945	3.802	3.649	3.485	3.309	3.124	2.928	2.721
85	4.213	4.083	3.957	3.817	3.666	3.504	3.332	3.149	2.955	2.751
90	4.231	4.092	3.969	3.831	3.683	3.524	3.354	3.174	2.983	2.780
95	4.249	4.101	3.980	3.846	3.701	3.544	3.376	3.199	3.010	2.810
100	4.267	4.110	3.992	3.860	3.718	3.564	3.399	3.224	3.037	2.840
105	4.285	4.119	4.004	3.875	3.735	3.583	3.421	3.248	3.065	2.870
110	4.303	4.127	4.015	3.889	3.752	3.603	3.443	3.273	3.092	2.900
115	4.321	4.136	4.027	3.903	3.769	3.623	3.466	3.298	3.119	2.930
120	4.338	4.145	4.039	3.918	3.786	3.643	3.488	3.323	3.147	2.959
125	4.355	4.154	4.050	3.932	3.803	3.662	3.510	3.348	3.174	2.989
130	4.371	4.163	4.062	3.947	3.821	3.682	3.533	3.373	3.201	3.019
135	4.387	4.172	4.074	3.961	3.838	3.702	3.555	3.398	3.229	3.049
140	4.402	4.181	4.085	3.976	3.855	3.722	3.577	3.422	3.256	3.079
145	4.416	4.189	4.097	3.990	3.872	3.742	3.600	3.447	3.283	3.108
150	4.430	4.198	4.109	4.005	3.889	3.761	3.622	3.472	3.311	3.138
155	4.443	4.207	4.121	4.019	3.906	3.781	3.644	3.497	3.338	3.168
160	4.456	4.216	4.132	4.034	3.923	3.801	3.667	3.522	3.365	3.198
165	4.468	4.225	4.144	4.048	3.941	3.821	3.689	3.547	3.393	3.228
170	4.481	4.234	4.156	4.063	3.958	3.840	3.711	3.572	3.420	3.258
175	4.493	4.242	4.167	4.077	3.975	3.860	3.734	3.596	3.448	3.287

= At or above atmospheric boiling point