

BAB VIII

PENUTUP

VIII.1 Kesimpulan

1. Dari hasil perhitungan yang telah dilakukan untuk kapal rancangan dengan ukuran utama sebagai berikut :

2. Tanker Product Oil HSD (High Speed Diesel) 7000 DWT

Principle Dimention:

Length over all (Loa)	: 115,5	Meters
Length per pendecular (Lpp)	: 105	Meters
Length water line (Lwl)	: 107	Meters
Breadth (B)	: 19,7	Meters
Depth (D)	: 9,5	Meters
Draught (T)	: 6	Meters
Speed (Vs)	: 12	Knots
Dead Weigth Ton (DWT)	: 7000	DWT
Coeffecient block (Cb)	: 0,752	
Coeffecient midship (Cm)	: 0,990	
Coeffecient perismatic (Cp)	: 0,760	
Coeffecient water line (Cw)	: 0,834	
Disp Δ	: 9.566,4	Tons
Disp ∇	: 9.333,1	M ³
Rasius Pelayaran	: 1500	Mil
Rute Pelayaran	: Jakarta – Palembang	

3. Untuk menentukan besarnya daya motor induk sebagai penggerak utama maka faktor kecepatan, daerah pelayaran dan ukuran utama kapal rancangan mempunyai pengaruh yang sangat besar. Dari hasil perhitungan diketahui bahwa untuk mencapai kecepatan 12 knots.

4. Propeler merupakan salah satu alat penggerak utama kapal yang harus diperhitungkan dimensinya dan juga kecocokanya dengan penggunaan jenis mesin penggeraknya.
5. Sistem perporosan propeler ada 2 macam, yaitu dengan menggunakan sistem pelumasan air laut dan menggunakan sistem pelumasan minyak. Pemilihan jenis sistem pelumasan, bisa direncanakan sesuai dengan kebutuhan dan pertimbangan teknis lain.
6. Perencanaan bearing dan pemilihan bahan materialnya bergantung pada jenis pelumasan yang dipakai.
7. Untuk perencanaan daun baling-baling maka ditentukan ukuran utama baling-baling sebagai berikut :
 - Tipe baling-baling berada pada : B4 – 55
 - Diameter baling-baling : $D_o = 4,20 \text{ m}$
 - Pitch Ratio baling-baling : $H_o/D = 0,76$
 - Blade Area Ratio baling-baling : $F_a/F = 0,55$
 - Effisiensi baling-baling : $\eta_p = 0,578$
 - Jumlah daun baling-baling : $Z = 4$
8. Dalam perencanaan kamar mesin tidak lepas dari asumsi-asumsi yang diberikan untuk mempermudah perhitungan dengan tidak mengabaikan tanggung jawab secara teknis, ekonomis, serta peraturan-peraturan yang ada sehingga hasil perhitungan dapat mendekati keadaan sebenarnya.
9. Tata letak mesin induk, mesin bantu serta permesinan lainnya diatur seefisien mungkin. Hal ini untuk mempermudah dalam hal perawatan dan perbaikan peralatan yang ada dikamar mesin.

VIII.2 Saran

Setelah melakukan perhitungan-perhitungan diatas dan dari pengalaman selama menyusun tugas perancangan mesin kapal, maka penulis dapat menyarankan sebagai berikut :

1. Mohon mahasiswa dibekali dengan pengetahuan yang lebih tentang perancangan mesin kapal serta referensi buku-buku panduan yang dapat membantu mahasiswa dalam menyelesaikan tugas perancangan ini.
2. Dalam menyelesaikan tugas merancang mesin kapal ini, pengalaman studi lapangan sangat membantu. Untuk disarankan agar lebih banyak mengadakan studi lapangan agar tugas perancangan ini dapat mudah dipahami dan diselesaikan dengan baik.
3. Mahasiswa harus mencari ilmu diluar kampus tentang dunia perkapalan agar mahasiswa mengetahui teknologi dan perkembangan industri dalam dunia perkapalan secara *up date*. Hal ini sangat berguna untuk menghadapi dunia persaingan kerja yang semakin ketat.

Demikian kesimpulan dan saran-saran yang penulis dapat berikan sehubungan dengan tugas perancangan mesin kapal ini.

DAFTAR REFERENSI

- A.R. Lester. *Merchant Ship Stability*. London : Butterworths, 1975.
- BKI Rules.
- Harald Poehls. *Lecture on Ships Design and Ship Theory*. University of Hannover, 1979.
- Harvald,SV.AA. *Resistance and Propulsion of Ship*. New York, John Wiley & Sons, Inc, 1983.
- Ikeda Masaharu. Diktat dan kumpulan buku.
- Robert Taggart. *Ship Design and Construction*. Now York : The Society of Naval Architects and Marine Engineers, 1980.
- Smith, R. Munro. *Merchant Ship Design*. London : Hutchinson & Co. Ltd, 1964.
- Soekarsono N.A. *Sistim dan Perlengkapan Kapal*. Jakarta : PT.Pamator Pressindo, 1995.
- Sastrodiwongso Teguh, Ir. Mse. *Propulsi Kapal*. Jakarta : Fakultas Teknologi Kelautan-Unsada, Jakarta, 1992.
- Soekarsono N.A. *Teori Bangunan Kapal*. Fakultas Teknologi Kelautan, Unsada, Jakarta, 1986.
- T. O'brien , *The Design Of Marine Screw Propeller*)
- Van Lammern W. P. A , Dr.Ir. “*Resistance Propulsion and Steering of Ship*”)

Perhitungan Torsi Main Engine degan Torsi Gear Box

$$\text{Torque} = 5252 \times \frac{\text{hp}}{\text{rpm}} (\text{Lb.ft})$$

(www.engineeringtoolbox.com)

1. Perhitungan torsi main engine

Diketahui :

$$\text{Hp}_{(\text{main engine})} = 1920 \text{ hp}$$

$$\text{Rpm}_{(\text{main engine})} = 250 \text{ rpm}$$

Ditanya : torsi....?

$$\text{Jawab : } T = 5252 \times \frac{\text{Hp}}{\text{rpm}} (\text{lb.ft})$$

$$T = 5252 \times \frac{1920}{250} (\text{lb.ft})$$

$$T = 40.335 \text{ lb.ft}$$

2. Perhitungan torsi gear box

Diketahui :

$$\text{Hp}_{(\text{gear box})} = 5124 \text{ hp}$$

$$\text{Rpm}_{(\text{gear box})} = 600 \text{ rpm}$$

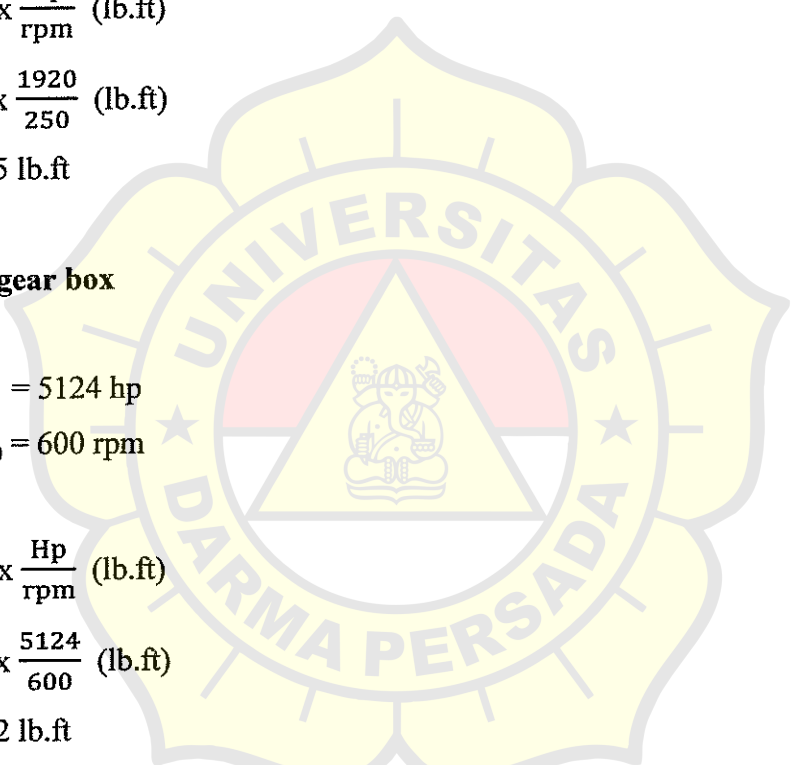
Ditanya : torsi....?

$$\text{Jawab : } T = 5252 \times \frac{\text{Hp}}{\text{rpm}} (\text{lb.ft})$$

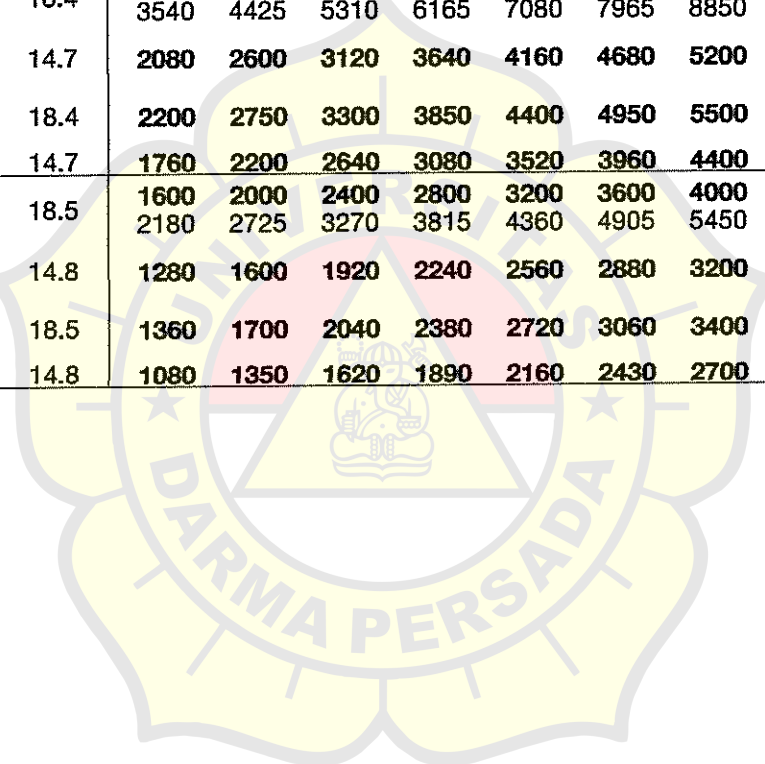
$$T = 5252 \times \frac{5124}{600} (\text{lb.ft})$$

$$T = 44.852 \text{ lb.ft}$$

Kesimpulan : Maka didapat torsi main engine lebih kecil dari pada torsi gear box maka perhitungan memenuhi syarat.



Engine type	Layout point	Engine speed r/min	Mean effective pressure bar	Power KW BHP								
				Number of cylinders								
				4	5	6	7	8	9	10	11	12
S35MC Bore 350 mm Stroke 1400 mm	L ₁	173	19.1	2960 4040	3700 5050	4440 6060	5180 7070	5920 8080	6660 9090	7400 10100	8140 11110	8880 12120
	L ₂	173	15.3	2380	2975	3570	4165	4760	5355	5950	6545	7140
	L ₃	147	19.1	2520	3150	3780	4410	5040	5670	6300	6930	7560
	L ₄	147	15.3	2020	2525	3030	3535	4040	4545	5050	5555	6060
L35MC Bore 350 mm Stroke 1050 mm	L ₁	210	18.4	2600 3540	3250 4425	3900 5310	4550 6165	5200 7080	5850 7965	6500 8850	7150 9735	7800 10620
	L ₂	210	14.7	2080	2600	3120	3640	4160	4680	5200	5720	6240
	L ₃	178	18.4	2200	2750	3300	3850	4400	4950	5500	6050	6600
	L ₄	178	14.7	1760	2200	2640	3080	3520	3960	4400	4840	5280
S26MC Bore 260 mm Stroke 980 mm	L ₁	250	18.5	1600 2180	2000 2725	2400 3270	2800 3815	3200 4360	3600 4905	4000 5450	4400 5995	4800 6540
	L ₂	250	14.8	1280	1600	1920	2240	2560	2880	3200	3520	3840
	L ₃	212	18.5	1360	1700	2040	2380	2720	3060	3400	3740	4080
	L ₄	212	14.8	1080	1350	1620	1890	2160	2430	2700	2970	3240



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Fig. 1.03f: Power and speed

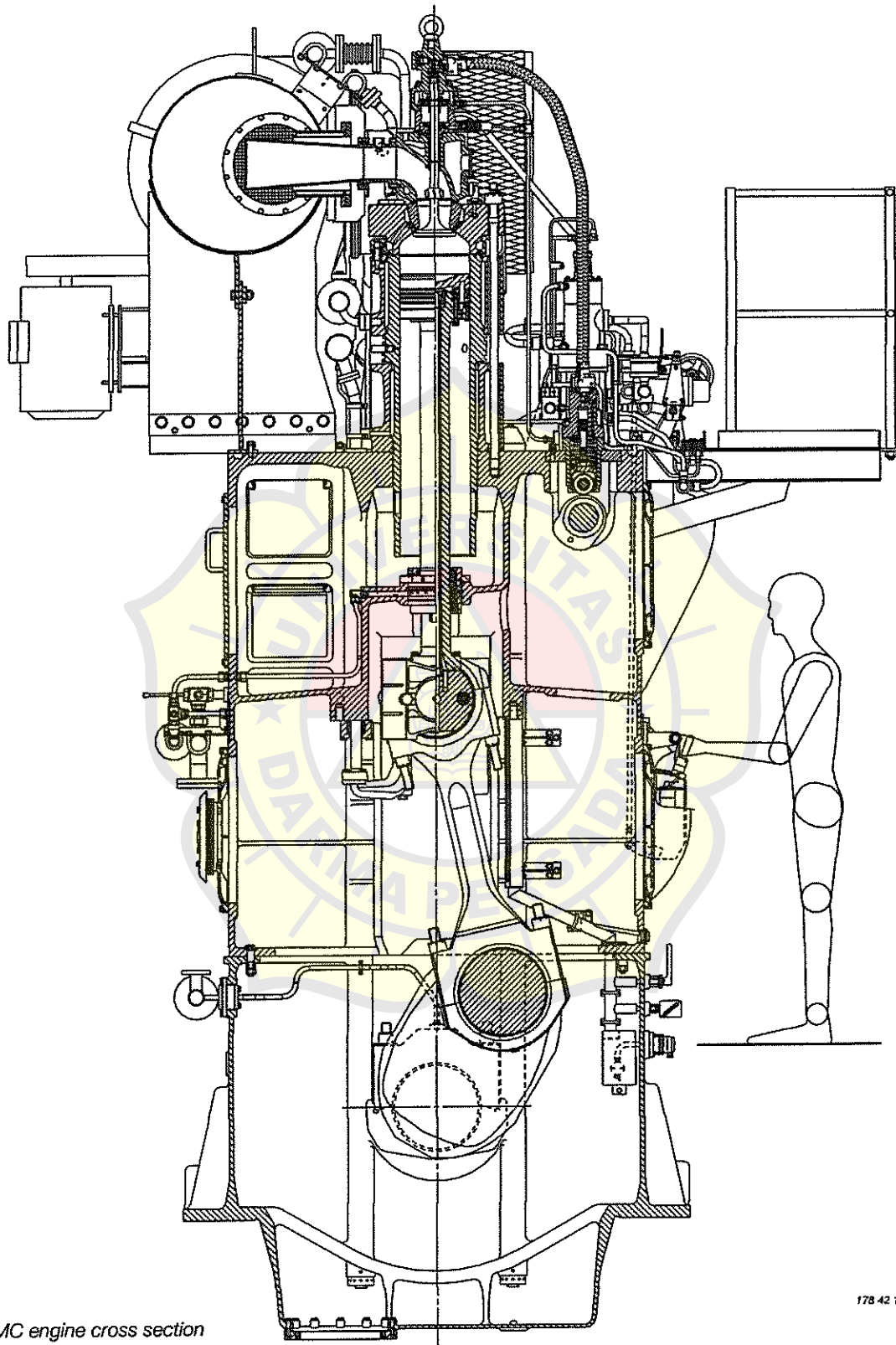


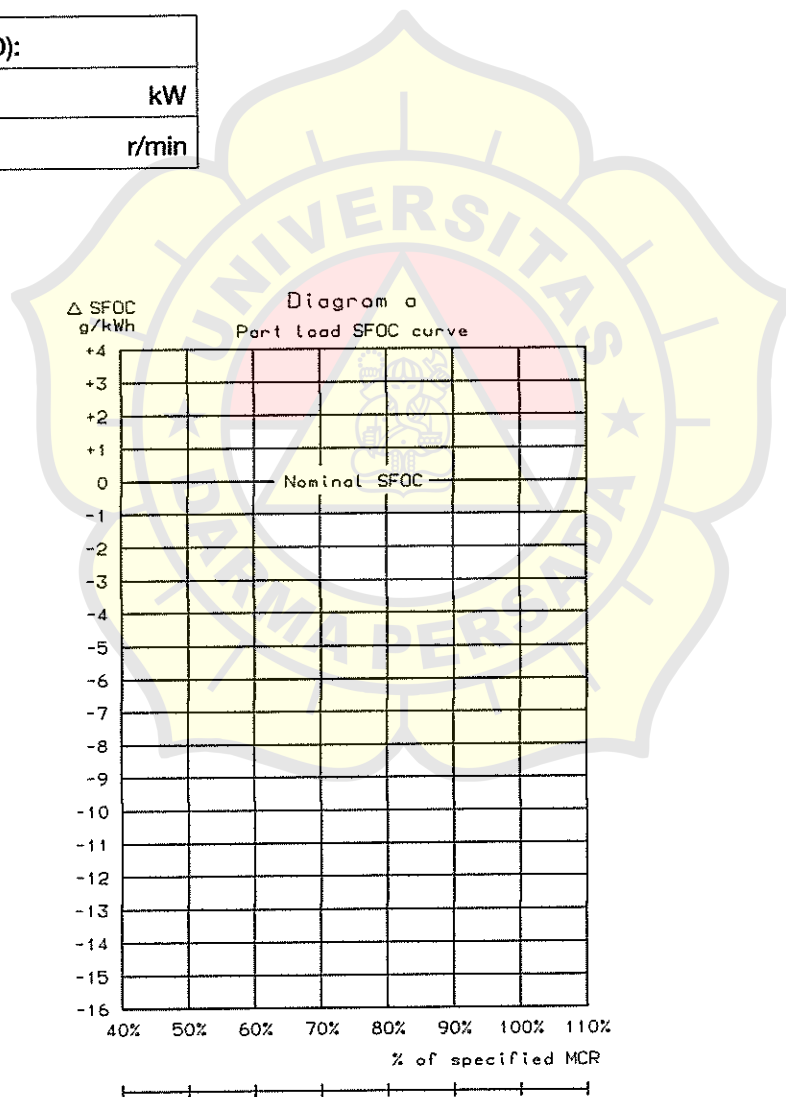
Fig. 1.12: S26MC engine cross section

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Data at nominal MCR (L ₁)				SFOC at nominal MCR (L ₁)
Engine	kW/cyl.	BHP/cyl.	r/min	g/kWh
4-8S46MC-C	1310	1785	129	174
4-12S42MC	1080	1470	136	177
4-12L42MC	995	1355	176	177
4-12S35MC	740	1010	173	178
4-12L35MC	650	885	210	177
4-12S26MC	400	545	250	179

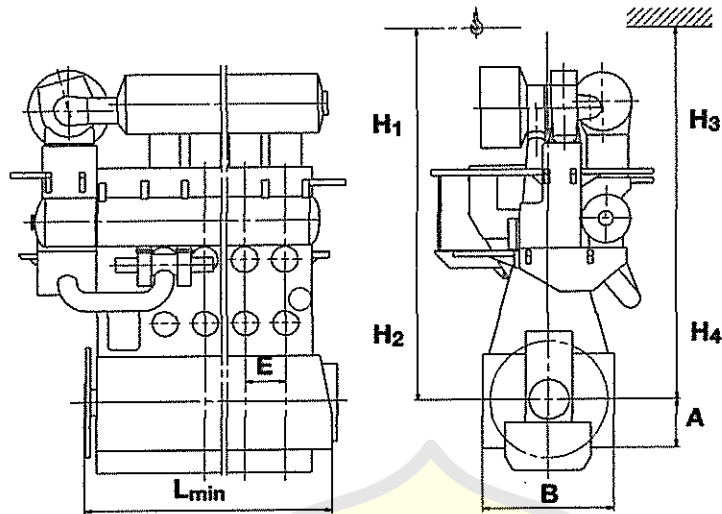
Data optimising point (O):	
Power: 100% of (O)	kW
Speed: 100% of (O)	r/min

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Fig. 2.20a: SFOC for S46MC-C, S42MC, L42MC, S35MC, L35MC and S26MC



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	S50MC-C	S50MC	L50MC	S46MC-C	S42MC	L42MC	S35MC	L35MC	S26MC
Dimensions in mm									
A	1085	1085	944	986	900	690	650	550	420
B	3150	2950	2710	2924	2670	2460	2200	1980	1880
E	850	890	890	782	748	748	600	600	490
H1	8950	8800	7825	8600	8050	6700	6425	5200	4825
H2	8375	8250	7325	8075	7525	6250	6050	4850	4725
H3	8150	8100	7400	7850	7300	6350	5925	5025	4525
H4							5850	4825	4500
Lmin									
4 cyl.	4695	5280	5280	4317	4198	4406	3520	3485	2970
5 cyl.	5542	6170	6170	5099	4946	5154	4120	4085	3460
6 cyl.	6392	7060	7060	5881	5694	5902	4720	4685	3950
7 cyl.	7242	7950	7950	6663	6442	6650	5320	5285	4440
8 cyl.	8092	8840	8840	7445	7190	7398	5920	5885	4930
9 cyl.					7938	8146	6520	6485	5420
10 cyl.					9434	9642	7720	7685	6400
11 cyl.					10182	10390	8320	8285	6890
12 cyl.					10930	11138	8920	8885	7380
Dry masses in tons									
4 cyl.	155	171	163	133	109	95	57	50	32
5 cyl.	181	195	188	153	125	110	65	58	37
6 cyl.	207	225	215	171	143	125	75	67	42
7 cyl.	238	255	249	197	160	143	84	75	48
8 cyl.	273	288	276	217	176	158	93	83	53
9 cyl.					195	176	103	92	58
10 cyl.					232	210	119	111	68
11 cyl.					249	229	133	120	74
12 cyl.					269	244	144	128	79

The distances H₁ and H₂ are from the centre of the crankshaft to the crane hook. The distances H₃ and H₄ for the double jib crane are from the centre of the crankshaft to the lower edge of the deck beam.

E - Cylinder distance H₁ - Vertical lift H₂ - Tilted lift H₃ - Electrical double jib crane H₄ Manual double jib crane

Fig. 5.01.01c: Space requirements and masses

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S26MC

		Cyl.	4	5	6	7	8	9	10	11	12	
Nominal MCR at 250 r/min		kW	1600	2000	2400	2800	3200	3600	4000	4400	4800	
Pumps	Fuel oil circulating pump	m ³ /h	1.5	1.8	2.0	2.4	2.7	3.0	3.3	3.6	3.9	
	Fuel oil supply pump	m ³ /h	0.4	0.5	0.6	0.7	0.8	0.9	1.1	1.2	1.3	
	Jacket cooling water pump	m ³ /h	1)	16	20	24	28	32	36	40	44	48
			2)	16	20	24	28	32	36	40	44	48
			3)	24	28	25	29	49	53	55	47	51
			4)	16	20	24	28	32	36	40	44	48
	Seawater cooling pump*	m ³ /h	1)	72	89	110	125	145	160	180	195	215
			2)	73	90	110	125	145	160	180	195	215
			3)	75	92	110	125	150	165	185	195	210
			4)	72	89	110	125	140	160	180	195	210
	Lubricating oil pump*	m ³ /h	1)	360	450	540	630	720	810	900	990	1090
			2)	365	455	540	630	720	810	910	1000	1090
3)			360	450	540	630	720	810	900	990	1080	
4)			360	450	540	630	720	810	900	990	1080	
Coolers	Scavenge air cooler	kW	570	710	850	990	1130	1270	1420	1560	1700	
	Heat dissipation approx.											
	Seawater	m ³ /h	45	56	68	79	90	101	112	123	134	
	Lubricating oil cooler	kW	1)	220	275	340	390	460	510	550	600	680
			2)	230	290	340	390	450	500	580	630	680
			3)	200	250	300	350	400	450	500	550	600
			4)	225	275	325	375	425	475	550	600	650
	Lubricating oil*	m ³ /h	See above 'Main lubricating oil pump'									
	Seawater	m ³ /h	1)	27	33	42	46	55	59	68	72	81
			2)	28	34	42	46	55	59	68	72	81
			3)	30	36	42	46	60	64	73	72	76
			4)	27	33	42	46	50	59	68	72	76
	Jacket water cooler	kW	1)	310	385	460	540	620	690	770	850	920
			2)	310	385	460	540	620	690	770	850	920
			3)	395	470	485	560	810	880	940	890	970
4)			310	385	460	540	620	690	770	850	920	
Jacket cooling water	m ³ /h	See above 'Jacket cooling water pump'										
Seawater	m ³ /h	See above 'Seawater quantity' for lube oil cooler										
Fuel oil heater	kW	39	47	52	63	71	79	87	94	100		
Exhaust gas flow at 265 °C**	kg/h	12400	15500	18600	21700	24800	27900	31000	34100	37200		
Air consumption of engine	kg/s	3.4	4.2	5.0	5.9	6.7	7.6	8.4	9.3	10.1		

- * For main engine arrangements with built-on power take off (PTO) of an MAN B&W recommended type and/or torsional vibration damper the engine's capacities must be increased by those stated for the actual system
** The exhaust gas amount and temperature must be adjusted according to the actual plant specification

- 1) Engines with MAN B&W turbochargers 3) Engines with ABB turbochargers, type VTR
2) Engines with ABB turbochargers, type TPL 4) Engines with Mitsubishi turbochargers

178 42 72-8.2

Fig. 6.01.07i: List of capacities, S26MC with **conventional turbocharger** and **seawater system** stated at the nominal MCR power (L₁) for engines complying with IMO's NO_x emission limitations

No. of cyl.	4	5	6	7	8	9	10	11	12
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Firing order	1-3-2-4	1-4-3-2-5	1-5-3-4-2-6	1-7-2-5-4-3-6	1-8-3-4-7-2-5-6	1-9-2-5-7-3-6-4-8	1-8-5-7-2-9-4-6-3-10	Uneven	1-8-12-4-2-9-10-5-3-7-11-6
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External forces in kN

	0	0	0	0	0	0	0	0	0
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External moments in kNm

Order:									
1st a	57 b	18	0	11	36	34	21	23	0
2nd	147	183	127	37	0	54	27	31	0
4th	0	1	7	19	8	28	6	15	13

Guide force H-moments in kNm

Order:									
1st	0	0	0	0	0	0	0	0	0
2nd	0	0	0	0	0	0	0	0	0
3rd	0	0	0	0	0	0	0	12	0
4th	87	0	0	0	0	0	0	29	0
5th	0	89	0	0	0	0	0	15	0
6th	0	0	70	0	0	0	0	17	0
7th	0	0	0	57	0	0	0	26	0
8th	21	0	0	0	42	0	0	21	0
9th	0	0	0	0	0	28	0	2	0
10th	0	10	0	0	0	0	21	4	0
11th	0	0	0	0	0	0	0	8	0
12th	3	0	4	0	0	0	0	2	8

Guide force X-moments in kNm

Order:									
1st	31	10	0	6	19	18	11	12	0
2nd	7	8	6	2	0	2	1	1	0
3rd	6	20	36	40	51	30	38	91	114
4th	0	4	33	93	38	137	29	75	65
5th	11	0	0	8	97	112	193	68	0
6th	20	2	0	1	0	39	16	6	0
7th	5	18	0	0	3	5	33	6	0
8th	0	11	8	1	0	2	2	42	16
9th	2	1	12	1	1	0	1	7	39
10th	4	0	3	9	0	1	0	6	0
11th	1	0	0	5	7	1	0	8	0
12th	0	1	0	0	1	2	0	2	0

- a) 1st order moments are, as standard, balanced so as to obtain equal values for horizontal and vertical moments for all cylinder numbers.
- b) By means of the adjustable counterweights on 4-cylinder engines, 70% of the 1st order moment can be moved from horizontal to vertical direction or vice versa, if required.

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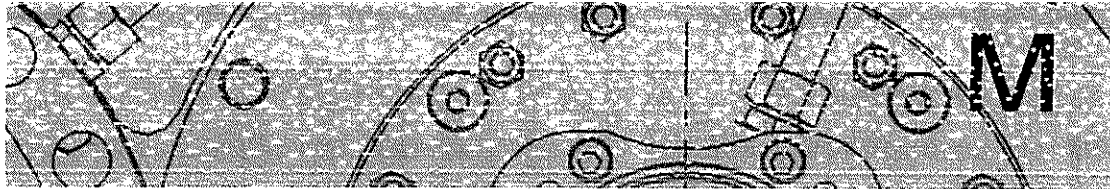
Fig. 7.09.27: External forces and moments in layout point L₁ for S26MC

Medium Duty

Single Speed

MODEL	RATIOS	POWER/RPM	
		kW	hp
ZF 30340 SGD ^{10 11}	2.500, 5.300	2.5496	3.4191
	5.700	2.3067	3.0933
ZF 30350 SG ¹¹	2.100, 4.600	2.9390	3.9412
	4.900	2.6590	3.5657
ZF 30350 SGD ^{10 11}	2.100, 4.600	2.9390	3.9412
	4.900	2.6590	3.5657
ZF 40060 NR2	1.514*, 1.735, 1.906	4.2304	5.6730
ZF 40060 NR2B	1.514*, 1.735, 1.906	4.2304	5.6730
ZF 40060 NR2H	1.514*, 1.735, 1.906	4.2304	5.6730
ZF 40350 SG ¹¹	1.800, 3.900	3.4689	4.6519
	4.200	3.1384	4.2087
ZF 40350 SGD ^{10 11}	1.800, 3.900	3.4689	4.6519
	4.200	3.1384	4.2087
ZF 40360 SG ¹¹	1.500, 3.100	4.3129	5.7837
	3.400	3.9019	5.2325
ZF 40360 SGD ^{10 11}	1.500, 3.100	4.3129	5.7837
	3.400	3.9019	5.2325
ZF 43700 NR2	2.516, 3.037, 3.500, 3.739	5.2000	6.9733
	3.909	5.0125	6.7218
	4.478	4.6148	6.1885
	4.684	4.4238	5.9324
	4.952	4.1739	5.5973
	5.579	3.2890	4.4106
	5.950	2.8460	3.8165
ZF 53000 NR2B	1.487, 1.694, 1.771, 1.853, 1.912, 2.129 2.464	5.5497	7.4423
ZF 53000 NR2H	1.487, 1.694, 1.771, 1.853, 1.912, 2.129 2.464	5.5497	7.4423
ZF 53500 NR2H	1.487, 1.694, 1.771, 1.853, 1.912, 2.129 2.464	7.3298	9.8295

* Special Order Ratio.

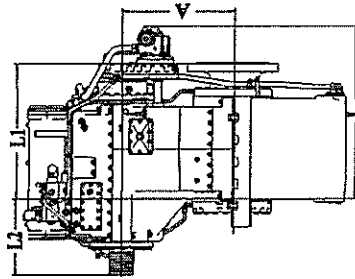
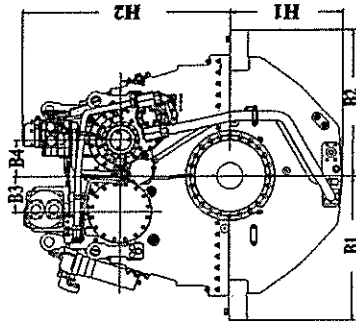


INPUT POWER CAPACITY						MAX RPM	WEIGHT		BELL HSGS. AND NOTES
kW	hp	kW	hp	kW	hp		kg	lb	
1200 rpm		1400 rpm		1810 rpm					
3060	4103	3569	4787	4615	6189	1810	4575	10065	
2768	3712	3229	4331	4175	5599	1810			
1100 rpm		1300 rpm		1570 rpm					
3233	4335	3821	5124	4614	6188	1570	4575	10065	
2925	3922	3457	4635	4175	5598	1570			
3233	4335	3821	5124	4614	6188	1570	4575	10065	
2925	3922	3457	4635	4175	5598	1570			
1600 rpm		1800 rpm		2000 rpm					
6769	9077	7615	10211	8461	11346	2300	1650	3630	
6769	9077	7615	10211	8461	11346	2300	1650	3630	
6769	9077	7615	10211	8461	11346	2300	1620	3564	
900 rpm		1100 rpm		1330 rpm					
3122	4187	3816	5117	4614	6187	1330	4625	10175	
2825	3788	3452	4630	4174	5598	1330			
3122	4187	3816	5117	4614	6187	1330	4625	10175	
2825	3788	3452	4630	4174	5598	1330			
800 rpm		900 rpm		1080 rpm					
3450	4627	3882	5205	4658	6246	1080	4625	10175	
3122	4186	3512	4709	4214	5651	1080			
3450	4627	3882	5205	4658	6246	1080	4625	10175	
3122	4186	3512	4709	4214	5651	1080			
1000 rpm		1150 rpm		1300 rpm					
5200	6973	5980	8019	6760	9065	1350	9300	20460	
5012	6722	5764	7730	6516	8738	1350			
4615	6189	5307	7117	5999	8045	1350			
4424	5932	5087	6822	5751	7712	1350			
4174	5597	4800	6437	5426	7277	1350			
3289	4411	3782	5072	4276	5734	1350			
2846	3817	3273	4389	3700	4961	1350			
750 rpm		1000 rpm		1200 rpm					
4162	5582	5550	7442	6660	8931	1350	3900	8580	
4162	5582	5550	7442	6660	8931	1350	3750	8250	
5497	7372	7330	9829	8796	11795	1350	3825	8415	

¹⁰ Left and Right version available.

¹¹ PTI also available (Hybrid).

Dragline, Crawler, Hydraulic, Mounted (ZF 3050 D to ZF 40360 D)



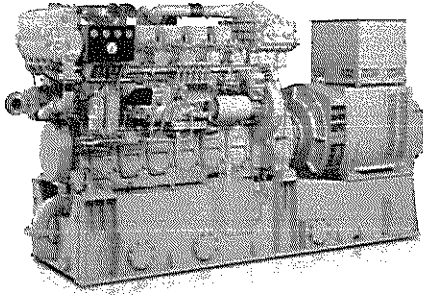
MODEL	mm (inches)											Weight kg (lb)	Oil I ¹ l (US qt)
	A	B ₁	B ₂	B ₃	B ₄	H ₁	H ₂	L	L ₁	L ₂			
ZF 3050 D	140 (5.52)	365 (14.4)	365 (14.4)	213 (8.39)	213 (8.39)	250 (9.84)	593 (23.4)	670 (26.4)	485 (19.1)	132 (5.20)	482 (1062)	31.0 (32.9)	
ZF 3055 D	140 (5.52)	365 (14.4)	365 (14.4)	213 (8.39)	213 (8.39)	250 (9.84)	593 (23.4)	670 (26.4)	485 (19.1)	132 (5.20)	482 (1062)	31.0 (32.9)	
ZF 3060 D	140 (5.52)	365 (14.4)	365 (14.4)	-	-	250 (9.84)	593 (23.4)	670 (26.4)	485 (19.1)	132 (5.20)	482 (1062)	31.0 (32.9)	
ZF 23560 D	441 (17.4)	592 (23.3)	592 (23.3)	213 (8.39)	213 (8.39)	440 (17.3)	1113 (43.8)	1217 (47.9)	934 (26.7)	231 (9.10)	2140 (4713)	180 (191)	
ZF 24320 SGD	254 (10.0)	890 (35.1)	890 (35.1)	440 (17.3)	-	690 (27.2)	1288 (50.7)	1073 (42.2)	845 (33.3)	750 (29.5)	4500 (9821)	200 (212)	
ZF 24340 D	675 (26.6)	890 (35.1)	890 (35.1)	220 (8.70)	220 (8.70)	690 (27.2)	1288 (50.7)	1073 (42.2)	845 (33.3)	448 (17.6)	3870 (8532)	200 (212)	
ZF 24340 SGD	254 (10.0)	890 (35.1)	890 (35.1)	440 (17.3)	-	690 (27.2)	1288 (50.7)	1073 (42.2)	845 (33.3)	750 (29.5)	4500 (9821)	200 (212)	
ZF 24350 D	675 (26.6)	890 (35.1)	890 (35.1)	220 (8.70)	220 (8.70)	690 (27.2)	1288 (50.7)	1073 (42.2)	845 (33.3)	448 (17.6)	3870 (8532)	200 (212)	
ZF 24350 SGD	254 (10.0)	890 (35.1)	890 (35.1)	440 (17.3)	-	690 (27.2)	1288 (50.7)	1073 (42.2)	845 (33.3)	750 (29.5)	4500 (9821)	200 (212)	
ZF 24355 D	675 (26.6)	890 (35.1)	890 (35.1)	220 (8.70)	220 (8.70)	690 (27.2)	1288 (50.7)	1073 (42.2)	845 (33.3)	448 (17.6)	3870 (8532)	200 (212)	
ZF 24355 SGD	254 (10.0)	890 (35.1)	890 (35.1)	440 (17.3)	-	690 (27.2)	1288 (50.7)	1073 (42.2)	845 (33.3)	750 (29.5)	4500 (9821)	200 (212)	
ZF 24360 D	675 (26.6)	890 (35.1)	890 (35.1)	220 (8.70)	220 (8.70)	690 (27.2)	1288 (50.7)	1073 (42.2)	845 (33.3)	448 (17.6)	3870 (8532)	200 (212)	
ZF 24360 SGD	254 (10.0)	890 (35.1)	890 (35.1)	440 (17.3)	-	690 (27.2)	1288 (50.7)	1073 (42.2)	845 (33.3)	750 (29.5)	4500 (9821)	200 (212)	
ZF 30340 SGD	254 (10.0)	890 (35.1)	890 (35.1)	440 (17.3)	-	690 (27.2)	1288 (50.7)	1073 (42.2)	845 (33.3)	750 (29.5)	4575 (10086)	200 (212)	
ZF 30350 SGD	254 (10.0)	890 (35.1)	890 (35.1)	440 (17.3)	-	690 (27.2)	1288 (50.7)	1073 (42.2)	845 (33.3)	750 (29.5)	4575 (10086)	200 (212)	
ZF 40350 SGD	254 (10.0)	890 (35.1)	890 (35.1)	440 (17.3)	-	690 (27.2)	1288 (50.7)	1073 (42.2)	845 (33.3)	750 (29.5)	4625 (10186)	200 (212)	
ZF 40360 SGD	254 (10.0)	890 (35.1)	890 (35.1)	440 (17.3)	-	690 (27.2)	1288 (50.7)	1073 (42.2)	845 (33.3)	750 (29.5)	4625 (10186)	200 (212)	

Diesel Engine Generator Set

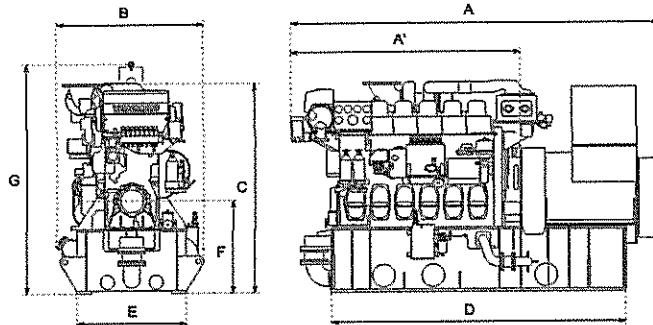
6NY16LW

Generator Capacity

~250kWe(50Hz) / ~320kWe(60Hz)



Dimensions



G : Minimum Height for Removing Piston

Depending on the specifications or options that have been chosen, your model may differ slightly from the one in the photograph and outline.

Specifications

Model			6NY16L-SW	6NY16L-UW
Frequency			50Hz	60Hz
Generator	Rated Output	kWe	250	320
	Type		3-Phase Brushless	
	Voltage	V	200-480	200-6600
	No. of Poles	P	6	
	Power Factor	%	80 (lagging)	
Diesel Engine	Rated Output	kW(HP)	279 (374)	353 (473)
	Type		Vertical, Water-cooled, 4-stroke Diesel	
	No. of Cylinders		6	
	Bore X Stroke	mm	160 X 200	
	Rated Speed	min ⁻¹	1000	1200
Total Weight (Gen.Set)		kg	5500	

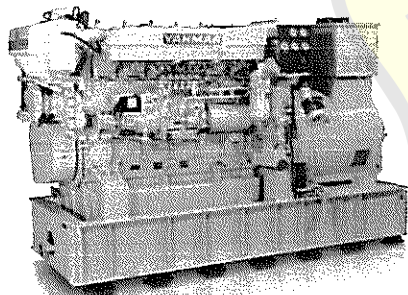
* The rated output is based on the "Prime Power" rating. * The rated output of generator is based on the bylaw of generator efficiency in JEM1355.
 * The dry weight value is for reference only. The value can vary depending on the generator manufacturer, equipment specifications, accessories, etc.
 * Specifications are subject to change without notice for incorporation of improvements.

Diesel Engine Generator Set

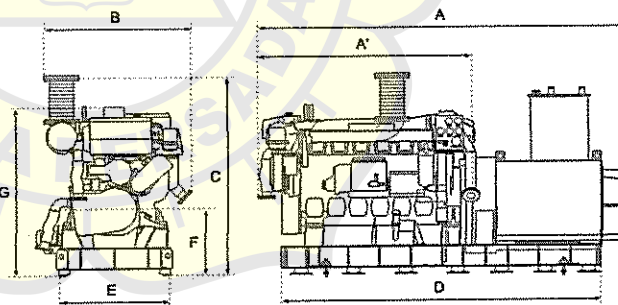
AY20L-ET

Generator Capacity

~500kWe(50Hz) / ~520kWe(60Hz)



Dimensions



G : Minimum Height for Removing Piston (Not included the dimension for bolt fitting to piston remove.)

Depending on the specifications or options that have been chosen, your model may differ slightly from the one in the photograph and outline.

Specifications

Model			AY20L-ET	
Frequency			50Hz	60Hz
Generator	Rated Output	kWe	500	520
	Type		3-Phase Brushless	
	Voltage	V	200-6600	
	No. of Poles	P	4	
	Power Factor	%	80 (lagging)	
Diesel Engine	Rated Output	kW(HP)	544 (730)	565 (758)
	Type		Vertical, Water-cooled, 4-stroke Diesel	
	No. of Cylinders		6	
	Bore X Stroke	mm	155 X 180	
	Rated Speed	min ⁻¹	1500	1800
Total Weight (Gen.Set)		kg	4750	

* The rated output is based on the "Prime Power" rating. * The rated output of generator is based on the bylaw of generator efficiency in JEM1355.
 * The dry weight value is for reference only. The value can vary depending on the generator manufacturer, equipment specifications, accessories, etc.
 * Specifications are subject to change without notice for incorporation of improvements.

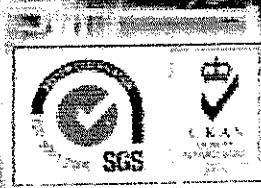


TECO

Three-phase Low Voltage Squirrel Cage Motors

V-SERIES

Totally-Enclosed Fan-cooled with IP 55 Enclosure
Aluminium Frame (63-132M) AEAUVUK / AEGVUK
Cast Iron Frame (80-355L) AEEVUK / AEUVUK
Class F Insulation with Class B Temperature Rise
Comply with CEMEP/EC EFF2 Efficiency
IEC Dimension



Performance Data

4 Poles 50 Hz, Synchronous Speed 1500 rpm, Class F insulation, S1 (MCR) Duty, Efficiency Class EFF2

4 Pole Performance Data

Output		Full Load Speed (RPM)	Frame Size	% Efficiency			% Power Factor			Full-load Current			LRC FLC (%)	Torque			Rotor GD ² (Kgmm ²)	Cast Iron frame motor Wt (Kg)	Al frame motor Wt (Kg)
KW	(HP)			Full Load	75% Load	50% Load	Full Load	75% Load	50% Load	380V	400V	415V		FLT	LRT FLT (%)	BDT FLT (%)			
0.12	0.16	1320	63M	57	57.5	53.5	72	62.5	49	0.44	0.42	0.41	440	0.088	210	220	0.001	---	4.8
0.18	0.25	1320	63M	60	61	57.5	73	63.5	50	0.62	0.59	0.57	440	0.133	210	220	0.002	---	5
0.25	0.33	1350	71M	65	65	61.5	74	63.5	49	0.79	0.75	0.72	520	0.18	210	220	0.003	---	6.3
0.37	0.50	1340	71M	67	68	64.5	75	65	49.5	1.12	1.06	1.03	520	0.269	210	220	0.003	---	6.5
0.55	0.75	1390	80M	71	71.5	68	75	65.5	50.5	1.57	1.49	1.44	520	0.385	240	230	0.005	15	9.5
0.75	1	1380	80M	74.5	75	73	76	66.5	52	2.01	1.91	1.85	600	0.529	230	230	0.007	16	10
1.1	1.5	1395	90S	76.2	76.5	74	77	68	52.5	2.85	2.71	2.61	600	0.767	230	230	0.009	22	11
1.5	2	1390	90L	78.5	79.5	78	79	70	55.5	3.67	3.5	3.37	600	1.05	230	230	0.013	27	15.5
2.2	3	1410	100L	81	82	80.5	81	73.5	59.5	5.09	4.85	4.67	700	1.518	230	230	0.024	34	20
3	4	1410	100L	82.6	83.5	83	82	75.5	62.5	6.73	6.4	6.17	700	2.07	230	230	0.032	35	23.5
4	5.5	1435	112M	84.2	85	84	82	75.5	62	8.8	8.37	8.07	700	2.712	230	230	0.052	44	30
5.5	7.5	1440	132S	85.7	86	85	83	78	68	11.7	11.2	10.8	700	3.716	230	230	0.106	61	40
7.5	10	1440	132M	87	87.5	86.5	84	79.5	69.5	15.6	14.8	14.3	700	5.068	230	230	0.146	73	51
11	15	1460	160M	88.5	89.5	89	85.5	80.5	69.5	22.1	21	20.2	700	7.331	220	290	0.332	113	---
15	20	1465	160L	90.3	90.5	90	85.5	80.5	70	29.5	28	27	750	9.962	220	310	0.442	133	---
18.5	25	1470	180M	90.7	91	90	86	81.5	71	36	34.2	33	750	12.25	220	260	0.607	167	---
22	30	1470	180L	91.5	91.5	90.5	86	81.5	71	42.5	40.4	38.9	750	14.56	220	270	0.679	181	---
30	40	1475	200L	92	92	91.5	87	83	74	56.9	54.1	52.1	720	19.79	220	260	1.111	232	---
37	50	1480	225S	92.7	92.5	92	87.5	84.5	76.5	69.3	65.8	63.5	720	24.33	220	230	1.911	287	---
45	60	1480	225M	93.3	93	92.5	87.5	84	75.5	83.7	79.6	76.7	720	29.58	220	250	2.335	322	---
55	75	1480	250M	93.3	93	92.5	87.5	84.5	76.5	102	97.2	93.7	720	36.16	220	230	2.755	385	---
75	100	1485	280S	93.6	93.5	92.5	88.5	86.5	80	138	131	126	720	49.14	220	230	5.123	510	---
90	125	1485	280M	94.4	94	93	88	85	76.5	165	156	151	720	58.97	220	260	6.433	600	---
110	150	1485	315S	94.7	94.5	93.5	89.5	87.5	81.5	197	187	181	690	72.07	210	220	12.412	930	---
132	175	1485	315M	94.8	94.5	94	89.5	87.5	81	236	225	216	690	86.49	210	220	13.963	1010	---
160	215	1485	315L	95	94.5	94	90	88.5	83.5	284	270	260	690	104.8	210	230	16.401	1070	---
200	268	1485	315L	95.2	95	94.5	90	89	84	355	337	325	690	131	210	220	19.282	1170	---
250	335	1490	355M	95.5	95	94.5	91	90	86	437	415	400	690	163.3	210	220	31.752	1720	---
315	422	1490	355L	95.8	95.5	94.5	91.5	91	87.5	546	519	500	690	205.7	210	220	39.311	1870	---

Note:

FLC = full-load current, LRC = locked rotor current,

FLT = full-load torque, LRT = locked rotor torque, BDT = breakdown torque or pull-out torque

Tests and performance tolerances are in accordance with EN60034

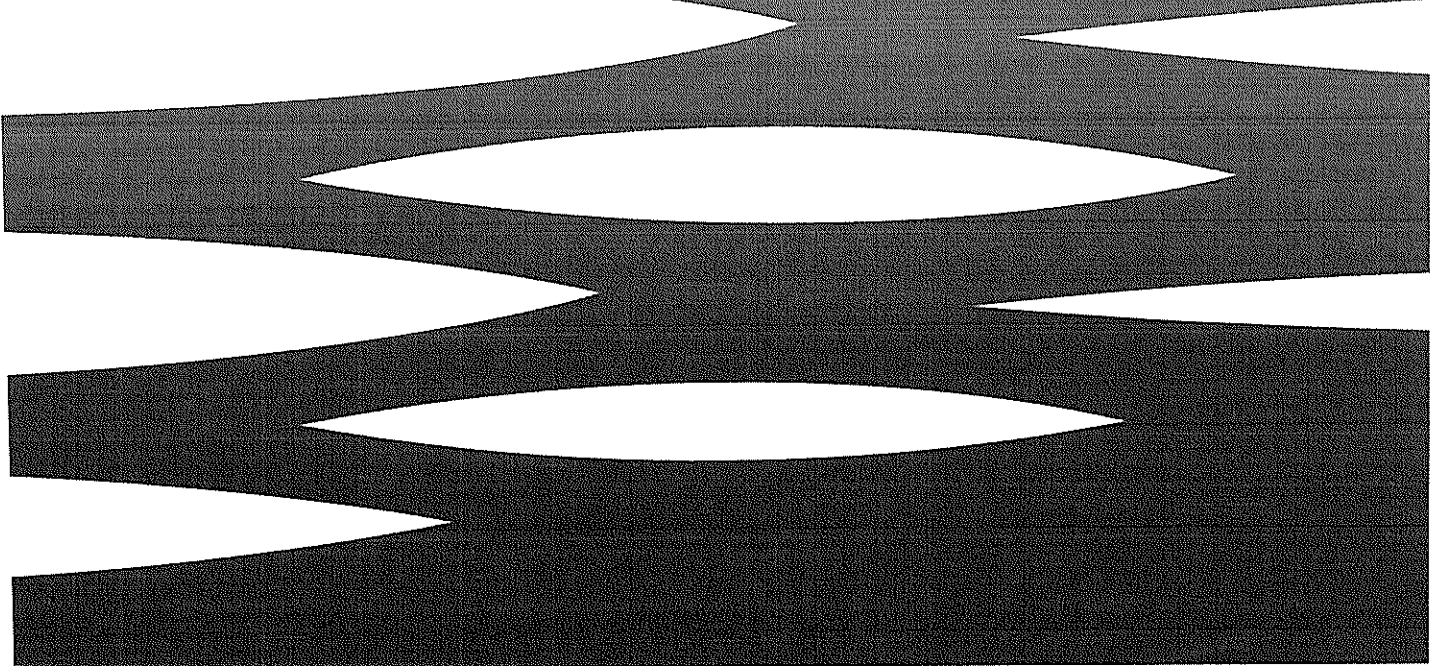
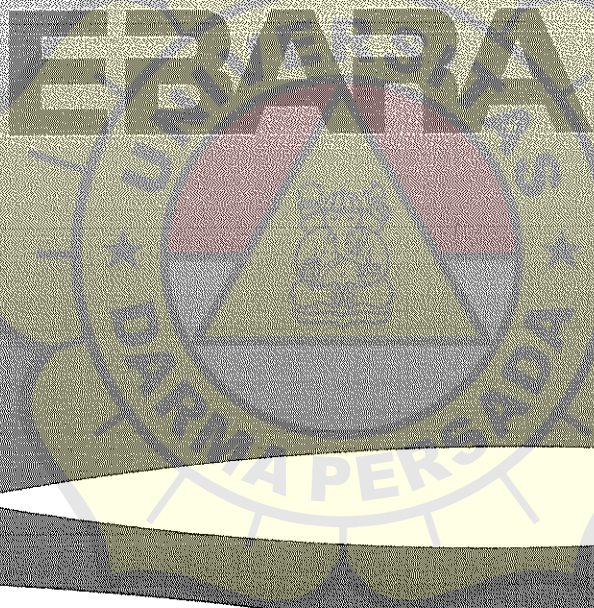
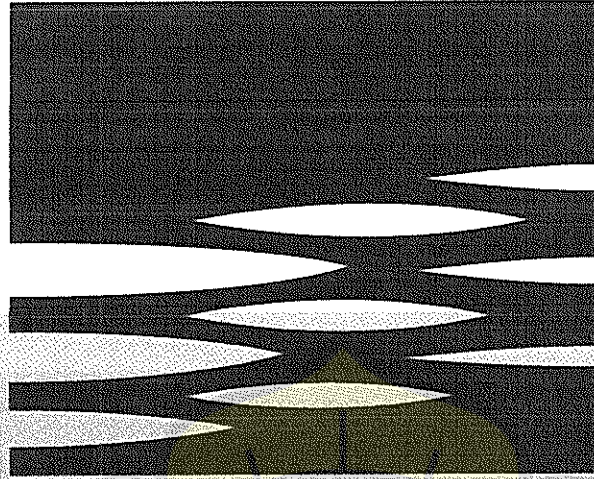
To obtain the ampere values of 220V 50Hz, multiply the 380 volt values by the factor of 1.73

Aluminium frame motors ABAVUK (foot-mounted), AEGVUK (flange-mounted) and ABAVUP (Foot and flange mounting) are up to frame size 132M only

Cast iron frame motors (Model AEEVUK, AEUVUK and AEEVUP) are from frame size 80 through 355L

Weights shown above are for foot-mounted motor.

Data is subject to change without prior notification.



SELECTION CHART

50 Hz

Rev. H

3 SERIES: 32, 40, 50 VERSION

Pump type	kW	HP	Flow rate (m³/h)															
			0	100	150	200	300	333	360	400	450	500	600	700	800	1000	1200	
32-125/1.1(M) *	1.1	1.5	22.5	21	19.9	18.4	14.1	12	-	-	-	-	-	-	-	-		
32-160/1.5(M) *	1.5	2	29.5	28	26.5	24.5	19.2	17	-	-	-	-	-	-	-	-		
32-160/2.2(M) *	2.2	3	37	35.5	34	32	27	25	-	-	-	-	-	-	-	-		
32-200/3.0	3	4	44	42	40	37.5	31	28	-	-	-	-	-	-	-	-		
32-200/4.0	4	5.5	55	53.5	52	49.5	43.5	40.5	38	-	-	-	-	-	-	-		
32-200/5.5	5.5	7.5	70.5	69	67.5	65	58.5	-	-	-	-	-	-	-	-	-		
32-200/7.5	7.5	10	70.5	69	67.5	65	58.5	55.5	53	49	44	-	-	-	-	-		
40-125/1.5(M) *	1.5	2	20	-	-	19	17.6	17	16.5	15.7	14.5	13.2	10.3	7	-	-		
40-125/2.2(M) *	2.2	3	26.5	-	-	25.6	24	23.5	23	22	21	19.5	16.4	13	-	-		
40-160/3.0	3	4	31	-	-	29.5	27.5	27	26.6	25.5	24	22.5	20	17	-	-		
40-160/4.0	4	5.5	40	-	-	38.5	37	36	35.5	34.5	33	32	29	25.5	-	-		
40-200/5.5	5.5	7.5	47	-	-	45.5	44	43	42.5	41	39.5	38	35	31	-	-		
40-200/7.5	7.5	10	58	-	-	57	55.5	55	54.5	53.5	52.5	51	47.5	44	-	-		
40-200/11	11	15	72	-	-	71	70	70	69.5	68.5	67.5	66	63	59	-	-		
50-125/2.2(M) *	2.2	3	19	-	-	-	-	-	17.5	17	16.3	14.9	13.4	11.7	8	-		
50-125/3.0	3	4	22	-	-	-	-	-	20.5	20	19.6	18.4	17	15.4	11.8	8		
50-125/4.0	4	5.5	26.5	-	-	-	-	-	26	25.5	25	24	22.5	21.5	17.9	14		
50-160/5.5	5.5	7.5	33	-	-	-	-	-	31	30.5	30	28.5	27	25.5	22	18		
50-160/7.5	7.5	10	40	-	-	-	-	-	38.5	38	37.5	36	35	33.5	30	26		
50-200/9.2	9.2	12.5	53	-	-	-	-	-	-	-	50	49	47.5	45.5	40.5	34		
50-200/11	11	15	59	-	-	-	-	-	-	-	56	55	54	52	48	42		
50-200/15	15	20	72	-	-	-	-	-	-	-	70	69	68	66	62	57		

* Single phase version only for 3M type.

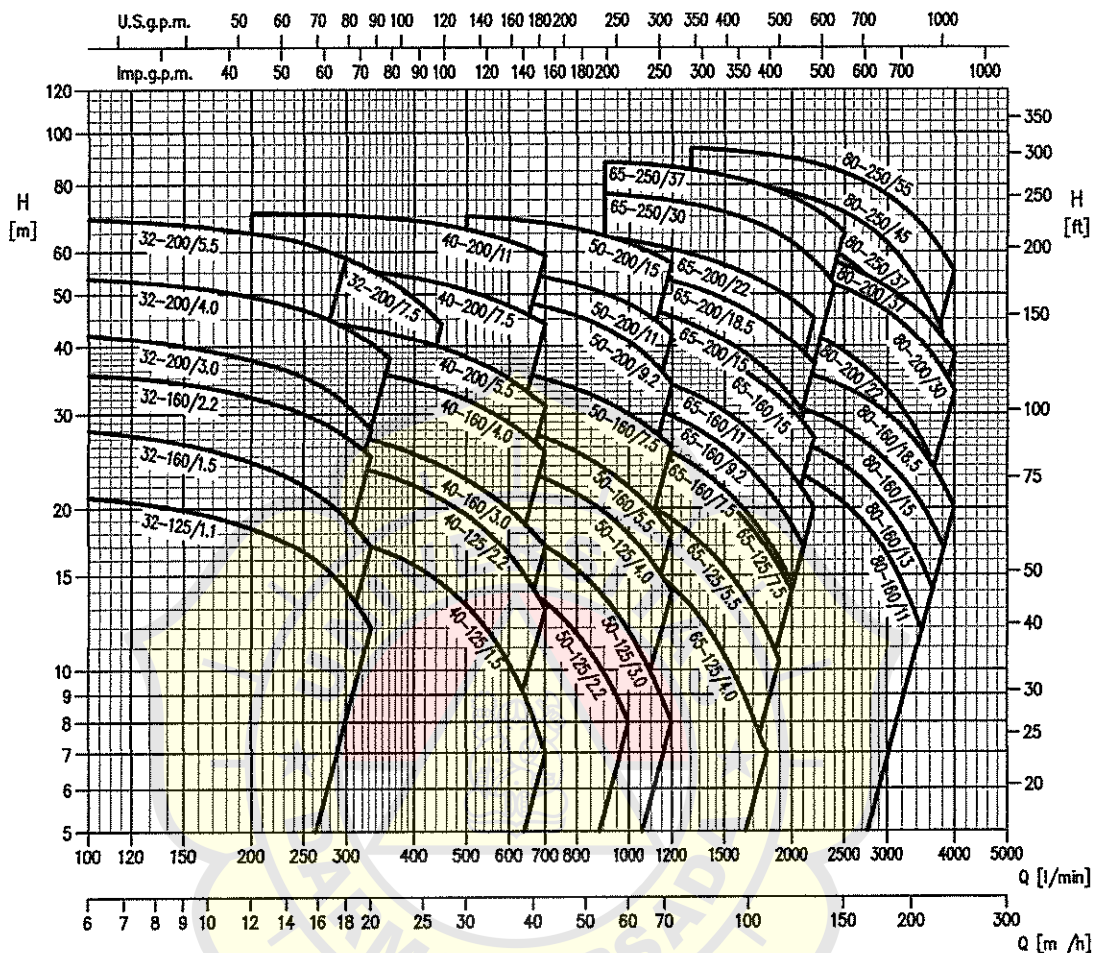
3 SERIES: 65, 80 VERSION

Pump type	kW	HP	Flow rate (m³/h)																
			0	600	700	900	1300	1500	1700	1900	2100	2200	2300	2400	2500	3000	3400	3600	3800
65-125/4.0	4	5.5	22.2	19.8	19	17.3	13.3	11	8.6	6.3	-	-	-	-	-	-	-	-	-
65-125/5.5	5.5	7.5	27	-	24	22.2	18	15.7	13.3	10.8	8	-	-	-	-	-	-	-	-
65-125/7.5	7.5	10	32	-	29.5	27.8	23.5	21.1	18.7	16.1	13.4	12	-	-	-	-	-	-	-
65-160/7.5	7.5	10	32	-	30	28.6	24.8	22.5	19.9	17.1	14.2	-	-	-	-	-	-	-	-
65-160/9.2	9.2	12.5	36.5	-	34.5	32.8	28.8	26.5	23.9	21.1	18.3	16.8	-	-	-	-	-	-	-
65-160/11	11	15	40.5	-	38.5	37.1	33.1	30.9	28.4	25.8	23	21.5	20	-	-	-	-	-	-
65-160/15	15	20	48	-	45.5	44	40	37.8	35.3	32.8	29.6	28	26.5	-	-	-	-	-	-
65-200/15	15	20	53.5	-	51	49	44	41.5	38.4	35.3	31.8	30	-	-	-	-	-	-	-
65-200/18.5	18.5	25	60.5	-	58.5	56.5	51.5	49	46	43	39.7	38	36.3	-	-	-	-	-	-
65-200/22	22	30	67	-	65.5	64	59.5	57	54	51	48	46.5	45	-	-	-	-	-	-
65-250/30	30	40	78	-	-	77	73.5	71	68	64.5	60	57.5	55	52	-	-	-	-	-
65-250/37	37	50	89	-	-	88	85.5	83	80.5	77.5	74	72	70	67.5	65	-	-	-	-
80-160/11	11	15	29	-	-	-	27.3	26.4	25.4	24.2	23	22.4	21.8	21.1	20.4	16.4	12.5	-	-
80-160/13	13	17.5	32	-	-	-	30.5	29.7	28.8	27.7	26.5	25.9	25.3	24.6	24	20.1	16.5	14.5	-
80-160/15R	15	20	35	-	-	-	34	33.3	32.5	31.5	30.5	30	29.4	28.8	28.1	24.4	21	19.1	17
80-160/15	15	20	35	-	-	-	34	33.3	32.5	31.5	30.5	30	29.4	28.8	28.1	24.4	21	19.1	17
80-160/18.5	18.5	25	40	-	-	-	39	38.4	37.6	36.7	35.7	35.2	34.7	34.1	33.5	30	26.4	24.4	22.3
80-200/22	22	30	50	-	-	-	48	47	45.5	44.5	43	42	41	40	39	33.2	27.8	25	-
80-200/30	30	40	60	-	-	-	58.5	58	57	56	54.5	54	53	52	51	46.5	41.5	39	36.1
80-200/37	37	50	66	-	-	-	64	63	62	61	59.5	59	58	57.5	56.5	51.5	47	44.5	41.5
80-250/37	37	50	73	-	-	-	71.5	70.5	68.5	66.5	64	63	61.5	60	58.5	48.5	38	-	-
80-250/45	45	60	84	-	-	-	82.5	81.5	80	78	76	75	73.5	72.5	71	62	53	48	42.5
80-250/55	55	75	95	-	-	-	93.5	92.5	91.5	90	88.5	87.5	86.5	85.5	84	76.5	68.5	64.5	60

SELECTION CHART

50 Hz

Rev. H



PERFORMANCE CURVES

The specifications below qualify the curves shown on the following pages.

- ◆ Tolerances according to ISO 9906 Annex A
- ◆ The curves refer to effective speed of asynchronous motors at 50 Hz
- ◆ Measurements were carried out with clean water at 20°C of temperature and with a kinematic viscosity of $\nu = 1 \text{ mm}^2/\text{s}$ (1 cSt)
- ◆ The NPSH curve is an average curve obtained in the same conditions of performance curves. During the pump selection, consider to get a safety margin of at least 1 m.
- ◆ The continuous curves indicate the recommended working range. The dotted curve is only a guide.
- ◆ In order to avoid the risk of over-heating, the pumps should not be used at a flow rate below 10% of best efficiency point.
- ◆ Symbols explanation:
 - Q = volume flow rate
 - H = total head
 - P_2 = pump power input (shaft power)
 - η = pump efficiency
 - NPSH = net positive suction head required by the pump



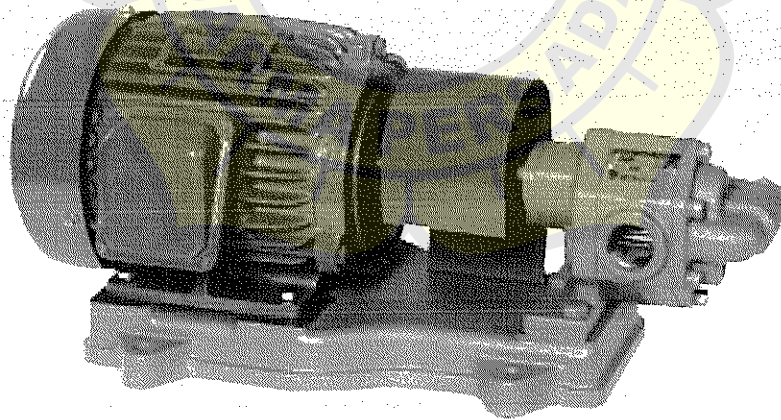
EBARA

CF4101UE

EBARA GEAR PUMPS

Model GPE, GPF

Model 000 in this catalogue is our model code.



MODEL GPE GPF

EBARA GEAR PUMPS

<Model GPE>

Gland Packing Type

Max. discharge pressure
0.3MPa

Standard Accessories

Safety valve (installed in pump) ...1
Common base1
Coupling1
Coupling guard1

Standard Specifications

Model		GPE
Liquid	Liquid Type	A.B.C. Heavy Oil, Turbine Oil
	Temperature	0-70°C
	Viscosity	7-500mm ² /s (cSt)
Suction Head		-0.03MPa (-0.3kgf/cm ²)
Max. Suction Pressure		0.1MPa (1kgf/cm ²)
Construction	Seal	Gland Packing
	Bearing	Needle Type Roller Bearing
Connection		Screw Type
Material	Casing	Cast Iron (FC200)
	Gear	Carbon Steel (S45C)
	Shaft	Carbon Steel (S45C)

Technical Data

50Hz

(Motor Synchronous Speed:1500min⁻¹
Capacity is the case of turbine oil 60mm²/s (cSt) use.

Size	Connection	Type	Pole	Output (kW)	Max. Discharge Pressure (MPa) (kgf/cm ²)	Capacity (L/min.)
12	Rc-3/8	12GPE	4	0.2	0.3 (3)	6
15	Rc-1/2	15GPE	4	0.4	0.3 (3)	10
20	Rc-3/4	20GPE	4	0.4	0.3 (3)	20
25	Rc-1	25GPE	4	0.75	0.3 (3)	40

Technical Data

60Hz

(Motor Synchronous Speed:1800min⁻¹
Capacity is the case of turbine oil 60mm²/s (cSt) use.

Size	Connection	Type	Pole	Output (kW)	Max. Discharge Pressure (MPa) (kgf/cm ²)	Capacity (L/min.)
12	Rc-3/8	12GPE	4	0.2	0.3 (3)	7
15	Rc-1/2	15GPE	4	0.4	0.3 (3)	12
20	Rc-3/4	20GPE	4	0.4	0.3 (3)	24
25	Rc-1	25GPE	4	0.75	0.3 (3)	48

<Model GPF>

Mechanical Seal Type

Max discharge pressure
1.0MPa

Standard Accessories

Safety valve (installed in pump) ...1
Common base1
Coupling1
Coupling guard1

Standard Specifications

Model		GPF
Liquid	Liquid Type	A.B.C. Heavy Oil, Turbine Oil
	Temperature	0-80°C
	Viscosity	5-500mm ² /s (cSt)
Suction Head		-0.05MPa (-0.5kgf/cm ²)
Max. Suction Pressure		0.1MPa (1kgf/cm ²)
Construction	Seal	Mechanical Seal
	Bearing	Needle Type Roller Bearing
Connection		Screw Type
Material	Casing	Cast Iron (FC200)
	Gear	Carbon Steel (S45C)
	Shaft	Carbon Steel (S45C)

Technical Data

50Hz

(Motor Synchronous Speed:1500min⁻¹
Capacity is the case of turbine oil 60mm²/s (cSt) use.

Size	Connection	Type	Pole	Output (kW)	Max. Discharge Pressure (MPa) (kgf/cm ²)	Capacity (L/min.)
12	Rc-3/8	12GPF	4	0.2	0.4 (4)	8.5
				0.4	1.0 (10)	8.5
15	Rc-1/2	15GPF	4	0.4	0.4 (4)	17
				0.75	1.0 (10)	17
20	Rc-3/4	20GPF	4	0.75	0.4 (4)	31
				1.5	1.0 (10)	31
25	Rc-1	25GPF	4	1.5	0.6 (6)	54
				2.2	1.0 (10)	54
32	Rc-1 1/4	32GPF	4	2.2	0.4 (4)	75
				3.7	1.0 (10)	75
40	Rc-1 1/2	40GPF	4	2.2	0.6 (6)	105
				3.7	1.0 (10)	105

Technical Data

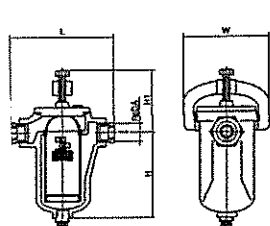
60Hz

(Motor Synchronous Speed:1800min⁻¹
Capacity is the case of turbine oil 60mm²/s (cSt) use.

Size	Connection	Type	Pole	Output (kW)	Max. Discharge Pressure (MPa) (kgf/cm ²)	Capacity (L/min.)
12	Rc-3/8	12GPF	4	0.2	0.4 (4)	10
				0.4	1.0 (10)	10
15	Rc-1/2	15GPF	4	0.4	0.4 (4)	21
				0.75	1.0 (10)	21
20	Rc-3/4	20GPF	4	0.75	0.4 (4)	37
				1.5	1.0 (10)	37
25	Rc-1	25GPF	4	1.5	0.6 (6)	65
				2.2	1.0 (10)	65
32	Rc-1 1/4	32GPF	4	2.2	0.4 (4)	90
				3.7	1.0 (10)	90
40	Rc-1 1/2	40GPF	4	3.7	0.4 (4)	125
				5.5	1.0 (10)	125

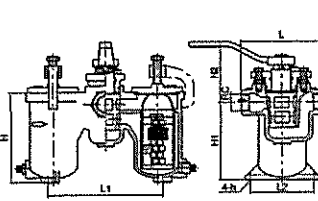
Suction Strainer (Special Accessories)

Model 12-40STU (Single Type)



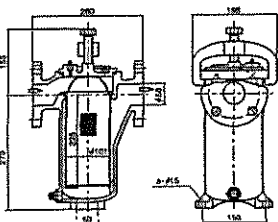
Type	Body						Filter Tube		Mass (kg)
	Rc	H	H1	L	W	D1	H2		
STU12	3/8	85	90	146	120	40	60	3	
STU15	1/2	85	90	120	120	40	60	3	
STU20	3/4	135	105	183	140	60	110	4	
STU25	1	135	105	150	140	60	110	4	
STU32	1 1/4	200	140	248	180	87	170	10	
STU40	1 1/2	200	140	210	180	87	170	10	

Model 12-40STW (Duplex Type)

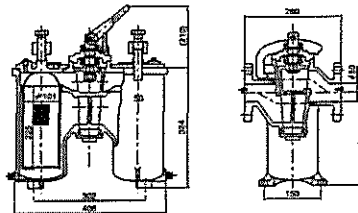


Type	Body						Fitting			Filter Tube		Mass (kg)
	Rc	H	H1	L	W	L1	L2	h	D1	H2		
STW12	3/8	115	92	115	146	125	90	12	40	60	7	
STW15	1/2	115	92	115	120	95	90	12	40	60	7	
STW20	3/4	170	145	120	183	215	120	12	60	110	15	
STW25	1	170	145	120	150	215	120	12	60	110	15	
STW32	1 1/4	225	195	150	175	250	120	15	70	150	21	
STW40	1 1/2	250	220	150	210	265	130	15	87	170	30	

Model STU-50 (Single Type) Flange: JIS 10K
Mass: 30kg



Model STW-50 (Duplex Type) Flange: JIS 10K
Mass: 48kg



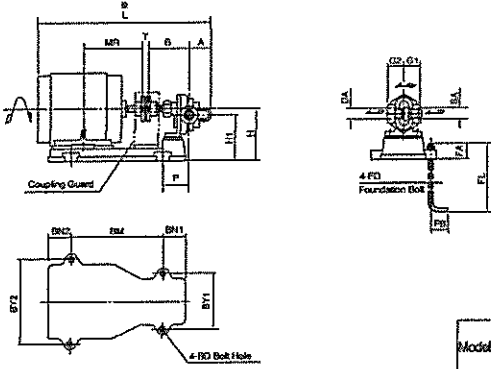
Specification

- Gauge Roughness: 60 mesh
- Effective Filtration Area: More than 8 times of strainer size
- Hydro Test Press of Case: 0.6MPa (6.2kgf/cm²)
- Max Allowable Normal Press: 0.3MPa (3kgf/cm²)

MODEL GPE GPF

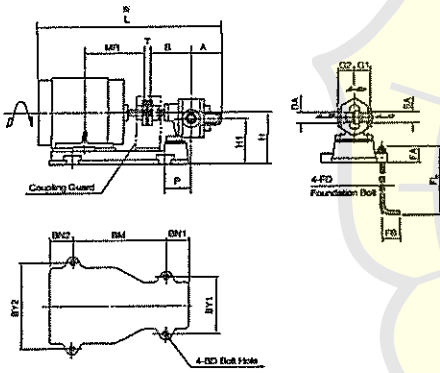
TIBARA GEAR PUMPS

Dimension (Model GPE)



Model	Type	Output (kW)	Pole	Connection (SA, DA)	Pump and Motor																Mass (kg)				
					A	B	H	H1	P	T	MR	L	G1	G2	BM	BN1	BN2	BY1	BY2	BD		FD	FL	FA	FB
GPE	12GPE	0.2	4	Rc-3/8"	50	90	103	90.5	64	15	103	367	40	40	160	60	60	138	180	12	M10	200	40	40	12
	15GPE	0.4	4	Rc-1/2"	50	100	111	96	65	15	120	416	40	40	180	60	60	138	194	12	M10	200	40	40	20
	20GPE	0.4	4	Rc-3/4"	55	105	111	96	70	15	120	426	40	40	180	60	60	138	194	12	M10	200	40	40	20
	25GPE	0.75	4	Rc-1"	65	117	135	115	70	15	140	480	50	50	220	60	60	168	214	12	M10	200	40	40	25

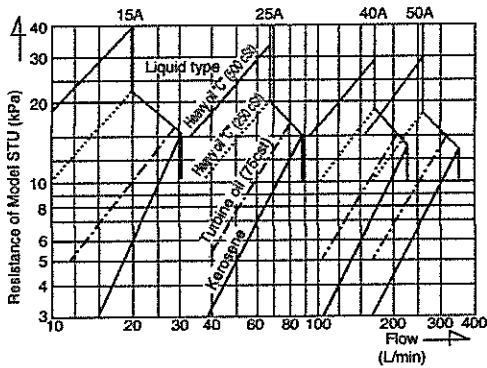
Dimension (Model GPF)



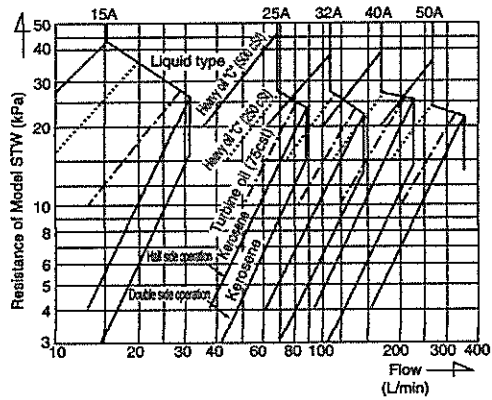
Model	Type	Output (kW)	Pole	Connection (SA, DA)	Pump and Motor																Mass (kg)				
					A	B	H	H1	P	T	MR	L	G1	G2	BM	BN1	BN2	BY1	BY2	BD		FD	FL	FA	FB
GPF	12GPF	0.2	4	Rc-3/8"	60	98	111	96	63	15	103	385	40	40	160	60	60	138	180	12	M10	200	40	40	14
		0.4	4	Rc-1/2"	60	98	111	96	63	15	120	424	40	40	180	60	60	138	194	12	M10	200	40	40	21
	15GPF	0.4	4	Rc-1/2"	65	103	111	96	68	15	120	434	40	40	180	60	60	138	194	12	M10	200	40	40	21
		0.75	4	Rc-3/4"	65	103	125	110	68	15	140	466	40	40	210	60	60	138	214	12	M10	200	40	40	24
	20GPF	0.75	4	Rc-3/4"	81	112	135	115	65	15	140	491	50	50	220	60	60	168	214	12	M10	200	40	40	27
		1.5	4	Rc-1"	81	112	135	115	65	15	168.5	541	50	50	260	60	60	168	232	12	M10	200	40	40	37
	25GPF	1.5	4	Rc-1"	89	120	135	115	73	15	168.5	557	50	50	260	60	60	168	232	12	M10	200	40	40	38
		2.2	4	Rc-1"	89	120	145	125	63	15	193	599	50	50	270	70	80	168	264	12	M10	200	40	40	47
	32GPF	2.2	4	Rc-1 1/4"	102	156	170	145	95	15	193	648	60	60	280	80	90	194	264	12	M10	200	40	40	52
		3.7	4	Rc-1 1/4"	102	156	170	145	95	15	200	665	60	60	300	80	80	194	290	12	M10	200	40	40	62
	40GPF	2.2	4	Rc-1 1/2"	108	162	170	145	101	15	193	660	60	60	280	80	90	194	264	12	M10	200	40	40	53
		3.7	4	Rc-1 1/2"	108	162	170	145	101	15	200	677	60	60	300	80	80	194	290	12	M10	200	40	40	63
		5.5	4	Rc-1 1/2"	108	162	187	162	111	3	235	727	60	60	310	90	90	194	320	12	M10	200	40	40	89

Strainer Resistance Curve

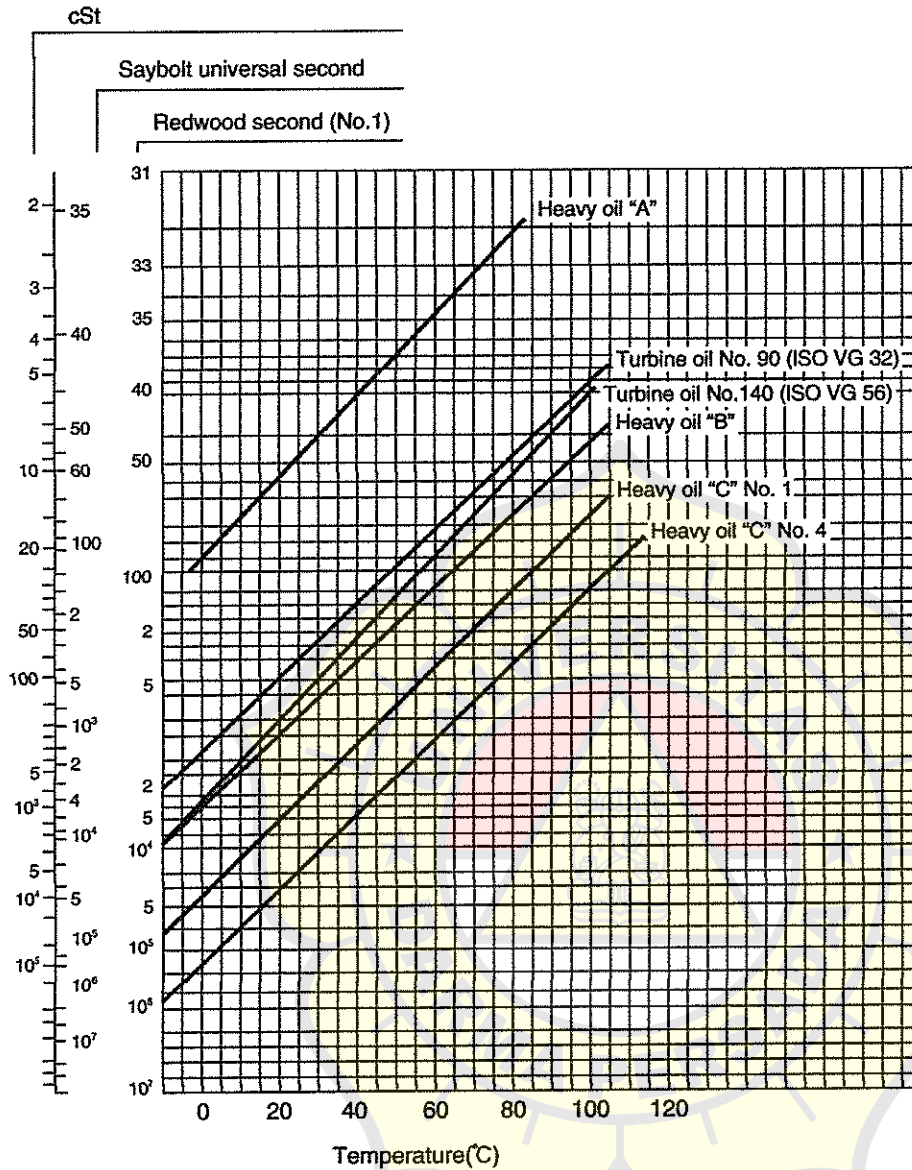
Model STU



Model STW



■ Viscosity Chart of Oil (Sample)



"Model ○○○" in this catalogue is our model code.



EBARA CORPORATION

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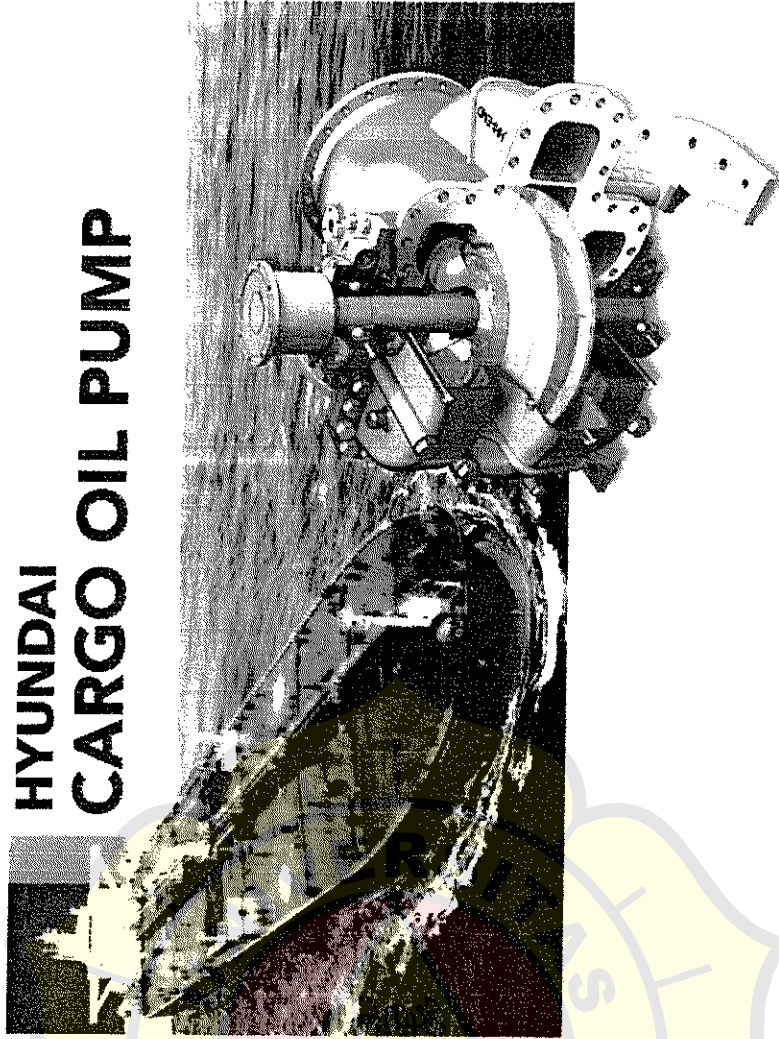
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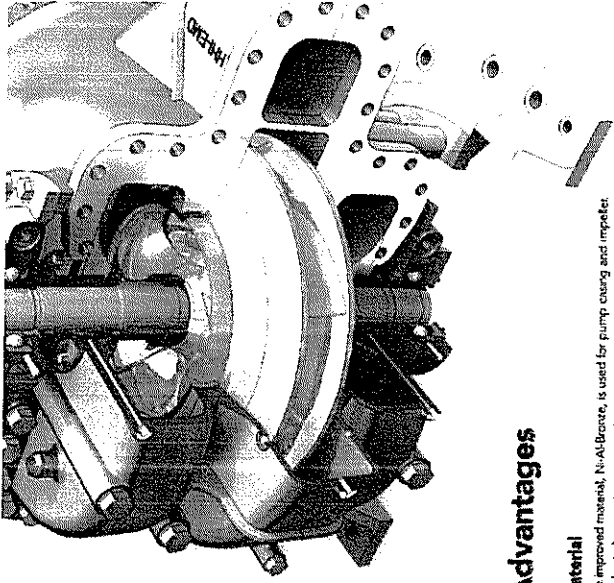
Cargo Oil Pumping System

Introduction

Hyundai Heavy Industries Co., Ltd. (HHI) is a worldwide leader in manufacturing industrial products. As such, the company has supplied a wide variety of pumps including those used in nuclear and thermal power plants since 1979.

HHI developed the technical matter gained from continuous R & D efforts and experience more than 10 years of producing marine cargo oil pumps and water ballast pumps.

The Hyundai HCP-type cargo oil pumps and HBP-type water ballast pumps have been supplied to customers since 1995, and these products now enjoy a strong reputation for quality.



Advantages

Material

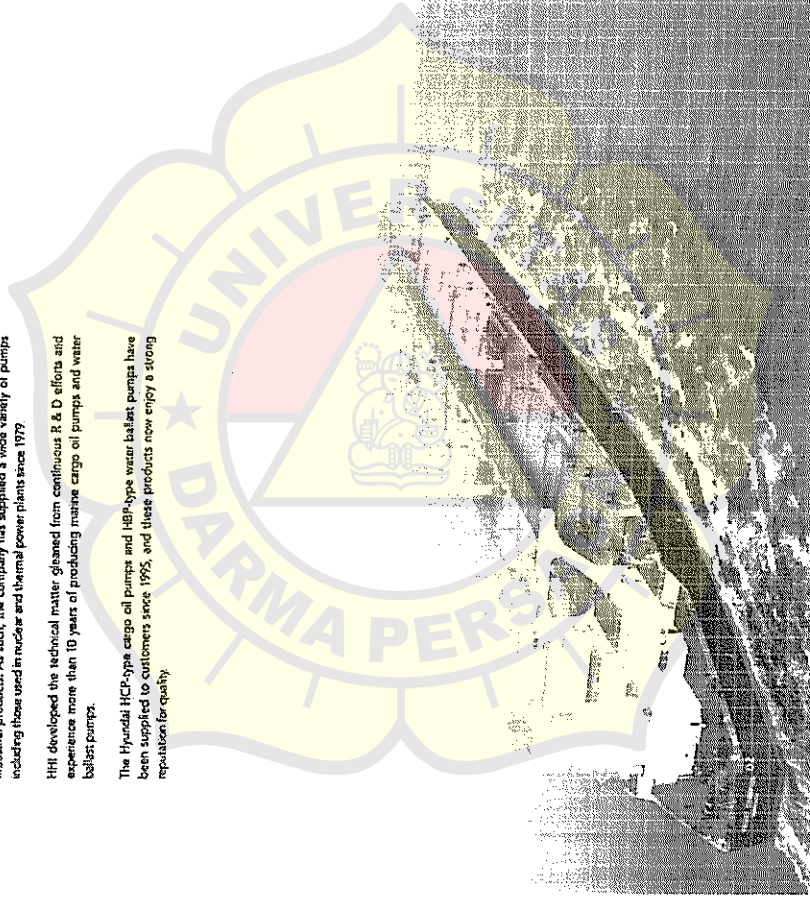
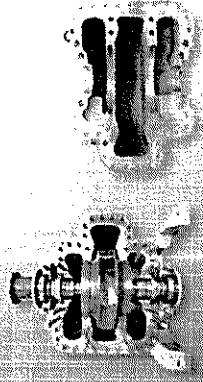
The improved material, Ni-Al-Bronze, is used for pump casing and impeller. Mechanical properties and corrosion resistance is higher than bronze casting. Life time of casing is long.

Easy Maintenance for Cartridge Type M/Seal

The cartridge-type mechanical seal facilitates easy maintenance.

Improvement of Hydraulic Performance

Adoption of high efficiency discharge volute, high performance suction volute and wear ring configuration.

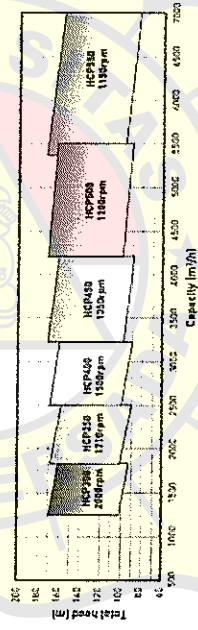


Cargo Oil Pump (Model HCP)

Principal Particulars of Cargo Oil Pump

Description	Model									
	HCP300	HCP350	HCP400	HCP450	HCP500	HCP550	HCP600	HCP650	HCP700	HCP750
Normal capacity (m ³ /h)	1800	2050	2300	2550	2800	3050	3300	3550	3800	4050
Total head (m)	2000	1770	1540	1310	1080	850	620	390	160	150
Normal speed (rpm)	Counter-clockwise from coupling side									
Suction bore (mm)	400	450	500	550	600	650	700	750	800	850
Discharge bore (mm)	300	350	400	450	500	550	600	650	700	750
Lubrication of pump bearing & intermediate shaft bearing	Grease (oil or other (sealed type bearing))									
Seal between pump and engine rooms	Bellows and O-ring									
Seal between shaft and stuffing box	Grease with oil seal									
Amount of grease for 5 non-leakable	170	250	330	410	490	570	650	730	810	890
Lubrication of gear coupling	Grease lubrication									
Amount of grease (kg)	300	320	340	360	380	400	420	440	460	480
Brand of grease	Shell base Lithium soap grease (EP or equivalent) 30 - +110°C									
	Shell base Lithium soap grease (EP or equivalent) 30 - +110°C									
Brand of grease	Shell base Lithium soap grease (EP or equivalent) 30 - +110°C									
	Shell base Lithium soap grease (EP or equivalent) 30 - +110°C									
Pump (H.A. bore casing)	680	1140	1600	2100	2600	3100	3600	4100	4600	5100
Stuffing box unit & connecting shaft	660	830	1120	1310	1510	1710	1910	2110	2310	2510
Gear coupling	95	110	150	220	270	320	370	420	470	520
Water in casing	330	520	710	900	1090	1280	1470	1660	1850	2040

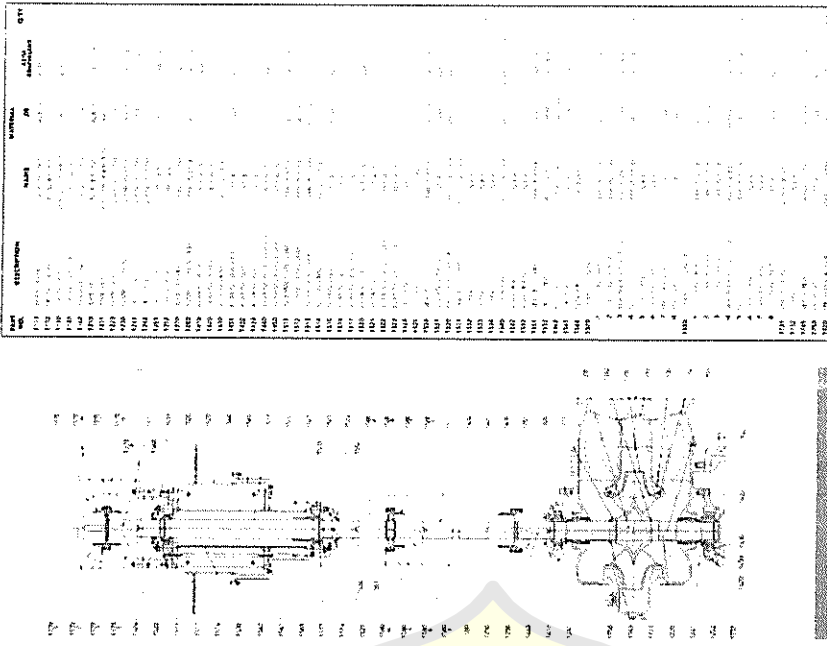
Performance Range



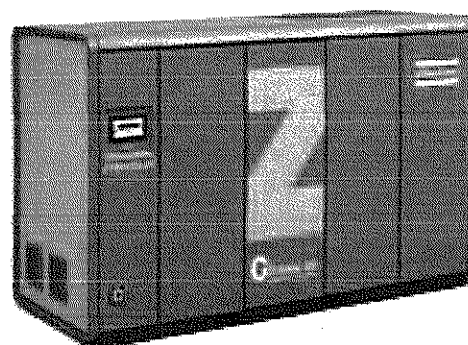
Applicable Turbine

Model	CS-6	CS-14	CS-18	RTV
Capacity (m ³ /h)	300-450	450-600	600-750	750-900

Construction and Standard Material



Oil-free Screw Compressors ZT 55-90 / ZR 75-900



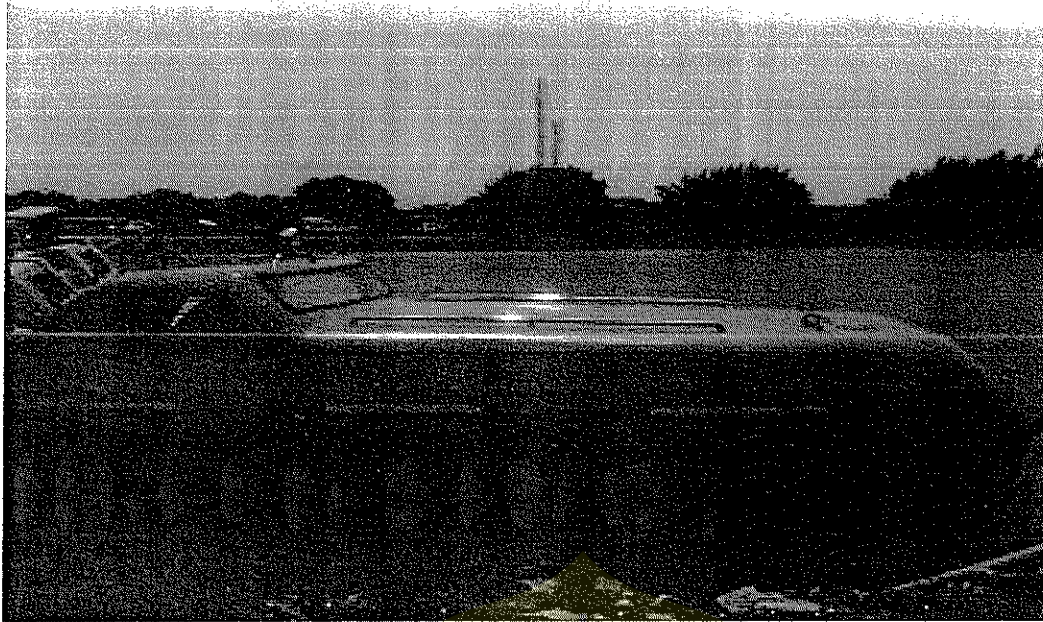
Your benefits

- ▶ **A complete and flexible solution**
 - Apart of the oil-free piston and scroll, rotary blower and turbine compressors, there is also a wide variety of oil-free screw compressors available. As no oil is injected, there will be no contact with the air and any oil.
 - The compressors are coming in several kinds depending on the pressure, drive as VSD or the cooling method and even as water injected screws, our AQ-compressors.
 - In fact we have for every application a compressor available, therefore the compressors listed here are only a part of the full portfolio.
- ▶ **Elektronikon® (MKIV) regulation**, ensuring reliable and safe operation.
 - Control panel (MKIV) including hour counter, amp meter, high-temperature outlet, motor overload, low cooling water, motor heating on (lamp), auto operation sign and general alarm
 - 50Hz units available.
- ▶ **Saving space**
 - There are some compressors ready for the Marine with small footprint and open design.
- ▶ **Ease of operation**
 - Voltage free contacts to customer installation (open-closed): automatic operation, general warning, general shut-down, load-unload, motor running and local-remote.
 - Analogue signals to customer installation (4-20mA): all signals can be provided such as, but not limited to, outlet pressure and motor current, temperature, etc.
- ▶ **Flexible installation and operation**
 - Flanged air and water connection, on same side of unit for easy installation.
 - Marine motor with reduced starting current, avoiding stress on generator system.

Technical specifications

Compressor type	Principle	Max.work.press.	Capacity FAD*		Motor power	Cooling
		bar(e)	l/s	m³/h	kW	
60 hz						
ZT 55-90	screw compressor	7.25-10.4	124-260	446-936	55-90	air-cooled
ZT 110-275	screw compressor	7.5-10	261-729	940-2613	110-275	air-cooled
ZR 75-90	screw compressor	9-10.4	79-260	284-936	75-90	water-cooled
ZR 132-315	screw compressor	8.6-10.4	max. 836	max. 3009	132-315	water + air-cooled
ZR 400-900	screw compressor	8.6-10.4	360-2456	1296-8842	400-900	water-cooled
ZD and ZD VSD	screw + piston	30-42	310-1123	1117-4044	220-400	water-cooled

* According to ISO 1217, Annex C, latest edition.



SEKOCI TERTUTUP LIFE BOAT

(Free Fall) A. Ukuran Panjang (LoA)	: 6,00
meter Lebar (BoA)	: 2,30 meter
Tinggi (H)	: 2,10 meter
Syarat air (Draft)	: 0,45 meter
Kapasitas	: 20 orang
Hull Material	: Fiber Glass + Aluminium foil
Mesin	: 3 Cylinder 40 pk + kemudi
Radio	: VHF Icon Lampu : Sorot/tembak/Spotligh
Kompas	: Standar Botol pemadam : 1 unit
Botol Oxigen O2	: 2 Unit
Sevety belt	: 20 PCs
Tanki BBM	: 50 liter
List feeder	: Rangka Besi lapis karet
Perlengkapan PMK : Life Saving Appliance (LSA) Life Boat dilengkapi lapisan dinding alumunium foil dengan ketebalan 5mm untuk pengamanan kebakaran dan benturan, pompa penyemprot Air, Perlengkapan Life Boat.	



inmarsat

FleetBroadband



Equipment List

Model	FELCOM250	FELCOM500
Standard		
1. Antenna Unit	FB-1250	FB-1500
2. Communication Unit	FB-2000	
3. IP Handset	FB-8000	
Option		
Incoming Indicator	FB-3000	
Analog Telephone	FC-755D1	
G3 FAX	FAX-2810/2820	
AC/DC Power Supply Unit	PR-240	

Features of FELCOM250/FELCOM500

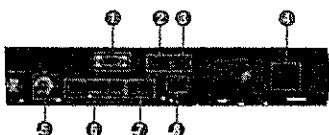
- ▶ **IP handsets and Incoming Indicators (option) can be integrated through Ethernet**
 - Multiple IP handsets can be incorporated into the network by using the switching hub
 - Different ringtones can be set for each of the communication lines for easy recognition of the incoming calls
- ▶ **IP-PBX incorporated**
 - Comprehensive selection of telephone exchange functions available, i.e., internal communication lines, incoming call routing, etc.
 - Wide range of incoming call setting available, i.e., group call function, etc.
- ▶ **Incoming call routing allows for assignment of multiple extension numbers to each of the handsets onboard for each voice line with a single SIM card**
 - Any incoming calls can be routed to any handsets in a ship according to the extension numbers assigned
- ▶ **Built-in NAT router facilitates smooth network integration to the Internet**
- ▶ **Wide variety of security settings available, i.e., firewall, IP filter, etc.**
- ▶ **No dedicated software required for configuration setup (web server function incorporated)**
 - Configuration setup can be done by using web browser

Supports PPPoE to facilitate automatic dial-up connection/disconnection via applications

Supports Inmarsat FleetBroadband MULTI VOICE service by which up to nine simultaneous voice lines (1 CS line and 8 VoIP lines) are made available through the IP Handset FB-8000

FB-2000 Communication Unit

▼ Back



▼ Front



- ① RS-232C port ↔ ISDN UDI/RDI
- ② NMEA in/out (NMEA0183 ver.2) ↔ Navigation equipment
- ③ Alarm output ↔ Alarm equipment
- ④ Power Supply
- ⑤ Antenna Unit (Antenna cable length selectable 30 m or 50 m)
- ⑥ LAN ports ↔ IP Handsets, PC/network equipment, telephone hub
- ⑦ Telephone RJ11 ↔ Telephones and G3FAX
- ⑧ Telephone Phoenix ↔ Telephones and G3FAX
- ⑨ USIM card slot

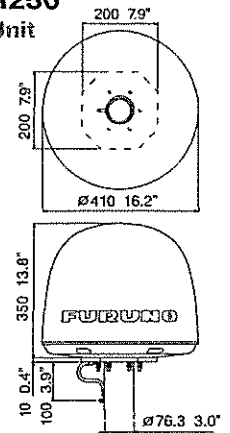
Specifications of FELCOM250/500

Product Name		Inmarsat FleetBroadband	
Model		FELCOM250	FELCOM500
General			
Transmitting Frequency		1626.5 - 1660.5 MHz	
Receiving Frequency		1525.0 - 1559.0 MHz	
Interface			
Ethernet	RJ45	4 ports	
2-wire analog telephone	RJ11	2 ports	
	Phoenix 4 pin	2 ports	
NMEA in/out	Phoenix 5 pin (NMEA0183 ver.2)	1 port	
Alarm output	Phoenix 3 pin Contact (Normal Close)	1 port	
USIM/SIM	Plug in type	1port	
RS-232	EIA574	1port	
L-band output	BNC	1 port	
Communication Service			
Voice		4 kbps circuit switched (AMBE+2 codec)	
		ISDN 3.1 kHz	
Data	ISDN (UDI/RDI)	-	56/64 kbps
	Standard IP (Best Effort Delivery)	284 kbps (RX), 225 kbps (TX)	432 kbps (RX), 372 kbps (TX)
	Streaming IP (Guaranteed Service Rate)	8, 16, 32, 64, 128 kbps	8, 16, 32, 64, 128, 256 kbps
SMS	Up to 160 characters		
FAX	G3 Fax through 3.1 kHz audio		
Environment			
Temperature	Antenna Unit	-25°C - +55°C	
	Communication Unit	-25°C - +55°C	
Storage Temperature	+70°C		
Waterproofing	Antenna Unit	IP56	
Ship's motion	Roll	± 30°/8 sec	
	Pitch	± 10°/6 sec	
	Yaw	± 8°/50 sec	
Rate of Turn	± 6°/1 sec		
Ship's Speed	30 knot		
Power Supply			
Power Supply	10.8 - 31.2 VDC		

FELCOM250

**Antenna Unit
FB-1250**

6.6 kg
14.5 lb

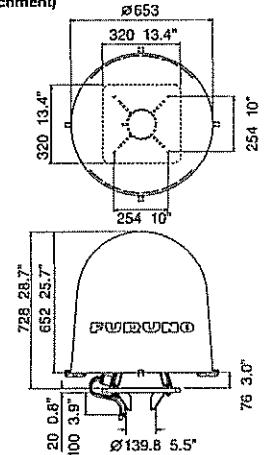


FELCOM500

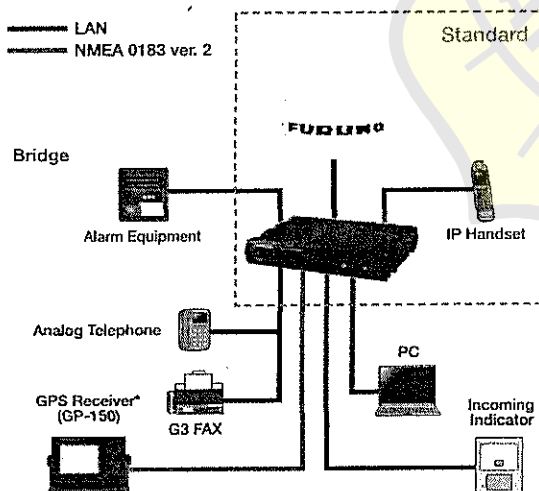
**Antenna Unit
FB-1500**

(with an attachment)

21 kg
46.3 lb



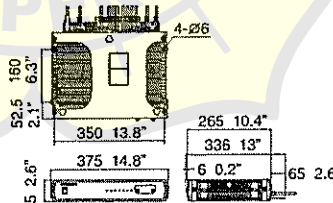
FleetBroadband System Configuration



FELCOM250/500

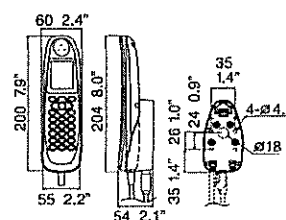
**Communication Unit
FB-2000**

4.1 kg
9 lb



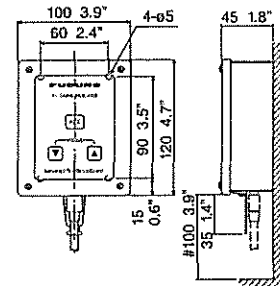
**IP Handset
FB-8000**

0.38 kg
0.83 lb



**Incoming Indicator
FB-3000**

0.37 kg 0.81 lb



*A vessel needs to notify Inmarsat Satellite of which spot beam area the vessel is currently located. In this way, the Inmarsat Satellite can transmit the spot beam to the vessels location. A GPS receiver is required for this function.

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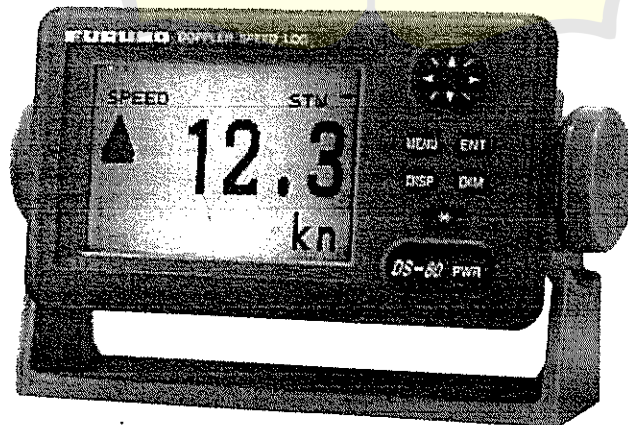
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www.safecomnet.com

FURUNO

DOPPLER SPEED LOG

Doppler Speed Log

Model: **DS-80**



- ▶ Speed and distance run indicated on a large illuminated LCD display
- ▶ Compact display unit and transducer
- ▶ High accuracy by utilizing the Doppler principle, paired beam eliminating effect of pitching, and velocity correction for change of water temperature
- ▶ Easy speed correction at mile post run

- ▶ Speed output to ARPA, radar, ECDIS, AIS, VDR, GMDSS equipment, etc.
- ▶ Complies with IMO standards MSC.96 (72), A.824 (19), A.694 (17), IEC 61023 and other related standards
- ▶ Fully meets SOLAS carriage requirement for ships over 300GT
- ▶ Fits to the hull either directly or with a gate valve

SPECIFICATIONS

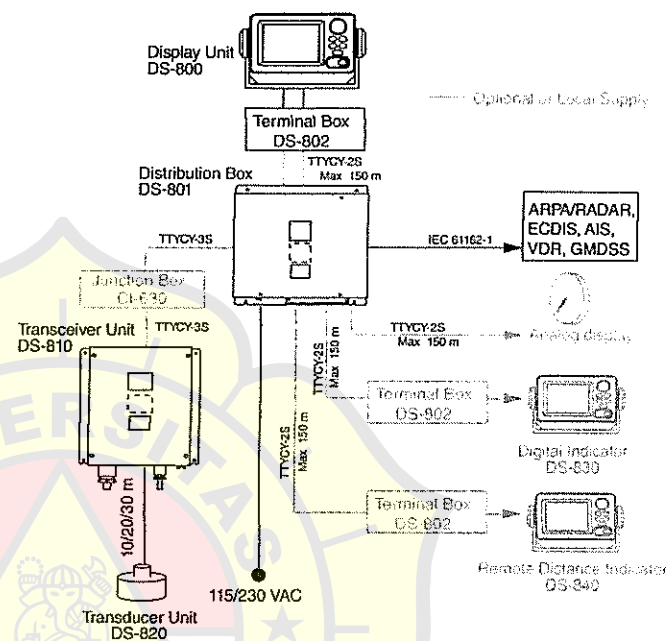
- Product Name: DOPPLER SPEED LOG
- Measuring System: Paired-beam Doppler log, 1 MHz
- Display unit: 4.5" (95 x 60 mm) Monochrome LCD 120 x 64 pixels
Character size: 15 or 21 mm high selectable
- Speed Range: Forward: 0 - 40 kn, 0.1 kn steps
Astern: 0 - 10 kn, 0.1 kn steps
- Distance Run: 0-999,999.99 NM, resettable to any value.
- Accuracy: Speed through-the-water (STW): 1%, display resolution 0.1 kn
Distance run: 1%, in steps of 0.1 NM
Deeper than 3 m
- Water Depth
- Correction: Automatic correction for change of water temperature
- Sound velocity: ±10% on menu
- Mile post run: -10 and 40 kn
- Test: 115/230 VAC
- Power Supply: IEC 61162-1
- Interface: VBW, VLW

ENVIRONMENT (IEC 60945 test method)
 Temperature: -15°C to +55°C (Display unit)
 Waterproofing: Display unit; IPX5 CFR-46 (USCG)

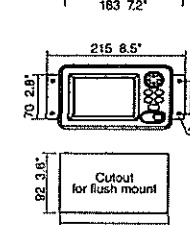
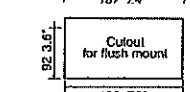
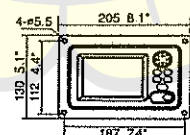
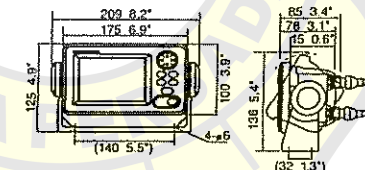
EQUIPMENT LIST

Standard	Quantity
Main Display DS-800	1 unit
Transducer Unit DS-820 with 10/20/30 m cable	1 unit
Transceiver Unit DS-810	1 unit
Distribution Box DS-801	1 unit
Terminal Box DS-802	1 unit
Option	
Digital Indicator DS-830	1 unit
Remote Distance Indicator DS-840	1 unit
Transducer Tank DS-850	1 unit
Flush Mount Kit F type or S type	1 unit
Gate Valve DS-782, DS-786	1 unit
Junction Box CI-630	1 unit
Analog Display	1 unit

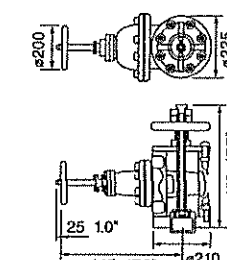
INTERCONNECTION DIAGRAM



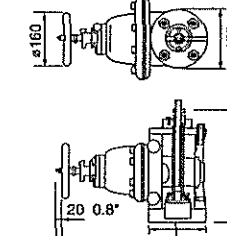
DISPLAY UNIT DS-800
0.6 kg, 1.3 lb



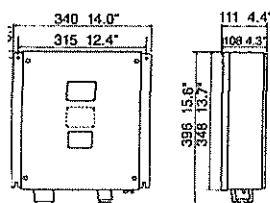
GATE VALVE DS-782
75 kg, 165.3 lb



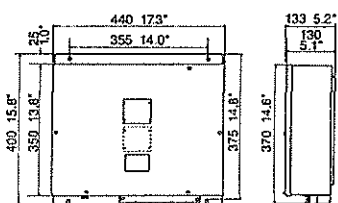
DS-786
40 kg, 88.1 lb



TRANSCIVER UNIT DS-810
3 kg, 17.6 lb



DISTRIBUTION BOX DS-801
14 kg, 30.9 lb



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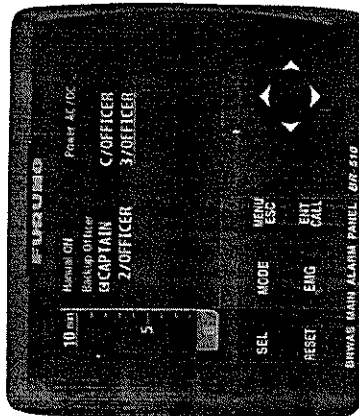
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 Piraeus, Greece
RICO (PTE) LTD
 Singapore
 www.rico.com.sg

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 Catalogue No. FX-616f

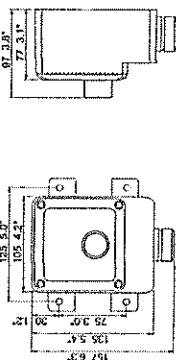


BRIDGE NAVIGATIONAL WATCH ALARM SYSTEM

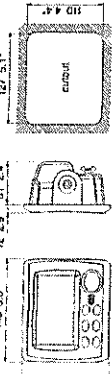
BR-500



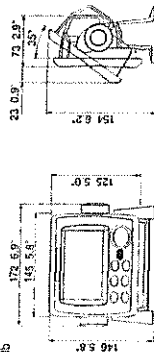
Watertight Timer Reset Panel
BR-550
0.57 kg 1.3 lb



Main Alarm Panel (Flush Mount Type)
BR-510
0.6 kg 1.3 lb

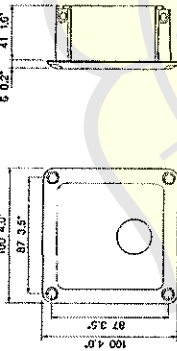


Main Alarm Panel (Hanger Type)
BR-510
0.7 kg 1.5 lb

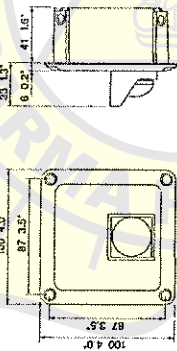


Option

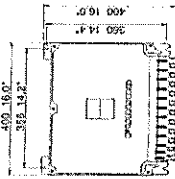
Motion Detector
BR-500
0.22 kg 0.5 lb



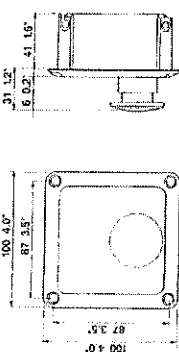
Flash Beacon
BR-570
0.24 kg 0.5 lb



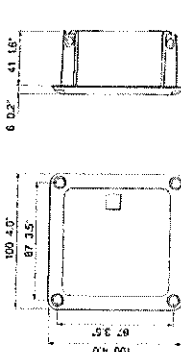
Processor Unit
BR-520
5.3 kg 11.7 lb



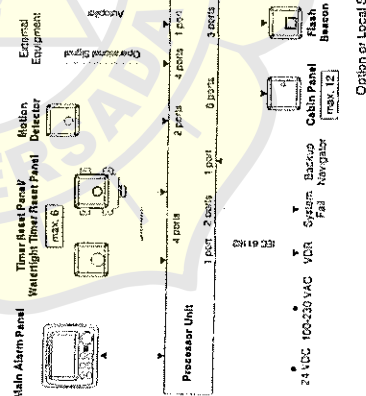
Timer Reset Panel
BR-530
0.26 kg 0.6 lb



Cabin Panel
BR-540
0.23 kg 0.5 lb



INTERCONNECTION DIAGRAM



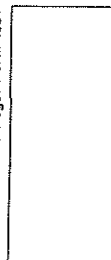
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11025U Printed in Japan
Catalogue No. M-1554



BRIDGE NAVIGATIONAL WATCH ALARM SYSTEM

The IMO MSC.86 (May 2009) decided to make the BNWAS (Bridge Navigational Watch Alarm System) mandatory of all ships of 150 GT and larger. Passenger ships constructed on or after July 1st 2011, irrespective of size, shall be fitted with the BNWAS to be in operation when the ship is at sea. Ships constructed prior to July 1st, 2011 are also requested to install BNWAS. (Please refer to the implementation schedule chart on the left page.)

The FURUNO BNWAS BR-500 monitors the watch officers' presence through watch safety system functions. A watch officer is required to press the button on a Timer Reset Panel or to operate navigation equipment (e.g. ECDIS, Radar, etc.) at certain intervals, which can be set between 3 and 12 minutes. When the officer fails to press the button within pre-set intervals, visual and audible alarms will be generated in the wheelhouse. If the officer doesn't respond to the alarm, the BR-500 transfers the alarm to the Cabin Panels installed in other sections of the vessel in order to inform backup officers of the watch officer's incapacity.

FURUNO offers the optional Motion Detector to watch the officer's capability. Also, the optional Flash Beacon enables the watch officer to recognize the visual alarm.

EQUIPMENT LIST

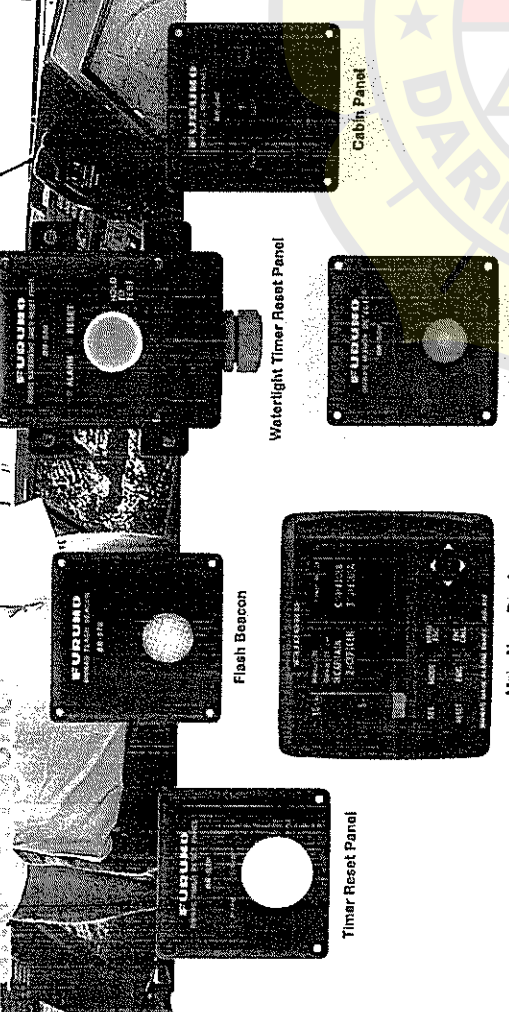
Standard	BR-510	1 set
1 Main Alarm Panel	BR-510	1 set
2 Processor Unit	BR-520	1 set
3 Timer Reset Panel	BR-530	(on demand)
4 Cabin Panel	BR-540	(on demand)
5 Installation Material and Spare Parts		1 set
Option		
- Watchlight Timer Reset Panel	BR-550	(on demand)
- Motion Detector	BR-560	(on demand)
- Flash Beacon	BR-570	
- Timer (for Main Alarm Panel)		
- Light Sensing Fan (for Main Alarm Panel)		
- Waterproof Brass (for BR-530-520/570)		

*Maximum number of connectable units
 - (Watchlight) Timer Reset Panel: 6
 - Cabin Panel: 12

SPECIFICATIONS

MAIN ALARM PANEL (BR-510)	4.3" color LCD 480 x 272
Screen Size	4.3" color LCD 480 x 272
Processor Unit (BR-520)	Operational Signal 4 ports Alarm 1 port Motion Detector 1 port System Fail 2 ports REG 811E2 1 port
Output	4 ports 1 port 2 ports 1 port
MOTION DETECTOR (BR-560)	Pyroelectric detection Up to 3m, 80 deg x 80 deg 0.5 mm, 1.0 mm 4°C (difference from surround in temperature)
POWER SUPPLY	100-230 VAC 21 VDC
ENVIRONMENT	Watchlight Timer Reset Panel: -25°C to +55°C Other Units: -15°C to +55°C Watchlight Timer Reset Panel: IP26 Other Units: IP22 Vibration: REC 2048 E2 4

easy to install and use
 easy detections in case of
 emergency



- Meets the IMO resolution MSC.128(75) for Bridge Navigational Watch Alarm System (BNWAS)
- Monitors the watch officer's presence for maritime casualty avoidance
- Transfers the watch alarm to the back-up officer, in the event that the watch officer fails to respond to watch pre-warning or watch alarm
- Quick access push keys for Navigation Officer's Call and Emergency Call
- Notifies Back-Up Navigators when TCS (Track Control System, option) has failed
- Outputs ALR sentence for VDR
- Optional Motion Detector and Flash Beacon available
- Set-up menu is protected by password
 - Mode selection (Manual OFF, Manual ON, AUTO)
 - Timer interval (3 to 12 min.)
 - System test
- Easy to read alphanumeric and graphic presentations
- Multilingual available
- English, Japanese, Russian, Chinese and Korean
- For use of languages other than English, please consult with the flag administration and/or class society concerned, before operating BNWAS in those languages.

Implementation schedule of Bridge Navigational Watch Alarm System (BNWAS)

	2010-07	2011-07	2012-07	2013-07	2014-07
Newly built passenger ships					
Newly built cargo vessels	>150 GT				
Existing passenger ships					
Existing cargo vessels	>3000 GT				
Existing cargo vessels	over 500 and under 3000 GT				
Existing cargo vessels	over 150 and under 500 GT				
Transferring period					



SAILOR RT4822
VHF-DSC
Operating Instructions

Distress Calls, see page ii . Contents, see page 1.

DISTRESS Call

Quick DISTRESS Call



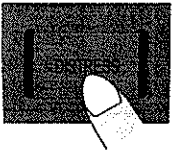
If off or UNIT OFF: press ON/OFF.



Open DISTRESS lid.

Press DISTRESS until RELEASE is displayed.

This takes 5 seconds, during which the indicator lamps TX and ALARM will flash



5 - 4 - 3 - 2 - 1 - RELEASE

Press the DISTRESS button for 5 seconds to transmit
 TYPE : Distress
 MSG. : Undesignated
 Pos : N:05°01E:009°54
 Time : 18.12 UTC CANCEL



19 for 155 acknowledgment 16
 Transmit distress every 4 minutes CANCEL

Wait for answer!

(The distress call is auto-repeated every 3.5-4.5 minutes.)

DISTRESS is only to be used in case of an emergency!

Acknowledgment



Distress acknowledgment received
 FROM: 002191000 VIEW
 TX 1W US CALL ALARM



Read call contents.

4. Press VIEW.

Call contents first page
 Time : 18.22.06 19 Aug 97
 TYPE : All station
 FROM : 002191000
 CAT : Distress
 ACK : Call MORE



View next page.

Call contents second page CONNECT
 COMM: Distress ackn
 SHIP : 123456789
 MSG. : Undesignated
 Pos : N:05°01E:009°54 AGAIN



View call again.

Mayday Procedure

5. Press "16".



16 25W INT
 MEM VOL SQ
 2 13 06

6. Lift handset.



Press PTT and say:

"MAYDAY, MAYDAY, MAYDAY
 This is <Ship name (3 times)>

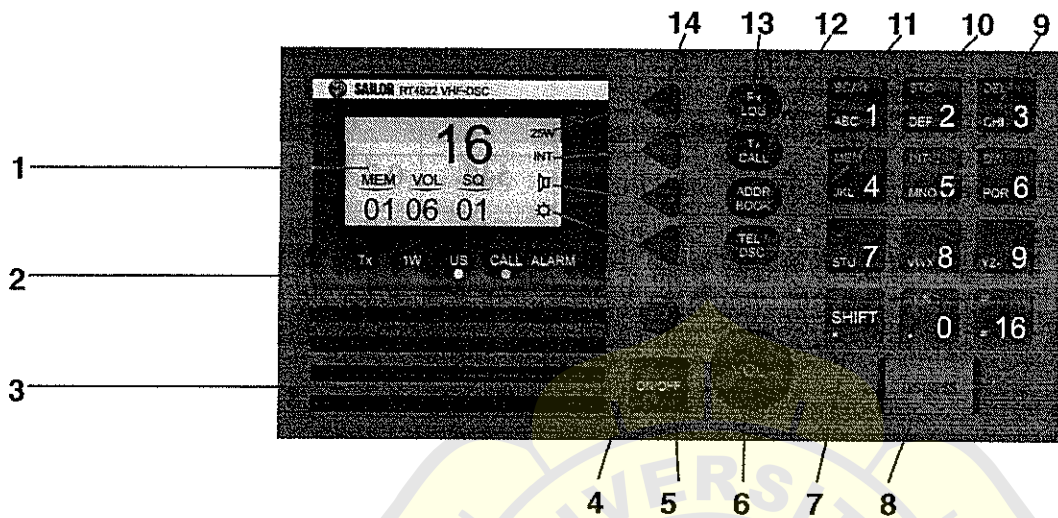
MAYDAY
 This is <Ship name + call sign>
 Position:.....
 What is wrong:.....
 Kind of assistance:.....
 Number of crew:.....
 Other info:.....
 OVER."

Release PTT and listen for answer.

Release



What is What?



1. Display.
2. Indicator lamps. Condition when lit:
Tx: Transmitting.
1W: 1 watt transmission mode.
US: US channel system activated.
(For information on the BI version, see page 11)
CALL: DSC (see button 10) call for you received.
ALARM: Alarm call received.
3. Loudspeaker.
4. Squelch control. Adjust to silent when no station is received.
5. ON/OFF push button.
6. Volume control.
7. Shift key. Press and hold for yellow functions.
8. DISTRESS button, protected by shield. To use, lift the shield and press for 3 seconds, guided by the text displayed.
9. Keyboard.
10. TEL/DSC function switch.
In TEL mode radiotelephone parameters are shown and selected.
In DSC mode DSC parameters are shown and selected.
11. Open the ADDR BOOK in DSC mode.
12. Tx CALL: Press to start creating a DSC call.
13. Open the Rx log of received calls in DSC mode.
14. Display keys. The function of each key is described in its respective line on the right side of the display.

Abbreviations Used in this Manual

ADDR	Address
ATIS	Automatic Transmitter Identification System
BI	Channel mode used when sailing on European rivers (more details on p. 11)
DSC	Digital Selective Calling
DUP	Duplex
DW	Dual Watch
GMDSS	Global Maritime Distress and Safety System
GPS	Global Positioning System
LF	Low Frequency
MEM	Memory
MMSI	Maritime Mobile Ship Identification
MSG	Message
PTT	Push-To-Talk
RX	Receive(r)
SQ	Squelch
STN	Station
TEL	Telephony
TX	Transmit(ter)
UTC	Coordinated Universal Time

- 4. Antenna Unit GPA-017S 1 Unit
 - GPA-018S 1 Unit
 - GPA-019S 1 Unit
- (Specify when ordering)
- *Selectable when a beacon receiver is incorporated into a display unit.
 - 3. Antenna Cable 15 m
 - 4. Interface Cable 5 m x 1
 - 5. Installation Materials and Spare Parts 1 set
- Option**
- 1. DGPS Receiver Kit OP20-32-1/20-33
 - 2. Whip Antenna FAW-1.2 for GPA-018S
 - 3. Antenna Cable, 3050 m
 - 4. Interface Cable, 510 m
 - 5. Antenna Base
 - 6. Flush Mount Kit OP20-24/20-25
 - 7. Interface Unit IF-2500
 - 8. External DGPS Receiver GR-80
 - 9. Rectifier PR-62

Positioning Augmentation

DGPS Automatic or manual selection
 Reference Station: 283.5 - 325.0 kHz (all ITU regions)
 Frequency Range: RTCM SC-104 Ver. 2.0 Type 1, 7, 9, 16

WAAS augmentation is available through the GPS core in the display unit

Accuracy

GPS: 10 m (95%)
 DGPS: 5 m (95%)
 WAAS: 3 m (95%), limited coverage
 SOG: ± 0.2 kt (SOG ≤ 10 kt)
 COG: $\pm 3^\circ$ (SOG 1-17 kt), $\pm 1^\circ$ (SOG > 17 kt)

Display

6" LCD (120 x 91 mm),
 330 (H) x 240 (V) pixels
 L/L resolution: 0.001 min

Display Modes
 VideoPlotter, Highway, Text, Steering

VideoPlotter

Scale: 0.02 to 320.0 nm,
 Plot Interval: 1 s - 60 min or 0.01-99.99 nm

Memory Capacity:
 2,000 points for ship's track and marks, 999 waypoints with comments,
 33 routes (containing 30 waypoints/route)

Antenna Unit

GPA-017S
 0.15 kg 0.3 lb

GPA-018S
 0.3 kg 0.7 lb

GPA-019S
 1.0 kg 2.2 lb

Display Unit
 2.2 kg 4.9 lb

Alarm
 Arrival, anchor watch, XTE, Speed, Time, Water Depth, Trip, DGPS, WAAS

Integrity Indication
 Safe, Caution, Unsate at accuracy level of 10 m or 100 m

Interface (IEC 61162-1 Ed 2, NMEA 0183)
 GBS (satellite fault), GLL (L/L), VTG (SOG, COG),
 ZDA (UTC), WPL (WPT location), etc.

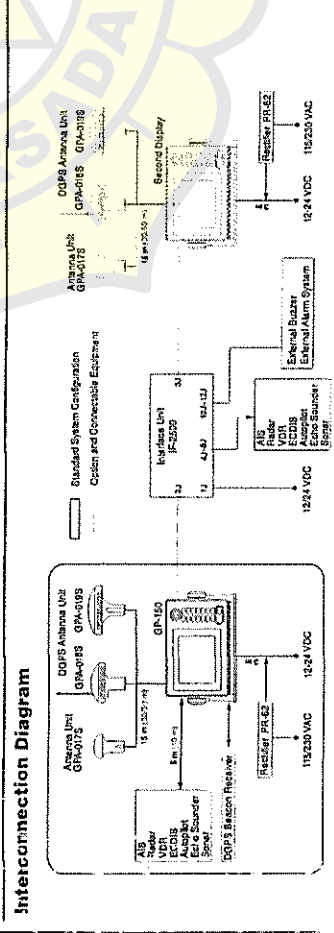
Input
 DBT (Depth), HDT (Compass), MTW (Water temperature),
 TLL (TGT L/L), YBW (Dual grid/wal speed), etc.

ENVIRONMENT (IEC 60945 test method)
 Temperature Display Unit: -15°C to +55°C
 Antenna Unit: -25°C to +70°C

Waterproofing
 Display Unit: IPX5 (IEC 60529)
 Antenna Unit: IPX6 (IEC 60529)

EMC
 IEC 60945 Ed. 4 (Up to 2 GHz)

POWER SUPPLY
 12-24 VDC, 0.3-0.4 A

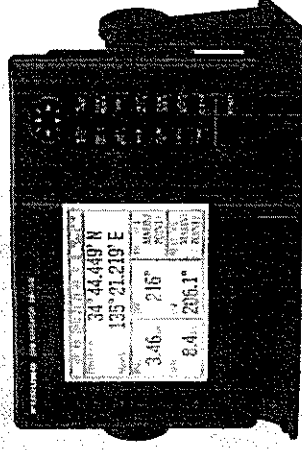


GPS

Global Positioning System

Marine GPS Navigator

GP-150



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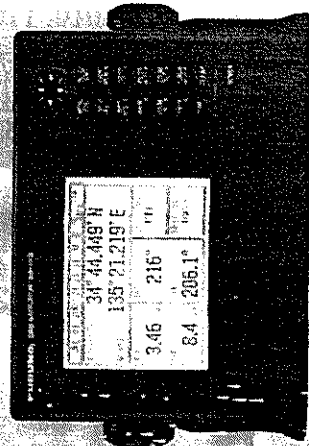
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 wwwSOLEINK.com, 09103355 Printed in Japan

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standalone positioning device and as a sensor for AIS, Radar, VDR, etc.

FURUNO GP-150 is a GPS navigator designed for the SOLAS ships according to the GPS performance standard IMO Res MSC. 112(73) and associated IEC standards effective on and after July 1, 2003. It is a highly reliable standalone EPFS (electronic position fixing system) that feeds positioning information to AIS, Radar, VDR, ECDIS, Autopilot, Echo Sounder and Sonar. Receiver dependability is improved by fault detection using five satellites, i.e., Receiver Autonomous Integrity Monitoring (RAIM) that shows the integrity status in Safe, Caution, and Unsafe levels. The status is given with respect to user selected accuracy level, 10 m or 100 m. RAIM also works on DGPS signals.

GP-150 MARINE GPS NAVIGATOR



Display Unit



GPS/WAAS Antenna:



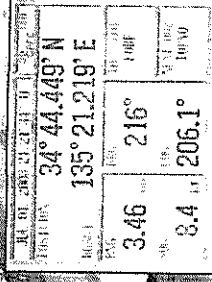
DGPS Antenna:

In order to improve position accuracy, WAAS and DGPS* augmentation systems are available. Dual configuration, with a second system, provides a backup and/or remote operation to ensure system availability.

*Internal or external beacon receiver is required for utilizing DGPS.

- ▶ Fully meets new IMO Resolution MSC.112(73) and IEC 61108-1 Ed.2 for SOLAS carriage requirements on and after 1 July 2003
- ▶ Ideal sensor of SOG and COG for AIS, radars, and other navigational aids
- ▶ Augmentation to enhance accuracy by standard IEC WAAS and optional DGPS
- ▶ Display modes: VideoPlotter, 3D Highway, Text, Steering
- ▶ Memory: 2000 points for ship's past positions and marks (not 999 event marks mark)
- ▶ 999 waypoints (30 routes each containing up to 300 waypoints)

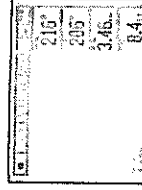
Text mode



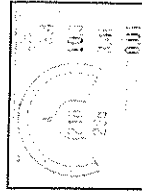
Highway mode



VideoPlotter mode



Steering mode



Display mode is selectable from VideoPlotter, Text, Highway and Steering. In the Highway mode, you can intuitively see how to steer and where the next waypoint is located relative to your ship. It is useful when you are following a series of waypoints along a planned route.

The SOLAS Chapter V as amended in December 2000 prohibits new installation of current GPS receivers which are designed to meet IMO A.819 on and after 1 July 2003*. With the comparison table, you will see why we say the new IMO equipment is epoch making.

Accuracy	MSC.112(73), IEC 61108-1 ed.2 10 m (95%)	A.819(19), IEC 61108-1 ed.1 100 m (95%)
SOG (speed over ground)	Required to accuracy of SDME	SOG prohibited, no lasting standard
COG (course over ground)	Required to accuracy of 3° (>17 kt)	COG prohibited, no lasting standard
UTC	Required to output	Data is limited to only L/L
RAIM (Receiver autonomous integrity monitoring)	Required to indicate integrity indication of Safe, Caution, Unsafe at confidence level of 10 m and 100 m	No
Display update rate	1 second at latest	every 2 second

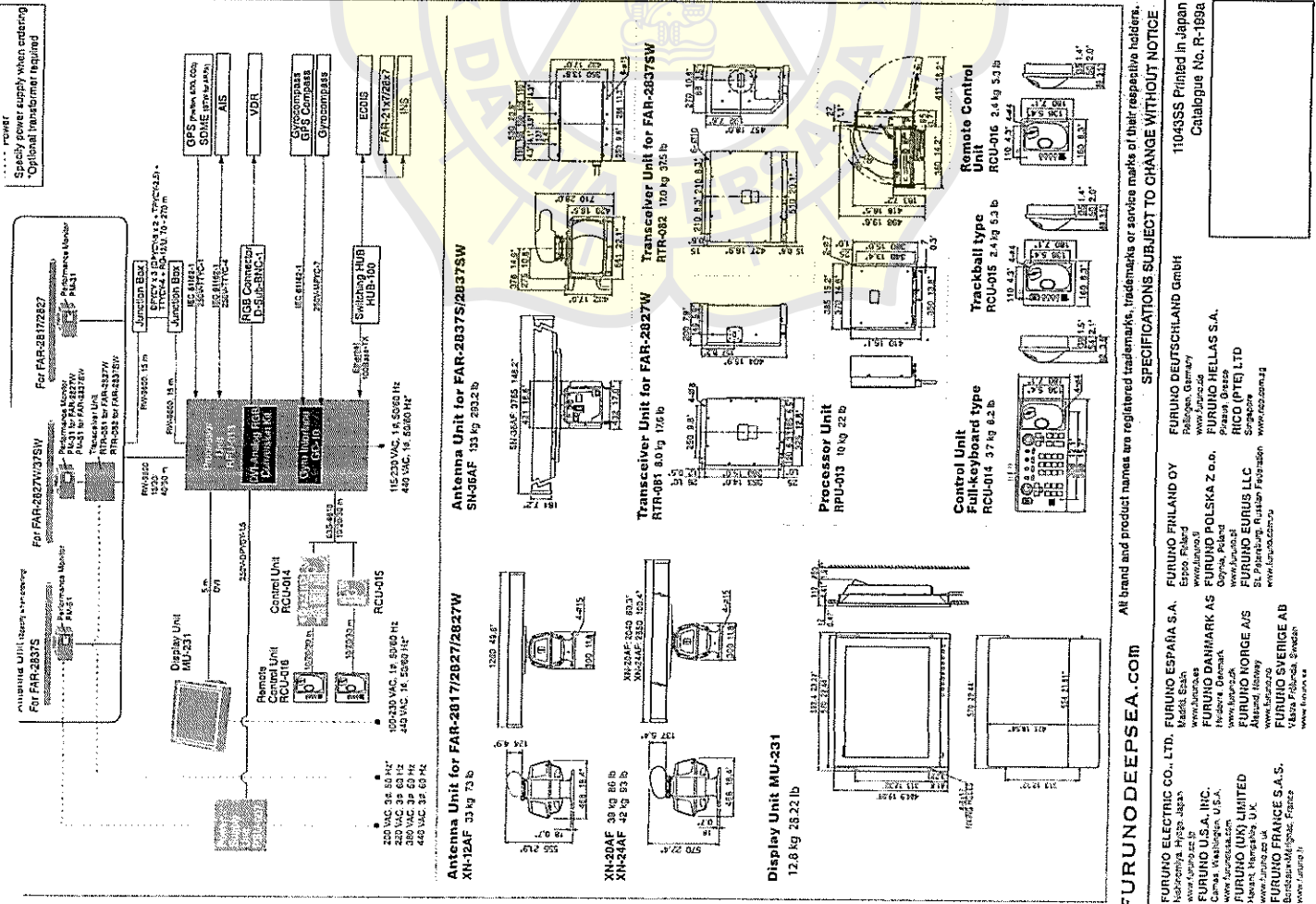
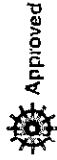
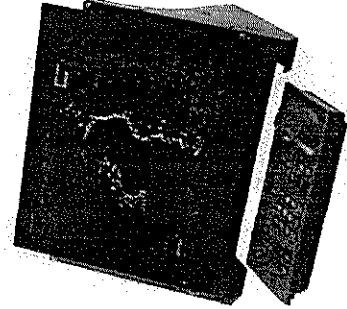
* Some Administrations may give a grace period for the current GPS receivers.



RADAR/RFP

Automatic Radar Plotting Aid

23.1" High resolution Multi-color LCD
FAR-28X7 series



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FURUNO has integrated leading-edge technology with a user-friendly interface, providing reliable performance and simplified installation

ARRARARPA
THE ORIGINAL



The revolutionary FAR-28x7 series of X- and S-band, TR-up and -down radars are the result of FURUNO's 50 years of experience in marine electronics and advanced computer technology. This series is designed to meet the exacting standards of the International Maritime Organization (IMO) for all ships.

The display unit employs a 26.1" LCD which provides an effective picture diameter of larger than 340 mm. The high-resolution UXGA, digital flat-panel display unit provides crisp and clear radar images through a DVI interface. The DVI interface provides a pure digital video signal by using a digital signal for the entire path which maintains the image quality at the highest level, because the signal is not degraded as a result of a digital-to-analog conversion. The display has selectable color with a day and night background colors for clear presentation in all lighting conditions. Different colors are assigned for marks, symbols and text for easy observation.

X-band antenna for FAR-2817/2827/2827W



8 ft antenna (4 or 6.5 ft. also available)

S-band antenna for FAR-2837S/2837SW



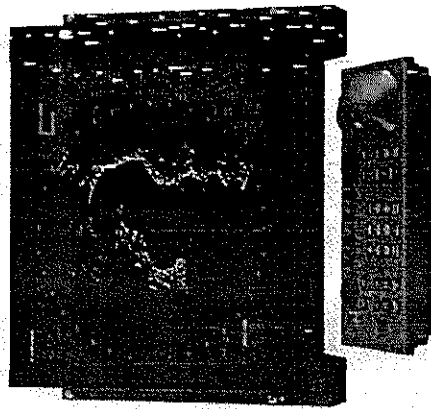
12 ft antenna

FAR-2817: X-band, 12 kW, TR up
 FAR-2827: X-band, 25 kW, TR up
 FAR-2827W: X-band, 25 kW, TR down
 FAR-2837S: S-band, 30 kW, TR up
 FAR-2837SW: S-band, 30 kW, TR down

- ▶ **Advanced signal processing for improved target detection**
- ▶ **High resolution UXGA LCD provides crisp radar images**
- ▶ **Complies with the existing IMO standards for all ships**
- ▶ **Low spurious magnitudes meeting ITU-R unwanted emission standards**
- ▶ **Up to four radars can be interswitched in the network without an extra device**
- ▶ **Automatic plotting/tracking of 100 targets manually or automatically acquired**
- ▶ **Displays 1000 AIS-equipped targets**
- ▶ **Easy operation by customizable function keys, trackball/wheel palm module and rotary controls**
- ▶ **Stylish streamlined design**

Target detection is improved by sophisticated signal processing techniques featuring superb short-range detection. Two guard zones are provided as automatic acquisition zones for ARPA (TT function). One of two can be set at required ranges and any sector in any form. The FAR-28x7 series can display data about AIS-equipped ships, when connected with an AIS transponder. AIS enhances detection of other ships and AtoN (Aid to Navigation) on radar by displaying their movement and status with easy to read symbols and text.

The radar antenna is available with 4, 6.5, or 8 feet radiator. For the X-band, the rotation speed is selectable from 24 rpm for standard radar or 42 rpm for HSC. The S-band radar is also available with the antenna radiator of 12 feet, and the rotation speed is selectable from 24/26 rpm for standard radar or 42 rpm for HSC application. The S-band radar assures target detection in adverse weather where an X-band is heavily affected by sea or rain clutter.



FAR-28x7 series radar

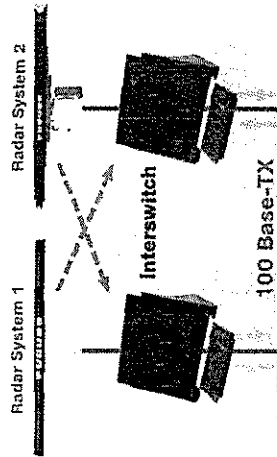
This series of radar complies with the latest IMO and IEC regulations:

- IEC 60945
- IEC 61162
- IEC 61993
- IEC 62388
- IMO MSC.191(79)
- IMO MSC.192(79)
- IMO A.694(17)
- IMO A.813(19)
- IMO SMC/Circ-217

Utilizing a high speed Ethernet network, the FAR-28x7 series brings flexible system expansion and consolidation to onboard navigation systems

FEATURES of FAR-28x7 series

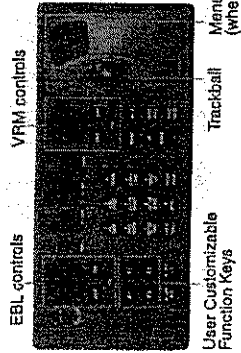
▶ 100 Base-TX Ethernet Network System



Other Radar Images, Chart data, Navigational information, etc.

The 100 Base-T Ethernet is utilized to link up to four sets of radar/ARPA FAR-21x7/28x7 with the ECDIS FEA-2107/2807. This link gives high-speed navigational data sharing within the system and allows operators to choose either a single station system or a total Integrated Navigation System (INS).

▶ Stress-free operation with versatile control units

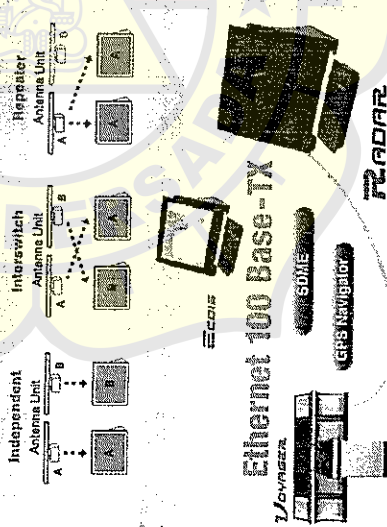


Full-keyboard type

The control head has logically arranged controls in a combination of push keys and trackball. Well organized menus ensure that all operations can be done by trackball.

Trackball type
Alternative to the Full-keyboard type or additional as a remote operation.

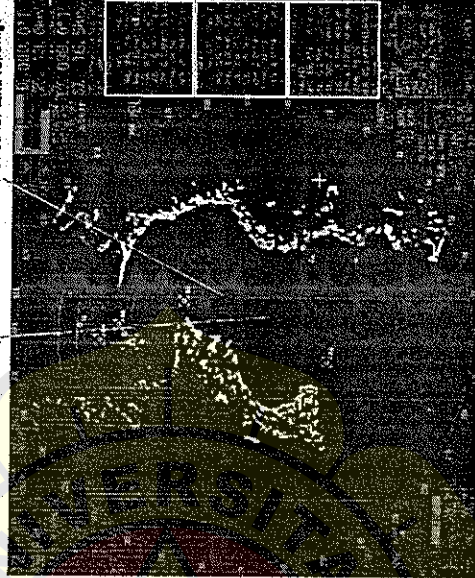
The radars can be connected to an Ethernet network for a variety of user requirements. Each of the X- and S-band radars can be interswitched without using an extra optical. Up to four radars can be interchanged in the network. In addition, the essential navigational information including the electronic chart, L/L, COG, SOG, STW, etc. can be shared in the network.



FUNCTIONS of FAR-28x7 series

▶ ARPA (TT)/AIS

Targets automatically acquired



Target Association (Fusion)

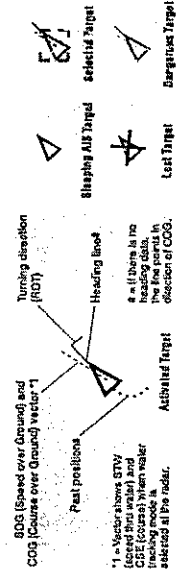
An AIS-equipped ship may be displayed by both AIS and ARPA (TT) symbols. This is because the AIS position is measured by a GPS navigator in L/L while the ARPA (TT) target/bip and data are measured by range and bearing from own ship. When the symbols are within an operator-set criteria, the ARPA (TT) symbol is merged with the AIS symbol. The criteria is determined by the differences in range, bearing, course, speed, etc.

Symbols for AIS

AIS COG/SOG vector changes its length with speed. ROT mark is viewable at the COG/SOG vector tip when a target ship is equipped with a FURUNO satellite compass SC-50/110 or gyrocompass which can talk ROT serial sentence.

Data Display

A variety of navigational information, own ship status, radar plotting data, wind, water temperature and information from other shipborne sensors are displayed on the cells. The FAR-28x7 series has an unique zoom function, which enlarges a part of the radar image twice or three times in size.



Target Tracking

1. Acquisition
Auto or manual acquisition: 100 targets in 0.2-24 (32) nm
2. Tracking
Auto tracking on all acquired targets
3. Guard zone (Target Acquisition Area)
0.5 nm width sector, within 3-6 nm, desired bearing
1 nm width sector or polygon, desired range and bearing
4. Past positions
5 or 10 past positions on all targets
5. Collision warning
CPA Limit: 0.1-20 nm, TCPA Limit: 1-60 minutes
6. Tidal maneuver
Dynamic or static, with selected delay time.

Power Supply (specify when ordering)

1. Processor Unit
FAR-2817
100-115 VAC; 2.6 A (3.0 A for HSC), 220-230 VAC; 1.6 A (1.7 A for HSC), 1 φ, 50/60 Hz
FAR-2827
100-115 VAC; 3.0 A (3.4 A for HSC), 220-230 VAC; 1.8 A (1.9 A for HSC), 1 φ, 50/60 Hz
FAR-2827W
100-115 VAC; 3.2 A, 220-230 VAC; 1.6 A, 1 φ, 50/60 Hz
FAR-2837S/2837SW
100-115 VAC; 3.0 A, 220-230 VAC; 1.5 A, 1 φ, 50/60 Hz
2. Display Unit
100-230 VAC; 0.8 A, 1 φ, 50/60 Hz
440 VAC, 1 φ, 50/60 Hz with optional transformer RU-1803
3. Antenna Unit
FAR-2837S/2837SW
200 VAC, 3.0 A, 3φ, 50 Hz; 220 VAC, 3.0 A (3.5 A for HSC), 3φ, 60 Hz; 380 VAC, 1.5 A, 3φ, 50 Hz; 440 VAC, 1.5 A (1.7 A for HSC), 3φ, 60 Hz
* for FAR-2837S only
110 VAC, 3φ, 60 Hz with RU-5693; 220 VAC, 3φ, 50 Hz with RU-6522; 440 VAC, 3φ, 50 Hz with RU-5466-1

Equipment List

Standard

1. Display Unit MU-231
2. Processor Unit RPU-013
3. Full-keyboard Control Unit RCU-014
Trackball Control Unit RCU-015
(Specify when ordering)
4. Antenna Unit with cable (15/30/40/50 m)
5. Power Supply Unit PSU-007 for FAR-2837S
6. Standard Spare Parts and Installation Materials

Option

1. Performance Monitor PM-31 for X-band, PM-51 for S-band
2. Remote Control Unit RCU-016
3. GYRO Interface GC-10
4. DVI-Analog RGB Conversion Kit OP03-180 (SXGA output)
5. RGB Connector DSUB-BNC-1 (for VDR)
6. Memory Card Interface Unit CU-200
7. Transformer RU-1803/5466-1/5693/6522
8. Rectifier RU-3424/1746B
9. Junction Box JB-001
10. Antenna Cable RW-9600
11. Hand Grip FP03-09840
12. Bracket FP03-09820
13. Switching Hub HUB-100

Automatic Acquisition Zone

Two automatic acquisition zones may be set in a sector or any form. They also act as suppression zones, avoiding unnecessary overloading to the processor and clutter by disabling automatic acquisition and tracking outside them. Targets in an automatic acquisition zone are shown with an inverse triangle. The operator can manually acquire important targets without restriction.

Guard Zones and Anchor Watch Zone

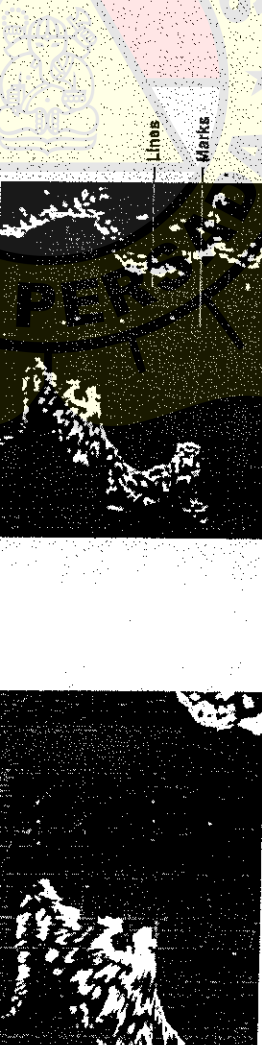
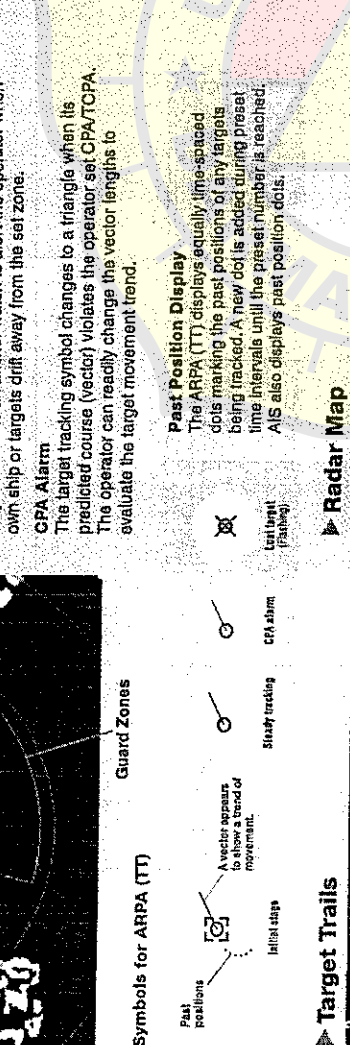
Guard Zones generate visual and audible alarms when targets enter the operator set zones. One of the Guard Zones may be used as an anchor watch to alert the operator when own ship or targets drift away from the set zone.

CPA Alarm

The target tracking symbol changes to a triangle when its predicted course (vector) violates the operator set CPA/TCPA. The operator can readily change the vector lengths to evaluate the target movement trend.

Past Position Display

The ARPA (TT) displays equally time-spaced dots marking the past positions of any targets being tracked. A new dot is added during preset time intervals until the preset number is reached. AIS also displays past position dots.



A radar map is a combination of lines and marks whereby the user can define and input the navigation area, route planning and monitoring data. The radar map can include up to 20,000 points for lines and marks. The map data can be saved to facilitate repeated use on a routine navigation area. Planned routes created on ECDIS can be transferred onto a radar display when interfaced with ECDIS.

Chart Overlay

This radar incorporates a VideoPlotter that displays electronic charts, plots own and other ship's track, enables entry of waypoints/routes, and makes a radar map. The Radar targets are overlaid on the chart. (For non-SOLAS ships only)

Presentation Colors

Target Tracking

1. Type
Slotted waveguide array
2. Beamwidth and sidelobe attenuation

Radiation Type	X-Band	S-Band
Length	XN-12AF, XN-20AF, XN-24AF	SN-36AF
Beamwidth(H)	4 ft, 6.5 ft, 8 ft	12 ft
Beamwidth(W)	1.9, 1.23, 0.95	1.8
Sidelobe (vertical)	20, 20, 20	25
Sidelobe (horizontal)	-24 dB, -28 dB, -28 dB	-24 dB
Sidelobe (overall)	-30 dB, -32 dB, -32 dB	-30 dB

RF Transceiver

1. Frequency
9410 MHz 30 MHz
3050 MHz 30 MHz
2. Output power
FAR-2817 | FAR-2827 | FAR-2827W | FAR-2837S | FAR-2837SW
12 kW, 25 kW, 25 kW, 30 kW, 30 kW
RTR-078 | RTR-079 | RTR-081 | RTR-080 | RTR-082

Range scale and ring intervals (nm)

Range	125	25	5	1.5	3	6	12	24	48	96
Ring	.025	.05	.1	.25	.5	1	2	4	8	16

ADDITIONAL FUNCTIONS (Data Input from AIS is required)

1. Number of targets
1,000 targets max.
2. Past Position Plot Intervals
OFF, 30 s, 1-60 minutes



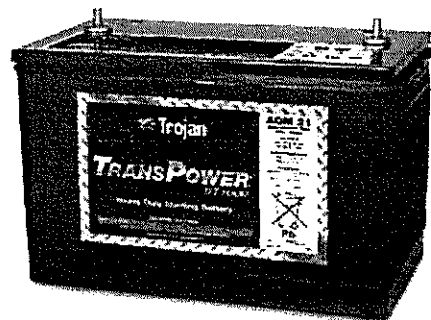
Introducing
OverDrive AGM 31™
Deep-Cycle Endurance

The Trojan OverDrive AGM 31 battery is a true deep-cycle AGM battery. Engineered exclusively to withstand the rigors and abuse of deep discharge applications, the OverDrive incorporates a series of design features essential to deliver energy storage and duration required for when your boat or RV goes through long periods of time without power hook ups. Selecting the wrong type of battery will cause disappointing performance of boat and RV house power functions such as lighting, water pump, furnace and other appliances. The Trojan OverDrive AGM 31 delivers high power cycling for extended periods of time and is designed to work hard so you can play hard in the great outdoors.



Introducing
TransPower™ ST1000 AGM 31
Starting Battery

The TransPower ST1000 is built specifically for demanding starting applications and is designed with unique features that provide extended battery life when compared to conventional starting batteries. As a sealed, maintenance-free AGM 31 starting battery, the Trojan TransPower ST1000 is engineered for rugged durability, outstanding cranking power and provides nearly double the battery life of a flooded starting battery. Design features that contribute to the overall performance and durability of the TransPower ST1000 include an advanced paste formulation, heavy-duty plate design and rugged polypropylene case. The TransPower ST1000 is durable enough to withstand the rigorous abuse recreation vehicle and marine applications can cause.



Product Specification Guide

BCI GROUP SIZE	TYPE	CAPACITY ^A Minutes		CRANKING Performance		CAPACITY ^B Amp-Hours (AH)				ENERGY (kWh)	TERMINAL Type	DIMENSIONS ^C Inches (mm)			WEIGHT lbs. (kg)
		@25 Amps	@75 Amps	CCA ^D @0°F	CA ^E @32°F	5-Hr Rate	10-Hr Rate	20-Hr Rate	100-Hr Rate	100-Hr Rate		Length	Width	Height ^F	
6 VOLT DEEP-CYCLE FLOODED BATTERIES - with T2 TECHNOLOGY™															
GC2	T-105	447	115	-	-	185	207	225	250	1.39	1, 2, 3, 4, 5	10-3/8 (264)	7-1/8 (181)	10-7/8 (276)	62 (28)
GC2	T-105 Plus	447	115	-	-	185	207	225	250	1.50	1, 2, 3, 4	10-3/8 (264)	7-1/8 (181)	10-11/16 (272)	62 (28)
GC2	T-125	488	132	-	-	195	221	240	266	1.50	1, 2, 3, 4	10-3/8 (264)	7-1/8 (181)	10-7/8 (276)	66 (30)
GC2	T-125 Plus	488	132	-	-	195	221	240	266	1.60	1, 2, 3, 4	10-3/8 (264)	7-1/8 (181)	10-11/16 (272)	66 (30)
GC2H	T-145	530	145	-	-	215	239	260	287	1.60	1, 2, 3, 4	10-3/8 (264)	7-1/8 (181)	11-5/8 (295)	72 (33)
GC2H	T-145 Plus	530	145	-	-	215	239	260	287	1.72	1, 2, 3, 4	10-3/8 (264)	7-1/8 (181)	11-1/2 (292)	72 (33)
902	J305H-AC*	781	215	-	-	295	331	360	400	1.72	6	11-5/8 (295)	7 (178)	14-3/8 (365)	98 (45)
903	L16H-AE*	935	245	-	-	357	400	435	483	2.89	6	11-5/8 (295)	7 (178)	16-3/4 (424)	125 (57)
12 VOLT DEEP-CYCLE FLOODED BATTERIES - with T2 TECHNOLOGY™															
24	24TMX	140	36	-	-	70	78	85	94	1.13	5, 7, 8, 9	11-1/4 (286)	6-3/4 (171)	9-3/4 (248)	47 (21)
27	27TMX	175	45	-	-	85	97	105	117	1.40	5, 9	12-3/4 (324)	6-3/4 (171)	9-3/4 (248)	55 (25)
121	J185H-AC*	440	121	-	-	185	207	225	249	2.99	6	15 (381)	7 (178)	14-5/8 (371)	128 (58)
34	SCS150	150	36	530	650	80	92	100	111	1.33	10	11-1/4 (286)	6-3/4 (171)	9-3/4 (248)	50 (23)
17	SCS200	200	52	620	760	95	105	115	128	1.54	10	12-3/4 (324)	6-3/4 (171)	9-3/4 (248)	60 (27)
31	SCS225	225	57	665	820	105	118	130	144	1.73	10	13-15/16 (355)	6-3/4 (171)	9-7/8 (251)	66 (30)

HydroLink™ Battery Watering Made Easy

Proper maintenance and periodic watering are important factors in maximizing the performance and life of Trojan deep-cycled flooded batteries. Battery maintenance can be a costly, time-consuming and messy job. With Trojan's HydroLink™ advanced, single-point watering system, precise battery watering is made easy saving valuable time and money.

Trojan's HydroLink watering system is specifically designed to work with Trojan 6-volt and 12-volt flooded batteries**. It makes the guess work out of properly watering flooded batteries. The unique HydroLink™ vent assembly features an independent water level indicator, valve shut off and dual air restrictors. With a simple installation of the HydroLink fittings and tubing, the system is ready for use. Once installed, a complete set of batteries can be filled in less than 10 minutes. The HydroLink™ watering system comes with a 1-year, limited warranty.



** HydroLink is not compatible with all Trojan batteries. Please visit: www.trojanbattery.com/HydroLink for more information.

Guide to uplampping for Fluorescent Lamps

Ever since the company was started in 1891, Philips Lighting has developed and launched many thousands of innovative and important products. With so many products to choose from, this handy and practical 'Guide to better lamps', makes it simpler to make the right choice.

Current product

Standard T8

Energy efficient alternative

MASTER TL-D Eco



Energy savings	10%
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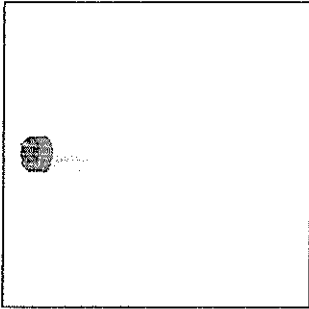
For more uplampping possibilities, visit www.philips.com/catalog



asimpleswitch.com

26th November 2009

TL-D MASTER TL-D Eco



- Can be directly retrofitted into existing fluorescent fittings operating on conventional EM or HF gear in indoor applications
- Uses the latest highly efficient phosphors and special filling gas
- High-quality lighting with good color rendering (CRI>80)
- Light output comparable to other TL-D Super 80 colors
- Lumen maintenance and lifetime the same as other TL-D Super 80 colors
- Dimmable

Product Benefits

- Simple lamp-for-lamp replacement for more than 10% energy savings

- Makes lighting installations compliant with latest indoor lighting standards
 - Relatively high efficacy, both initially and during lifetime, with high lumen maintenance
- ### Environment
- Allows easy switching to more energy-conscious solutions
 - Helps reduce CO₂ emissions and meet climate change targets
 - Philips Green Flagship label due to extremely low mercury levels
 - RoHS compliant
 - Covered by WEEE

- Primary focus on offices, schools and hospitals; secondary focus on retail, industry, supermarkets
- Not recommended under the following conditions:
 - with air flow around the lamps
 - in luminaires with active air handling (lamp temperature will not be the required 25-35 °C, but room temperature)
 - in open luminaires/battens very close to air conditioning outlets or cold air flows
 - in space above freezers (temperature may easily drop below 20 °C)
 - in combination with VRUs (voltage reduction units)

Application

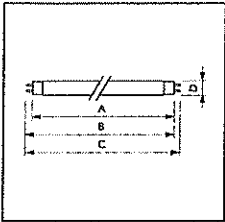
- For use in indoor applications with room temperatures above 20 °C (which implies temperature around the lamp of over 25-35 °C)

Product Description

- Low-pressure mercury discharge lamps with a tubular 26 mm envelope

Product Features

- The only T8 fluorescent lamp that saves more than 10% of energy in existing indoor luminaires

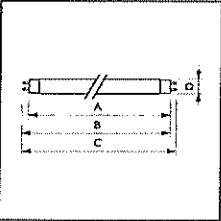
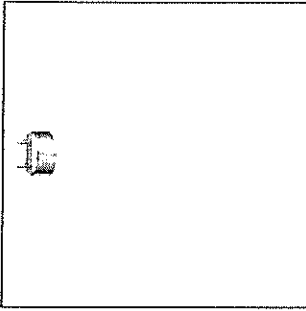


Dim. no.	A max.	B min.	B max.	C max.	D max.
1	589.8	594.5	596.9	604.0	28
2	1199.4	1204.1	1206.5	1213.6	28
3	1500.0	1504.7	1507.1	1514.2	28
4	1763.6	1768.5	1770.9	1778.0	28

MASTER TL-D Eco G13

Wattage/ Colour Code	Colour Rendering Index	Colour Temperature	Energy Efficiency Label (EEL)	Luminous Flux Lamp EM 30°C	Life to 50% fail Preheat EL,3h	Dim. no.	Packing type/ Packing configuration	Packs per outer box	National Order Code	Ordering number 8711500...	Nett Trade Price per Piece (£)	
	(Ra)	(K)		(lm)	(h)							
16W/830	85	3000	A	1300	20000	1	1SL / 25	25	16830TLDECO	268570 40	23.79	yes
16W/840	85	4000	A	1300	20000	1	1SL / 25	25	16840TLDECO	268617 40	23.79	yes
16W/865	85	6500	A	1225	20000	1	1SL / 25	25	16865TLDECO	268716 40	23.79	yes
32W/830	85	3000	A	3000	20000	2	1SL / 25	25	32830TLDECO	264589 40	23.79	yes
32W/840	85	4000	A	3000	20000	2	1SL / 25	25	32840TLDECO	264626 40	23.79	yes
32W/865	85	6500	A	2850	20000	2	1SL / 25	25	32865TLDECO	264640 40	23.79	yes
51W/830	85	3000	A	4800	20000	3	1SL / 25	25	51830TLDECO	264664 40	25.92	yes
51W/840	85	4000	A	4800	20000	3	1SL / 25	25	51840TLDECO	264701 40	25.92	yes
51W/865	85	6500	A	4470	20000	3	1SL / 25	25	51865TLDECO	264725 40	25.92	yes
63W/830	85	3000	A	5600	20000	4	1SL / 25	25	63830TLDECO	268730 40	36.29	yes
63W/840	85	4000	A	5600	20000	4	1SL / 25	25	63840TLDECO	268754 40	36.29	yes

MASTER TL-D Super 80



Product Description

- Low-pressure mercury discharge lamps with a tubular 26 mm envelope

Product Features

- Highly efficient 3-band fluorescent coating in combination with New Generation pre-coating technology
- High initial light output
- Available in varying colour designations
- Low mercury dose

Product Benefits

- Special fluorescent coating gives good colour rendering

- Relatively high efficacy, both initially and during lamp lifetime, with high lumen maintenance
- Create atmospheres from warm white to cool daylight

Environment

- Best environmental T8 choice because of TL-D /800 superior energy efficiency compared to TL-D Standard lamps. Lowest mercury content in the industry and 100% lead free
- Lowest amount of mercury in the market for colour 800 fluorescent tubes

- RoHS compliant
- This product range is covered by WEEE

Application

- Suitable for use in a wide range of luminaires for TL-D fluorescent lamps for 'human' applications such as schools, offices, shops, factory halls etc.

System

- Can be used with conventional or electronic gear
- Higher efficacy is achieved with electronic gear

Dim. no.	A max.	B min.	B max.	C max.	D max.
1	437.4	442.1	444.5	451.6	28
2	589.8	594.5	596.9	604	28
3	970.0	974.7	977.1	984.2	28
4	894.6	899.3	901.7	908.8	28
5	1189.4	1204.1	1206.5	1213.6	28
6	1047.0	1051.7	1054.1	1061.2	28
7	1500.0	1504.7	1507.1	1514.2	28
8	1763.8	1768.5	1770.9	1778	28

MASTER TL-D Super 80 G13

Wattage/Colour Code/ Version	Colour Rendering Index (R _a)	Colour Temperature (K)	Energy Efficiency Label (EEL)	Lamp Luminous Flux EM (lm)	Life to 50% fail Preheat EL,3h (h)	Dim. no.	Packing type/ Packing configuration	Packs per outer box	National Order Code	Ordering number 8711500...	Nett Trade Price per Piece (£)	
15W/830	85	3000	B	1000	20000	1	1SL / 25	25	15830	702791 40	25.07	yes
15W/840	85	4000	B	1000	20000	1	1SL / 25	25	15840	702807 40	25.07	yes
18W/827	85	2700	A	1350	20000	2	1SL / 25	25	18827	631626 40	17.46	yes
18W/830	85	3000	A	1350	20000	2	1SL / 25	25	18830	631657 40	17.46	yes
18W/830	85	3000	A	1350	20000	2	UNP / 25	25	18830IP	610546 40	17.46	yes
18W/835	85	3500	A	1350	20000	2	1SL / 25	25	18835	631688 40	17.46	yes
18W/840	85	4000	A	1350	20000	2	1SL / 25	25	18840	631718 40	17.46	yes
18W/840	85	4000	A	1350	20000	2	UNP / 25	25	18840IP	610126 40	17.46	yes
18W/865	85	6500	A	1300	20000	2	1SL / 25	25	18865	631770 40	17.46	yes
23W/840	85	4000	A	2050	20000	3	1SL / 25	25	23840	558701 40	25.07	yes
30W/830	85	3000	A	2400	20000	4	1SL / 25	25	30830	631831 40	22.47	yes
30W/840	85	4000	A	2400	20000	4	1SL / 25	25	30840	631862 40	22.47	yes
36W/827	85	2700	A	3350	20000	5	1SL / 25	25	36827	631923 40	17.66	yes
36W/830	85	3000	A	3350	20000	5	1SL / 25	25	36830	631954 40	17.66	yes
36W/830	85	3000	A	3350	20000	5	UNP / 25	25	36830IP	610171 40	17.66	yes
36W/835	85	3500	A	3350	20000	5	1SL / 25	25	36835	631985 40	17.66	yes
36W/840	85	4000	A	3350	20000	5	1SL / 25	25	36840	632012 40	17.66	yes
36W/840	85	4000	A	3350	20000	5	UNP / 25	25	36840IP	610188 40	17.66	yes
36W/865	85	6500	A	3250	20000	5	1SL / 25	25	36865	632074 40	17.66	yes
36W/830 - 1m	85	3000	A	3100	20000	3	1SL / 25	25	M36830NG	558749 40	19.73	yes
36W/840 - 1m	85	4000	A	3100	20000	3	1SL / 25	25	M36840NG	558770 40	19.73	yes
8W/830	85	3000	A	3350	20000	6	1SL / 25	25	38830NG	558800 40	19.73	yes
8W/840	85	4000	A	3350	20000	6	1SL / 25	25	38840NG	558831 40	19.73	yes
8W/827	85	2700	A	5200	20000	7	1SL / 25	25	58827	632104 40	16.66	Yes
3W/830	85	3000	A	5200	20000	7	1SL / 25	25	58830	632135 40	19.24	yes
3W/830	85	3000	A	5200	20000	7	UNP / 25	25	58830IP	610195 40	19.24	yes
3W/835	85	3500	A	5200	20000	7	1SL / 25	25	58835	632166 40	19.24	yes
3W/840	85	4000	A	5200	20000	7	1SL / 25	25	58840	632197 40	19.24	yes
1W/840	85	4000	A	5200	20000	7	UNP / 25	25	58840IP	610294 40	19.24	yes
1W/865	85	6500	A	5000	20000	7	1SL / 25	25	58865	632258 40	19.24	yes
1W/830	85	3000	A	6200	20000	8	1SL / 25	25	70830	615985 40	29.74	yes
1W/835	85	3500	A	6200	20000	8	1SL / 25	25	70835	642738 40	29.74	yes
1W/840	85	4000	A	6200	20000	8	1SL / 25	25	70840	615923 40	29.74	yes

LED PRO

2, 3 and 5 Nautical Mile LED Navigation Lamps

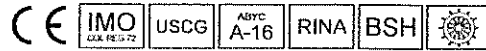
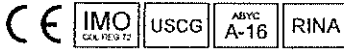


Port

Starboard

Stern

Masthead

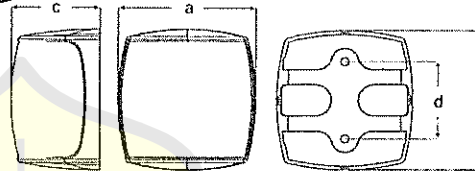


LED Multivolt 2 Nautical Mile LED Navigation Lamps - Acrylic Lens

Lamp Type	Visibility	Black Shroud	White Shroud
Port	2 NM	2LT 959 900-001	2LT 959 900-011
Starboard	2 NM	2LT 959 908-001	2LT 959 908-011
Stern	2 NM	2LT 959 909-001	2LT 959 909-011

LED Multivolt 2 Nautical Mile LED Navigation Lamps - Acrylic Lens

Lamp Type	Visibility	Black Shroud	White Shroud
Port	2 NM	2LT 959 900-601	2LT 959 900-611
Starboard	2 NM	2LT 959 908-601	2LT 959 908-611
Stern	2 NM	2LT 959 909-601	2LT 959 909-611
Bi-Colour	2 NM	2LT 959 941-001	2LT 959 941-011
Masthead	3 NM	2LT 959 940-601	2LT 959 940-611
Masthead	5 NM	2LT 959 940-401	2LT 959 940-411



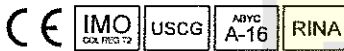
Dimensions
 a = 87mm / 3.43"
 b = 90mm / 3.54"
 c = 57mm / 2.25"
 d = 50mm / 1.97"

LED Multivolt 3 Nautical Mile LED Navigation Lamps - Acrylic Lens

Lamp Type	Visibility	Black Shroud	White Shroud
Port	3 NM	2LT 959 900-201	2LT 959 900-211
Starboard	3 NM	2LT 959 908-201	2LT 959 908-211
Stern	3 NM	2LT 959 909-201	2LT 959 909-211
Masthead	3 NM	2LT 959 940-201	2LT 959 940-211

LED

Compact 2 Nautical Mile LED Navigation Lamps



Port

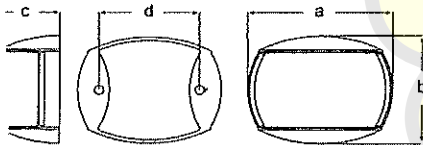
Starboard

Stern

Towing

LED Multivolt 2 Nautical Mile Lamps - Acrylic Lens

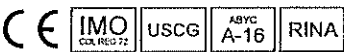
Lamp Type	Visibility	Black Shroud	White Shroud
Port	2 NM	2LT 980 520-001	2LT 980 520-011
Starboard	2 NM	2LT 980 520-201	2LT 980 520-211
Stern	2 NM	2LT 980 520-501	2LT 980 520-511
Towing	2 NM	2LT 980 520-601	2LT 980 520-611



Dimensions
 a = 71mm / 2.80"
 b = 53mm / 2.09"
 c = 33mm / 1.30"
 d = 50mm / 1.97"

LED 360

2 Nautical Mile LED Anchor and All Round Lamps



All Round White / Anchor

All Round Green

All Round Red

LED Multivolt 2 Nautical Mile All Round Lamps - Straps Mount

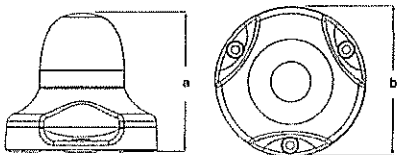
Light Colour	Visibility	Black Base	White Base
White	2 NM	2LT 980 910-001	2LT 980 910-011
Red	2 NM	2LT 980 910-401	2LT 980 910-411
Green	2 NM	2LT 980 910-201	2LT 980 910-211

LED Multivolt 2 Nautical Mile All Round White Lamps - Fixed Pole Mount

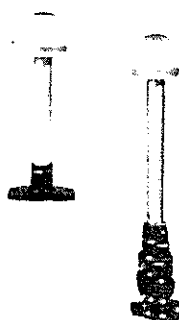
Overall Length	Visibility	Black Base	White Base
8" / 204mm	2 NM	2LT 959 910-011	2LT 959 910-111

LED Multivolt 2 Nautical Mile All Round White Lamps - Fold Down Pole Mount

Overall Length	Visibility	Black Base	White Base
12" / 305mm	2 NM	2LT 959 910-621	2LT 959 910-721
20" / 500mm	2 NM	2LT 959 910-661	2LT 959 910-761
24" / 610mm	2 NM	2LT 959 910-631	2LT 959 910-731
34" / 850mm	2 NM	2LT 959 910-651	2LT 959 910-751

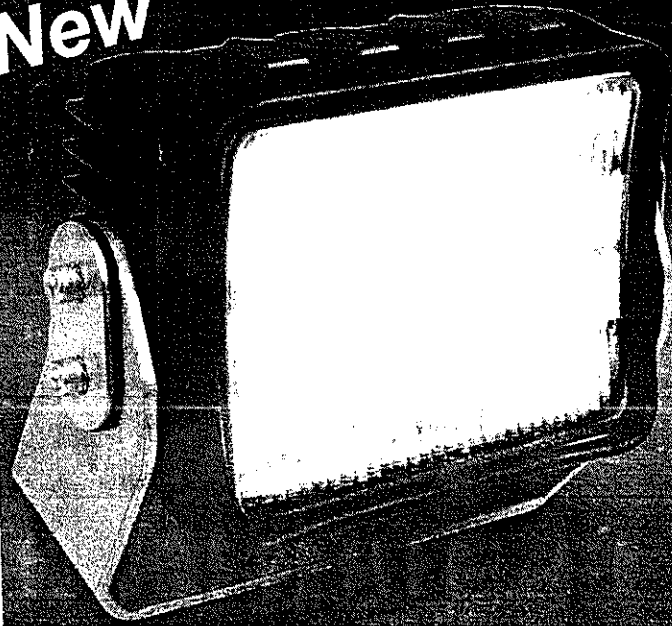


Dimensions
 a = 83mm / 3.27"
 b = 90mm / 3.54"



Bulk OEM packages available for all LED navigation lamps. Enquire with your Hella marine representative or distributor.

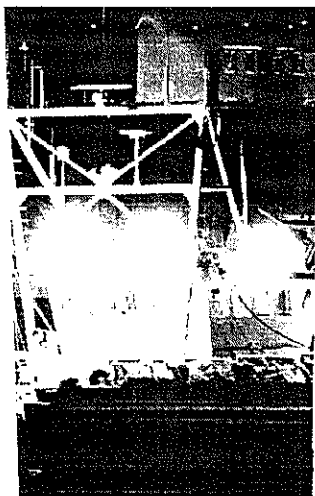
New



AS 5000 LED

**High Performance
Ultra Durable
No compromise**

**Purpose built commercial floodlights offering
over 5000 lumens of intense white light**



Hella marine AS 5000 LED floodlights are precision engineered to perform without failure, season after season.

Every aspect, material and component has been carefully selected to ensure longevity in the most demanding environments.

Relentless Hella marine 'test to destruction' development programmes help lift product reliability to new levels. AS 5000 lamps endure the worst of vibration, shock and high impact torture tests.

Powerful and efficient

With over 5000 lumens, AS5000 lamps offer highly effective illumination with a power consumption of only 60W (5A@12V and 2.5A@24V DC).

Fully sealed and salt water durable

Each lamp is a completely sealed IP 6K 9K unit, impervious to moisture and contaminants. The housing features a unique bonded non-stick coating that will not corrode, discolour, peel or flake even under harsh UV and is highly resistant to cleaning chemicals.

Benchmark light distribution

Hella's optical engineering expertise provides highly effective illumination for working vessels. Wide or narrow light beam patterns offer a crisp white 'close to daylight' 5700K colour temperature. Working under this colour of light reduces the fatigue and eye strain sometimes caused by warmer colour halogen lighting.

Multivolt™ 9-33V DC

Advanced electronics ensure reliable illumination and lamp protection even under severe voltage fluctuations and low battery voltages.

A reduced power mode activates below 11.6V to prevent battery drain when lights are on but the charging system may not be operating.

Durable in extreme temperatures

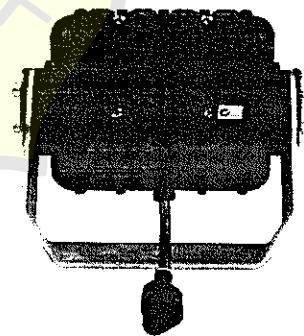
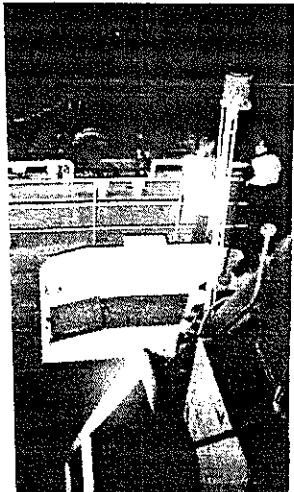
Tested to operate effectively from -40° to +50° Celsius. Integrated thermal protection ensures longevity of the electrical components at the most extreme operating temperatures.

Long term secure installation

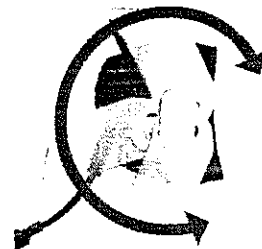
A sturdy 316 stainless steel bracket firmly holds the lamp to withstand harsh vibration and impact.

Designed and manufactured in Australia

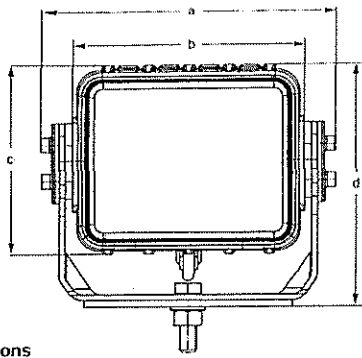
Hella marine AS 5000 lamps carry a 5 year warranty.



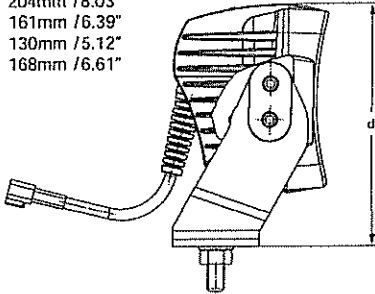
Completely sealed lamp and cable assembly.



316 stainless steel adjustable bracket holds the lamp to withstand harsh vibration and impact.

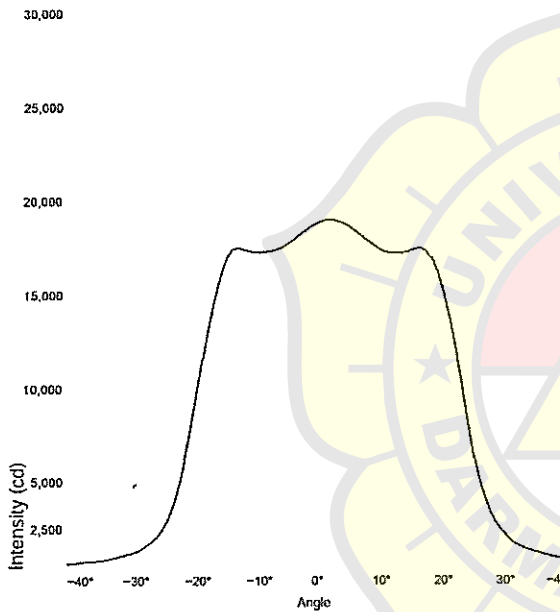


Dimensions
 a = 204mm / 8.03"
 b = 161mm / 6.39"
 c = 130mm / 5.12"
 d = 168mm / 6.61"

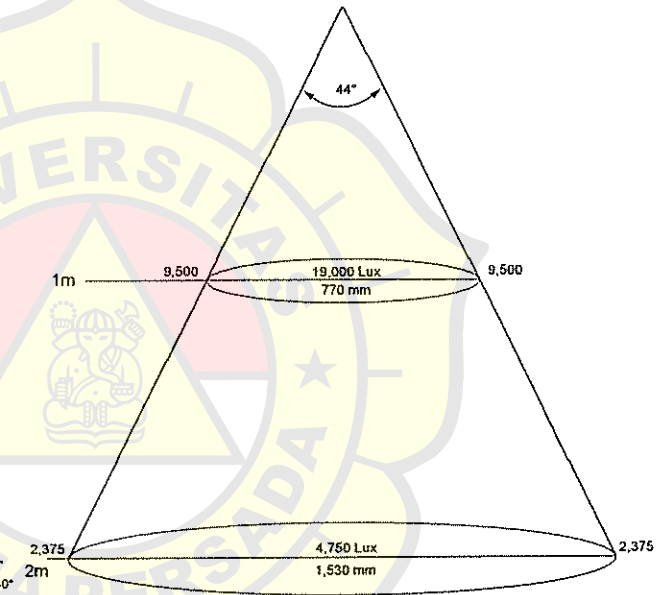


Lamp Type	AS 5000 LED
Housing Material	Die cast aluminium body. Non-stick surface coating
Lens Material	Heavy duty Grilamid®
Bracket Material	316 stainless steel
Colour Temperature	5700K (Daylight White)
Cable	Pre-wired with twin core marine cable. 2 pin DT.
Operating Voltage	Multivolt™ 9-33V DC
Power Consumption	60W (5A@12V / 2.5A@24V)
Operating Temperature	-40°C to +50°C
Degree of Protection	IP 6K 9K - Completely sealed
Dimensions	204mm (w) x 168mm (h) x 160mm (d)
Weight (including cable)	2600g (including cable)
Light Output	5000 lumens
EMC Protection	CISPR25 Class 2, ISO13766:2006
Shock Rating	200G
Vibration Rating	750Hz at 3.2mm

AS 5000 Wide Beam Floodlight Candela Output

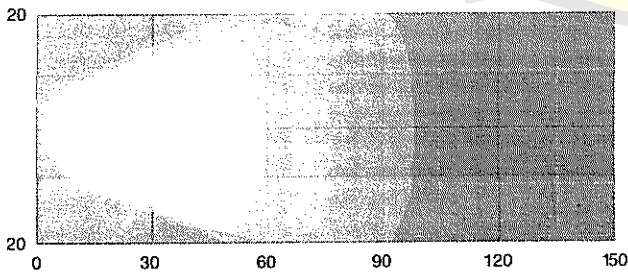


Luminous Intensity - Distance / Lux



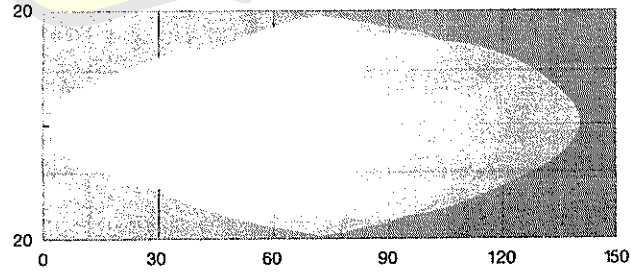
AS 5000LED Wide Beam

2.5m high at 5°



AS 5000LED Narrow Beam

2.5m high at 5°



LED Multivolt White Light LED Floodlight - Wide Beam

Voltage	Housing Colour	Part Number
9-33V DC	Black Housing	1GA 011 293-081

New

LED Multivolt White Light LED Floodlight - Narrow Beam

Voltage	Housing Colour	Part Number
9-33V DC	Black Housing	1GA 011 293-091

New

Accessories for AS5000 Series

Description	Part Number
100W 24V IP 67 AC-DC Power Supply	8ES 910 345-041
2.5m cable with DT Plug	9.1549.05



Dimensions
 L 200mm / 7.87"
 W 68mm / 2.68"
 H 40mm / 1.58"

