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**INNHOLDFORTEGNELSE**

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## 1. NOTATER FOR BEREGNINGENE

Beregningene er utført med programmet Autohydro Pro 6.8.0.

Følgende fyllingspunkter er lagt inn i beregningene.

Name	L (m)	T (m)	V (m)
(2) VENTILASJON BB	11.700f	1.340p	6.841

Forbrukstanker må ikke ha mindre fylling enn 48% i noen lastekondisjoner.

## 2. GENERELLE DATA

Fartøyet's navn : M/S BALDER  
Reder : Bukser og Berging AS  
Hjemsted : Oslo  
Kjennings bokstaver : JXFF

### HOVED DIMENSJONER:

Lengde o.a adt. : 26.68 M  
Lengde pp : 23.50 M  
Bredde mld. : 8.20 M  
Dybde i riss. : 4.50 M  
Dypgang : 3.903 M

KLASSE: Sjøfartsdirektoratet.

## 3. REFERANSE SYSTEM

Referansepunkt (origo) for lastekondisjoner er som følgende:

Tverrskips : Senterlinje  
Langskips : AP  
Vertikalt : Bases linje (underkant skrog)

## 4. LETT SKIP DATA

Lett skip er fra krengeprøve avholdt i Horten den 04.08.2013.

Lett skip data er som følgende:

Lett skip : 44,204 tonn  
VCG : 1,917 m  
LCG : 6.7035 m ff Ap

**5. INDEKS FOR LASTEKONDISJONER**

<b>Kond. Nr.</b>	<b>Loastekondisjoner</b>	<b>Side</b>
1	Departure, 100% consumables.	4 – 7
2	Towing Conditions, 48% consumables.	8 – 11

## 6. LASTEKONDISJONER

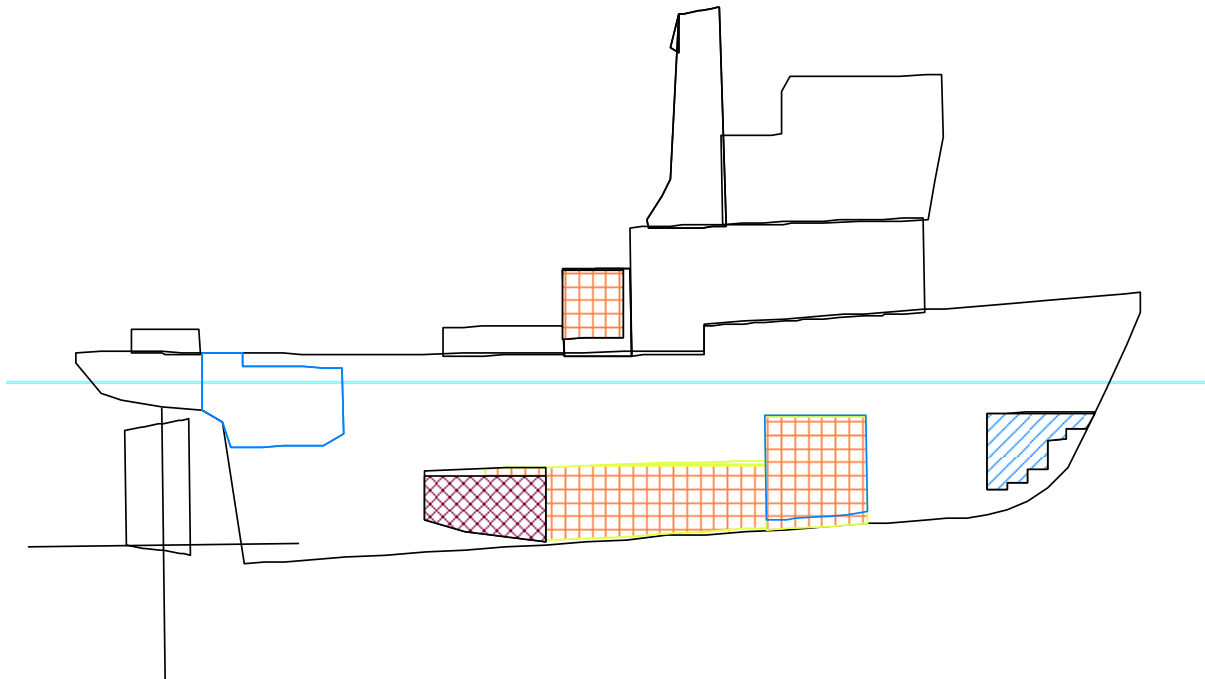
### CONDITION NO1 DEPARTURE CONDITION 100% CONSUMABLES

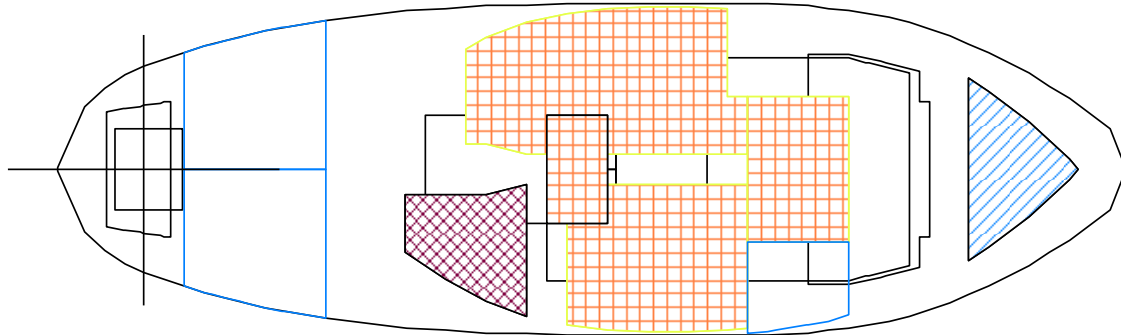
#### Floating Status





Draft FP	3.752 m	Heel	0.35p deg	GM(Solid)	0.890 m
Draft MS	3.903 m	Equil	Yes	F/S Corr.	0.090 m
Draft AP	4.053 m	Wind	Off	GM(Fluid)	0.799 m
Trim	0.30a m	Wave	No	KMT	4.160 m
LCG	12.063f m	VCG-Solid	3.270 m	TPcm	1.68
Displacement	412.3 MT	WaterSpgr	1.025		

#### Loading Summary

Item	Weight (MT)	LCG (m)	TCG (m)	VCG (m)
Light Ship	329.87	11.640f	0.000	3.615
Deadweight	82.38	13.755f	0.027p	1.890
Displacement	412.25	12.063f	0.005p	3.270





Tank Group	Weight (MT)	Load%	Tank Group	Weight (MT)	Load%
 FUEL OIL	60.87	98.00	 FRESH WATER	7.24	98.00
 LUB OIL	4.58	80.00	 FUEL IOL	5.69	98.00

## Fixed Weight Status

Item	Weight (MT)	LCG (m)	TCG (m)	VCG (m)
LIGHT SHIP	329.87	11.640f	0.000	3.615
CPS	4.00	15.500f	0.000	5.600
<b>Total Fixed:</b>	<b>333.87</b>	<b>11.686f</b>	<b>0.000</b>	<b>3.639</b>

## Tank Status

## FUEL OIL

Tank Name	Spgr	Load (%)	Weight (MT)	LCG (m)	TCG (m)	VCG (m)	FSMT (MT-m)
FO5.S	0.850	98.00%	17.77	12.742f	1.939s	1.132	8.9
FO4.P	0.850	98.00%	23.60	11.655f	1.820p	1.120	9.9
FO3.C	0.850	98.00%	19.51	16.236f	0.003p	1.652	8.1
<b>Subtotals:</b>		<b>98.00%</b>	<b>60.87</b>	<b>13.440f</b>	<b>0.140p</b>	<b>1.294</b>	<b>26.9</b>

## FRESH WATER

Tank Name	Spgr	Load (%)	Weight (MT)	LCG (m)	TCG (m)	VCG (m)	FSMT (MT-m)
FW.C	1.000	98.00%	7.24	21.228f	0.005p	2.271	5.4
<b>Subtotals:</b>		<b>98.00%</b>	<b>7.24</b>	<b>21.228f</b>	<b>0.005p</b>	<b>2.271</b>	<b>5.4</b>

## LUB OIL

Tank Name	Spgr	Load (%)	Weight (MT)	LCG (m)	TCG (m)	VCG (m)	FSMT (MT-m)
LO.S	0.900	80.00%	4.58	8.346f	1.395s	1.075	2.8
<b>Subtotals:</b>		<b>80.00%</b>	<b>4.58</b>	<b>8.346f</b>	<b>1.395s</b>	<b>1.075</b>	<b>2.8</b>

## FUEL IOL

Tank Name	Spgr	Load (%)	Weight (MT)	LCG (m)	TCG (m)	VCG (m)	FSMT (MT-m)
DAGTK.C	0.850	98.00%	5.69	10.749f	0.002p	5.824	2.1
<b>Subtotals:</b>		<b>98.00%</b>	<b>5.69</b>	<b>10.749f</b>	<b>0.002p</b>	<b>5.824</b>	<b>2.1</b>

## SEA WATER

Tank Name	Spgr	Load (%)	Weight (MT)	LCG (m)	TCG (m)	VCG (m)	FSMT (MT-m)
Septik.s	1.025	<empty>					0.0
WB.s	1.025	<empty>					0.0
WB.p	1.025	<empty>					0.0
<b>Subtotals:</b>		<b>0.00%</b>	<b>0.00</b>	<b>&lt;und&gt;</b>	<b>&lt;und&gt;</b>	<b>&lt;und&gt;</b>	<b>0.0</b>

## All Tanks

	Spgr	Load (%)	Weight (MT)	LCG (m)	TCG (m)	VCG (m)	FSMT (MT-m)
<b>Totals:</b>		<b>64.44%</b>	<b>78.38</b>	<b>13.666f</b>	<b>0.028p</b>	<b>1.700</b>	<b>37.2</b>

## Displacer Status

Item	Status	Spgr	Displ (MT)	LCB (m)	TCB (m)	VCB (m)	Perm
HULL	Intact	1.025	412.25	12.051f	0.011p	2.374	1.000
<b>SubTotals:</b>			<b>412.25</b>	<b>12.051f</b>	<b>0.011p</b>	<b>2.374</b>	

## Unprotected Flood Points

Name	L (m)	T (m)	V (m)	Height (m)
(1) VENTILASJON SB	11.700f	1.340s	6.841	2.946
(2) VENTILASJON BB	11.700f	1.340p	6.841	2.929

Least freeboard is 0.525 m at 6.500f

Least freeboard (to margin line) is 0.525 m at 6.500f

## Hydrostatic Properties

Draft is from Baseline.

Trim: aft 0.301/23.500, heel: port 0.35 deg., VCG = 3.270

Draft at 11.750f (m)	Displ (MT)	LCB (m)	VCB (m)	LCF (m)	TPcm (MT/cm)	MTcm (MT-m/cm)	GML (m)	GM(Fluid) (m)
3.903	412.251	12.051f	2.374	10.737f	1.68	2.61	14.854	0.799

Water Specific Gravity = 1.025.

Trim is per 23.50m

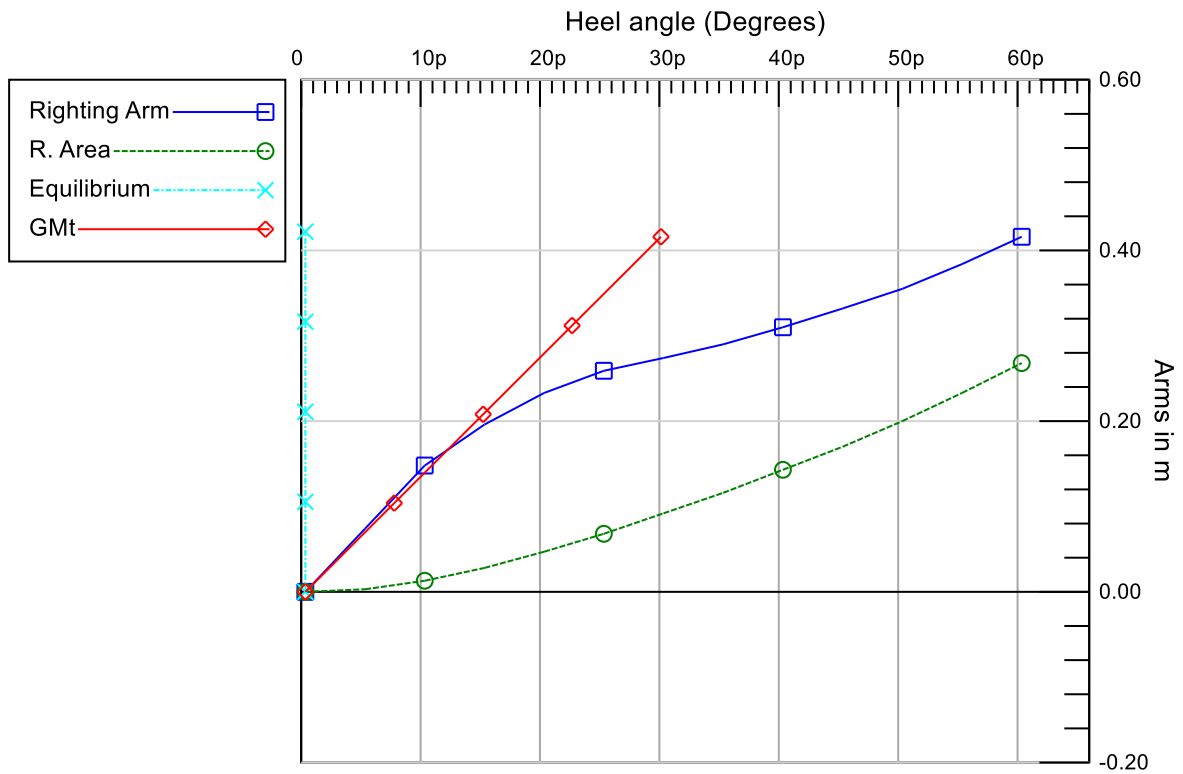
## NMD, INTACT STABILITY

Heel Angle (deg)	Trim Angle (deg)	Origin Depth (m)	Righting Arm (m)	Area (m-Rad)	Flood Pt Height (m)
0.35p	0.73a	4.053	0.000	0.000	2.929 (2)
5.35p	0.69a	4.025	0.074	0.003	2.803 (2)
10.35p	0.62a	3.956	0.148	0.013	2.659 (2)
15.35p	0.61a	3.888	0.196	0.028	2.478 (2)
20.35p	0.72a	3.825	0.233	0.047	2.270 (2)
25.35p	0.90a	3.760	0.258	0.068	2.033 (2)
30.35p	1.10a	3.681	0.274	0.092	1.769 (2)
35.35p	1.28a	3.576	0.290	0.116	1.489 (2)
40.35p	1.47a	3.444	0.310	0.142	1.200 (2)
45.35p	1.67a	3.289	0.332	0.170	0.906 (2)
50.35p	1.93a	3.117	0.355	0.200	0.609 (2)
55.35p	2.24a	2.928	0.384	0.233	0.314 (2)
60.35p	2.60a	2.726	<b>0.416</b>	0.268	0.023 (2)

## Unprotected Flood Points

Name	L (m)	T (m)	V (m)
(2) VENTILASJON BB	11.700f	1.340p	6.841

### NMD, INTACT STABILITY



Limit	Min/Max	Actual	Margin	Pass
(1) Area from 0.00 deg to 30.00	>0.0550 m-R	0.092	0.037	Yes
(2) Area from 0.00 deg to 40.00 or Flood	>0.0900 m-R	0.142	0.052	Yes
(3) Area from 30.00 deg to 40.00 or Flood	>0.0300 m-R	0.051	0.021	Yes
(4) Righting Arm at 30.00 deg or MaxRA	>0.200 m	0.416	0.216	Yes
(5) Angle from 0.00 deg to MaxRA	>25.00 deg	60.00	35.00	Yes
(6) GMt at Equilibrium	>-0.150 m	0.799	0.649	Yes

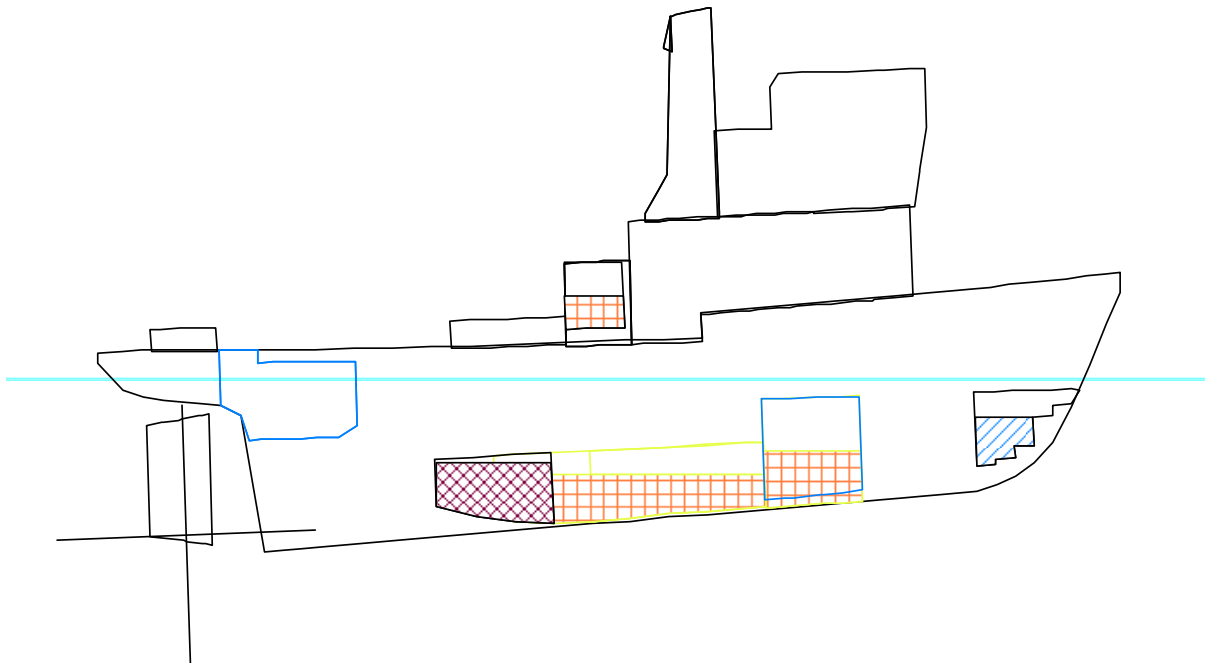
**CONDITION NO2  
TOWING CONDITION  
48% CONSUMABLES**

**Floating Status**

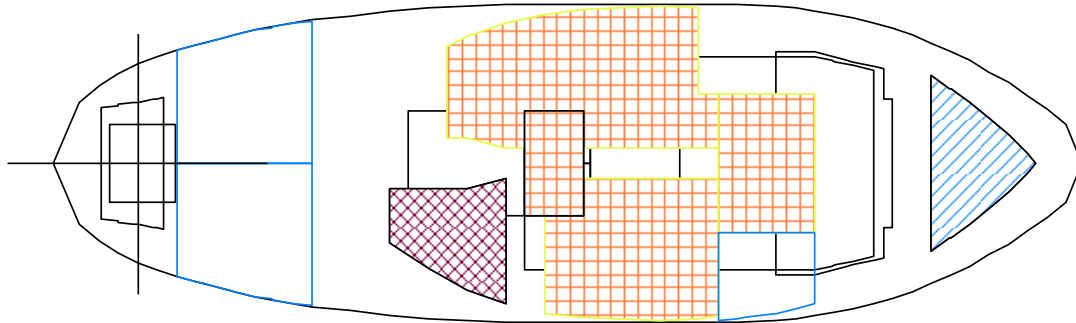
Draft FP	3.252 m	Heel	0.72s deg	GM(Solid)	0.777 m
Draft MS	3.654 m	Equil	Yes	F/S Corr.	0.112 m
Draft AP	4.056 m	Wind	Off	GM(Fluid)	0.664 m
Trim	0.80a m	Wave	No	KMT	4.156 m
LCG	11.860f m	VCG-Solid	3.380 m	TPcm	1.66
Displacement	374.6 MT	WaterSpgr	1.025		





**Loading Summary**

Item	Weight (MT)	LCG (m)	TCG (m)	VCG (m)
Light Ship	329.87	11.640f	0.000	3.615
Deadweight	44.73	13.484f	0.080s	1.645
Displacement	374.60	11.860f	0.010s	3.380







Tank Group	Weight (MT)	Load%	Tank Group	Weight (MT)	Load%
 FUEL OIL	29.81	48.00	 FRESH WATER	3.54	48.00
 LUB OIL	4.58	80.00	 FUEL IOL	2.79	48.00

## Fixed Weight Status

Item	Weight (MT)	LCG (m)	TCG (m)	VCG (m)
LIGHT SHIP	329.87	11.640f	0.000	3.615
CPS	4.00	15.500f	0.000	5.600
<b>Total Fixed:</b>	<b>333.87</b>	<b>11.686f</b>	<b>0.000</b>	<b>3.639</b>

## Tank Status

## FUEL OIL

Tank Name	Spgr	Load (%)	Weight (MT)	LCG (m)	TCG (m)	VCG (m)	FSMT (MT-m)
FO5.S	0.850	48.00%	8.70	12.644f	1.749s	0.757	11.9
FO4.P	0.850	48.00%	11.56	11.542f	1.577p	0.746	13.7
FO3.C	0.850	48.00%	9.55	16.212f	0.011s	0.990	8.1
<b>Subtotals:</b>		<b>48.00%</b>	<b>29.81</b>	<b>13.360f</b>	<b>0.097p</b>	<b>0.827</b>	<b>33.7</b>

## FRESH WATER

Tank Name	Spgr	Load (%)	Weight (MT)	LCG (m)	TCG (m)	VCG (m)	FSMT (MT-m)
FW.C	1.000	48.00%	3.54	21.075f	0.012s	1.849	3.5
<b>Subtotals:</b>		<b>48.00%</b>	<b>3.54</b>	<b>21.075f</b>	<b>0.012s</b>	<b>1.849</b>	<b>3.5</b>

## LUB OIL

Tank Name	Spgr	Load (%)	Weight (MT)	LCG (m)	TCG (m)	VCG (m)	FSMT (MT-m)
LO.S	0.900	80.00%	4.58	8.331f	1.404s	1.076	2.8
<b>Subtotals:</b>		<b>80.00%</b>	<b>4.58</b>	<b>8.331f</b>	<b>1.404s</b>	<b>1.076</b>	<b>2.8</b>

## FUEL IOL

Tank Name	Spgr	Load (%)	Weight (MT)	LCG (m)	TCG (m)	VCG (m)	FSMT (MT-m)
DAGTK.C	0.850	48.00%	2.79	10.742f	0.009s	5.398	2.1
<b>Subtotals:</b>		<b>48.00%</b>	<b>2.79</b>	<b>10.742f</b>	<b>0.009s</b>	<b>5.398</b>	<b>2.1</b>

## SEA WATER

Tank Name	Spgr	Load (%)	Weight (MT)	LCG (m)	TCG (m)	VCG (m)	FSMT (MT-m)
Septik.s	1.025	<empty>					0.0
WB.s	1.025	<empty>					0.0
WB.p	1.025	<empty>					0.0
<b>Subtotals:</b>		<b>0.00%</b>	<b>0.00</b>	<b>&lt;und&gt;</b>	<b>&lt;und&gt;</b>	<b>&lt;und&gt;</b>	<b>0.0</b>

## All Tanks

	Spgr	Load (%)	Weight (MT)	LCG (m)	TCG (m)	VCG (m)	FSMT (MT-m)
<b>Totals:</b>		<b>33.49%</b>	<b>40.73</b>	<b>13.286f</b>	<b>0.088s</b>	<b>1.257</b>	<b>42.1</b>

## Displacer Status

Item	Status	Spgr	Displ (MT)	LCB (m)	TCB (m)	VCB (m)	Perm
HULL	Intact	1.025	374.60	11.821f	0.024s	2.239	1.000
<b>SubTotals:</b>			<b>374.60</b>	<b>11.821f</b>	<b>0.024s</b>	<b>2.239</b>	

## Unprotected Flood Points

Name	L (m)	T (m)	V (m)	Height (m)
(1) VENTILASJON SB	11.700f	1.340s	6.841	3.166
(2) VENTILASJON BB	11.700f	1.340p	6.841	3.200

Least freeboard is 0.593 m at 2.500f

Least freeboard (to margin line) is 0.593 m at 2.500f

## Hydrostatic Properties

Draft is from Baseline.

Trim: aft 0.804/23.500, heel: stbd 0.72 deg., VCG = 3.380

Draft at 11.750f (m)	Displ (MT)	LCB (m)	VCB (m)	LCF (m)	TPcm (MT/cm)	MTcm (MT-m/cm)	GML (m)	GM(Fluid) (m)
3.654	374.599	11.821f	2.239	10.634f	1.66	2.48	15.542	0.664

Water Specific Gravity = 1.025.

Trim is per 23.50m

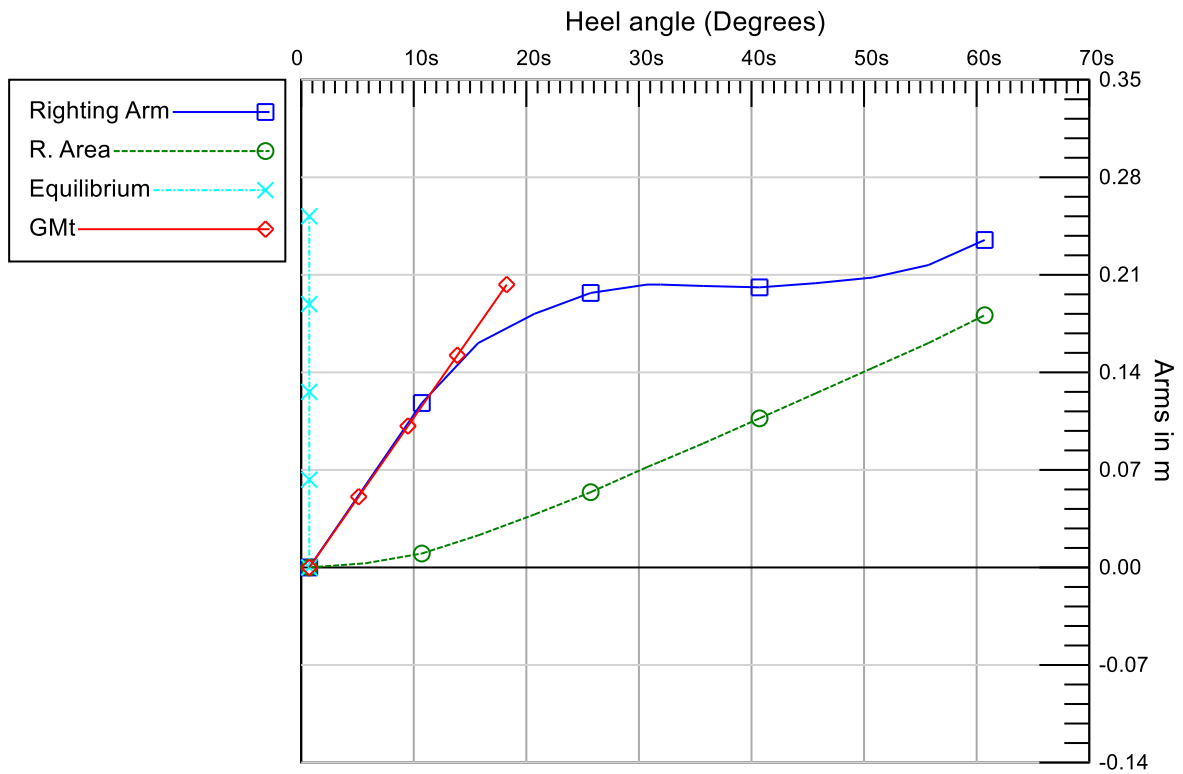
## NMD, INTACT STABILITY

Heel Angle (deg)	Trim Angle (deg)	Origin Depth (m)	Righting Arm (m)	Area (m-Rad)	Flood Pt Height (m)
0.72s	1.96a	4.053	0.000	0.000	3.166 (1)
5.72s	1.91a	4.022	0.059	0.003	3.038 (1)
10.72s	1.80a	3.944	0.118	0.010	2.893 (1)
15.72s	1.71a	3.849	0.161	0.023	2.720 (1)
20.72s	1.72a	3.762	0.182	0.038	2.511 (1)
25.72s	1.83a	3.675	0.197	0.054	2.277 (1)
30.72s	1.98a	3.582	0.203	0.072	2.017 (1)
31.92s	2.02a	3.557	<b>0.203</b>	0.076	1.951 (1)
35.72s	2.13a	3.468	0.202	0.089	1.736 (1)
40.72s	2.27a	3.326	0.201	0.107	1.444 (1)
45.72s	2.42a	3.159	0.204	0.125	1.149 (1)
50.72s	2.62a	2.973	0.208	0.143	0.852 (1)
55.72s	2.86a	2.770	0.217	0.161	0.557 (1)
60.72s	3.16a	2.553	0.235	0.181	0.267 (1)

## Unprotected Flood Points

Name	L (m)	T (m)	V (m)
(1) VENTILASJON SB	11.700f	1.340s	6.841

### NMD, INTACT STABILITY



Limit	Min/Max	Actual	Margin	Pass
(1) Area from 0.00 deg to 30.00	>0.0550 m-R	0.072	0.017	Yes
(2) Area from 0.00 deg to 40.00 or Flood	>0.0900 m-R	0.107	0.017	Yes
(3) Area from 30.00 deg to 40.00 or Flood	>0.0300 m-R	0.035	0.005	Yes
(4) Righting Arm at 30.00 deg or MaxRA	>0.200 m	0.203	0.003	Yes
(5) Angle from 0.00 deg to MaxRA	>25.00 deg	31.20	6.20	Yes
(6) GM at Equilibrium	>0.150 m	0.664	0.514	Yes

## APPENDIX 1

### HYDROSTATISKE DATA, KRYSS-KURVE DATA OG FORMKOEFFISIENTER

Hydrostiske data og Kryss-kurve data er beregnet for følgende trim-verdier:

1. 0.00 m trim
2. 0.4 m akterlig trim
3. 0.8 m akterlig trim

**HYDROSTATIC PROPERTIES  
FORM COEFF**

**Hydrostatic Properties**

Draft is from Baseline.

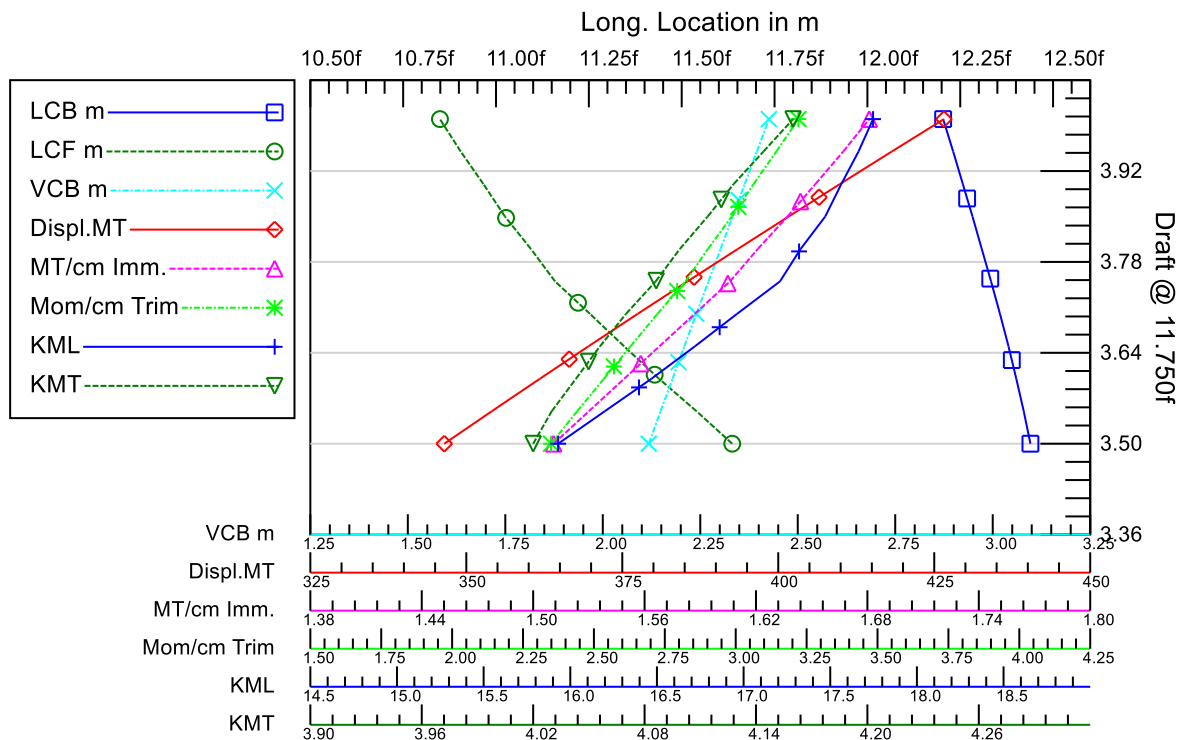
No Trim, No heel, VCG = 0.000

Draft at 11.750f (m)	Displ (MT)	LCB (m)	VCB (m)	LCF (m)	TPcm (MT/cm)	MTcm (MT-m/cm)	KML (m)	KMT (m)
3.500	346.469	12.439f	2.118	11.636f	1.51	2.35	15.930	4.020
3.550	354.078	12.421f	2.148	11.540f	1.53	2.44	16.199	4.030
3.600	361.782	12.401f	2.179	11.439f	1.55	2.54	16.468	4.043
3.650	369.576	12.380f	2.209	11.345f	1.57	2.63	16.719	4.056
3.700	377.463	12.357f	2.240	11.253f	1.59	2.72	16.962	4.070
3.750	385.446	12.333f	2.271	11.159f	1.61	2.82	17.210	4.086
3.800	393.518	12.308f	2.302	11.094f	1.62	2.90	17.329	4.099
3.850	401.666	12.283f	2.333	11.024f	1.64	2.99	17.471	4.114
3.900	409.889	12.257f	2.364	10.965f	1.65	3.06	17.564	4.128
3.950	418.184	12.231f	2.395	10.905f	1.67	3.14	17.663	4.144
4.000	426.554	12.204f	2.426	10.849f	1.68	3.22	17.747	4.160

Water Specific Gravity = 1.025.

Trim is per 23.50m

**Hydrostatic Properties at zero, Heel = 0.00**



Specific Gravity = 1.025    Assumed KG = 0.000  
K = Baseline

**Hydrostatic Properties**

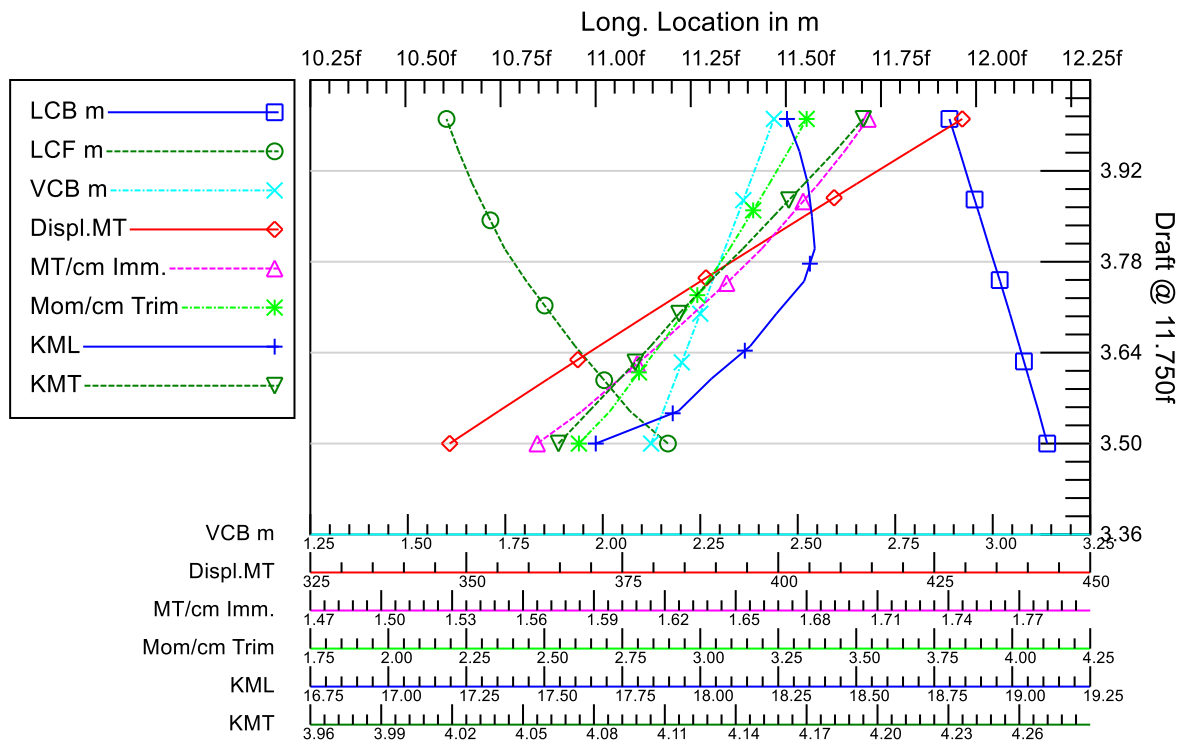
Draft is from Baseline.

Trim: aft 0.400/23.500, No heel, VCG = 0.000

Draft at 11.750f (m)	Displ (MT)	LCB (m)	VCB (m)	LCF (m)	TPcm (MT/cm)	MTcm (MT-m/cm)	KML (m)	KMT (m)
3.500	347.332	12.187f	2.124	11.190f	1.57	2.61	17.665	4.065
3.550	355.212	12.164f	2.155	11.090f	1.59	2.71	17.930	4.078
3.600	363.180	12.139f	2.187	11.019f	1.60	2.79	18.036	4.091
3.650	371.230	12.114f	2.218	10.946f	1.62	2.87	18.160	4.104
3.700	379.357	12.089f	2.250	10.882f	1.63	2.95	18.244	4.116
3.750	387.557	12.063f	2.281	10.818f	1.65	3.02	18.333	4.129
3.800	395.829	12.036f	2.313	10.761f	1.66	3.09	18.366	4.143
3.850	404.158	12.010f	2.345	10.717f	1.67	3.16	18.358	4.156
3.900	412.547	11.983f	2.376	10.676f	1.68	3.22	18.345	4.169
3.950	420.993	11.957f	2.408	10.639f	1.70	3.28	18.318	4.182
4.000	429.495	11.930f	2.439	10.608f	1.71	3.34	18.277	4.194

Water Specific Gravity = 1.025.  
Trim is per 23.50m

**Hydrostatic Properties at aft 0.400/23.500, Heel = 0.00**



Specific Gravity = 1.025      Assumed KG = 0.000  
K = Baseline

Hydrostatic Properties

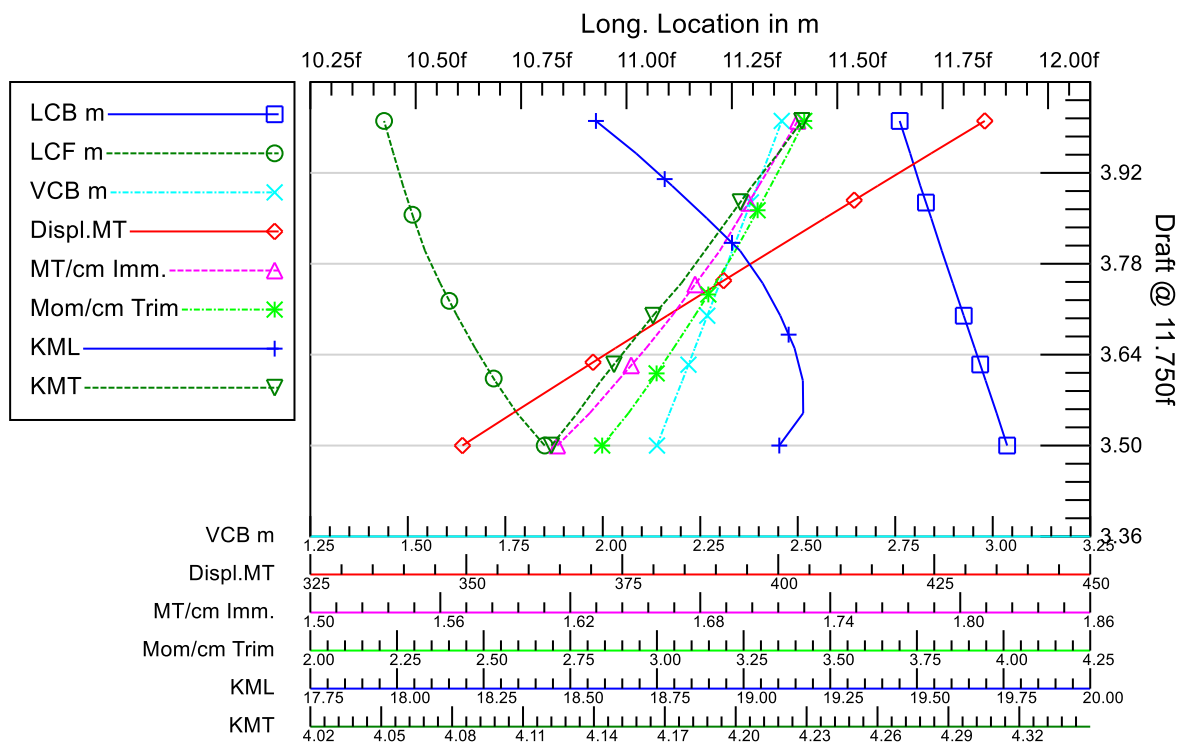
Draft is from Baseline.

Trim: aft 0.800/23.500, No heel, VCG = 0.000

Draft at 11.750f (m)	Displ (MT)	LCB (m)	VCB (m)	LCF (m)	TPcm (MT/cm)	MTcm (MT-m/cm)	KML (m)	KMT (m)
3.500	349.384	11.903f	2.139	10.805f	1.61	2.84	19.103	4.122
3.550	357.486	11.878f	2.171	10.740f	1.63	2.92	19.172	4.133
3.600	365.659	11.852f	2.204	10.688f	1.64	2.98	19.171	4.143
3.650	373.896	11.826f	2.236	10.641f	1.65	3.05	19.147	4.154
3.700	382.194	11.800f	2.268	10.598f	1.67	3.11	19.106	4.165
3.750	390.551	11.774f	2.300	10.558f	1.68	3.17	19.055	4.176
3.800	398.965	11.748f	2.332	10.522f	1.69	3.23	18.990	4.187
3.850	407.429	11.723f	2.364	10.495f	1.70	3.28	18.894	4.197
3.900	415.941	11.697f	2.396	10.470f	1.71	3.33	18.794	4.207
3.950	424.499	11.673f	2.428	10.447f	1.72	3.38	18.690	4.217
4.000	433.102	11.648f	2.459	10.425f	1.72	3.43	18.574	4.228

Water Specific Gravity = 1.025.  
Trim is per 23.50m

Hydrostatic Properties at aft 0.800/23.500, Heel = 0.00



Specific Gravity = 1.025      Assumed KG = 0.000  
K = Baseline

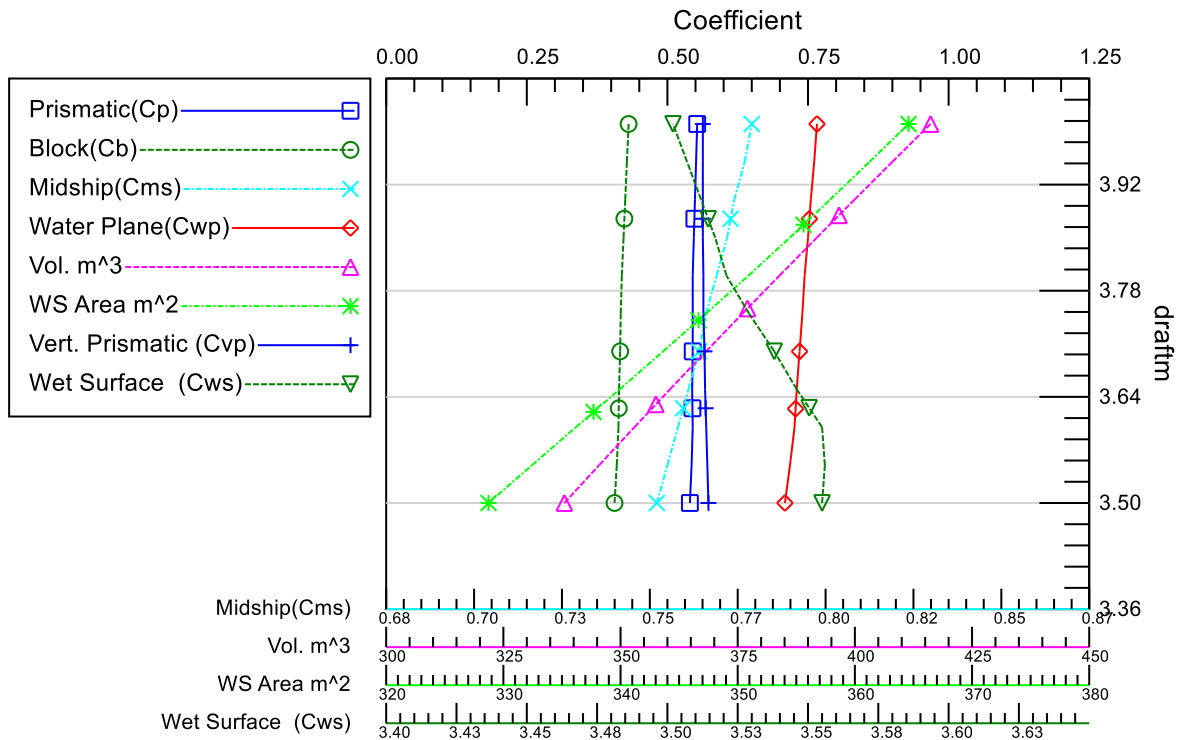
Draft is from Baseline  
 Trim: zero  
 Heel: zero

**Hull Form Coefficients (with appendages)**

Draft m	Volume m <sup>3</sup>	Coefficients						WS Area m <sup>2</sup>
		Cp	Cb	Cms	Cwp	Cvp	Cws	
3.500	338.02	0.540	0.406	0.752	0.709	0.572	3.555	328.73
3.550	345.44	0.543	0.410	0.755	0.718	0.571	3.556	332.45
3.600	352.96	0.545	0.413	0.758	0.726	0.569	3.555	336.19
3.650	360.56	0.544	0.414	0.761	0.730	0.567	3.546	339.93
3.700	368.26	0.545	0.416	0.764	0.735	0.566	3.538	343.63
3.750	376.04	0.545	0.417	0.766	0.740	0.564	3.529	347.31
3.800	383.92	0.545	0.419	0.769	0.744	0.564	3.521	350.92
3.850	391.87	0.547	0.422	0.772	0.750	0.563	3.517	354.45
3.900	399.89	0.549	0.425	0.774	0.755	0.563	3.512	357.87
3.950	407.98	0.551	0.428	0.777	0.760	0.563	3.507	361.25
4.000	416.15	0.553	0.431	0.779	0.766	0.563	3.502	364.58

Note: Coefficients calculated based on waterline length at given draft

**Curves of Form (with appendages)**



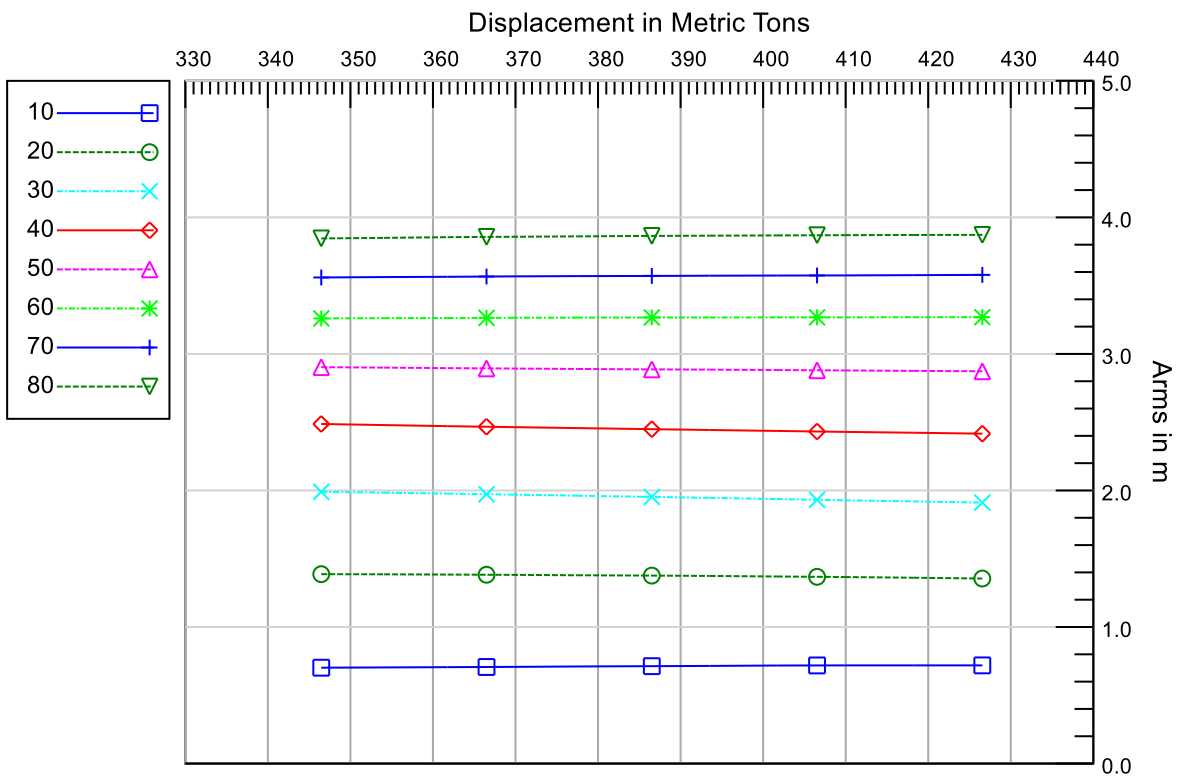


Cross Curves of Stability  
 Righting Arms(heel) for VCG = 0.00  
 Trim zero at heel = 0 (RA Trim = 0)

Displ (MT)	10.000s	20.000s	30.000s	40.000s	50.000s	60.000s	70.000s	80.000s
346.469	0.702s	1.387s	1.990s	2.487s	2.903s	3.260s	3.560s	3.846s
354.078	0.704s	1.386s	1.984s	2.479s	2.900s	3.262s	3.563s	3.850s
361.782	0.706s	1.384s	1.977s	2.471s	2.896s	3.263s	3.565s	3.854s
369.576	0.708s	1.382s	1.970s	2.464s	2.893s	3.265s	3.568s	3.858s
377.463	0.711s	1.379s	1.962s	2.457s	2.890s	3.266s	3.570s	3.861s
385.446	0.713s	1.377s	1.954s	2.450s	2.887s	3.267s	3.571s	3.864s
393.518	0.715s	1.374s	1.946s	2.442s	2.885s	3.267s	3.573s	3.866s
401.666	0.718s	1.370s	1.937s	2.436s	2.882s	3.268s	3.574s	3.868s
409.889	0.719s	1.366s	1.928s	2.429s	2.879s	3.268s	3.575s	3.870s
418.184	0.719s	1.361s	1.920s	2.422s	2.876s	3.269s	3.577s	3.871s
426.554	0.718s	1.355s	1.911s	2.416s	2.873s	3.269s	3.579s	3.872s

Water Specific Gravity = 1.025.

### Cross Curves



Trim: zero at heel = 0, VCG = 0.00

Cross Curves of Stability

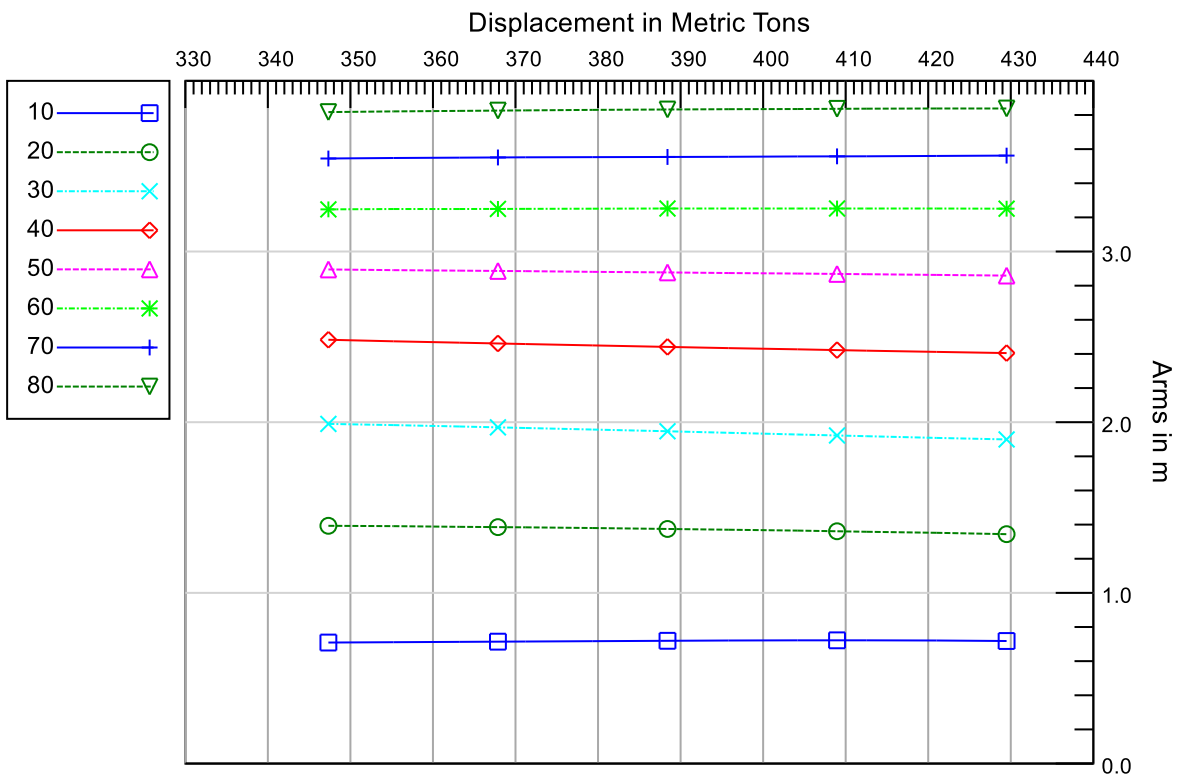
Righting Arms(heel) for VCG = 0.00

Trim aft 0.400/23.500 at heel = 0 (RA Trim = 0)

Displ (MT)	10.000s	20.000s	30.000s	40.000s	50.000s	60.000s	70.000s	80.000s
347.332	0.709s	1.393s	1.990s	2.483s	2.895s	3.247s	3.545s	3.817s
355.212	0.711s	1.390s	1.983s	2.474s	2.891s	3.249s	3.548s	3.821s
363.180	0.713s	1.387s	1.975s	2.466s	2.888s	3.249s	3.550s	3.824s
371.230	0.715s	1.384s	1.966s	2.458s	2.885s	3.250s	3.552s	3.827s
379.357	0.717s	1.380s	1.957s	2.449s	2.881s	3.251s	3.553s	3.830s
387.557	0.719s	1.375s	1.948s	2.442s	2.878s	3.251s	3.554s	3.832s
395.829	0.721s	1.370s	1.938s	2.434s	2.874s	3.252s	3.555s	3.834s
404.158	0.722s	1.365s	1.928s	2.427s	2.871s	3.252s	3.556s	3.835s
412.547	0.722s	1.358s	1.918s	2.419s	2.867s	3.252s	3.558s	3.837s
420.993	0.721s	1.351s	1.908s	2.412s	2.863s	3.252s	3.560s	3.837s
429.495	0.718s	1.344s	1.899s	2.405s	2.859s	3.251s	3.562s	3.838s

Water Specific Gravity = 1.025.

Cross Curves



Trim: aft 0.400/23.500 at heel = 0, VCG = 0.00

**Cross Curves of Stability**

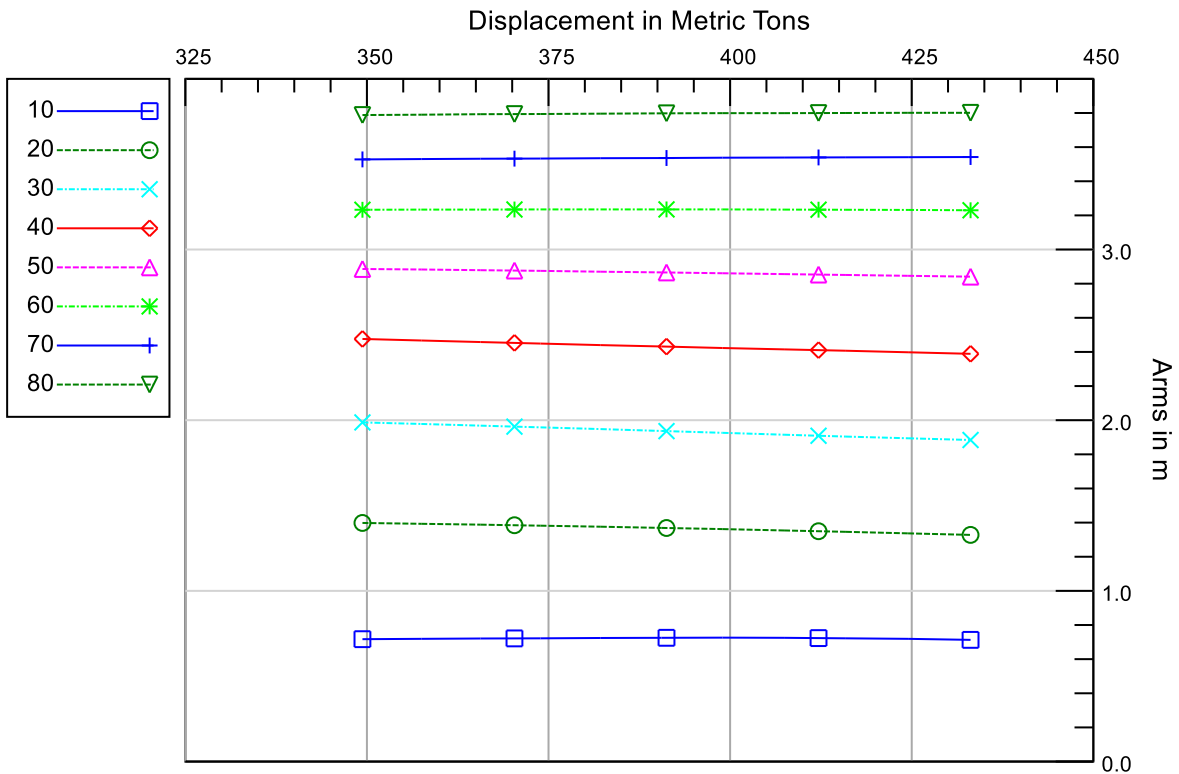
Righting Arms(heel) for VCG = 0.00

Trim aft 0.800/23.500 at heel = 0 (RA Trim = 0)

Displ (MT)	10.000s	20.000s	30.000s	40.000s	50.000s	60.000s	70.000s	80.000s
349.384	0.717s	1.398s	1.987s	2.476s	2.886s	3.233s	3.528s	3.788s
357.486	0.719s	1.393s	1.978s	2.467s	2.883s	3.234s	3.530s	3.790s
365.659	0.721s	1.388s	1.968s	2.458s	2.879s	3.234s	3.532s	3.793s
373.896	0.722s	1.382s	1.958s	2.449s	2.875s	3.235s	3.533s	3.794s
382.194	0.724s	1.376s	1.947s	2.440s	2.870s	3.235s	3.535s	3.796s
390.551	0.725s	1.369s	1.937s	2.432s	2.866s	3.235s	3.536s	3.798s
398.965	0.726s	1.362s	1.926s	2.423s	2.861s	3.235s	3.538s	3.799s
407.429	0.725s	1.354s	1.915s	2.415s	2.856s	3.234s	3.539s	3.799s
415.941	0.722s	1.346s	1.904s	2.406s	2.851s	3.233s	3.540s	3.800s
424.499	0.719s	1.337s	1.894s	2.398s	2.846s	3.232s	3.541s	3.801s
433.102	0.713s	1.327s	1.883s	2.389s	2.841s	3.230s	3.542s	3.801s

Water Specific Gravity = 1.025.

**Cross Curves**



Trim: aft 0.800/23.500 at heel = 0, VCG = 0.00

## APPENDIX 2

### MAX VCG KURVER, INTACT KONDISJONER

Max VCG kurve data er beregnet for følgende trim-verdier:

1. 0.0 m trim
2. 0.4m akterlig trim
3. 0.80m akterlig trim

**MAX VCG CURVES; INTACT CONDITION**

Trim = zero at zero heel (Trim righting arm held at zero)

**Maximum VCG vs. Displacement**

Intact Displ (MT)	Intact Draft At MS (m)	Max.VCG (m)	Limit 1	Limit 2	Limit 3
275.0	3.00	3.680	0.1%	9.8°	140.0°
288.8	3.10	3.664	0.0%	9.2°	140.0°
302.8	3.20	3.646	0.0%	8.6°	140.0°
317.0	3.30	3.626	0.0%	8.2°	140.0°
331.6	3.40	3.604	0.0%	7.4°	140.0°
346.5	3.50	3.580	0.0%	6.4°	140.0°
361.8	3.60	3.554	0.0%	5.6°	140.0°
377.5	3.70	3.524	0.0%	4.6°	140.0°
393.5	3.80	3.491	0.0%	3.6°	140.0°
409.9	3.90	3.456	0.0%	55.0°	140.0°
426.6	4.00	3.420	0.0%	55.0°	140.0°

Trim = aft 0.400/23.500 at zero heel (Trim righting arm held at zero)

Intact Displ (MT)	Intact Draft At MS (m)	Max.VCG (m)	Limit 1	Limit 2	Limit 3
274.8	3.01	3.692	0.1%	9.2°	140.0°
288.5	3.10	3.674	0.1%	8.8°	140.0°
302.4	3.20	3.653	0.0%	8.4°	140.0°
316.5	3.30	3.632	0.0%	7.6°	140.0°
331.0	3.39	3.609	0.0%	7.0°	140.0°
345.9	3.49	3.583	0.0%	6.2°	140.0°
361.2	3.59	3.553	0.0%	5.4°	140.0°
377.0	3.69	3.519	0.0%	4.6°	140.0°
393.1	3.78	3.480	0.0%	4.2°	140.0°
409.5	3.88	3.440	0.0%	55.0°	140.0°
426.2	3.98	3.400	0.1%	55.0°	140.0°

Trim = aft 0.800/23.500 at zero heel (Trim righting arm held at zero)

Intact Displ (MT)	Intact Draft At MS (m)	Max.VCG (m)	Limit 1	Limit 2	Limit 3
273.7	3.00	3.705	0.1%	8.6°	140.0°
287.0	3.09	3.685	0.1%	8.2°	140.0°
300.6	3.19	3.664	0.1%	7.6°	140.0°
314.7	3.28	3.641	0.0%	7.0°	140.0°
329.4	3.37	3.615	0.0%	6.4°	140.0°
344.5	3.47	3.584	0.0%	5.8°	140.0°
359.9	3.57	3.548	0.0%	5.4°	140.0°
375.9	3.66	3.508	0.0%	4.8°	140.0°
392.1	3.76	3.465	0.0%	6.6°	140.0°
408.6	3.86	3.420	0.1%	55.0°	140.0°
425.4	3.96	3.375	0.0%	55.0°	140.0°

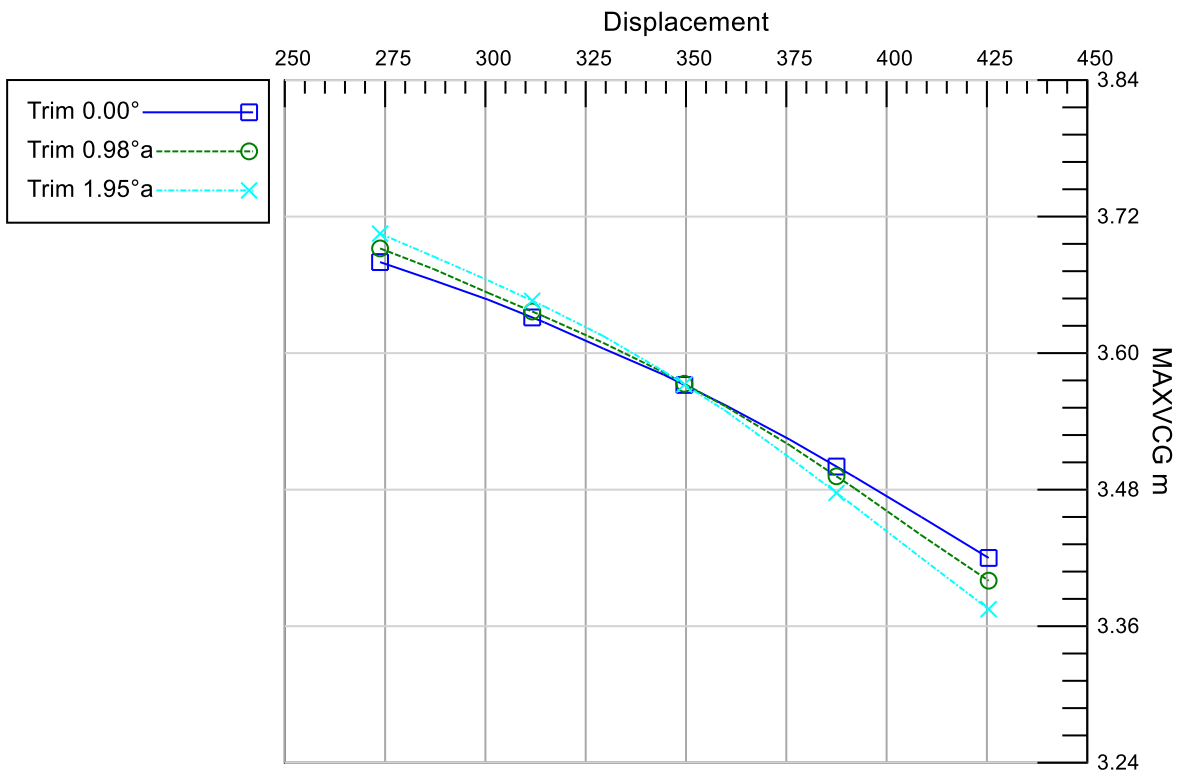
**NBS****Limit**

- (1) Righting Arm at 30.00 deg
- (2) Angle from 0.00 deg to MaxRA
- (3) Absolute Angle at RAzero

**Min/Max**

- >0.200 m
- >25.00 deg
- >40.00 deg

### Max. VCG vs. Displacement



## EKSEMPEL PÅ BRUK AV KG-GRENSEKURVE

Momentbetraktning for en gitt lastekondisjon:

Eksempelet viser kondisjon nr. 2 side 4.

Vi finner følgende data for en gitt lastekondisjon (lettskip + last + bunkers/forråd, etc.):

Deplasement	374.60 tonn
Dypgang(L/2)	3.654 m
Trim	0.80 m akterlig
LCG	11.86 m ff AP
KG	3.38 m
KMT	4.156 m (avleses fra hydrostatiske tabeller)
KG	<u>3.380 m</u>
GM	0.776 m
Korreksjon for fri væskeoverflate	<u>0.112 m</u>
GM (korrigert for fri væskeoverflate)	<u>0.664 m</u>

KG-verdien fra lastekondisjon sjekkes mot KG-grensekurve:

Se KG-grensekurve side 49 og 50 i stabilitetsmanualen.

Deplasement	374.60 tonn
Trim	0.80 m akterlig

Ved interpolasjon mellom dypganger og trim, finnes KG å være 3.38 m

Maksimal KG-verdi fra KG-grensekurve	3.51 m
Aktuell KG-verdi.	<u>3.38 m</u>
Margin på KG	<u>0.13 m</u>

Lastekondisjonen vil tilfredstille alle relevante krav til stabilitet.

### Beregninger for korreksjon av fri væskeoverflate

Når en tank er mindre enn 100% full, skal det korrigeres for fri væskeoverflate.

Treghetsmoment av væskespeil i en tank om langskips akse:  $I = b^3 \cdot l / 12 (m^4)$

Treghetsmomentet av alle forbrukstanker summeres til  $I_{total}$

Tap av GM =  $I_{total} \cdot \gamma$  (egenvekt av de respektive væsker) / Deplasement.