

APPENDIX H

Weights

Group	Metric	Units	Int. Value	Units	Mass (kg)	VCG (m)	Vmoment (kgm)	LCG (m)	Lmoment (kgm)	TCG (m)	Tmoment (kgm)
Hull and Appendages											
Hull (7mm)	10.92	kg/m2	19	m2	207.48	0.68	140.67	-2.27	-470.15	0.00	0.00
Hull (8mm)	12.48	kg/m2	10.66	m2	133.04	0.78	103.37	3.60	478.53	0.00	0.00
Hull (13mm)	20.28	kg/m2	30.6	m2	620.57	-0.21	-130.32	-0.76	-471.01	0.00	0.00
Cabin Top (6mm)	9.36	kg/m2	16.185	m2	151.49	1.71	258.44	0.11	17.27	0.00	0.00
Deck and cockpit (8mm)	12.48	kg/m2	23.32	m2	291.03	1.14	331.78	-1.42	-411.81	0.00	0.00
Transom (7mm)	10.92	kg/m2	4.878	m2	53.27	0.64	33.93	-5.53	-294.36	0.00	0.00
Side Stringers	1.75	kg/m	48	m	84.00	0.34	28.56	0.00	0.00	0.00	0.00
Bottom Stringers	2.5	kg/m	20	m	50.00	-0.33	-16.25	0.00	0.00	0.00	0.00
Floors	2.5	kg/m	8	m	20.00	-0.33	-6.50	0.40	8.00	0.00	0.00
Bulkhead 1	4	kg/m2	2.4	m2	9.60	0.60	5.76	4.45	42.72	0.00	0.00
Bulkhead 2	4	kg/m2	4.5	m2	18.00	0.40	7.20	1.89	34.06	0.00	0.00
Bulkhead 3	4	kg/m2	2.2	m2	8.80	0.20	1.76	1.15	10.10	0.00	0.00
Bulkhead 4	4	kg/m2	3	m2	12.00	0.25	3.00	-0.24	-2.88	0.00	0.00
Bulkhead 5	4	kg/m2	4.5	m2	18.00	0.60	10.80	-2.28	-41.04	0.00	0.00
Bulkhead 6	4	kg/m2	2.5	m2	10.00	0.30	3.00	-4.76	-47.60	0.00	0.00
Misc Structure					125.00	0.00	0.00	0.00	0.00	0.00	0.00
Keel	15	kg/m2	5.211	m2	78.17	-1.10	-86.14	-0.14	-10.79	0.00	0.00
Keel Ballast					2500.00	-1.15	-2875.00	-0.14	-345.00	0.00	0.00
Movable Ballast					200.00	-0.40	-80.00	2.20	440.00	0.25	50.00
Rudder					30.00	-0.60	-18.00	-5.22	-156.60	0.00	0.00
Group Total					4620.44	-0.49	-0.26	-0.26	0.01		
Sails and Rigging											
Main (hoisted)	0.5	kg/m2	40	m2	20.00	6.90	138.00	0.00	0.00	0.00	0.00
Jib (hoisted)	0.4	kg/m2	45	m2	18.00	6.20	111.60	2.00	36.00	0.00	0.00
Spinnaker Stowed					10.00	0.40	4.00	3.20	32.00	0.00	0.00
Mast					117.00	8.40	982.80	1.50	175.50	0.00	0.00
Boom					27.00	3.50	94.50	-1.00	-27.00	0.00	0.00
Wire rope (8mm)	0.327	kg/m	16.5	m	5.40	9.00	48.56	4.50	24.28		
Wire rope (7mm)	0.225	kg/m	18.3	m	4.12	9.00	37.06	-2.00	-8.24		
Wire rope (6mm)	0.165	kg/m	54	m	8.91	9.00	80.19	1.50	13.37		
Wire rope (5mm)	0.113	kg/m	11	m	1.24	10.75	13.36	1.50	1.86		
Deck Hardware					300.00	1.20	360.00	1.50	450.00	0.00	0.00
Group Total					511.67	3.65	1.36	1.36	0.00		
Tankage (1/2 levels)											
Water	8	lb/gal	45	gal	163.27	0.30	48.98	2.00	326.53	0.00	0.00
Fuel	5.6	lb/gal	17	gal	43.17	0.15	6.48	-4.50	-194.29	0.00	0.00
Gray Water	9	lb/gal	12	gal	48.98	-0.10	-4.90	-2.50	-122.45	0.60	29.39
Water Tank					40.00	0.30	12.00	2.00	80.00	0.00	0.00
Fuel Tank					25.00	0.15	3.75	-4.50	-112.50	0.00	0.00
Holding Tank					10.00	-0.10	-1.00	-2.50	-25.00	0.60	6.00
Group Total					330.42	0.20	-0.14	-0.14	0.11		
Mechanical											
Engine					223.00	0.12	26.76	-2.60	-579.80	0.00	0.00
Shaft					12.00	-0.20	-2.40	-3.60	-43.20	0.00	0.00
Prop					5.00	-0.36	-1.80	-4.40	-22.00	0.00	0.00
Batteries					120.00	0.00	0.00	-2.60	-312.00	-0.60	-72.00
Steering Pedestal					17.00	0.80	13.60	-4.20	-71.40	0.00	0.00
Wiring					75.00	0.20	15.00	-1.00	-75.00	0.00	0.00
Rudder stock & quad.					35.00	0.00	0.00	-5.00	-175.00	0.00	0.00
Misc					100.00	0.20	20.00	-2.00	-200.00	0.00	0.00
Group Total					587.00	0.12	-2.52	-2.52	-0.12		
Interior Furnishings (incl gear)											
Forward Cabin					135.00	0.60	81.00	3.00	405.00	0.00	0.00
Salon					195.00	0.60	117.00	0.60	117.00	0.00	0.00
Galley					125.00	0.60	75.00	-1.00	-125.00	-1.10	-137.50
Head					75.00	0.50	37.50	-1.80	-135.00	0.88	66.00
Nav Station					70.00	0.60	42.00	-0.80	-56.00	1.40	98.00
Aft Cabin					105.00	0.40	42.00	-3.00	-315.00	-1.12	-117.60
Cockpit Locker					65.00	0.00	0.00	-3.76	-244.40	1.20	78.00
Group Total					770.00	0.51	-0.46	-0.46	-0.02		

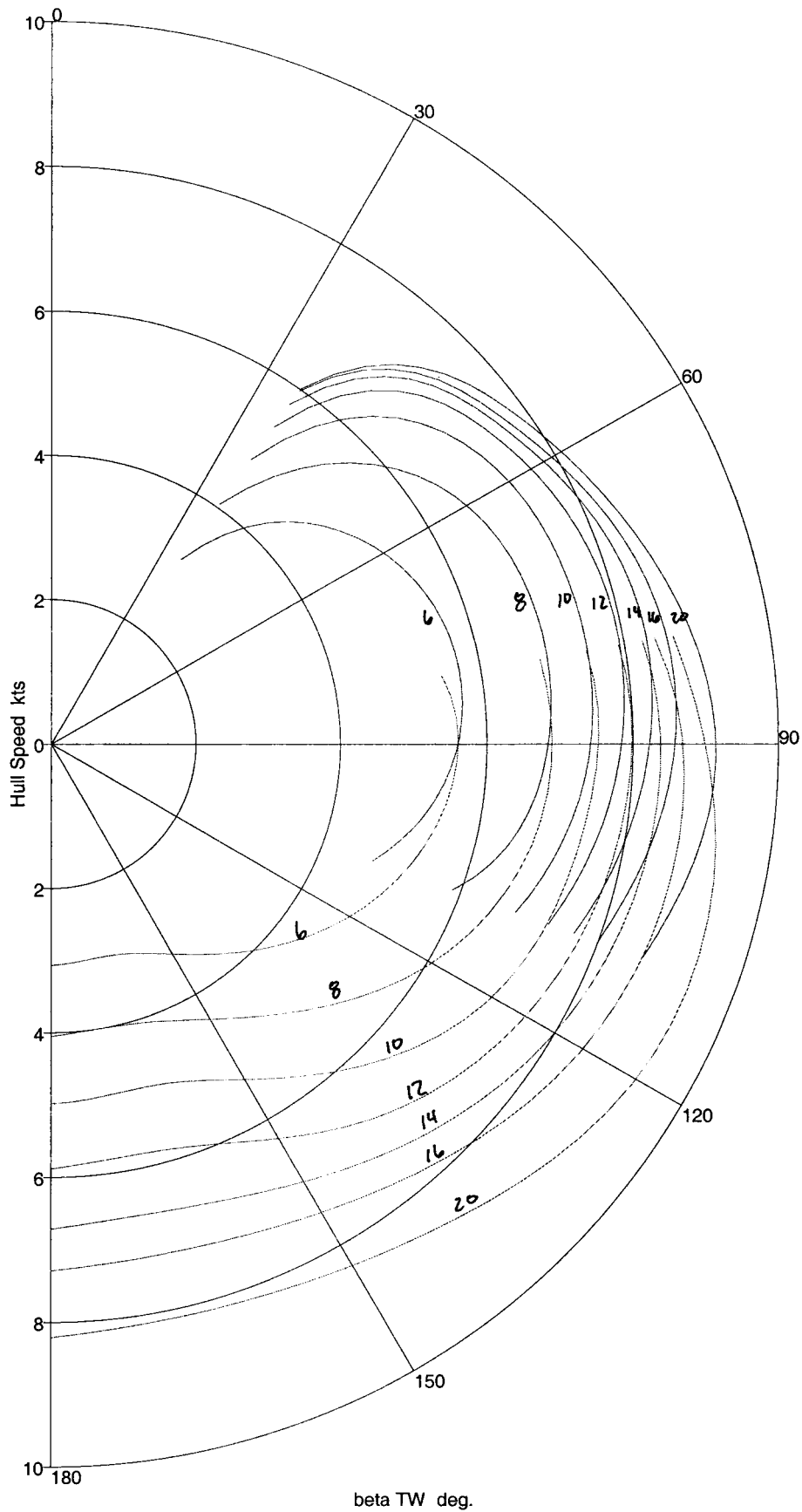
Payload

Normal Crew	320.00	1.30	416.00	-1.00	-320.00	0.00	0.00
Group Total	320.00	1.30		-1.00		0.00	

Groups

	Mass	VCG	Vmoment	LCG	Lmoment	TCG	Tmoment
Hull	4620.44	-0.49	-2283.93	-0.26	-1220.56	0.01	50.00
Sails and Rig	511.67	3.65	1870.07	1.36	697.77	0.00	0.00
Tankage	330.42	0.20	65.31	-0.14	-47.70	0.11	35.39
Mechanical	587.00	0.12	71.16	-2.52	-1478.40	-0.12	-72.00
Payload	320.00	1.30	416.00	-1.00	-320.00	0.00	0.00
Interior Furnishings	770.00	0.51	394.50	-0.46	-353.40	-0.02	-13.10
Whole Boat	7139.53	0.07		-0.38		0.00	

ballast 2700
ballast ratio 0.38



Polar Graph View

	V TW kts	beta TW deg	Spinnaker	V AW kts	beta AW deg	Hull Speed kts	VMG kts	Heel Angle deg	Fwd Force kN	Sideforce kN	Reef	Flat	Form Drag kN	Ind. Drag kN
1	6.00	35	down	8.59	22.95	3.12	2.55	3.04	0.25	1.38	1	1	0.16	0.09
2	6.00	39	down	9.02	24.03	3.69	2.87	3.31	0.31	1.52	1	1	0.23	0.08
3	6.00	42	down	9.25	24.96	4.04	3.01	3.46	0.35	1.60	1	1	0.27	0.08
4	6.00	45	down	9.43	25.95	4.34	3.07	3.57	0.39	1.66	1	1	0.32	0.07
5	6.00	50	down	9.60	27.73	4.74	3.05	3.68	0.46	1.71	1	1	0.39	0.06
6	6.00	60	down	9.64	31.59	5.29	2.65	3.67	0.56	1.70	1	1	0.51	0.05
7	6.00	75	down	9.14	38.06	5.69	1.47	3.27	0.64	1.48	1	1	0.61	0.03
8	6.00	90	down	8.09	46.19	5.60	0.00	2.55	0.61	1.09	1	1	0.59	0.02
9	6.00	100	down	7.16	53.52	5.27	-0.92	1.95	0.52	0.77	1	1	0.51	0.01
10	6.00	110	down	6.13	63.72	4.71	-1.61	1.33	0.39	0.47	1	1	0.39	0.00
11	6.00	80	up	8.75	42.08	5.46	0.95	3.17	0.58	1.22	1	1	0.56	0.02
12	6.00	90	up	8.18	46.77	5.60	0.00	2.93	0.61	1.10	1	1	0.59	0.02
13	6.00	100	up	7.36	52.85	5.48	-0.95	2.45	0.57	0.87	1	1	0.56	0.01
14	6.00	110	up	6.42	60.85	5.17	-1.77	1.89	0.49	0.62	1	1	0.49	0.01
15	6.00	120	up	5.46	71.08	4.75	-2.38	1.39	0.40	0.41	1	1	0.40	0.00
16	6.00	130	up	4.59	84.3	4.29	-2.76	0.93	0.31	0.25	1	1	0.31	0.00
17	6.00	140	up	3.92	101.7	3.78	-2.89	0.54	0.24	0.14	1	1	0.24	0.00
18	6.00	150	up	3.50	121.53	3.34	-2.89	0.31	0.18	0.07	1	1	0.18	0.00
19	6.00	165	up	3.12	150.36	3.05	-2.95	0.14	0.15	0.03	1	1	0.15	0.00
20	6.00	175	up	2.97	169.9	3.02	-3.01	0.06	0.15	0.01	1	1	0.15	0.00
21	6.00	180	up	2.90	180	3.06	-3.06	-0.02	0.15	0.00	1	1	0.15	0.00
22	8.00	35	down	11.35	23.09	4.06	3.32	5.11	0.44	2.39	1	0.99	0.28	0.17
23	8.00	39	down	11.85	24.3	4.74	3.69	5.89	0.54	2.63	1	1	0.39	0.15
24	8.00	42	down	12.09	25.36	5.14	3.82	6.38	0.62	2.73	1	1	0.48	0.14
25	8.00	45	down	12.27	26.46	5.48	3.88	6.74	0.69	2.81	1	1	0.56	0.13
26	8.00	50	down	12.48	28.29	5.99	3.85	7.14	0.80	2.89	1	1	0.69	0.11
27	8.00	60	down	12.46	32.49	6.62	3.31	6.94	0.98	2.83	1	1	0.89	0.09
28	8.00	75	down	11.65	40.02	6.91	1.79	5.18	1.10	2.38	1	1	1.05	0.06
29	8.00	90	down	10.35	48.68	6.84	0.00	3.74	1.03	1.73	1	1	1.00	0.03
30	8.00	100	down	9.27	55.82	6.56	-1.14	2.84	0.88	1.24	1	1	0.87	0.02
31	8.00	110	down	8.00	66.26	5.88	-2.01	1.95	0.67	0.76	1	1	0.66	0.01
32	8.00	80	up	11.31	43.55	6.82	1.18	5.35	1.04	2.08	1	1	0.99	0.05
33	8.00	90	up	10.50	49.01	6.89	0.00	4.56	1.07	1.80	1	1	1.03	0.03
34	8.00	100	up	9.50	55.32	6.79	-1.18	3.66	1.00	1.42	1	1	0.98	0.02
35	8.00	110	up	8.37	63.05	6.52	-2.23	2.84	0.86	1.04	1	1	0.85	0.01
36	8.00	120	up	7.19	73.26	6.05	-3.02	2.1	0.71	0.70	1	1	0.70	0.01
37	8.00	130	up	6.10	86.63	5.47	-3.52	1.43	0.56	0.43	1	1	0.56	0.00
38	8.00	140	up	5.25	103.27	4.89	-3.74	0.88	0.43	0.24	1	1	0.42	0.00
39	8.00	150	up	4.70	122.22	4.38	-3.80	0.53	0.33	0.13	1	1	0.33	0.00
40	8.00	165	up	4.20	150.61	4.03	-3.89	0.25	0.27	0.06	1	1	0.27	0.00
41	8.00	175	up	3.99	169.99	4.00	-3.98	0.1	0.27	0.02	1	1	0.27	0.00
42	8.00	180	up	3.91	180	4.05	-4.05	-0.04	0.27	-0.01	1	1	0.27	0.00
43	10.00	35	down	13.91	23.3	4.81	3.94	9.35	0.65	3.40	1	0.94	0.41	0.24
44	10.00	39	down	14.41	24.51	5.57	4.33	11.9	0.82	3.89	1	1	0.58	0.24

	Aero Heel Moment kg.m	Hydro Heel Moment kg.m	Hull Right Moment kg.m	Crew Right Moment kg.m	Force Err kN	Moment Err kg.m
1	1.10	0.11	0.67	0.54	0.00	0.00
2	1.21	0.12	0.72	0.61	0.00	0.00
3	1.27	0.13	0.75	0.65	0.00	0.00
4	1.32	0.13	0.77	0.68	0.00	0.00
5	1.36	0.14	0.79	0.71	0.00	0.00
6	1.35	0.14	0.78	0.71	0.00	0.00
7	1.18	0.12	0.70	0.60	0.00	0.00
8	0.86	0.09	0.55	0.41	0.00	0.00
9	0.61	0.06	0.42	0.25	0.00	0.00
10	0.37	0.04	0.29	0.12	0.00	0.00
11	1.15	0.10	0.68	0.57	0.00	0.00
12	1.04	0.09	0.62	0.51	0.00	0.00
13	0.83	0.07	0.52	0.38	0.00	0.00
14	0.59	0.05	0.41	0.24	0.00	0.00
15	0.40	0.03	0.30	0.13	0.00	0.00
16	0.24	0.02	0.20	0.06	0.00	0.00
17	0.13	0.01	0.12	0.02	0.00	0.00
18	0.07	0.01	0.07	0.01	0.00	0.00
19	0.03	0.00	0.03	0.00	0.00	0.00
20	0.01	0.00	0.01	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	-0.01
22	1.90	0.19	1.10	1.00	0.00	0.00
23	2.09	0.21	1.25	1.05	0.00	0.00
24	2.17	0.22	1.35	1.05	0.00	0.00
25	2.23	0.23	1.41	1.05	0.00	0.00
26	2.30	0.23	1.49	1.05	0.00	0.00
27	2.25	0.23	1.43	1.05	0.00	0.00
28	1.89	0.19	1.08	1.00	0.00	0.00
29	1.37	0.14	0.79	0.73	0.00	0.00
30	0.98	0.10	0.60	0.48	0.00	0.00
31	0.61	0.06	0.42	0.25	0.00	0.00
32	1.97	0.17	1.11	1.02	0.00	0.00
33	1.72	0.15	0.95	0.91	0.00	0.00
34	1.36	0.11	0.77	0.71	0.00	0.00
35	1.00	0.08	0.60	0.48	0.00	0.00
36	0.68	0.06	0.45	0.29	0.00	0.00
37	0.41	0.03	0.31	0.14	0.00	0.00
38	0.22	0.02	0.19	0.05	0.00	0.00
39	0.13	0.01	0.12	0.02	0.00	0.00
40	0.05	0.00	0.05	0.00	0.00	0.00
41	0.02	0.00	0.02	0.00	0.00	0.00
42	-0.01	0.00	0.01	0.00	0.00	-0.02
43	2.70	0.27	1.93	1.04	0.00	0.00
44	3.09	0.31	2.37	1.03	0.00	0.00

	V TW kts	beta TW deg	Spinnaker	V AW kts	beta AW deg	Hull Speed kts	VMG kts	Heel Angle deg	Fwd Force kN	Sideforce kN	Reef	Flat	Form Drag kN	Ind. Drag kN
45	10.00	42	down	14.71	25.51	6.06	4.50	12.82	0.92	4.04	1	1	0.71	0.22
46	10.00	45	down	14.89	26.64	6.45	4.56	13.39	1.02	4.13	1	1	0.83	0.20
47	10.00	50	down	14.94	28.92	6.84	4.40	13.47	1.19	4.13	1	1	1.01	0.18
48	10.00	60	down	14.63	34.18	7.25	3.63	12.14	1.45	3.88	1	1	1.31	0.14
49	10.00	75	down	13.65	42.88	7.48	1.94	8.68	1.62	3.19	1	1	1.53	0.09
50	10.00	90	down	12.21	52.63	7.41	0.00	4.91	1.50	2.27	1	1	1.46	0.05
51	10.00	100	down	11.04	60.15	7.18	-1.25	3.56	1.27	1.62	1	1	1.25	0.02
52	10.00	110	down	9.78	69.25	6.80	-2.32	2.56	0.99	1.08	1	1	0.98	0.01
53	10.00	80	up	13.31	46.34	7.47	1.30	9.8	1.59	2.91	1	1	1.51	0.07
54	10.00	90	up	12.39	52.67	7.51	0.00	7.38	1.61	2.46	1	1	1.56	0.05
55	10.00	100	up	11.29	59.7	7.42	-1.29	4.99	1.50	1.94	1	1	1.47	0.03
56	10.00	110	up	10.08	67.61	7.24	-2.48	3.76	1.31	1.45	1	1	1.30	0.02
57	10.00	120	up	8.83	76.86	6.98	-3.49	2.82	1.10	1.03	1	1	1.09	0.01
58	10.00	130	up	7.62	88.59	6.58	-4.23	1.98	0.88	0.65	1	1	0.88	0.00
59	10.00	140	up	6.61	104.83	5.93	-4.54	1.25	0.67	0.36	1	1	0.67	0.00
60	10.00	150	up	5.96	123.4	5.33	-4.62	0.79	0.53	0.21	1	1	0.52	0.00
61	10.00	165	up	5.32	151.07	4.95	-4.78	0.38	0.44	0.09	1	1	0.44	0.00
62	10.00	175	up	5.06	170.14	4.92	-4.90	0.16	0.43	0.04	1	1	0.43	0.00
63	10.00	180	up	4.97	180	4.98	-4.98	-0.06	0.44	-0.01	1	1	0.44	0.00
64	12.00	35	down	16.25	23.53	5.36	4.39	13.72	0.83	4.23	1	0.86	0.53	0.30
65	12.00	39	down	16.74	24.69	6.18	4.81	16.91	1.02	4.71	1	0.9	0.74	0.28
66	12.00	42	down	16.91	25.8	6.61	4.91	18.47	1.16	4.91	1	0.92	0.89	0.27
67	12.00	45	down	16.94	27.1	6.89	4.87	19.58	1.30	5.03	1	0.94	1.04	0.26
68	12.00	50	down	16.83	29.47	7.22	4.64	20.91	1.53	5.16	1	0.99	1.28	0.25
69	12.00	60	down	16.46	35.3	7.64	3.82	18.69	1.91	4.88	1	1	1.71	0.20
70	12.00	75	down	15.48	45.08	7.92	2.05	13.04	2.18	4.02	1	1	2.05	0.13
71	12.00	90	down	14.00	55.92	7.84	0.00	6.99	2.02	2.82	1	1	1.95	0.06
72	12.00	100	down	12.76	64.07	7.61	-1.32	4.35	1.70	2.02	1	1	1.67	0.03
73	12.00	110	down	11.45	73.38	7.27	-2.49	3.12	1.34	1.38	1	1	1.32	0.02
74	12.00	80	up	15.06	48.5	7.92	1.38	15.2	2.17	3.71	1	1	2.06	0.11
75	12.00	90	up	14.13	55.62	7.98	0.00	11.4	2.22	3.14	1	1	2.14	0.08
76	12.00	100	up	13.01	63.34	7.91	-1.37	7.7	2.09	2.50	1	1	2.04	0.05
77	12.00	110	up	11.75	71.8	7.75	-2.65	4.94	1.87	1.91	1	1	1.84	0.03
78	12.00	120	up	10.43	81.4	7.52	-3.76	3.55	1.59	1.35	1	1	1.57	0.02
79	12.00	130	up	9.14	92.82	7.22	-4.64	2.48	1.28	0.87	1	1	1.28	0.01
80	12.00	140	up	8.02	106.99	6.80	-5.21	1.63	0.98	0.51	1	1	0.98	0.00
81	12.00	150	up	7.21	124.17	6.28	-5.44	1.07	0.77	0.30	1	1	0.77	0.00
82	12.00	165	up	6.47	151.51	5.84	-5.64	0.54	0.65	0.14	1	1	0.65	0.00
83	12.00	175	up	6.17	170.3	5.81	-5.78	0.24	0.64	0.05	1	1	0.64	0.00
84	12.00	180	up	6.05	180	5.88	-5.88	-0.09	0.66	-0.02	1	1	0.66	0.00
85	14.00	35	down	18.40	23.77	5.75	4.71	17.31	0.97	4.79	1	0.76	0.63	0.34
86	14.00	39	down	18.81	25.15	6.52	5.07	19.97	1.15	5.10	1	0.77	0.86	0.30
87	14.00	42	down	18.88	26.51	6.86	5.10	21.14	1.30	5.21	1	0.78	1.02	0.28
88	14.00	45	down	18.84	27.98	7.10	5.02	22.03	1.46	5.28	1	0.8	1.19	0.27

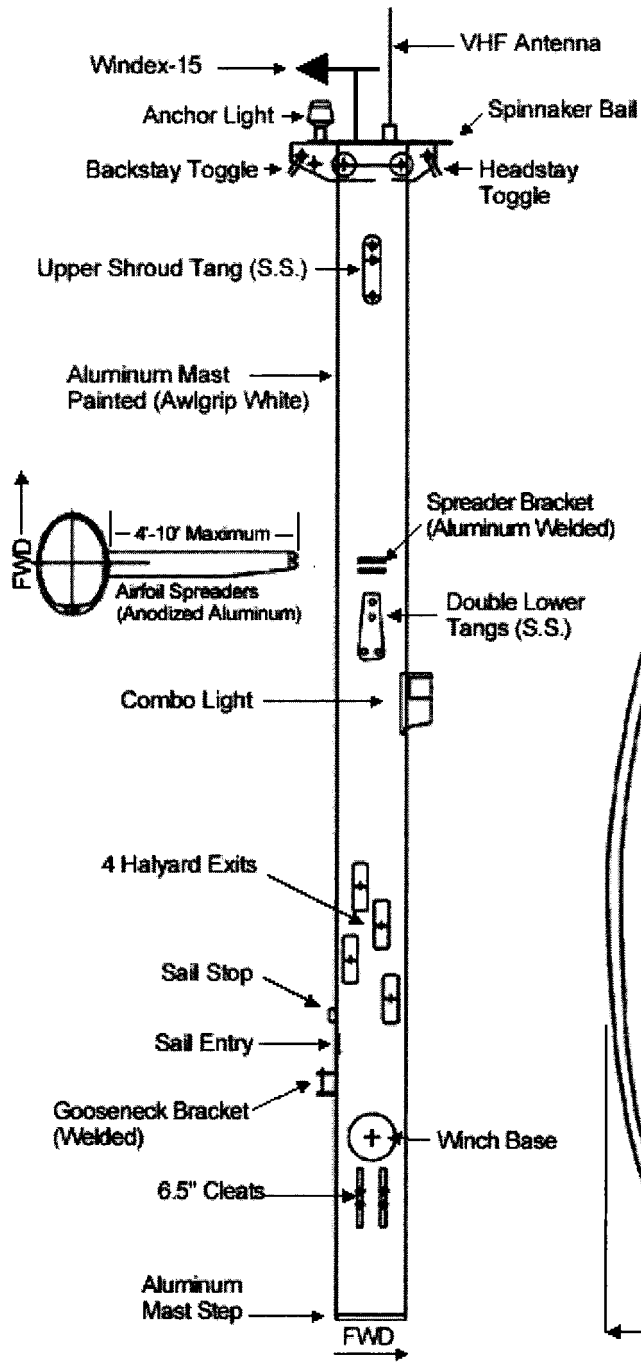
	Aero Heel Moment kg.m	Hydro Heel Moment kg.m	Hull Right Moment kg.m	Crew Right Moment kg.m	Force Err kN	Moment Err kg.m
45	3.22	0.33	2.51	1.03	0.00	0.00
46	3.29	0.33	2.59	1.03	0.00	0.00
47	3.29	0.33	2.59	1.03	0.00	0.00
48	3.08	0.31	2.37	1.03	0.00	0.00
49	2.54	0.26	1.75	1.04	0.00	0.00
50	1.80	0.18	1.02	0.97	0.00	0.00
51	1.29	0.13	0.74	0.88	0.00	0.00
52	0.86	0.09	0.54	0.41	0.00	0.00
53	2.76	0.23	1.96	1.04	0.00	0.00
54	2.35	0.20	1.50	1.05	0.00	0.00
55	1.86	0.16	1.03	0.98	0.00	0.00
56	1.40	0.12	0.78	0.73	0.00	0.00
57	0.99	0.08	0.59	0.48	0.00	0.00
58	0.62	0.05	0.42	0.26	0.00	0.00
59	0.34	0.03	0.27	0.11	0.00	0.00
60	0.20	0.02	0.17	0.04	0.00	0.00
61	0.09	0.01	0.08	0.01	0.00	0.00
62	0.03	0.00	0.04	0.00	0.00	0.00
63	-0.01	0.00	0.01	0.00	0.00	-0.03
64	3.37	0.34	2.68	1.03	0.00	0.00
65	3.75	0.38	3.12	1.01	0.00	0.00
66	3.90	0.40	3.30	1.00	0.00	0.00
67	4.00	0.41	3.41	0.99	0.00	0.00
68	4.10	0.42	3.53	0.99	0.00	0.00
69	3.88	0.39	3.28	1.00	0.00	0.00
70	3.20	0.32	2.49	1.03	0.00	0.00
71	2.24	0.23	1.42	1.05	0.00	0.00
72	1.61	0.16	0.90	0.87	0.00	0.00
73	1.10	0.11	0.65	0.56	0.00	0.00
74	3.53	0.30	2.82	1.02	0.00	0.00
75	3.00	0.25	2.22	1.03	0.00	0.00
76	2.40	0.20	1.56	1.05	0.00	0.00
77	1.84	0.15	1.02	0.97	0.00	0.00
78	1.30	0.11	0.74	0.68	0.00	0.00
79	0.84	0.07	0.52	0.39	0.00	0.00
80	0.49	0.04	0.35	0.18	0.00	0.00
81	0.29	0.02	0.23	0.08	0.00	0.00
82	0.13	0.01	0.12	0.02	0.00	0.00
83	0.05	0.00	0.05	0.00	0.00	0.00
84	-0.02	0.00	0.02	0.00	0.00	-0.04
85	3.81	0.39	3.19	1.01	0.00	0.00
86	4.05	0.41	3.47	0.99	0.00	0.00
87	4.14	0.42	3.58	0.98	0.00	0.00
88	4.20	0.43	3.65	0.98	0.00	0.00

	V TW kts	beta TW deg	Spinnaker	V AW kts	beta AW deg	Hull Speed kts	VMG kts	Heel Angle deg	Fwd Force kN	Sideforce kN	Reef	Flat	Form Drag kN	Ind. Drag kN
89	14.00	50	down	18.66	30.58	7.40	4.76	23.12	1.71	5.36	1	0.84	1.46	0.25
90	14.00	60	down	18.02	36.05	7.84	3.92	24.45	2.20	5.45	1	0.94	1.97	0.23
91	14.00	75	down	17.09	46.49	8.26	2.14	18.52	2.72	4.84	1	1	2.56	0.17
92	14.00	90	down	15.73	58.47	8.23	0.00	9.81	2.57	3.40	1	1	2.49	0.08
93	14.00	100	down	14.50	67.19	7.99	-1.39	5.49	2.19	2.46	1	1	2.15	0.05
94	14.00	110	down	13.13	76.87	7.65	-2.62	3.76	1.74	1.71	1	1	1.71	0.02
95	14.00	80	up	16.46	49.76	8.24	1.43	22.05	2.67	4.42	1	1	2.53	0.14
96	14.00	90	up	15.71	57.77	8.38	0.00	16.25	2.83	3.81	1	1	2.73	0.10
97	14.00	100	up	14.66	66.13	8.34	-1.45	11.34	2.73	3.11	1	1	2.67	0.07
98	14.00	110	up	13.41	75.08	8.21	-2.81	7.27	2.50	2.41	1	1	2.46	0.04
99	14.00	120	up	12.06	85.08	7.99	-4.00	4.42	2.17	1.72	1	1	2.15	0.02
100	14.00	130	up	10.72	96.72	7.69	-4.94	3.01	1.77	1.11	1	1	1.76	0.01
101	14.00	140	up	9.54	110.43	7.33	-5.62	2.03	1.38	0.68	1	1	1.38	0.00
102	14.00	150	up	8.61	126.1	6.98	-6.05	1.39	1.10	0.42	1	1	1.09	0.00
103	14.00	165	up	7.68	152.02	6.66	-6.44	0.72	0.91	0.19	1	1	0.91	0.00
104	14.00	175	up	7.33	170.47	6.64	-6.62	0.32	0.90	0.08	1	1	0.90	0.00
105	14.00	180	up	7.21	180	6.71	-6.71	-0.13	0.93	-0.03	1	1	0.93	0.00
106	16.00	35	down	20.40	24.1	5.97	4.89	19.87	1.04	5.12	1	0.66	0.69	0.36
107	16.00	39	down	20.72	25.73	6.68	5.19	22.02	1.24	5.31	1	0.66	0.93	0.31
108	16.00	42	down	20.73	27.22	6.99	5.20	23.02	1.40	5.38	1	0.67	1.11	0.29
109	16.00	45	down	20.65	28.81	7.22	5.10	23.8	1.56	5.43	1	0.69	1.29	0.27
110	16.00	50	down	20.41	31.58	7.51	4.83	24.73	1.84	5.51	1	0.73	1.58	0.26
111	16.00	60	down	19.65	37.43	7.96	3.98	25.55	2.38	5.65	0.97	0.88	2.13	0.24
112	16.00	75	down	18.27	46.98	8.49	2.20	25.73	3.14	5.50	1	1	2.93	0.20
113	16.00	90	down	17.39	60.44	8.58	0.00	13.11	3.16	4.01	1	1	3.05	0.11
114	16.00	100	down	16.21	69.64	8.34	-1.45	7.65	2.72	2.94	1	1	2.66	0.06
115	16.00	110	down	14.84	79.66	7.99	-2.73	4.57	2.19	2.09	1	1	2.15	0.03
116	16.00	80	up	17.72	51.08	8.42	1.46	26.18	2.98	4.79	0.97	1	2.82	0.16
117	16.00	90	up	16.95	59.21	8.68	0.00	22.22	3.36	4.39	1	1	3.24	0.12
118	16.00	100	up	16.15	68.27	8.73	-1.52	15.67	3.40	3.71	1	1	3.31	0.09
119	16.00	110	up	15.02	77.65	8.64	-2.95	10.39	3.21	2.94	1	1	3.15	0.06
120	16.00	120	up	13.71	87.96	8.44	-4.22	5.74	2.84	2.12	1	1	2.81	0.03
121	16.00	130	up	12.34	99.79	8.13	-5.22	3.62	2.35	1.39	1	1	2.34	0.01
122	16.00	140	up	11.13	113.37	7.77	-5.95	2.47	1.87	0.87	1	1	1.86	0.01
123	16.00	150	up	10.15	128.42	7.47	-6.47	1.74	1.52	0.56	1	1	1.52	0.00
124	16.00	165	up	9.11	153.14	7.24	-6.99	0.93	1.29	0.26	1	1	1.29	0.00
125	16.00	175	up	8.73	170.86	7.23	-7.20	0.44	1.29	0.10	1	1	1.29	0.00
126	16.00	180	up	8.63	180	7.29	-7.29	-0.18	1.34	-0.04	1	1	1.34	0.00
127	20.00	35	down	23.99	25.08	6.01	4.92	22.53	1.10	5.49	0.98	0.53	0.70	0.40
128	20.00	39	down	24.20	26.97	6.77	5.26	23.7	1.32	5.74	0.93	0.6	0.97	0.35
129	20.00	42	down	24.14	28.64	7.09	5.27	24.33	1.51	5.86	0.91	0.65	1.18	0.33
130	20.00	45	down	24.00	30.4	7.32	5.18	24.82	1.70	5.96	0.89	0.7	1.38	0.32
131	20.00	50	down	23.66	33.42	7.64	4.91	25.47	2.03	6.09	0.87	0.77	1.72	0.31
132	20.00	60	down	22.78	39.75	8.13	4.06	26.32	2.66	6.23	0.85	0.93	2.37	0.28

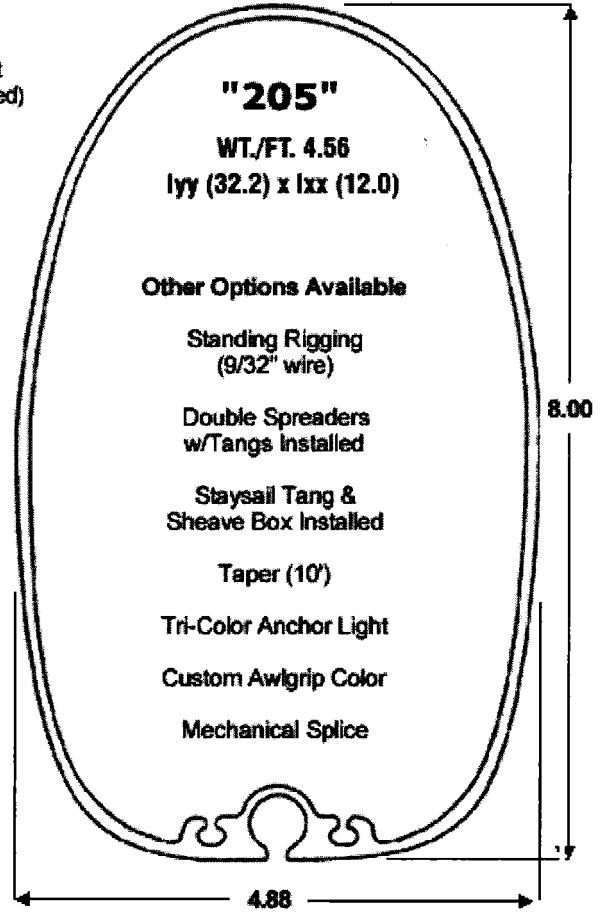
	Aero Heel Moment kg.m	Hydro Heel Moment kg.m	Hull Right Moment kg.m	Crew Right Moment kg.m	Force Err kN	Moment Err kg.m
89	4.26	0.43	3.73	0.97	0.00	0.00
90	4.33	0.44	3.81	0.96	0.00	0.00
91	3.84	0.39	3.23	1.00	0.00	0.00
92	2.71	0.27	1.94	1.04	0.00	0.00
93	1.96	0.20	1.13	1.03	0.00	0.00
94	1.37	0.14	0.78	0.73	0.00	0.00
95	4.21	0.36	3.59	0.98	0.00	0.00
96	3.65	0.31	2.94	1.01	0.00	0.00
97	2.99	0.25	2.20	1.03	0.00	0.00
98	2.32	0.19	1.47	1.05	0.00	0.00
99	1.66	0.14	0.91	0.88	0.00	0.00
100	1.07	0.09	0.63	0.53	0.00	0.00
101	0.64	0.05	0.43	0.27	0.00	0.00
102	0.39	0.03	0.29	0.13	0.00	0.00
103	0.17	0.02	0.15	0.04	0.00	0.00
104	0.07	0.01	0.07	0.01	0.00	0.00
105	-0.03	0.00	0.03	0.00	0.00	-0.06
106	4.07	0.41	3.49	0.99	0.00	0.00
107	4.22	0.43	3.67	0.98	0.00	0.00
108	4.28	0.43	3.74	0.97	0.00	0.00
109	4.32	0.44	3.79	0.97	0.00	0.00
110	4.36	0.44	3.85	0.96	0.00	0.00
111	4.37	0.46	3.88	0.95	0.00	0.00
112	4.36	0.44	3.86	0.95	0.00	0.00
113	3.19	0.32	2.48	1.03	0.00	0.00
114	2.35	0.24	1.54	1.05	0.00	0.00
115	1.69	0.17	0.94	0.91	0.00	0.00
116	4.45	0.39	3.89	0.95	0.00	0.00
117	4.20	0.35	3.58	0.98	0.00	0.00
118	3.57	0.30	2.85	1.02	0.00	0.00
119	2.83	0.24	2.03	1.04	0.00	0.00
120	2.04	0.17	1.17	1.05	0.00	0.00
121	1.33	0.11	0.75	0.69	0.00	0.00
122	0.83	0.07	0.51	0.38	0.00	0.00
123	0.52	0.05	0.37	0.20	0.00	0.00
124	0.24	0.02	0.20	0.06	0.00	0.00
125	0.10	0.01	0.09	0.01	0.00	0.00
126	-0.04	0.00	0.04	0.00	0.00	-0.08
127	4.28	0.44	3.75	0.97	0.00	0.00
128	4.31	0.46	3.81	0.97	0.00	0.00
129	4.33	0.47	3.84	0.96	0.00	0.00
130	4.34	0.48	3.86	0.96	0.00	0.00
131	4.35	0.49	3.89	0.95	0.00	0.00
132	4.36	0.50	3.92	0.95	0.00	0.00

	V TW kts	beta TW deg	Spinnaker	V AW kts	beta AW deg	Hull Speed kts	VMG kts	Heel Angle deg	Fwd Force kN	Sideforce kN	Reef	Flat	Form Drag kN	Incl. Drag kN
133	20.00	75	down	21.20	50.02	8.73	2.26	27.21	3.56	5.96	0.91	1	3.34	0.23
134	20.00	90	down	20.12	62.99	9.14	0.00	21.61	4.23	5.11	1	1	4.08	0.15
135	20.00	100	down	19.44	73.21	8.99	-1.56	13.18	3.87	3.98	1	1	3.78	0.10
136	20.00	110	down	18.21	83.72	8.65	-2.96	8.05	3.22	2.99	1	1	3.16	0.06
137	20.00	80	up	20.66	54.47	8.67	1.51	27.25	3.42	5.23	0.87	1	3.24	0.18
138	20.00	90	up	19.31	62.26	8.99	0.00	28.09	3.96	4.95	0.94	1	3.82	0.15
139	20.00	100	up	18.21	71.24	9.25	-1.61	26.54	4.45	4.61	1	1	4.33	0.12
140	20.00	110	up	17.83	81.52	9.38	-3.21	18.05	4.65	3.95	1	1	4.57	0.09
141	20.00	120	up	16.89	92.19	9.27	-4.64	10.81	4.37	3.00	1	1	4.32	0.05
142	20.00	130	up	15.63	104.1	8.97	-5.77	5.4	3.76	2.05	1	1	3.73	0.03
143	20.00	140	up	14.38	117.46	8.60	-6.59	3.5	3.09	1.35	1	1	3.08	0.01
144	20.00	150	up	13.34	131.88	8.32	-7.20	2.54	2.63	0.91	1	1	2.62	0.01
145	20.00	165	up	12.22	155.1	8.13	-7.85	1.41	2.34	0.43	1	1	2.34	0.00
146	20.00	175	up	11.80	171.55	8.14	-8.11	0.71	2.36	0.18	1	1	2.36	0.00
147	20.00	180	up	11.69	180	8.20	-8.20	-0.33	2.45	-0.07	1	1	2.45	0.00

	Aero Heel Moment kg.m	Hydro Heel Moment kg.m	Hull Right Moment kg.m	Crew Right Moment kg.m	Force Err kN	Moment Err kg.m
133	4.39	0.48	3.93	0.94	0.00	0.00
134	4.07	0.41	3.50	0.98	0.00	0.00
135	3.19	0.32	2.48	1.03	0.00	0.00
136	2.41	0.24	1.61	1.04	0.00	0.00
137	4.46	0.42	3.94	0.94	0.00	0.00
138	4.50	0.40	3.97	0.93	0.00	0.00
139	4.43	0.37	3.86	0.94	0.00	0.00
140	3.81	0.32	3.12	1.00	0.00	0.00
141	2.88	0.24	2.09	1.04	0.00	0.00
142	1.96	0.17	1.10	1.02	0.00	0.00
143	1.28	0.11	0.72	0.66	0.00	0.00
144	0.85	0.07	0.53	0.40	0.00	0.00
145	0.40	0.03	0.29	0.14	0.00	0.00
146	0.17	0.01	0.15	0.04	0.00	0.00
147	-0.07	-0.01	0.07	0.01	0.00	-0.15

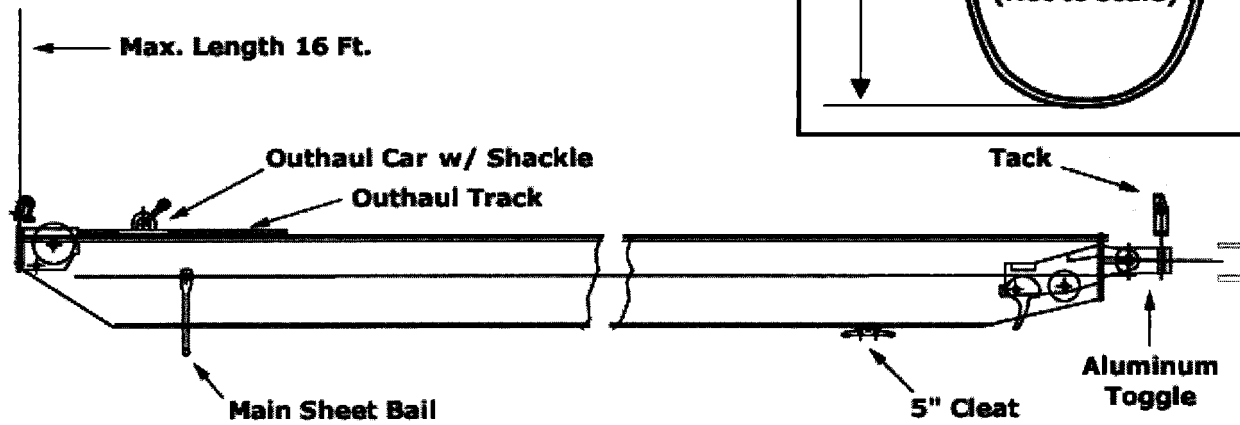
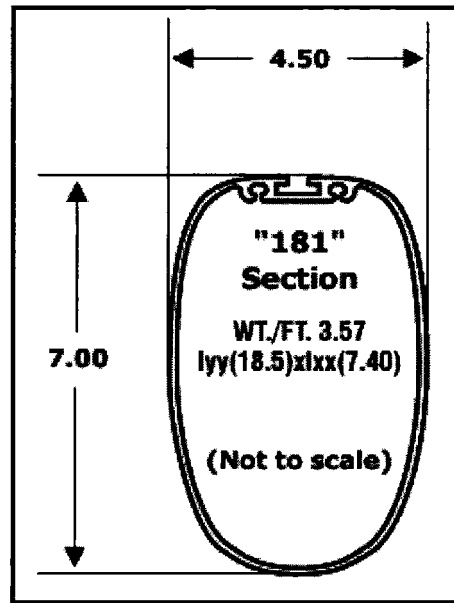


Typical Configuration
"205" Section Mast
Boats 36' to 40'
(Mast Length 50' Max)



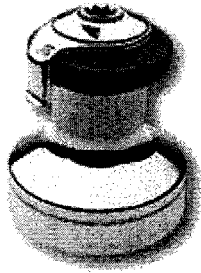
"181 Section" Boom

Max. Length 16 Ft.



40ST Two Speed, Self-Tailing Winch

Product Detail



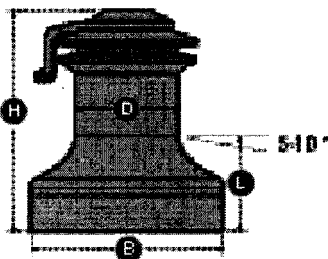
Lb/in Kg/mm

Specifications

Part Number	Finish	Gear Ratio 1st/2nd	Power Ratio 1st/2nd	Weight lb
49040055	Alloy	1.9:1/5.8:1	13.2:1/40.2:1	10.7
49040056	Chrome	1.9:1/5.8:1	13.2:1/40.2:1	14.3
49040057	Bronze	1.9:1/5.8:1	13.2:1/40.2:1	14.3
49040058	Stainless Steel	1.9:1/5.8:1	13.2:1/40.2:1	14.1
49040059	All Chrome	1.9:1/5.8:1	13.2:1/40.2:1	14.7
49040060	All Bronze	1.9:1/5.8:1	13.2:1/40.2:1	14.7

Dimensions

Drum Diameter D in	Base Diameter B in	Height H in	Line Entry L in	Line Size in
2 15/16	5 13/16	6 13/16	3 1/8	5/16-1/2



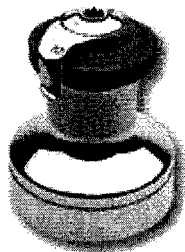
Mounting Instructions

5 x M6 (1/4 in) c'sk head screws on 121mm (4 3/4 in) PCD. Lewmar recommend that the rope enters onto the drum at an angle of 5° to 10° to the base axis of the winch. To achieve this angle it may be necessary to use a base wedge when installing the winch. The winch must be mounted on an even surface.

Spares Information

54ST Two Speed, Self-Tailing Winch

Product Detail



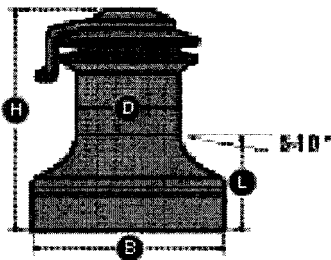
Lb/in Kg/mm

Specifications

Part Number	Finish	Gear Ratio 1st/2nd	Power Ratio 1st/2nd	Weight lb
49054000	Alloy	2.8:1/11.2:1	13.8:1/54:1	26.4
49054001	Chrome	2.8:1/11.2:1	13.8:1/54:1	37.5
49054019	Bronze	2.8:1/11.2:1	13.8:1/54:1	37.5
49054004	Stainless Steel	2.8:1/11.2:1	13.8:1/54:1	36.9
49054003	All Chrome	2.8:1/11.2:1	13.8:1/54:1	38.7
49054002	All Bronze	2.8:1/11.2:1	13.8:1/54:1	38.7

Dimensions

Drum Diameter D in	Base Diameter B in	Height H in	Line Entry L in	Line Size in
4 1/8	8 1/16	9 7/8	4 1/2	5/16-5/8



Mounting Instructions

6 x M8 (5/16 in) c'sk head screws on 165mm (6 1/2 in) PCD. Lewmar recommend that the rope enters onto the drum at an angle of 5° to 10° to the base axis of the winch. To achieve this angle it may be necessary to use a base wedge when installing the winch. The winch must be mounted on an even surface.



Spares Information

[Click here for a complete spares listing](#)

MARINE DIESEL ENGINES

PLEASURE-CRAFT POWER

3JH3E
291KW (401hp)

4JH3E
414KW (561hp)
528KW (725hp)

YANMAR

Compact Mid-Range Marine Power Plants

The 3JH3E 3 cylinder and the 4JH3E 4 cylinder naturally aspirated pair of engines have been joined by three new release 4 cylinder engines in the 3JH3E power plant family. The 4JH3E-DTE (power turbocharger turbo) to create a family of five lightweight, user-friendly, clean, efficient and reliable marine diesels.

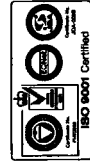
Lightweight: Compact design iron block and head feature close spaced cylinder walls for light weight. Extensive use of aluminum alloys in the crankcase, cylinder heads, oil pan, covers, and many parts make for good weight savings.

User Friendly: Sophisticated engine mounts, a range of utility-amount accessories, a complete timing system components, close attention to bearing tolerances and accurate balance of moving parts make for low vibration, low noise, low down-time and an easy-to-ship engine.

Clean: Inlet swirl design improves fuel-air mix, extra high pressure fuel injection system with 1500 psi injection pressure, low coolant flow minimizes hot and cool spots - these are just some of the ways Yanmar improves combustion efficiency. Exhaust gas emissions on all 5 engines clear the strict European BSO regulations.

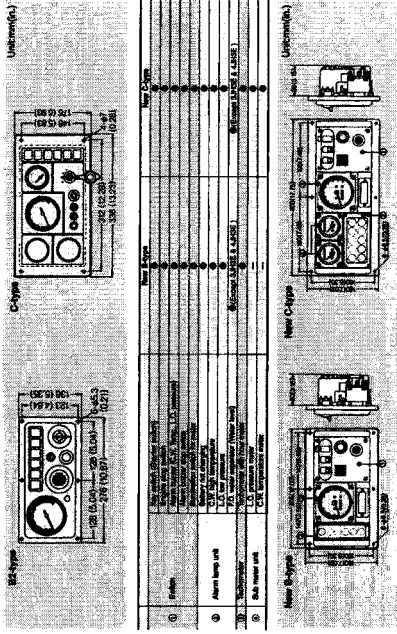
Efficient: Diesels are synonymous with fuel economy. Being a Yanmar also means long years of experience in building some of the most advanced and reliable engines in the world. Yanmar's extremely modern research facilities have been incorporated into every new Yanmar engine.

Reliable: Long trouble-free engine life is a common reason for choosing Yanmar. Worldwide parts backup and quick response times make for minimum down-time. These engines are again and again the first choice of bluewater yachtmen and boat owners the world over.



INSTRUMENT PANEL

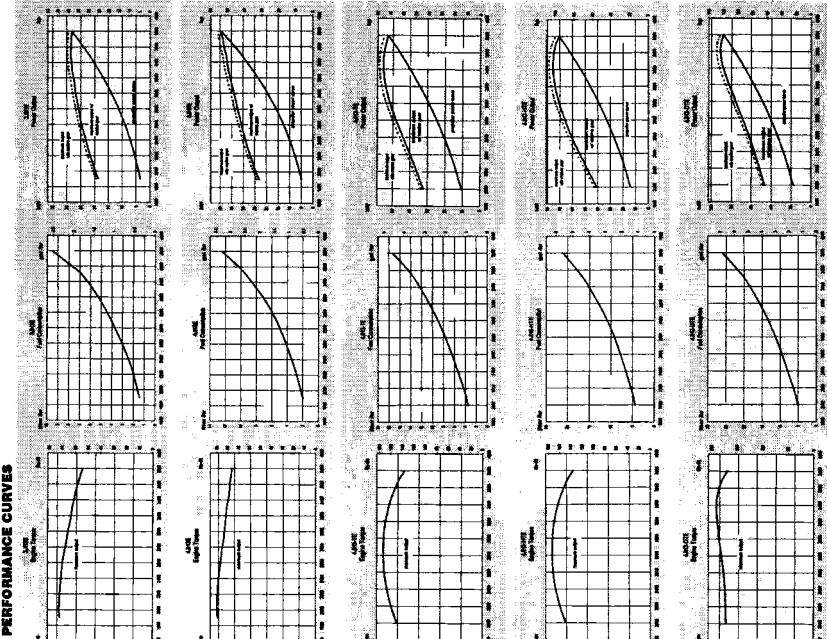
Instrument	Model	Availability
1. Alarm Indicator	3JH3E, 4JH3E, 4JH3E-DTE	Not available
2. Oil Pressure Indicator	3JH3E, 4JH3E, 4JH3E-DTE	Not available
3. Water Temperature Indicator	3JH3E, 4JH3E, 4JH3E-DTE	Not available
4. Fuel Pressure Indicator	3JH3E, 4JH3E, 4JH3E-DTE	Not available
5. Hour Meter	3JH3E, 4JH3E, 4JH3E-DTE	Not available
6. Tachometer	3JH3E, 4JH3E, 4JH3E-DTE	Not available
7. Alternator	3JH3E, 4JH3E, 4JH3E-DTE	Not available
8. Battery Monitor	3JH3E, 4JH3E, 4JH3E-DTE	Not available
9. Diesel Engine Oil Pressure	3JH3E, 4JH3E, 4JH3E-DTE	Not available
10. Diesel Engine Water Temperature	3JH3E, 4JH3E, 4JH3E-DTE	Not available
11. Diesel Engine Fuel Pressure	3JH3E, 4JH3E, 4JH3E-DTE	Not available
12. Diesel Engine Hour Meter	3JH3E, 4JH3E, 4JH3E-DTE	Not available
13. Diesel Engine Tachometer	3JH3E, 4JH3E, 4JH3E-DTE	Not available
14. Diesel Engine Alternator	3JH3E, 4JH3E, 4JH3E-DTE	Not available
15. Diesel Engine Battery Monitor	3JH3E, 4JH3E, 4JH3E-DTE	Not available
16. Diesel Engine Diesel Engine Oil Pressure	3JH3E, 4JH3E, 4JH3E-DTE	Not available
17. Diesel Engine Diesel Engine Water Temperature	3JH3E, 4JH3E, 4JH3E-DTE	Not available
18. Diesel Engine Diesel Engine Fuel Pressure	3JH3E, 4JH3E, 4JH3E-DTE	Not available
19. Diesel Engine Diesel Engine Hour Meter	3JH3E, 4JH3E, 4JH3E-DTE	Not available
20. Diesel Engine Diesel Engine Tachometer	3JH3E, 4JH3E, 4JH3E-DTE	Not available
21. Diesel Engine Diesel Engine Alternator	3JH3E, 4JH3E, 4JH3E-DTE	Not available
22. Diesel Engine Diesel Engine Battery Monitor	3JH3E, 4JH3E, 4JH3E-DTE	Not available



Note: All data subject to alteration without notice.

YANMAR DIESEL AMERICA CORP. 601 Corporate Drive, Buffalo Grove, IL 60089
 YANMAR EUROPE S.R.L. P. Pagnanelli 11 1322 BS Altare-GR Italy. The Netherlands
 YANMAR DIESEL ENGINE CO., LTD. 1-2, E-choum, Yachi, Choshi, Tokyo 104, Japan
 www.yanmar.com

PERFORMANCE CURVES



Load factor calculation based on an assumption of 3.0.

SPECIFICATIONS

Model	3 in-line			4 in-line			4 in-line			4 in-line			4 in-line			4 in-line					
	3.HBE	3.HBE	3.HBE	4.HBE	4.HBE	4.HBE	4.HBE	4.HBE	4.HBE	4.HBE	4.HBE	4.HBE	4.HBE	4.HBE	4.HBE	4.HBE	4.HBE				
Class	4 in-line																				
Configuration	4 in-line, vertical, water cooled, diesel engine																				
Number of cylinders	4																				
Bore x Stroke	94 x (90.31 x 3.54)																				
Displacement	1.96(121.7)																				
Continuous rating output at crankshaft	27(80)2650			37(60)3850			51(80)3700			59(62)3700			65(118)3700			85(118)3700					
Maximum output at crankshaft	28(40)3800			41(59)3800			55(79)3800			74(100)3800			82(125)3800			92(125)3800					
Combustion system	Direct Injection																				
Aspiration	Natural Aspiration																				
Starting System	Electric starting (24V, 1.2kW starting motor)(24V, 50A alternator)																				
Cooling System	Electric starting (24V, 1.2kW starting motor)(24V, 50A alternator)																				
Reduction and reversing gear	Fresh water cooling by centrifugal fresh water pump and rubber impeller sea water pump																				
Direction of rotation	Clockwise, viewed from stern																				
Dry Weight	138 (413)			222 (492)			238 (520)			247 (545)			250 (551)			256 (564)			262 (573)		

Atmospheric conditions: SG 30461, Density of water 0.9997, 11000-7350kWh

DIMENSIONS Unit: mm (in.)

