

# TRIM & STABILITETSBOOK



## VIKE, hemort Landskrona

A/S HVIDE SANDE SKIBS- & BAADEBYGGERI NB 106

*Intaktstabilitetsboken är framtagen av*

**Jorgen Petersen Ltd.** Consulting Naval Architects, Horsens Denmark, maj 2009  
och omarbetad av **Jan-Åke Jönsson**, Consulting Naval Architect, Höllviken Sweden,  
mars 2018

*Läckstabilitetsboken är framtagen av*

**OSK – ShipTech**, Aarhus Denmark, maj 2018

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(extract from the damage stability addendum, showing the general terms, the limiting GM curve and as an example damage in one of the watertight compartments. For more information, look in the damage stability addendum in separate ring binder)	

**GENERAL INFORMATION**

Ship name	VIKE, ex. FOB TRIM
Ship type	Passenger ship
Signal letters	
Flag	Swedish, ex. Danish
Port of registry	Landskrona
Owner	Hartford Rederi AB Rundelsvägen 7 261 73 Häljarp
Builder	A/S Hvide Sande Skibs- och Bådebyggeri
Yard no.	106
Keel laid	July 2006
Delivered	February 2007
Hull Class	Lloyd's Register +100A1 SSC Cargo (A) Trimaran G2 Service Area
Length overall	
Length b. p.p.	22,23 m
Breadth moulded	7,40 m
Depth mld. to Main Deck	3,71
Max. draught at midships (B.L.)	1,90 m
Displacement at max. draught	75 tonnes
Dead weight at max. draught	16,7 tonnes
Gross Tonnage	
Net Tonnage	

When the ship was transferred to Swedish Flag (March 2018) she was converted to a passenger vessel, and new cargo conditions were thus calculated and have replaced the original cargo conditions.

Following the passenger ship requirements also the damage stability properties have been investigated (by OSK-ShipTech in Aarhus), and the full damage stability report is compiled in a separate ring binder.

Extracts from that report are included in this Stability Book as Annex I, and found under the heading *Summary of damage stability*.

## **DESCRIPTION OF CALCULATIONS**

This booklet contains updated intact stability information for a special service aluminium trimaran, intended for transport of upto 12 persons, built as Yard No. 106 at Hvide Sande Skibs- og Bådebyggeri.

Calculations are updated after a conversion of the vessel carried out in May 2009 at Hvide Sande Skibs- og Bådebyggeri, where a new crane and rescue net were fitted on the starboard side amidships. In addition a ballast tank, subdivided into a centre tank and 2 wing tanks, was built on the transom stern, thereby increasing the vessel's length by 0.80 metres. Calculations are carried out for the owners by P.K. Bagai from Jorgen Petersen Ltd., Consulting Naval Architects, Horsens, Denmark.

Stability calculations are carried out to comply with the regulations: Meddelelser fra Søfartsstyrelsen B (IMO Resolution A.749(18)).

For hydrostatic and form stability calculations, **Autohydro** is used, which is a Windows based software, developed by **Autoship Systems Corporation**, Canada. Hull geometry is transferred from the surface modelling program **Rhinocerus** to the program **Modelmaker**, where the internal geometry is defined. Loading conditions are calculated using Autohydro software by equilibrium calculations on the hull model and presented by software developed by Jorgen Petersen Ltd., Consulting Naval Architects, Horsens, Denmark. Drafts and stability data for the loading conditions are transferred to Excel from Autohydro direct stability calculations.

The hull model for calculations includes shell plating. A mean thickness of 6.0 mm is used.

## **BASIC DATA**

The vessel is an aluminium trimaran hull with a deckhouse placed on the centre hull and extending over about  $\frac{3}{4}$  of the length aft, and is partly recessed into the hull. Deckhouse contains accommodation for passengers in the after part with the wheelhouse positioned in the forward part. The engine room is situated amidships below the wheelhouse. The deckhouse is included as a bouyant part in the hull definition.

The following drawings have been used for the description of hull geometry and compartment definition:

- 1206-01-01      General Arrangement
- 1206-02-01      Lines plan
- 1206-02-11      Tankplan – included in this booklet

## **DOWN FLOODING POINTS**

Wheelhouse windows, not provided with deadlights, are considered as downflooding openings:

Windows P & S      9.76f      1.85s/1.85p      5.10u

Windows aft in deckhouse in way of passenger seating area are to be provided with storm covers in accordance with Lloyds SSC rules part 3, chapter4, section 7.12.4 for each different size of window.

## TRIM

Hydrostatic data, form stability data and tables of maximum permissible KG have been calculated for the vessel on even keel, and for the following trim values: 0.3 m aft and 0.3 m fwd.

All loading conditions in this booklet are a result of direct calculations on the hull model, i.e. on the actual waterline.

## LOADING CONDITIONS

The original loading conditions are not applicable any more, and have been replaced with loading conditions, adequate for the traffic the ship now will be used in. With the fixed ballast all conditions fulfil both the intact and damage stability requirements.

Specific gravity  $1.025 \text{ t/m}^3$  for seawater is used in the calculations.

## ANTI-ROLL TANK

The vessel has a passive anti-roll tank in the afterpeak space. Loading conditions 7 & 8 show the effect of filling the tank to a level of 50% on stability compared to the corresponding conditions 2 & 5. The amount of water in the tank has to be adjusted optimize the level of damping in the prevailing conditions, having due regard to fulfilling the stability criteria. In the event of grounding, leakage, ice accretion or other factors, which might have effect on the vessels stability, the tank must be emptied immediately.

## DRAFTS, DRAFT MARKS AND BASELINE

Draft Marks on the vessel are offset from the deepest points on the keel at the ends. A sketch of the draft marks (page 40) is included in this booklet showing the exact position of the marks with respect to the vessels Base Line as defined on the Lines Plan drawing. All drafts indicated in loading conditions in this booklet relate to the Base Line.

Base Line drafts calculated in the loading conditions can be converted to drafts above Bottom of Keel as follows:

$$\begin{aligned} \text{BOK draft forward} &= \text{Baseline draft at FP} - 0.231 \text{ m} \\ \text{BOK draft aft} &= \text{Baseline draft at AP} + 0.366 \text{ m} \end{aligned}$$

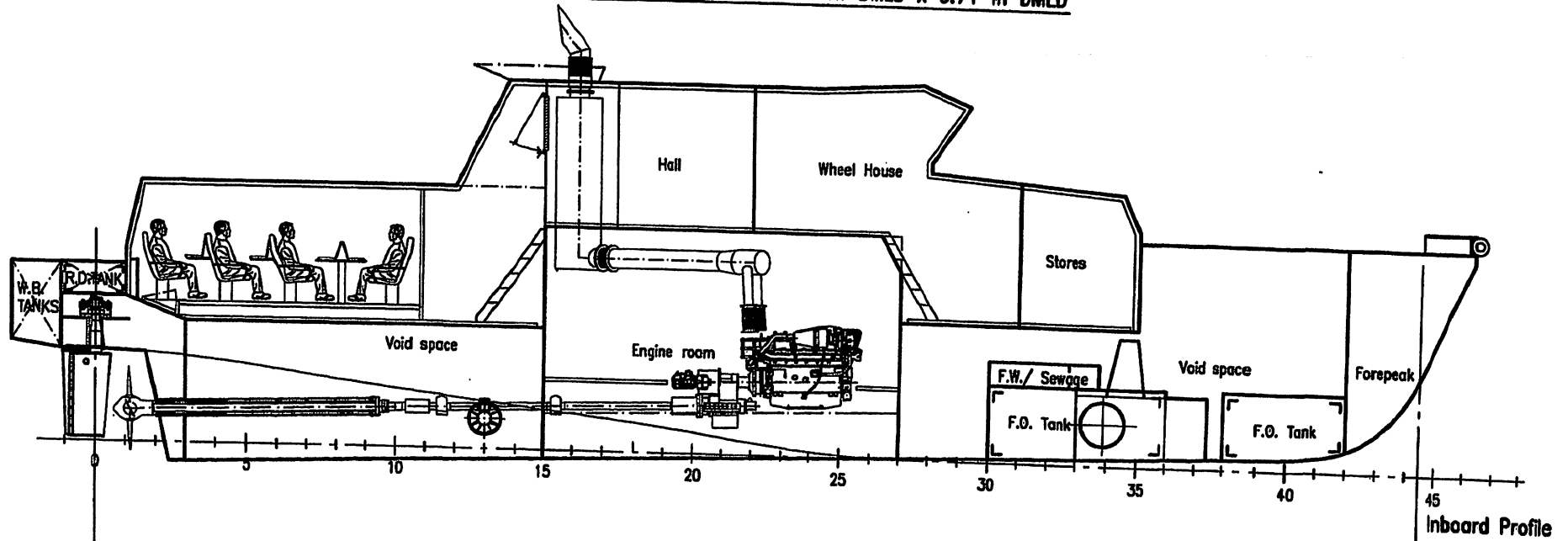
For symbols, units and terms – refer to page 6.

SYMBOL	UNIT	TERM
AP		: After perpendicular
FP		: Fore perpendicular
MP		: Mid between perpendiculars
BL		: Baseline
CL		: Centerline
BK		: Bottom of keel
X,Y,Z	[m]	: X or Y or Z coordinate with origin in AP,CL,BL
XG	[m]	: X-coordinate of centre of gravity
YG	[m]	: Y-coordinate of centre of gravity
ZG	[m]	: Z-coordinate of centre of gravity
KG	[m]	: Z-coordinate of centre of gravity for loaded vessel
KGc	[m]	: Free surface corrected Z-coordinate of centre of gravity
KGmax	[m]	: Max permissible Z-coordinate of centre of gravity according to stability criteria
GM	[m]	: Metacentric height = $KMt - KG$
GMc	[m]	: Free surface corrected Metacentric height
GMmin	[m]	: Min permissible metacentric height according to stability criteria
Lpp	[m]	: Length between perpendiculars (AP and FP) at design draft
Bmld	[m]	: Breadth moulded (excl. shell plating)
Tmld	[m]	: Draft at MP above BL
Tka	[m]	: Draft at AP above BK
Tkf	[m]	: Draft at FP above BK
Tkm	[m]	: Draft at MP above BK = $0.5 \times (Tka + Tkf)$
t	[m]	: Trim = $Tkf - Tka \Rightarrow$ Negative for trim aft
DISV	[m <sup>3</sup> ]	: Displacement volume
DISM	[t]	: Displacement mass in saltwater
VCB	[m]	: Z-coordinate of centre of buoyancy
KMt	[m]	: Z-coordinate of transverse metacentre
TPC	[t/cm]	: Displacement mass per centimetre change of draft
MTC	[tm/cm]	: Moment to change trim one centimetre
XB	[m]	: X-coordinate of centre of buoyancy
XF	[m]	: X-coordinate of centre of flotation
Cb		: Block coefficient = $DISV / (Lpp \times Bmld \times Tmld)$
Cm		: Midship area coefficient = $Midship\ area / (Bmld \times Tmld)$
Theta Max	[deg]	: Angle at Max GZ
$\theta$	[deg]	: Angle of Heel
Lk	[m]	: Value of stability crosscurve = $GZ + KG \times \sin(\theta)$
F.S. Mom	[tm]	: Free Surface moment = moment of inertia x spec. gravity

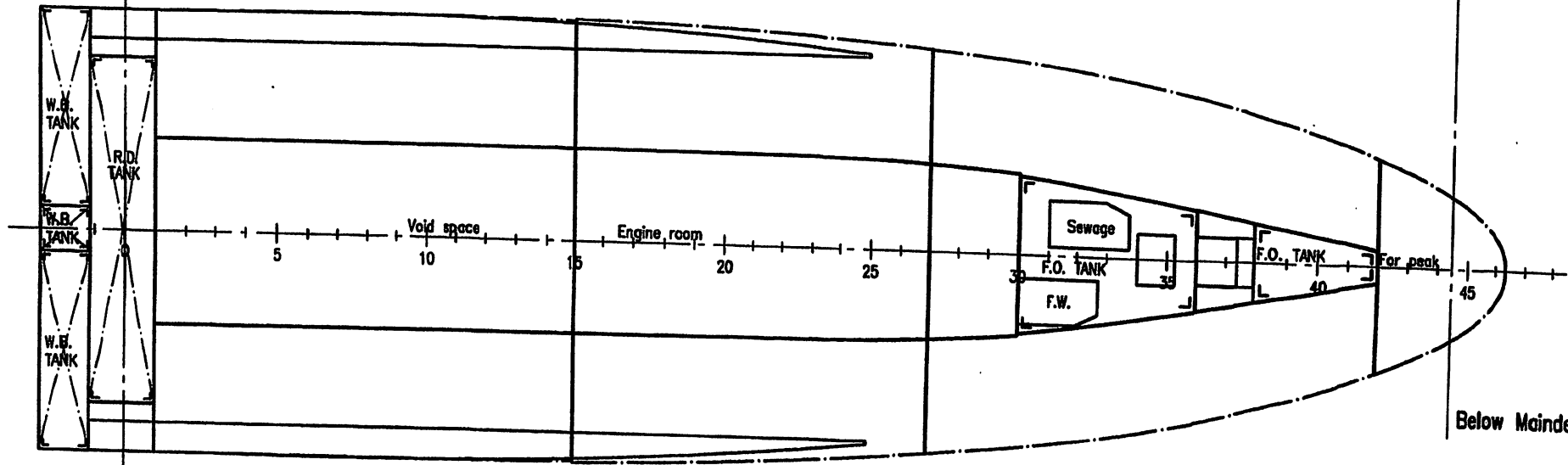
Project specific parameters:

Lpp	: 22.234 m
Bmld	: 7.400 m
Design trim	: 0.000 m
BL-BK	: 0.000 m, distance from BK to BL (positive for BK below BL)
Rho	: 1.025 , specific gravity of seawater

Main Dimensions: 22.23m LBP x 7.40 m BMLD x 3.71 m DMLD



Inboard Profile



Below Maindeck

Tank Plan

Scale 1:100

Drq. no. 1206-11-01C

PKB 19.05.09

# CAPACITY TABLES

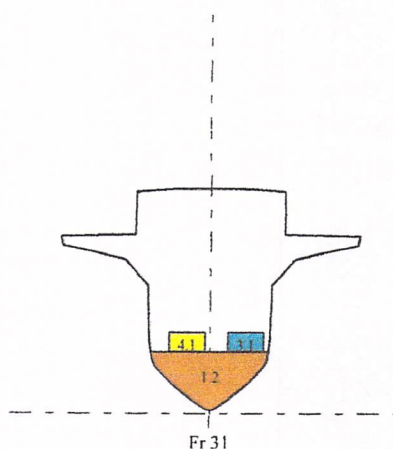
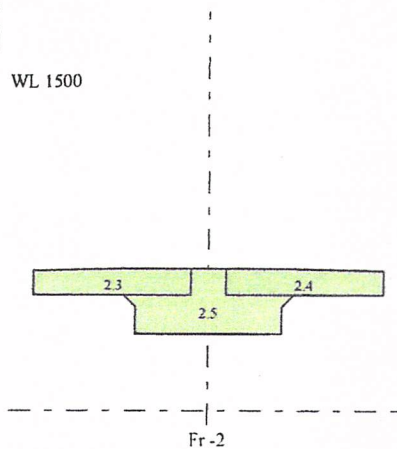
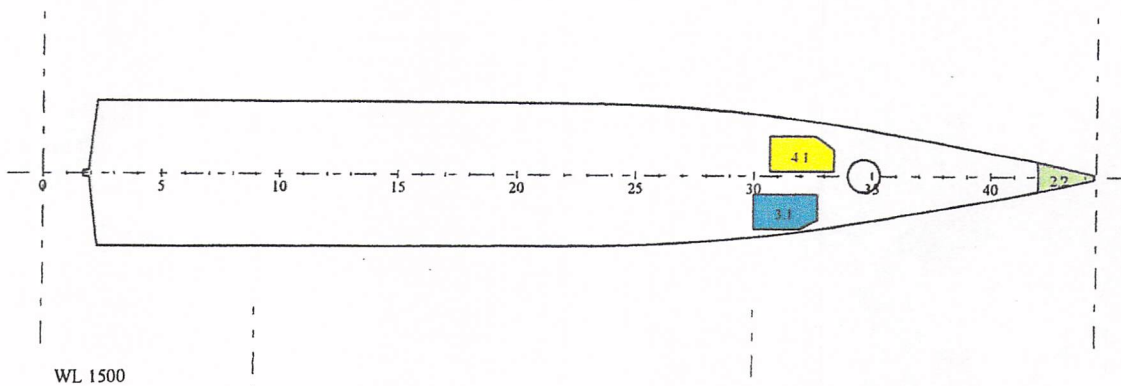
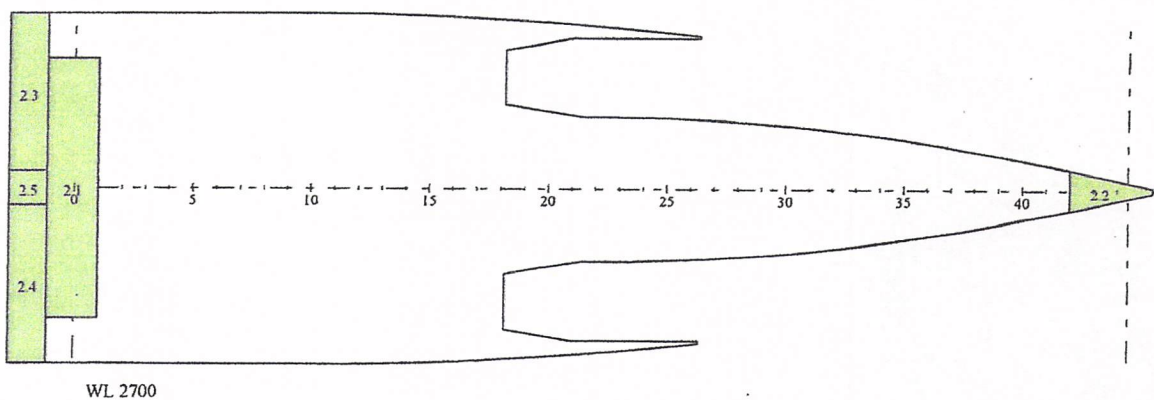
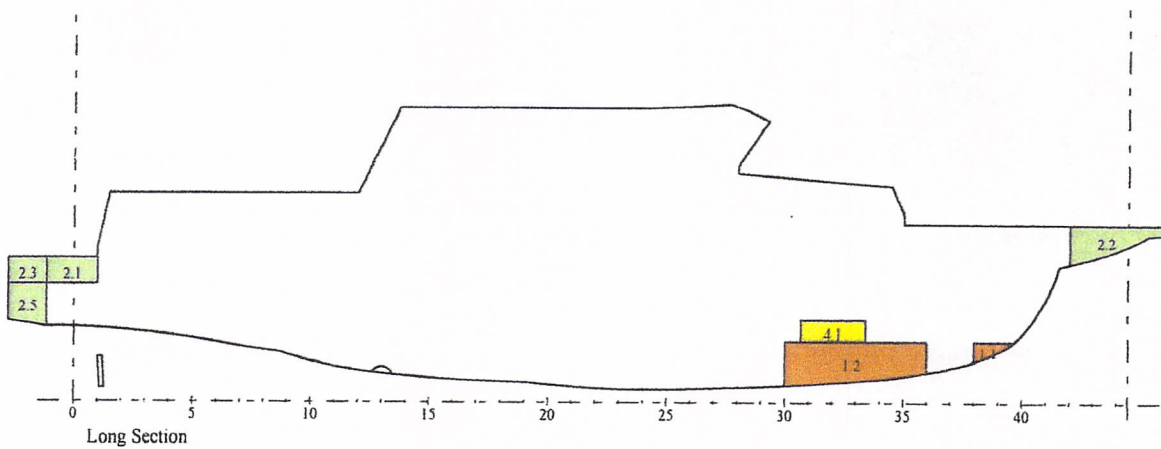
Fuel Oil		FRM NO.	S.G. [t/m3]	CONTENTS			XG FROM AP [m]	YG FROM CL [m]	ZG FROM BL [m]	F.S MOM [tm]
ID				100% [m3]	100% [t]	98% [t]				
1.1	Tank 1	38-42	0.850	1.19	1.01	0.99	19.84	0.00	0.89	0.1
1.2	Tank 2	30 - 36	0.850	3.48	2.96	2.90	16.03	0.00	0.88	2.2
TOTAL				4.67	3.97	3.89	17.00	0.00	0.88	

Water Ballast		FRM NO.	S.G. [t/m3]	CONTENTS			XG FROM AP [m]	YG FROM CL [m]	ZG FROM BL [m]	F.S MOM [tm]
ID				100% [m3]	100% [t]	98% [t]				
2.1	Anti-Roll Tank	Tr.- 1	1.025	3.07	3.15	3.08	-0.04	0.00	2.72	17.2
2.2	Forpeak Tank	42 - stem	1.025	3.56	3.65	3.58	21.71	0.00	3.00	3.4
2.3	W.B. Aft P	-3 --1	1.025	1.38	1.41	1.39	-0.97	2.01	2.71	2.5
2.4	W.B. Aft S	-3 --1	1.025	1.38	1.41	1.39	-0.97	-2.01	2.71	2.5
2.5	W.B. Aft C	-3 --1	1.025	2.40	2.46	2.41	-0.96	0.00	2.13	3.1
TOTAL				11.79	12.08	11.84	6.12	0.00	2.68	

Fresh Water		FRM NO.	S.G. [t/m3]	CONTENTS			XG FROM AP [m]	YG FROM CL [m]	ZG FROM BL [m]	F.S MOM [tm]
ID				100% [m3]	100% [t]	98% [t]				
3.1	Fresh Water S	30 - 33	1.000	0.39	0.39	0.38	15.66	-0.75	1.51	0.0
TOTAL				0.39	0.39	0.38	15.66	-0.75	1.51	

Misc.		FRM NO.	S.G. [t/m3]	CONTENTS			XG FROM AP [m]	YG FROM CL [m]	ZG FROM BL [m]	F.S MOM [tm]
ID				100% [m3]	100% [t]	98% [t]				
4.1	Sewage Tank P	33 - 36	1.000	0.38	0.38	0.37	15.99	0.46	1.51	0.0
TOTAL				0.38	0.38	0.37	15.99	0.46	1.51	

# CAPACITY PLAN



■ - Fresh Water   
 ■ - Fuel oil   
 ■ - Misc   
 ■ - Water Ballast

**INTACT STABILITY CRITERIA - IMO RES. A 749 (18), Ch 3.1.2**

The vessels the stability must in any sailing condition comply with at least the following minimum criteria.

1. Area under the righting lever curve (GZ curve) should be:
  - a) At least 0,055 metre-radians up to an angle of heel of 30°.
  - b) At least 0,090 metre-radians up to an angle of heel of 40°, or the angle of flooding, if this angle is less than 40°. (Angle of flooding is the angle of heel at which openings in the hull, superstructures or deckhouses, which cannot be closed weathertight, immerse. In applying this criterion, small openings through which progressive flooding cannot take place need not be considered as open.)
  - c) Additionally, the area under the righting lever curve (GZ curve) between the angles of 30° and 40° or between 30° and the angle of flooding, if this angle is less than 40°, should not be less than 0,03 metre-radians.
2. The righting lever GZ should be at least 0,20 m at an angle of heel equal to or greater than 30° but less than 40°, or the angle of flooding if this angle is less than 40°
3. The maximum righting arm should occur at an angle of heel not less than 25°.
4. The initial metacentric height GM should not be less than 0,15 m.

## **NOTES TO THE MASTER**

Compliance with the stability criteria does not ensure immunity against capsizing regardless of the circumstances or absolve the master from his responsibilities. The master should therefore exercise prudence and good seamanship having regard to the season of the year, weather forecasts and the navigational zone and should take the appropriate action as to speed and course warranted by the prevailing circumstances.

Care should be taken to ensure that the cargo allocated to the vessel is capable of being stowed in such a way that compliance with the stability criteria can be achieved and if necessary the amount of cargo should be limited so as to allow any required ballast water to be taken.

Before a voyage commences care should be taken to ensure that the cargo and sizeable pieces of equipment have been properly stowed or lashed so as to minimize the possibility of both longitudinal and lateral shifting while at sea, under the effect of acceleration caused by rolling and pitching.

The number of tanks containing slack liquids should be kept to a minimum.

Hatches, doors, etc., which give access to the spaces below deck should be kept closed during navigation, except when necessarily opened for the working of the vessel, and should always be ready for immediate closure.

Ship owners bear the responsibility to ensure that adequate, accurate and up-to-date stability information for the master's use is provided.

It is of vital importance to ensure that all ballast tanks in any condition which are to be full, are in fact pressed full. Those tanks that are to be empty should be completely dry.

Doors and hatches etc. that provide access to exposed decks should be kept closed and secured at sea.

The vessel has a passive anti-roll tank in the afterpeak space. The amount of water in the tank has to be adjusted optimize the level of damping in the prevailing conditions, having due regard to fulfilling the stability criteria. In the event of grounding, leakage, ice accretion or other factors, which might have effect on the vessels stability, the tank must be emptied immediately.

Simplified stability Information is given as tables of maximum permitted values for the vessels vertical centre of gravity (KG). Corresponding minimum values of GM are also given. An example showing the use of the maximum permissible KG principle is included in this booklet.

Drafts in all loading conditions in this booklet refer to the draft above the baseline (B.L.).

If the vessel is subjected to alterations that would affect the stability of the vessel, the information provided in this booklet must be corrected accordingly.

## NOTES ON USE OF FREE SURFACE MOMENTS

Provided a tank is completely filled with liquid no movement of the liquid is possible and the effect on the ship's stability is precisely the same as if the tank contained solid material.

Immediately a quantity of liquid is withdrawn from the tank the situation changes completely and the stability of the ship is adversely affected by what is known as the "free surface effect". This adverse effect on the stability is referred to as a "loss in GM" or as a "virtual rise in KG" and is calculated as follows:

$$\text{Loss in GM} = \frac{\text{Free Surface Moment (tonnes metres)}}{\text{Displacement of the vessel in tonnes}}$$

Free surface moment of a tank is the transverse moment of inertia of the free surface multiplied by the specific gravity of the tank.

All free surface moments quoted in this booklet are at the specific gravity given on the "Capacities and Centres of Gravity" sheets for any particular Liquid/Tank combination.

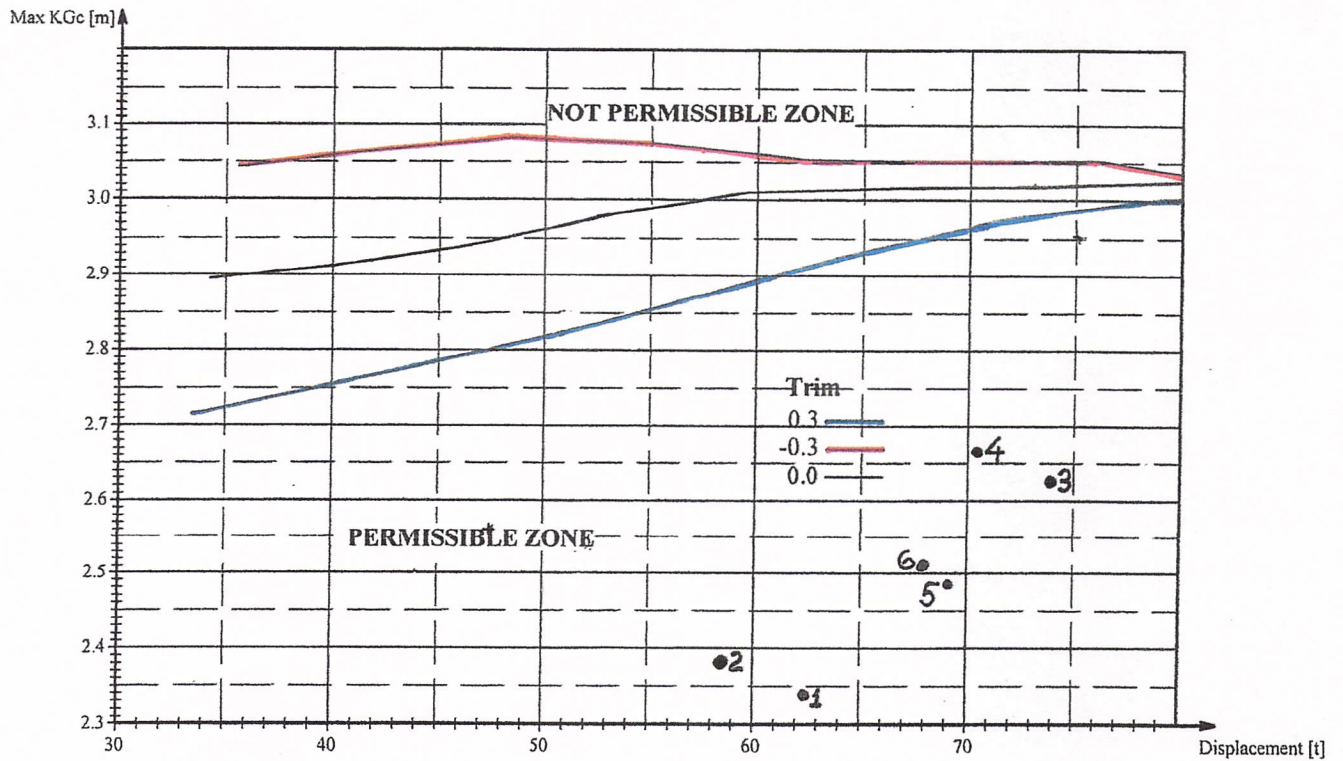
If it is required to ship for example, Fuel oil at an S.G. varying from the quoted 0,850, then the Free Surface Moment for any tank at this new S.G. is obtained by:

$$\text{F.S.M.} = \frac{\text{F.S.M. as stated}}{0,85} \times \text{New S.G.}$$

The "free surface effects" of all slack oil-fuel, fresh water, service and ballast tanks should be taken into account in both the Arrival and Departure Conditions.

Information on free surface moments for all tanks is shown in the Capacities & Centres of Gravity section.

# MAX KGc DIAGRAM



## Loading Conditions

Loading Conditions	Displacement	KGc
1. Ballast – departure (100 % bunkers & store)	62,55 t	2,34 m
2. Ballast –arrival (10 % bunkers & store)	58,88 t	2,38 m
3. Cargo ship with maximum load – departure	74,05 t	2,62 m
4. Cargo ship with maximum load – arrival	70,38 t	2,67 m
5. Passenger ship with full number of passengers – departure *	69,30 t	2,48 m
6. Passenger ship with full number of passengers – arrival *	68,07 t	2,51 m

\*) Note that these two passenger conditions shall also comply with the curves related to the damage stability requirements (Summary of damage stability when used as passenger ship)

**EXAMPLE WITH CALCULATION OF STABILITY AND TRIM**

(Based on loading condition no. 2)

	A	B	C	D = B · C	E	F = B · E	G
	Item	Weight [t]	XG [m]	Long.Mom. [tm]	ZG [m]	Vert.Mom. [tm]	F.S.Mom [tm]
1	Light ship						
2	Consumables						
3	Ballast						
4	Cargo						
5	Miscellaneous						

6	DISPLACEMENT	51.58	9.96	513.6	2.43	125.3	4.8
		= SUM(B1-B5)	= D6/B6	= SUM(D1-D5)	= F6/B6	= SUM(F1-F5)	= SUM(G1-G5)

DISM = Displacement mass = B6 = 51.58 t

Table with trim value = 0.000 is selected, the following values have been obtained:

Tkm = 1.58 m; MTC = 1.01 tm/cm; XB = 10.06 m; XF = 8.50 m

The following values are calculated:

t = Trim = Table Trim + [ DISM · ( XG - XB ) ] / ( MTC · 100 ) = -0.05 m

Tka = Draught at AP = Tkm - ( t / 2 ) + Design trim / 2 = 1.61 m

Tkf = Draught at FP = Tkm + ( t / 2 ) - Design trim / 2 = 1.56 m

KG of Displacement = Vertical moment / DISM = E6 = 2.43 m

FSmom = Free Surface Moment = G6 = 4.8 tm

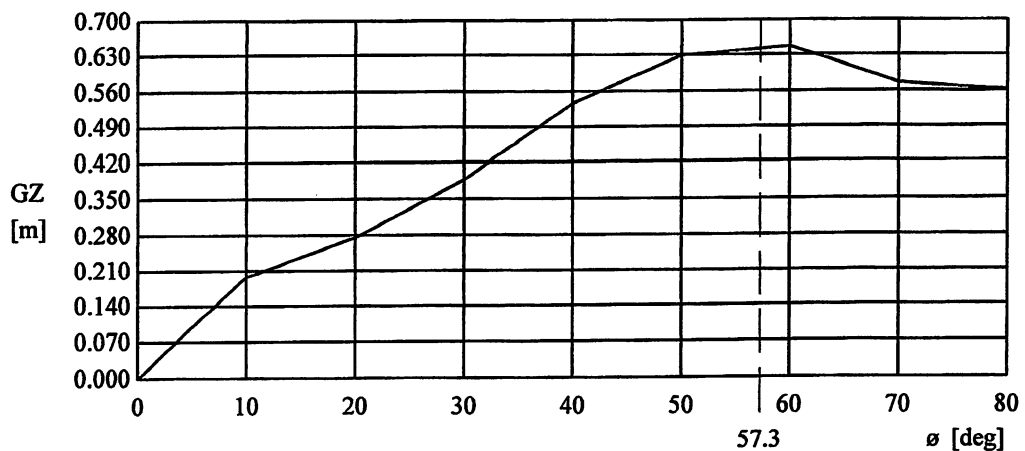
KGc = KG + FSmom / DISM = 2.52 m

MAX PERMISSIBLE KGc from tables, interpolating for trim = 2.97 m

KGc must be less than this value!

Form for calculation and plotting the righting lever curve (Lk taken from selected table):

ø [deg]	10	20	30	40	50	60	70	80
Lk [m]	0.64	1.14	1.65	2.16	2.56	2.83	2.94	3.04
KGc · sin(ø) [m]	0.44	0.86	1.26	1.62	1.93	2.18	2.37	2.48
GZ [m]	0.20	0.27	0.39	0.54	0.63	0.65	0.57	0.56
GZ = Lk - KGc · sin(ø); KM = <u>4.04 m</u> ; KGc = <u>2.52 m</u> ; GMc = KM - KGc = <u>1.52 m</u>								



Summary of loading conditions as cargo ship (reference to TSFS 2009:114)

Condition.....**1. Barlast, avgång**

*Kondition*

Regel	3:1.1.1	3:1.1.2	3:1.1.3	3:1.2	3:1.3	3:1.4
Krav	$e_{30} \geq 0,055$ mrad	$e_{40} \geq 0,090$ mrad	$e_{30-40} \geq 0,030$ mrad	$GZ \geq 0,20$ m vid $\Theta = 30^\circ$	$\Theta_{GZ-max} \geq 25^\circ$	$GM_0 \geq 0,15$ m
Aktuellt värde	0,149	0,250	0,101	0,51	55	1,40
Status	OK	OK	OK	OK	OK	OK

Condition.....**2. Barlast, ankomst**

*Kondition*

Regel	3:1.1.1	3:1.1.2	3:1.1.3	3:1.2	3:1.3	3:1.4
Krav	$e_{30} \geq 0,055$ mrad	$e_{40} \geq 0,090$ mrad	$e_{30-40} \geq 0,030$ mrad	$GZ \geq 0,20$ m vid $\Theta = 30^\circ$	$\Theta_{GZ-max} \geq 25^\circ$	$GM_0 \geq 0,15$ m
Aktuellt värde	0,160	0,261	0,101	0,52	56	1,47
Status	OK	OK	OK	OK	OK	OK

Condition.....**3. Lastfartyg med 11,5 ton däckslast, avgång**

*Kondition*

Regel	3:1.1.1	3:1.1.2	3:1.1.3	3:1.2	3:1.3	3:1.4
Krav	$e_{30} \geq 0,055$ mrad	$e_{40} \geq 0,090$ mrad	$e_{30-40} \geq 0,030$ mrad	$GZ \geq 0,20$ m vid $\Theta = 30^\circ$	$\Theta_{GZ-max} \geq 25^\circ$	$GM_0 \geq 0,15$ m
Aktuellt värde	0,118	0,190	0,072	0,39	42	0,88
Status	OK	OK	OK	OK	OK	OK

Condition.....**4. Lastfartyg med 11,5 ton däckslast, ankomst**

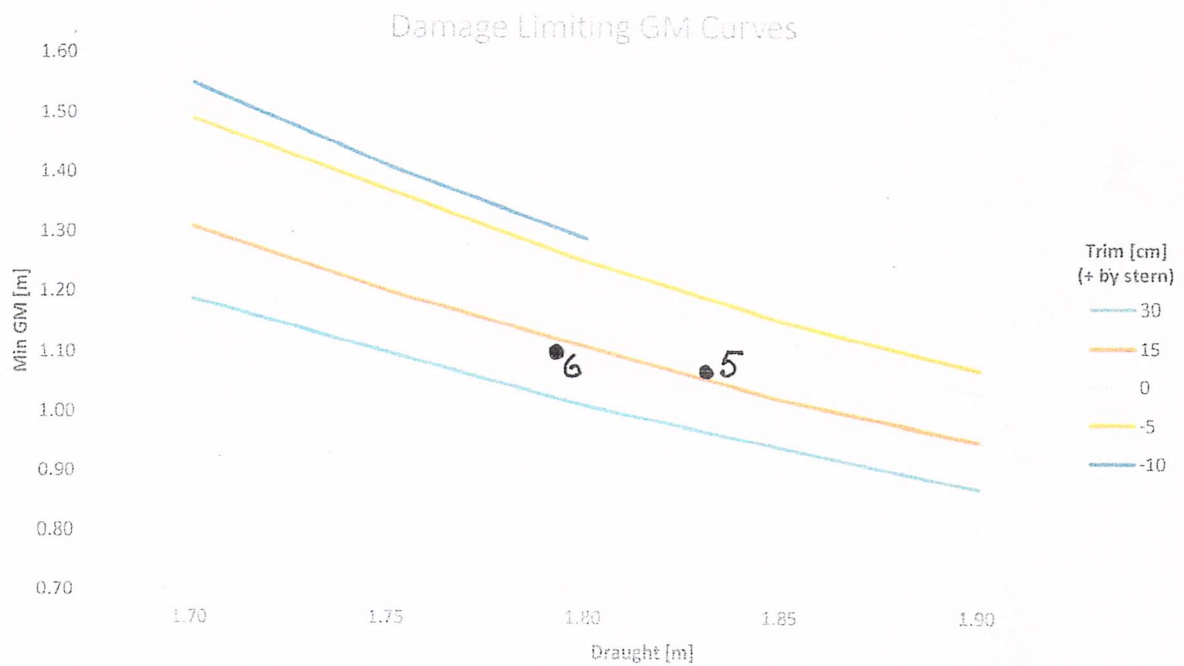
*Kondition*

Regel	3:1.1.1	3:1.1.2	3:1.1.3	3:1.2	3:1.3	3:1.4
Krav	$e_{30} \geq 0,055$ mrad	$e_{40} \geq 0,090$ mrad	$e_{30-40} \geq 0,030$ mrad	$GZ \geq 0,20$ m vid $\Theta = 30^\circ$	$\Theta_{GZ-max} \geq 25^\circ$	$GM_0 \geq 0,15$ m
Aktuellt värde	0,120	0,190	0,070	0,39	41	0,87
Status	OK	OK	OK	OK	OK	OK



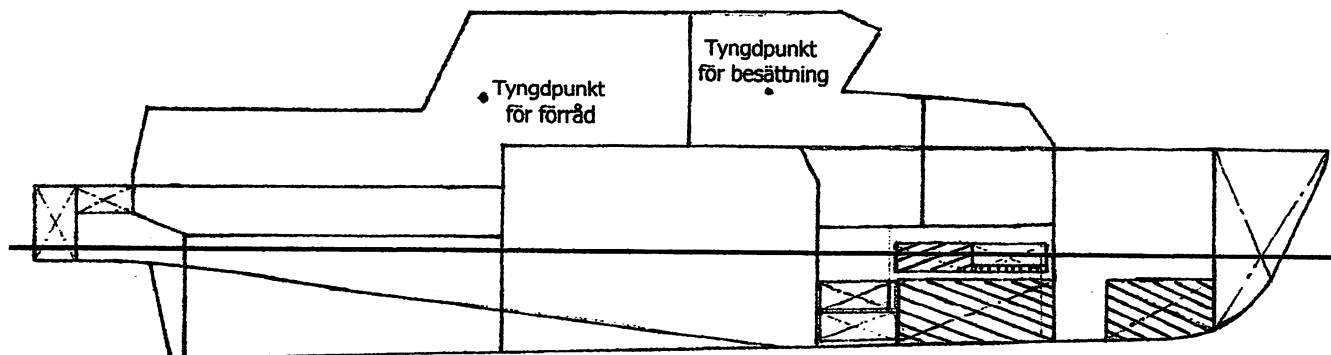


	1.7	-0.15	1.60	MARGIN.S	0.000	0.001	DAM05
		0.00	1.44	O.MINGZ1.S	0.250	0.254	DAM03
		0.15	1.31	O.MINGZ1.S	0.250	0.252	DAM03
		0.30	1.19	O.MINGZ1.S	0.250	0.255	DAM02
	1.75	-0.10	1.41	O.MINGZ1.S	0.250	0.253	DAM03
		0.00	1.32	O.MINGZ1.S	0.254	0.254	DAM03
		0.15	1.20	O.MINGZ1.S	0.250	0.256	DAM03
		0.30	1.10	O.MINGZ1.S	0.250	0.252	DAM03
	1.8	-0.10	1.29	O.MINGZ1.S	0.250	0.256	DAM03
		0.00	1.21	O.MINGZ1.S	0.250	0.254	DAM03
		0.15	1.11	O.MINGZ1.S	0.250	0.252	DAM03
		0.30	1.01	O.MINGZ1.S	0.250	0.252	DAM03
	1.85	-0.05	1.15	O.MINGZ1.S	0.250	0.255	DAM03
		0.00	1.12	O.MINGZ1.S	0.250	0.252	DAM03
		0.15	1.02	O.MINGZ1.S	0.250	0.251	DAM03
		0.30	0.94	O.MINGZ1.S	0.250	0.254	DAM03
	1.9	-0.05	1.07	O.MINGZ1.S	0.250	0.255	DAM03
		0.00	1.03	O.MINGZ1.S	0.250	0.251	DAM03
		0.15	0.95	O.MINGZ1.S	0.250	0.254	DAM03
		0.30	0.87	O.MINGZ1.S	0.250	0.253	DAM03



Loading Conditions	Draught	trim	GM
5. Passenger ship, 90 passengers – departure	1,83 m	0,15 m aft	1,07 m
6. Passenger ship, 90 passengers – arrival	1,79 m	0,27 m aft	1,10 m

Condition.....**Barlast, avgång**  
*Kondition*



100 % bunker och förråd		Weight	Centre of gravity from AP	Moment about AP	Centre of gravity above keel	Moment about keel	Moment of inertia · y
		<i>Vikt</i>	<i>Viktstyngd-punkt från AP</i>	<i>Moment om AP</i>	<i>Viktstyngd-punkt över köl</i>	<i>Moment om köl</i>	<i>Yttröghetsmoment · y</i>
		ton	m	m·ton	m	m·ton	m·ton
	Diesellolja i tank 1	0,990	19,84	19,643	0,88	0,874	0,13
	Diesellolja i tank 2	2,740	16,03	43,914	0,86	2,356	2,10
	Färskvatten	0,380	15,66	5,951	1,51	0,574	
	Svartvatten	0,080	15,99	1,279	1,35	0,108	
	Småtankar	0,500	14,00	7,000	1,50	0,750	
	Besättning och förråd	0,500	7,00	3,500	4,50	2,250	

Deadweight <i>Dödsvikt</i>	5,190	15,66	81,287	1,33	6,912	
Light ship weight <i>Egenvikt</i>	57,358	9,24	530,100	2,39	136,931	
<b>Total weight <i>Summa vikter</i></b>	<b>62,548</b>	<b>9,77</b>	<b>611,387</b>	<b>2,30</b>	<b>143,843</b>	<i>korr=0,036</i>

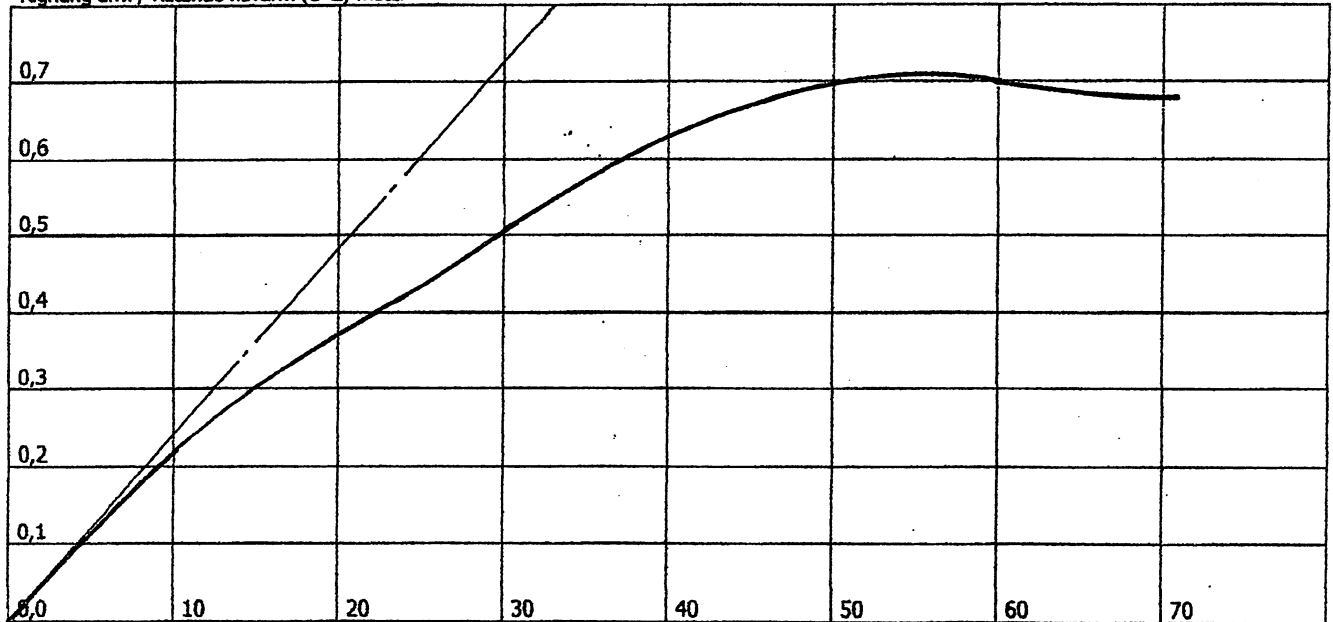
Mean draught           1,74 m  
*Medeldjupgående*  
Total trim               0,00 m  
*Totalt trim*  
Draught forward       1,74 m  
*Djupgående för*  
Draught aft             1,74 m  
*Djupgående akter*

Corrected metacentric height   1,40 m  
*Reducerad meracenterhöjd*

Condition.....**Barlast, avgång**

<b>Trim</b>	Displacement (Total weight)	(Page .18.)	$\Delta$ = 62,548 ton
<b>Trim</b>	Deplacemnt ( <i>Summa vikter</i> )	<i>Sida</i>	
	Mean draught at L/2		d = 1,74 m
	<i>Medeldjupgående vid L/2</i>		
	Centre of buoyancy from AP (Even keel)		LCB = 9,77 m
	<i>Deplacemntsryngdpunkt från AP (Jämn köl)</i>		
	Centre of gravity from AP	(Page .18.)	LCG = 9,77 m
	<i>Viktstyngdpunkt från AP</i>	<i>Sida</i>	
	Trimming lever	LCB - LCG	h = 0,00 m
	<i>Trimmande hävarm</i>		
	Total trim		t = 0,00 m
	<i>Totalt trim</i>		
	Centre of flotation from L/2		LCF = -2,69 m
	<i>Flytcentrum från L/2</i>		
	Trim forward	$t(0,5L-LCF)/L =$	$t_f = 0,00$ m
	<i>Trim för</i>		
	Trim aft	$t(0,5L+LCF)/L =$	$t_a = 0,00$ m
	<i>Trim akter</i>		
	Draught forward	d - $t_f$	$d_f = 1,74$ m
	<i>Djupgående för</i>		
	Draught aft	d - $t_a$	$d_a = 1,74$ m
	<i>Djupgående akter</i>		
<b>Stability</b>	Transverse metacentre above keel		KM = 3,74 m
<b>Stabilitet</b>	<i>Tvårskeppscentrum över köl</i>		
	Centre of gravity above keel	(Page .18.)	KG = 2,30 m
	<i>Viktstyngdpunkt över köl</i>	<i>Sida</i>	
	Transverse metacentric height	KM - KG	GM = 1,44 m
	<i>Tvårskeppsmetacenterhöjd</i>		
	Correction for free surfaces		GG' = 0,04 m
	<i>Reduktion för fria vätskeytor</i>		
	Corrected metacentric height	GM - GG' =	<b>G'M = 1,40 m</b>
	<i>Reducerad metacenterhöjd</i>		

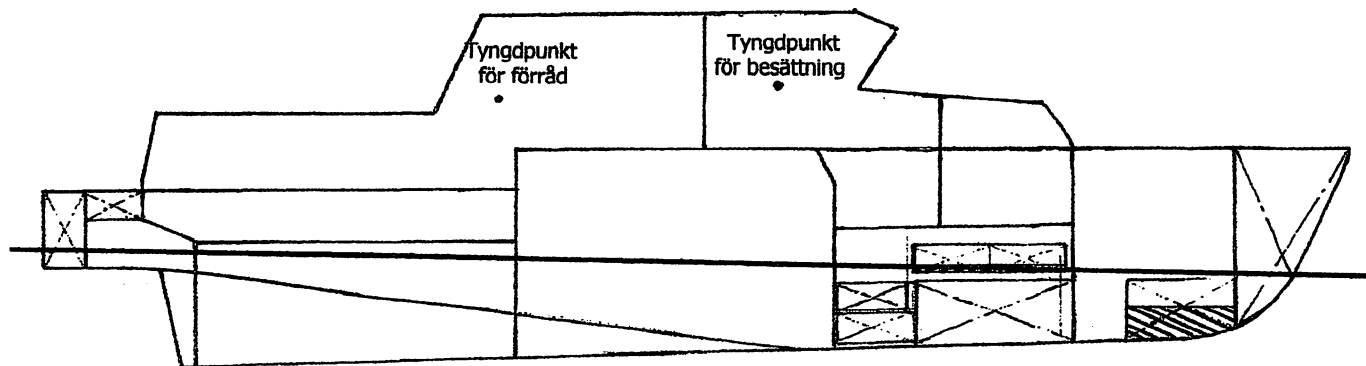
Righting arm / Rätande hävarm (G'Z) meter



Angle of heel / Krängningsvinkel

$\varphi^\circ$	10	20	30	40	50	60	70
KN / MS	0,626	1,173	1,679	2,145	2,490	2,723	2,878
G'Msin $\varphi^\circ$ / KG'sin $\varphi^\circ$	0,406	0,800	1,170	1,504	1,793	2,026	2,199
Righting lever: G'Z = KN - KG'sin $\varphi^\circ$ = Rätande hävarm: MS + G'Msin $\varphi^\circ$	0,22	0,37	0,51	0,64	0,70	0,70	0,68
Dynamic arm, e: Dynamisk hävarm, e:	Up to 30° = 0,149		Up to 40° = 0,250		Between 30° and 40° = 0,101		

Condition..... **Barlast, ankomst**  
Kondition



10 % bunker och förråd		Weight <i>Vikt</i>	Centre of gravity from AP <i>Viktstyngdpunkt från AP</i>	Moment about AP <i>Moment om AP</i>	Centre of gravity above keel <i>Viktstyngdpunkt över köl</i>	Moment about keel <i>Moment om köl</i>	Moment of inertia · y <i>Yttröghetsmoment · y</i>
		ton	m	m·ton	m	m·ton	m·ton
	Dieselolja i tank 1	0,400	19,83	7,932	0,60	0,240	0,05
	Färskvatten	0,040	15,66	0,626	1,33	0,053	
	Svartvatten	0,080	15,99	1,279	1,35	0,108	
	Småtankar	0,500	14,00	7,000	1,50	0,750	
	Besättning och förråd	0,500	7,00	3,500	4,50	2,250	

Deadweight <i>Dödvikt</i>	1,520	13,38	20,337	2,24	3,401	
Light ship weight <i>Egenvikt</i>	57,358	9,24	530,100	2,39	136,931	
<b>Total weight <i>Summa vikter</i></b>	<b>58,878</b>	<b>9,35</b>	<b>550,437</b>	<b>2,38</b>	<b>140,332</b>	<b>kor=0,001</b>

Mean draught 1,65 m

*Medeldjupgående*

Total trim 0,28 m akterligt

*Totalt trim*

Draught forward 1,51 m

*Djupgående för*

Draught aft 1,79 m

*Djupgående akter*

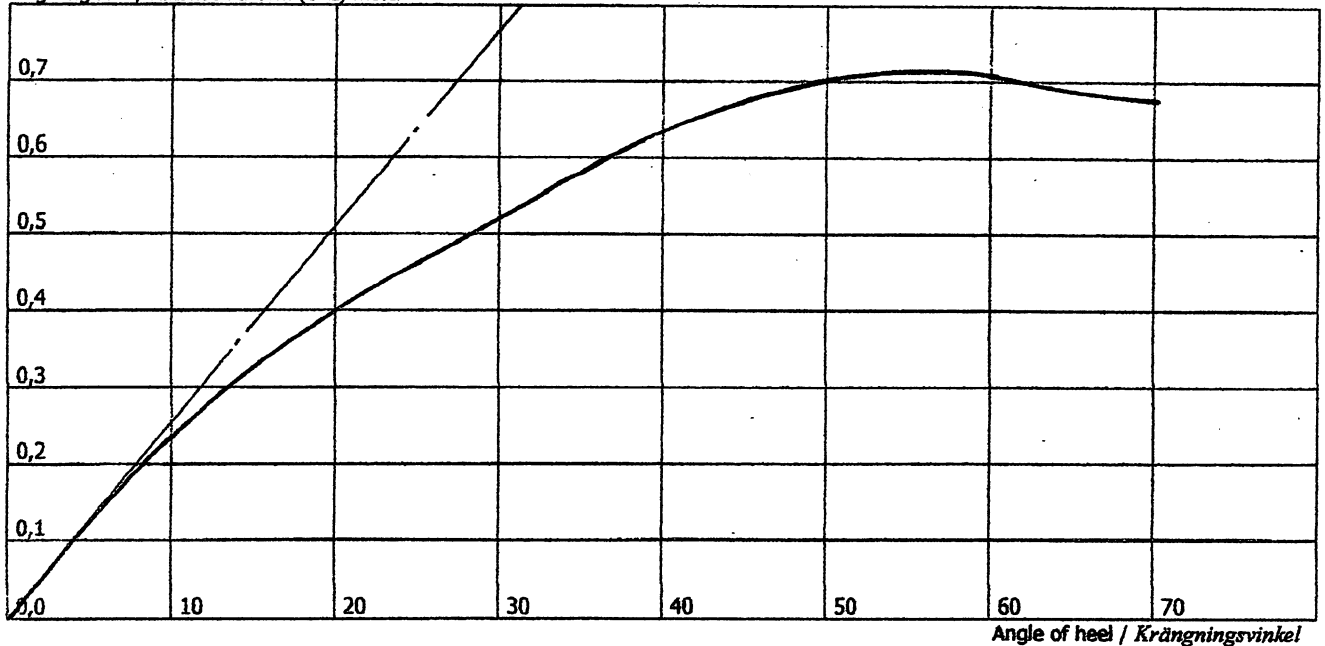
Corrected metacentric height 1,47 m

*Reducerad meracenterhöjd*

Condition..... **Barlast, ankomst**

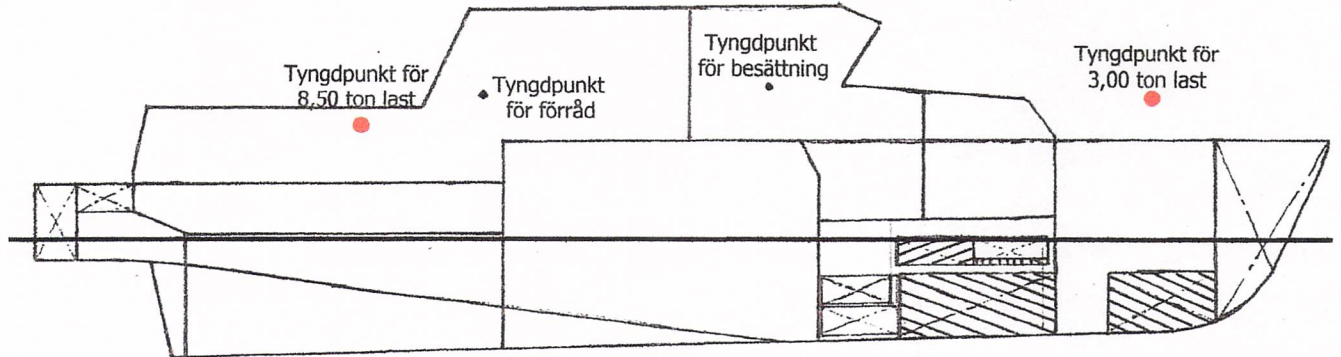
<b>Trim</b>	Displacement (Total weight)	(Page .20.)	$\Delta$ = 58,878 ton
<b>Trim</b>	Deplacement (Summa vikter)	Sida	
	Mean draught at L/2		d = 1,69 m
	Medeldjupgående vid L/2		
	Centre of buoyancy from AP (Even keel)		LCB = 9,85 m
	Deplacemensryngdpunkt från AP (Jämn köl)		
	Centre of gravity from AP	(Page .20.)	LCG = 9,35 m
	Viktstyngdpunkt från AP	Sida	
	Trimming lever	LCB - LCG	h = 0,50 m
	Trimmande hävarm		
	Total trim		t = 0,28 m akterligt
	Totalt trim		
	Centre of flotation from L/2		LCF = -2,79 m
	Flytcentrum från L/2		
	Trim forward	$t(0,5L-LCF)/L =$	$t_f = 0,18$ m
	Trim för		
	Trim aft	$t(0,5L+LCF)/L =$	$t_a = 0,10$ m
	Trim akter		
	Draught forward	d - $t_f$	$d_f = 1,51$ m
	Djupgående för		
	Draught aft	d - $t_a$	$d_a = 1,79$ m
	Djupgående akter		
<b>Stability</b>	Transverse metacentre above keel		KM = 3,85 m
<b>Stabilitet</b>	Tvårskeppscentrum över köl		
	Centre of gravity above keel	(Page .20.)	KG = 2,38 m
	Viktstyngdpunkt över köl	Sida	
	Transverse metacentric height	KM - KG	GM = 1,47 m
	Tvårskeppsmetacenterhöjd		
	Correction for free surfaces		GG' = 0,00 m
	Reduktion för fria vätskeytor		
	Corrected metacentric height	GM - GG' =	<b>G'M = 1,47 m</b>
	Reducerad metacenterhöjd		

Righting arm / Rätande hävarm (G'Z) meter



$\varphi^\circ$	10	20	30	40	50	60	70
KN / MS	0,648	1,212	1,714	2,171	2,518	2,761	2,910
$G'M \sin \varphi^\circ / KG' \sin \varphi^\circ$	0,413	0,814	1,190	1,530	1,823	2,061	2,236
Righting lever: $G'Z = KN - KG' \sin \varphi^\circ =$ Rätande hävarm: $MS + G'M \sin \varphi^\circ$	0,24	0,40	0,52	0,64	0,70	0,70	0,67
Dynamic arm, e: Dynamisk hävarm, e:	Up to 30° = 0,160		Up to 40° = 0,261		Between 30° and 40° = 0,101		

**Condition.....Lastfartyg med full last (11,50 ton däckslast), avgång**  
**Kondition**



100 % bunker och förråd		Weight	Centre of gravity from AP	Moment about AP	Centre of gravity above keel	Moment about keel	Moment of inertia · y
		Vikt	Viktstyngdpunkt från AP	Moment om AP	Viktstyngdpunkt över köl	Moment om köl	Yttröghetsmoment · y
		ton	m	m·ton	m	m·ton	m·ton
	Diesellojja i tank 1	0,990	19,84	19,643	0,88	0,874	0,13
	Diesellojja i tank 2	2,740	16,03	43,914	0,86	2,356	2,10
	Färskvatten	0,380	15,66	5,951	1,51	0,574	
	Svartvatten	0,080	15,99	1,279	1,35	0,108	
	Småtankar	0,500	14,00	7,000	1,50	0,750	
	Besättning och förråd	0,500	7,00	3,500	4,50	2,250	
	8,50 ton däckslast på akterdäck	8,500	4,50	38,250	3,97	33,745	
	3,00 ton däckslast på fördäck	3,000	19,80	59,400	4,72	14,160	
<b>Deadweight</b> <i>Dödvikt</i>		<b>16,690</b>	<b>10,72</b>	<b>178,937</b>	<b>3,28</b>	<b>54,817</b>	
<b>Light ship weight</b> <i>Egenvikt</i>		<b>57,358</b>	<b>9,24</b>	<b>530,100</b>	<b>2,39</b>	<b>136,931</b>	
<b>Total weight</b> <i>Summa vikter</i>		<b>74,048</b>	<b>9,58</b>	<b>709,037</b>	<b>2,59</b>	<b>191,748</b>	<b>kor=0,03</b>

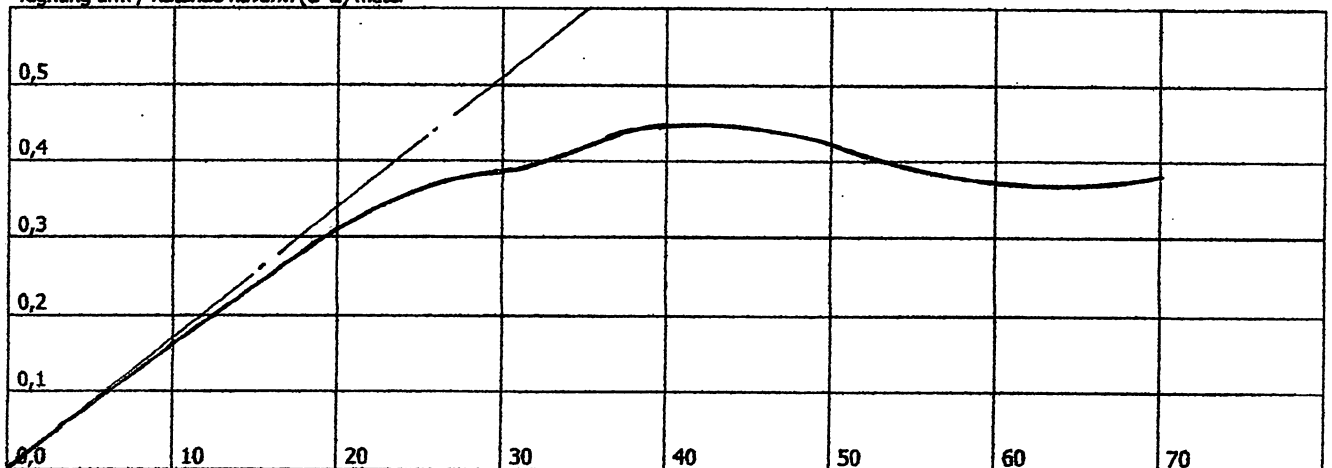
Mean draught 1,90 m  
*Medeldjupgående*  
Total trim 0,01 m förligt  
*Totalt trim*  
Draught forward 1,91 m  
*Djupgående för*  
Draught aft 1,90 m  
*Djupgående akter*

Corrected metacentric height 0,88 m  
*Reducerad meracenterhöjd*

Condition.....**Lastfartyg med full last (11,50 ton däckslast), avgång**  
Kondition

<b>Trim</b>	Displacement (Total weight)	(Page .22.)	$\Delta$ = 74,048 ton
<b>Trim</b>	Displacement (Summa vikter)	Sida	
	Mean draught at L/2		d = 1,90 m
	Medeldjupgående vid L/2		
	Centre of buoyancy from AP (Even keel)		LCB = 9,57 m
	Deplacemensryngdpunkt från AP (Jämn köl)		
	Centre of gravity from AP	(Page .22.)	LCG = 9,58 m
	Viktstyngdpunkt från AP	Sida	
	Trimming lever	LCB - LCG	h = 0,01 m
	Trimmande hävarm		
	Total trim		t = 0,01 m (förligt)
	Totalt trim		
	Centre of flotation from L/2		LCF = -2,63 m
	Flytcentrum från L/2		
	Trim forward	$t(0,5L-LCF)/L =$	$t_f = 0,006$ m
	Trim för		
	Trim aft	$t(0,5L+LCF)/L =$	$t_a = 0,004$ m
	Trim akter		
	Draught forward	d - $t_f$	$d_f = 1,906$ m
	Djupgående för		
	Draught aft	d - $t_a$	$d_a = 1,896$ m
	Djupgående akter		
<b>Stability</b>	Transverse metacentre above keel		KM = 3,50 m
<b>Stabilitet</b>	Tvårskeppscentrum över köl		
	Centre of gravity above keel	(Page .22.)	KG = 2,59 m
	Viktstyngdpunkt över köl	Sida	
	Transverse metacentric height	KM - KG	GM = 0,91 m
	Tvårskeppsmetacenterhöjd		
	Correction for free surfaces		GG' = 0,03 m
	Reduktion för fria vätskeytor		
	Corrected metacentric height	GM - GG' =	<b>G'M = 0,88 m</b>
	Reducerad metacenterhöjd		

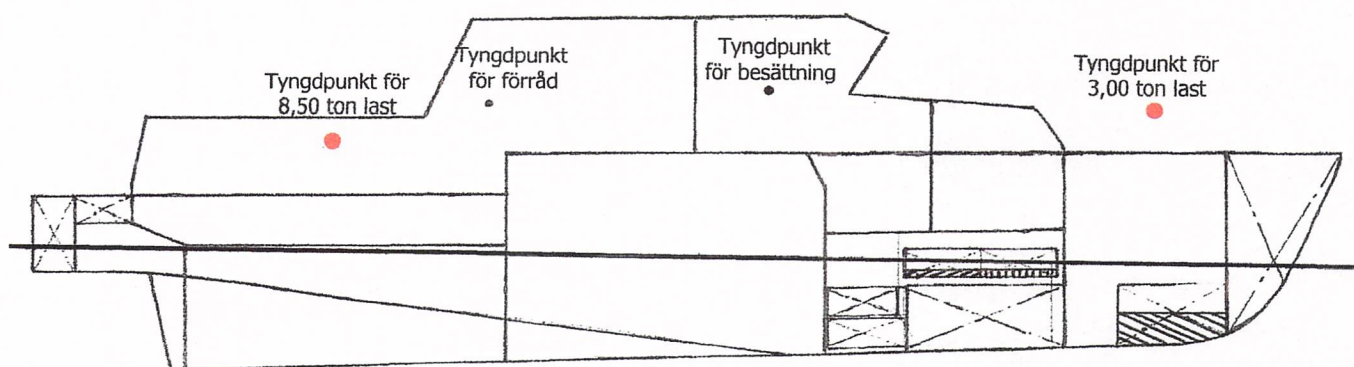
Righting arm / Rätande hävarm (G'Z) meter



Angle of heel / Krängningsvinkel

$\phi^\circ$	10	20	30	40	50	60	70
KN / MS	0,613	1,205	1,701	2,129	2,431	2,635	2,842
$G'M \sin \phi^\circ / KG' \sin \phi^\circ$	0,455	0,896	1,310	1,684	2,007	2,269	2,462
Righting lever: $G'Z = KN - KG' \sin \phi^\circ =$ Rätande hävarm: $MS + G'M \sin \phi^\circ$	0,16	0,31	0,39	0,45	0,42	0,37	0,38
Dynamic arm, e: Dynamisk hävarm, e:	Up to 30° = 0,118		Up to 40° = 0,190		Between 30° and 40° = 0,072		

Condition..... **Lastfartyg med full last (11,50 ton däckslast), ankomst**  
Kondition



10 % bunker och förråd		Weight	Centre of gravity from AP	Moment about AP	Centre of gravity above keel	Moment about keel	Moment of inertia · y
		Vikt	Viktstyngdpunkt från AP	Moment om AP	Viktstyngdpunkt över köl	Moment om köl	Yttröghetsmoment · y
		ton	m	m·ton	m	m·ton	m·ton
	Dieseloilja i tank 1	0,400	19,83		0,60		0,05
	Färskvatten	0,040	15,66	0,626	1,33	0,053	
	Svartvatten	0,080	15,99	1,279	1,35	0,108	
	Småtankar	0,500	14,00	7,000	1,50	0,750	
	Besättning och förråd	0,500	7,00	3,500	4,50	2,250	
	8,50 ton däckslast på akterdäck	8,50	4,50	38,250	3,97	33,745	
	3,20 ton däckslast på fördäck	3,00	19,80	59,400	4,72	14,160	

Deadweight Dödvikt	13,020	9,06	117,987	3,94	51,306	
Light ship weight Egenvikt	57,358	9,24	530,100	2,39	136,931	
<b>Total weight</b> <b>Summa vikter</b>	<b>70,378</b>	<b>9,21</b>	<b>648,087</b>	<b>2,67</b>	<b>188,237</b>	korr=0,001

Mean draught 1,84 m

Medeldjupgående

Total trim 0,26 m akterligt

Totalt trim

Draught forward 1,71 m

Djupgående för

Draught aft 1,97 m

Djupgående akter

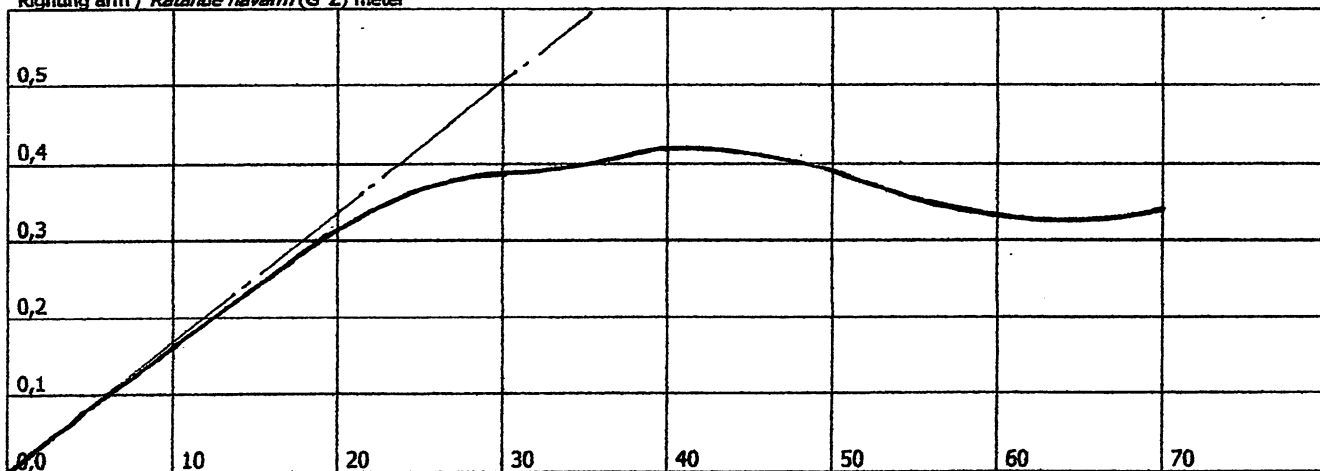
Corrected metacentric height 0,87 m

Reducerad meracenterhöjd

Condition..... **Lastfartyg med full last (11,50 ton däckslast), ankomst**  
Kondition

<b>Trim</b>	Displacement (Total weight)	(Page .24.)	$\Delta$ = 70,378 ton
<b>Trim</b>	Deplacement (Summa vikter)	Sida	
	Mean draught at L/2		d = 1,87 m
	Medeldjupgående vid L/2		
	Centre of buoyancy from AP (Even keel)		LCB = 9,61 m
	Deplacemansryngdpunkt från AP (Jämn köl)		
	Centre of gravity from AP	(Page .24.)	LCG = 9,21 m
	Viktstyngdpunkt från AP	Sida	
	Trimming lever	LCB - LCG	h = 0,40 m
	Trimmande hävarm		
	Total trim		t = 0,26 m akterligt
	Totalt trim		
	Centre of flotation from L/2		LCF = -2,64 m
	Flytcentrum från L/2		
	Trim forward	$t(0,5L-LCF)/L =$	$t_F = 0,16$ m
	Trim för		
	Trim aft	$t(0,5L+LCF)/L =$	$t_A = 0,10$ m
	Trim akter		
	Draught forward	d - $t_F$	$d_F = 1,71$ m
	Djupgående för		
	Draught aft	d - $t_A$	$d_A = 1,97$ m
	Djupgående akter		
<b>Stability</b>	Transverse metacentre above keel		KM = 3,54 m
<b>Stabilitet</b>	Tvårskeppscentrum över köl		
	Centre of gravity above keel	(Page .24.)	KG = 2,67 m
	Viktstyngdpunkt över köl	Sida	
	Transverse metacentric height	KM - KG	GM = 0,87 m
	Tvårskeppsmetacenterhöjd		
	Correction for free surfaces		GG' = 0,00 m
	Reduktion för fria vätskeytor		
	Corrected metacentric height	GM - GG' =	<b>G'M = 0,87 m</b>
	Reducerad metacenterhöjd		

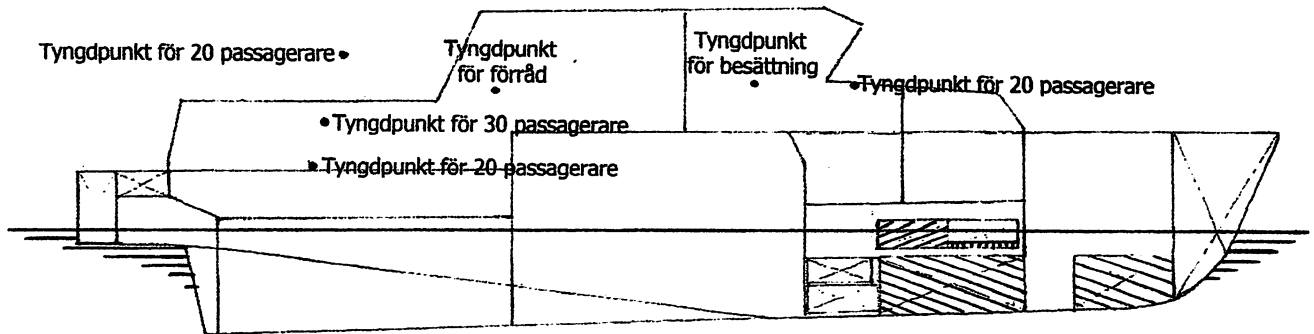
Righting arm / Rätande hävarm (G'Z) meter



Angle of heel / Krängningsvinkel

$\varphi^\circ$	10	20	30	40	50	60	70
KN / MS	0,626	1,237	1,724	2,139	2,434	2,638	2,853
$G'M \sin \varphi^\circ / KG' \sin \varphi^\circ$	0,464	0,913	1,335	1,716	2,045	2,312	2,509
Righting lever: $G'Z = KN - KG' \sin \varphi^\circ =$ Rätande hävarm: $MS + G'M \sin \varphi^\circ$	0,16	0,32	0,39	0,42	0,39	0,33	0,34
Dynamic arm, e: Dynamisk hävarm, e:	Up to 30° = 0,120		Up to 40° = 0,190		Between 30° and 40° = 0,070		

Condition.....90 passagerare, avgång  
Kondition



100 % bunker och förråd		Weight	Centre of gravity from AP	Moment about AP	Centre of gravity above keel	Moment about keel	Moment of inertia · y
		Vikt	Viktstyngdpunkt från AP	Moment om AP	Viktstyngd punkt över köl	Moment om köl	Yttröghetsmoment · y
		ton	m	m·ton	m	m·ton	m·ton
	Dieselolja i tank 1	0,990	19,84	19,643	0,88	0,874	0,48
	Färskvatten	0,380	15,66	5,951	1,51	0,574	
	Svartvatten	0,080	15,99	1,279	1,35	0,108	
	Småtankar	0,500	14,00	7,000	1,50	0,750	
	Besättning och förråd	0,500	7,00	3,500	4,50	2,250	
20	Passagerare i salongen	1,500	3,20	4,800	2,99	4,485	
20	Passagerare på soldäck	1,500	3,90	5,850	5,28	7,920	
30	Passagerare på akterdäck	2,250	3,55	7,988	3,97	8,933	
20	Passagerare på fördäck	1,500	14,20	21,300	4,72	7,080	
	Dieselolja i tank 2 – denna tank ska alltid vara full i detta lastfall	2,740	16,027	43,914	0,864	2,367	

Deadweight Dödvikt	11,940	10,153	121,225	2,96	35,341	
Light ship weight Egenvikt	57,358	9,24	530,100	2,39	136,931	
<b>Total weight Summa vikter</b>	<b>69,298</b>	<b>9,40</b>	<b>651,325</b>	<b>2,49</b>	<b>172,272</b>	<b>kor=0,007</b>

Mean draught 1,83 m

Medel djupgående

Total trim 0,15 m akterligt

Totalt trim

Draught forward 1,75 m

Djupgående för

Draught aft 1,90 m

Djupgående akter

Corrected metacentric height 1,07 m

Reducerad meracenterhöjd

**Krängningsvinkel när passagerarna samlas vid fartygets ena sida (TSFS 2009:114, Bilaga 4:1.1)**

4 passagerare/m<sup>2</sup> ger ett krängande moment  $M_{kr} = 13,37$  tonmeter, som leder till krängningsvinkeln  $\phi = 10^\circ$

**Krängningsvinkel pga gir (TSFS 2009:114, Bilaga 4:1.2)**

Fartygets servicefart är 14 knop. Krängande moment pga gir = 48,71 kNm ger krängningsvinkeln  $\phi = 4^\circ$

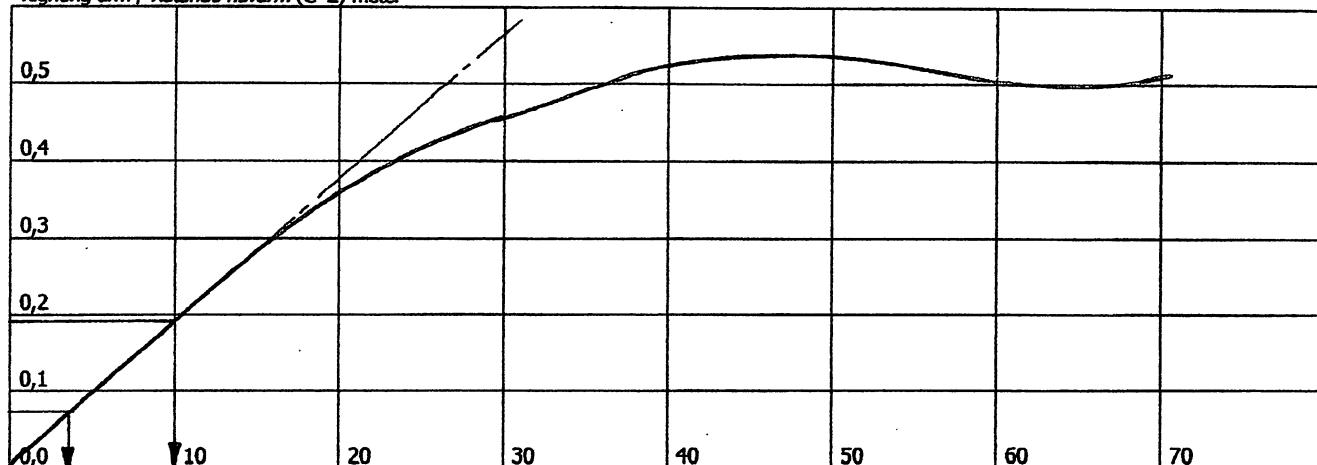
**Condition.....90 passagerare, avgång**

*Kondition*

<b>Trim</b>	Displacement (Total weight)	(Page .26.)	$\Delta$ = 69,298 ton
<b>Trim</b>	<i>Deplacement (Summa vikter)</i>	<i>Sida</i>	
	Mean draught at L/2		$d$ = 1,84 m
	<i>Medeldjupgående vid L/2</i>		
	Centre of buoyancy from AP (Even keel)		LCB = 9,64 m
	<i>Deplacemansryngdpunkt från AP (Jämn köl)</i>		
	Centre of gravity from AP	(Page .26.)	LCG = 9,40 m
	<i>Viktstyngdpunkt från AP</i>	<i>Sida</i>	
	Trimming lever	LCB - LCG	$h$ = 0,24 m
	<i>Trimmande hävarm</i>		
	Total trim		$t$ = 0,15 m (akterligt)
	<i>Totalt trim</i>		
	Centre of flotation from L/2		LCF = -2,65 m
	<i>Flytcencrum från L/2</i>		
	Trim forward	$t(0,5L-LCF)/L =$	$t_F$ = 0,09 m
	<i>Trim för</i>		
	Trim aft	$t(0,5L+LCF)/L =$	$t_A$ = 0,06 m
	<i>Trim akter</i>		
	Draught forward	$d - t_F$	$d_F$ = 1,75 m
	<i>Djupgående för</i>		
	Draught aft	$d - t_A$	$d_A$ = 1,90 m
	<i>Djupgående akter</i>		

<b>Stability</b>	Transverse metacentre above keel		KM = 3,57 m
<b>Stabilitet</b>	<i>Tvårskeppscentrum över köl</i>		
	Centre of gravity above keel	(Page .26.)	KG = 2,49 m
	<i>Viktstyngdpunkt över köl</i>	<i>Sida</i>	
	Transverse metacentric height	KM - KG	GM = 1,08 m
	<i>Tvårskeppsmetacenterhöjd</i>		
	Correction for free surfaces		GG' = 0,01 m
	<i>Reduktion för fria vätskeytor</i>		
	Corrected metacentric height	GM - GG' =	<b>G'M = 1,07 m</b>
	<i>Reducerad metacenterhöjd</i>		

Righting arm / Rätande hävarm (G'Z) meter

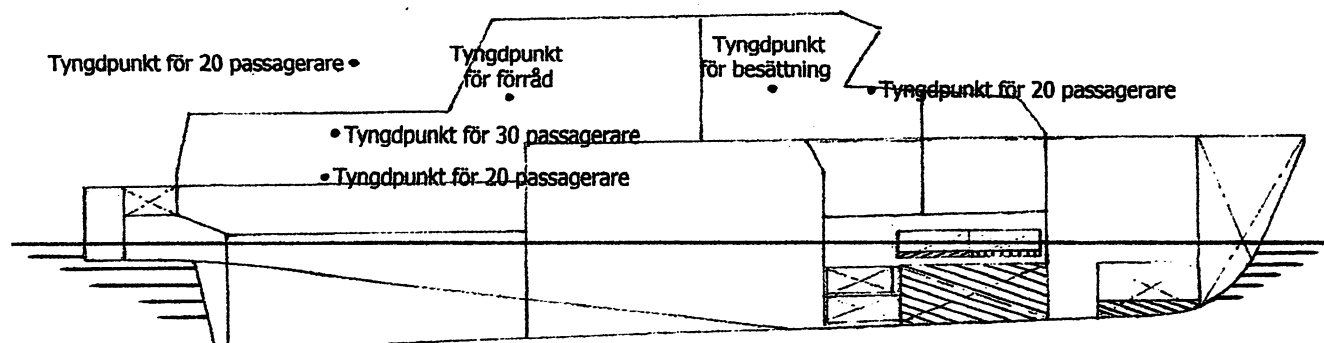


4° krängn vid gir      10° krängn med alla pass på ena sidan

Angle of heel / Krängningsvinkel

$\varphi^\circ$	10	20	30	40	50	60	70
KN / MS	0,624	1,216	1,710	2,141	2,452	2,662	2,858
$G'M\sin\varphi^\circ / KG'\sin\varphi^\circ$	0,434	0,855	1,250	1,607	1,915	2,165	2,349
Righting lever: $G'Z = KN - KG'\sin\varphi^\circ =$ <i>Rätande hävarm: MS + G'Msin<math>\varphi^\circ</math></i>	0,19	0,36	0,46	0,53	0,54	0,50	0,51
Dynamic arm, e: <i>Dynamisk hävarm, e:</i>	Up to 30° = 0,138		Up to 40° = 0,224		Between 30° and 40° = 0,086		

**Condition.....90 passagerare, ankomst**  
**Kondition**



10 % bunker och förråd		Weight	Centre of gravity from AP	Moment about AP	Centre of gravity above keel	Moment about keel	Moment of Inertia · y
		Vikt	Viktstyngdpunkt från AP	Moment om AP	Viktstyngdpunkt över köl	Moment om köl	Yttröghetsmoment · y
		ton	m	m·ton	m	m·ton	m·ton
	Dieselloolja i tank 1	0,100	19,79	1,979	0,37	0,037	0,18
	Färskvatten	0,040	15,66	0,626	1,33	0,053	
	Svartvatten	0,080	15,99	1,279	1,35	0,108	
	Småtankar	0,500	14,00	7,000	1,50	0,750	
	Besättning och förråd	0,500	7,00	3,500	4,50	2,250	
20	Passagerare i salongen	1,500	3,20	4,800	2,99	4,485	
20	Passagerare på soldäck	1,500	3,90	5,850	5,28	7,920	
30	Passagerare på akterdäck	2,250	3,55	7,988	3,97	8,933	
20	Passagerare på fördäck	1,500	14,20	21,300	4,72	7,080	
	Dieselloolja i tank 2 – denna tank ska alltid vara full i detta lastfall	2,740	16,027	43,914	0,864	2,367	

Deadweight Dödvikt	10,710	9,17	98,236	3,17	33,983	
Light ship weight Egenvikt	57,358	9,24	530,100	2,39	136,931	
<b>Total weight Summa vikter</b>	<b>68,068</b>	<b>9,23</b>	<b>628,336</b>	<b>2,51</b>	<b>170,914</b>	<b>kon=0,003</b>

Mean draught 1,79 m

Medeldjupgående

Total trim 0,27 m akterligt

Totalt trim

Draught forward 1,65 m

Djupgående för

Draught aft 1,92 m

Djupgående akter

Corrected metacentric height 1,10 m

Reducerad meracenterhöjd

**Krängningsvinkel när passagerarna samlas vid fartygets ena sida (TSFS 2009:114, Bilaga 4:1.1)**

4 passagerare/m<sup>2</sup> ger ett krängande moment  $M_{kr} = 13,37$  tonmeter, som leder till krängningsvinkeln  $\varphi = 10^\circ$

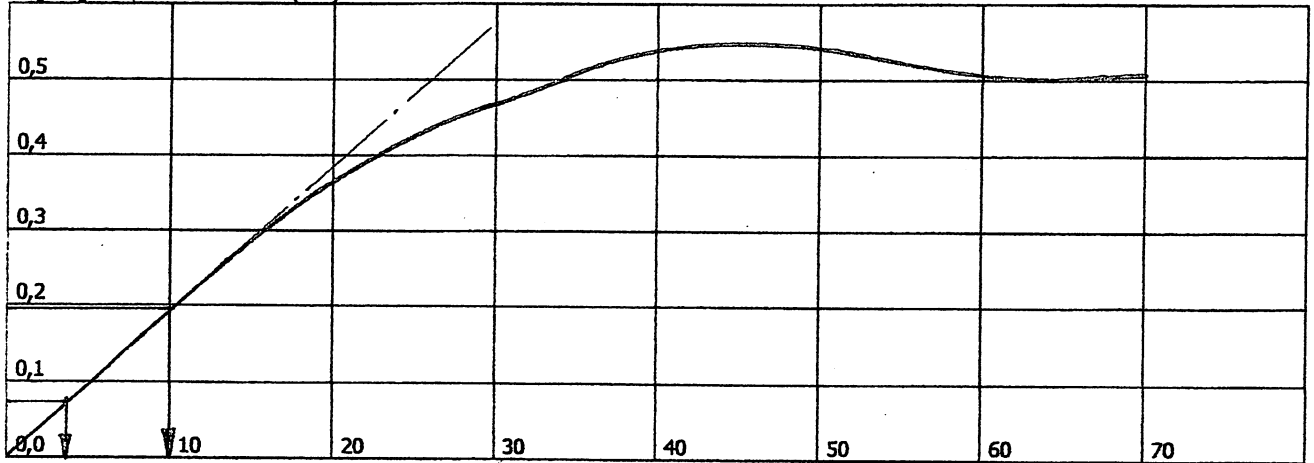
**Krängningsvinkel pga gir (TSFS 2009:114, Bilaga 4:1.2)**

Fartygets servicefart är 12 knop. Krängande moment pga gir = 49,06 kNm ger krängningsvinkeln  $\varphi = 4^\circ$

**Condition.....90 passagerare, ankomst**  
**Kondition**

<b>Trim</b>	Displacement (Total weight)	(Page .28.)	$\Delta$ = 68,068 ton
<b>Trim</b>	Deplacement (Summa vikter)	Sida	
	Mean draught at L/2		d = 1,82 m
	Medeldjupgående vid L/2		
	Centre of buoyancy from AP (Even keel)		LCB = 9,67 m
	Deplacemensryngdpunkt från AP (Jämn köl)		
	Centre of gravity from AP	(Page .28.)	LCG = 9,23 m
	Viktstyngdpunkt från AP	Sida	
	Trimming lever	LCB - LCG	h = 0,44 m
	Trimmande hävarm		
	Total trim		t = 0,27 m akterligt
	Totalt trim		
	Centre of flotation from L/2		LCF = -2,66 m
	Flytcentrum från L/2		
	Trim forward	$t(0,5L-LCF)/L =$	$t_f = 0,17$ m
	Trim för		
	Trim aft	$t(0,5L+LCF)/L =$	$t_a = 0,10$ m
	Trim akter		
	Draught forward	d - $t_f$	$d_f = 1,65$ m
	Djupgående för		
	Draught aft	d - $t_a$	$d_a = 1,92$ m
	Djupgående akter		
<b>Stability</b>	Transverse metacentre above keel		KM = 3,61 m
<b>Stabilitet</b>	Tvärskeppscentrum över köl		
	Centre of gravity above keel	(Page .28.)	KG = 2,51 m
	Viktstyngdpunkt över köl	Sida	
	Transverse metacentric height	KM - KG	GM = 1,10 m
	Tvärskeppsmetacenterhöjd		
	Correction for free surfaces		GG' = 0,00 m
	Reduktion för fria vätskeytor		
	Corrected metacentric height	GM - GG' =	<b>G'M = 1,10 m</b>
	Reducerad metacenterhöjd		

Righting arm / Rätande hävarm (G'Z) meter



4° krängn vid gir      10° krängn med alla pass på ena sidan

Angle of heel / Krängningsvinkel

$\phi^\circ$	10	20	30	40	50	60	70
KN / MS	0,630	1,230	1,722	2,151	2,461	2,674	2,869
$G'M \sin \phi^\circ / KG' \sin \phi^\circ$	0,436	0,858	1,255	1,613	1,923	2,174	2,359
Righting lever: $G'Z = KN - KG' \sin \phi^\circ =$ Rätande hävarm: $MS + G'M \sin \phi^\circ$	0,19	0,37	0,47	0,54	0,54	0,50	0,51
Dynamic arm, e: Dynamisk hävarm, e:	Up to 30° = 0,141		Up to 40° = 0,228		Between 30° and 40° = 0,087		

Report from heeling experiment with weighing / Rapport från krängningsprov med vägning

**General / Allmänt** Centre of gravity of the light ship has been determined by heeling experiment  
Egenviktsstyngdpunkten har bestämts genom krängningsprov

Place / Plats: Landskrona Temperature of water / Vattentemperatur: 5 ° C  
Date / Datum: 2018-02-22 Wind / Vind: NV 1 m/s  
Specific gravity of water / Vattendensitet: 1,005 ton/m<sup>3</sup>

Present / Närvarande: Peter Hartford och Jens Eriksson från rederiet och Jan-Åke Jönsson, sakkunnig krängare

**Condition of the ship / Fartygets kondition**

Draught at FP: *Djupgående vid FP:* 1,74 m ö.BL Trim / Trim: 0,23 m akterligt  
Draught at L/2: *Djupgående vid L/2:* 1,64 m ö.BL Displacement / *Deplacement:* 52,039 ton  
Draught at AP: *Djupgående vid AP:* 1,51 m ö.BL Centre of buoyancy from AP: 10,423 m  
Mean draught: *Medeldjupgående:* 1,63 m ö.BL *Deplacementstyngdpunkt från AP*

**Heeling experiment / Krängningsprov**

Heeling techniques / *Krängningsmetod:* Sidoförflyttning av en kontrollvägd tyngd med vikten = 379,8 kg  
Measuring techniques for the heeling angles / *Mätmetod för krängningsvinklarna:* En pendel med längden 2090 mm i maskinrummet

Weight movement <i>Viktsförflyttning</i>			Heeling / <i>Krängande</i>			Pendulum declination <i>Pendelutslag</i>	G'M m
no	BB	CL	SB	weights / <i>vikter</i>	sidoförflyttning <i>side shift</i>		
				ton	m	m ton	mm
0	0			0,3798	-----	-----	-----
1			0	0,3798	6,75	2,564	79
2	0			0,3798	6,75	2,564	79
3			0	0,3798	6,75	2,564	79
4	0			0,3798	6,75	2,564	79
5			0	0,3798	6,75	2,564	79
6	0			0,3798	6,75	2,564	79

Calculated G'M / *Beräknat G'M:* 1,303 m

**Calculation of the centre of gravity for light ship / Beräkning av lätt fartygs tyngdpunktsläge**

Calculated G'M / *Beräknat G'M:* 1,303 m  
Correction for free surfaces / *Korrigerig för fria vätskeytor:* 0,045 m  
GM / *GM:* 1,348 m

Transverse metacentre above BL / *Tvårskeppsmetacentrum över BL:* 3,803 m  
Transverse metacentric height, GM / *Metacenterhöjd, GM:* 1,348 m  
Centre of gravity above BL / *Tyngdpunkt över BL:* 2,455 m  
Moment around BL / *Moment om BL:* 2,455 · 52,039 = 127,756 m · ton

Weights / <i>Vikter</i>		Weight <i>Vikt</i>	Moment about AP <i>Moment om AP</i>	Moment around base line <i>Moment om BL</i>
		ton	m ton	m ton
Displacement at weighing	<i>Vägningsdeplacement</i>	52,039	542,402	127,756
Subtracted weights	<i>Avgående vikter</i>	-0,760	-3,986	-2,793
Subtracted oil and water	<i>Avgående olja och vatten</i>	-4,179	-68,445	-4,048
Light ship	<i>Lätt fartygs egenvikt</i>	47,100	469,971	120,915

**After correction for subtracted and added weights / Efter korrigerig för avgående och tillkommande vikter:**

Light ship / *Egenvikt:* 47,10 ton  
Centre of gravity from AP: *Tyngdpunkt från AP:* 9,98 m  
Centre of gravity above BL: *Tyngdpunkt över BL:* 2,57 m

Condition.....Krängningsprov  
Kondition

	Weight Vikt	LCG from AP Tp från AP	Mom. about AP Moment om AP	VCG above BL Tp över BL	Mom. about BL Mom. om BL	Mom. of inertia · ρ Yttröghetsmom. · ρ
<b>Subtracted weights Avgående vikter</b>	ton	m	m·ton	m	m·ton	m·ton
1 Krängningsvikt	0,380	0,50	0,190	3,96	1,505	
1 Avläsare i mr	0,083	8,50	0,706	1,80	0,149	
1 Extra livflotte	0,120	-0,80	-0,096	3,30	0,396	
Oljedunkar på däck om SB	0,177	18,00	3,186	4,20	0,743	
Total weight Summa vikter	<b>0,760</b>	<b>5,24</b>	<b>3,986</b>	<b>3,68</b>	<b>2,793</b>	

<b>Subtracted oil &amp; water Avgående olja &amp; vatten</b>	ton	m	m·ton	m	m·ton	m·ton
Dieseltank 1 (934 l)	0,803	19,84	15,932	0,80	0,642	0,10
Dieseltank 2 (2 650 l)	2,279	16,00	36,464	0,79	1,800	2,20
Dieseldagtank för hjm (170 l)	0,146	12,50	1,825	3,30	0,482	0,01
Färskvatten (full)	0,390	15,66	6,107	1,51	0,589	0,01
Svartvatten (20 cm)	0,210	15,99	3,358	1,41	0,296	0,01
Spillolja ( full)	0,150	13,85	2,078	1,30	0,195	0,01
Slop (20 cm)	0,050	13,85	0,693	0,38	0,019	0,01
Slagvatten i mr (100 l)	0,101	12,50	1,263	0,15	0,015	-
Slagvatten i tankrum (50 l)	0,050	14,50	0,725	0,20	0,010	-
Total weight Summa vikter	<b>4,179</b>	<b>16,38</b>	<b>68,445</b>	<b>0,97</b>	<b>4,048</b>	<b>2,35</b>

All hydraulolja i hydraultankarna ingår i lättvikten, eftersom de alltid måste innehålla olja vid fartygets drift.

Correction for free surfaces / Korrektion för fria vätskeytor:

$$GG' = \frac{\sum i \cdot \rho}{\Delta} = 2,35/52,039 = 0,045 \text{ m}$$

Bestämning av rullningsprovkonstantens värde:

$$GM = \left( \frac{c \cdot B}{T} \right)^2 \Rightarrow c = 0,66$$

$$B = 7,40 \text{ m}$$

$$T = 4,27 \text{ sek (medelvärde av 4 rullningar)}$$

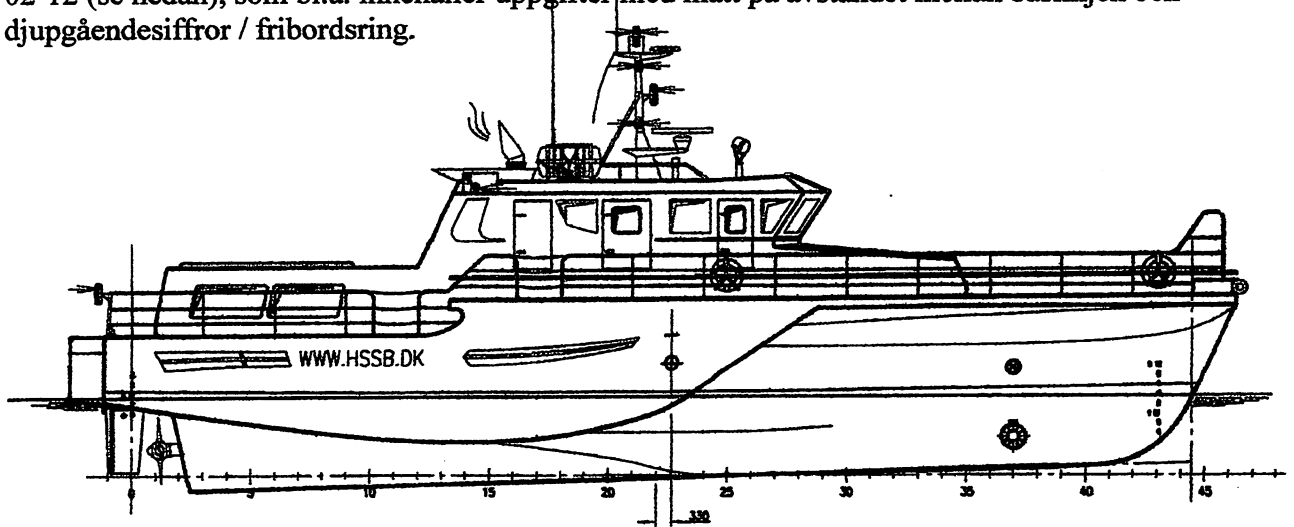
**1) Djupgåendemätning:**

Fartyget har åmning i för och akter samt på akterspegeln.

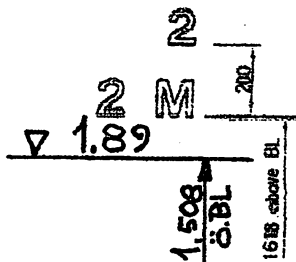
Siffrorna är markerade genom plåtdubbling, och underkanten av siffran 2 M användes som referens.

Vid L/2, där fribordsmärket är placerat, finns ingen åmning, varför avståndet mellan vattenytan och ovkant av linjen genom ringen (fribordet) uppmättes på båda sidor.

Vid omformning av djupgående över köl till djupgående över baslinjen användes ritning no 1206-02-12 (se nedan), som bl.a. innehåller uppgifter med mått på avståndet mellan baslinjen och djupgåendesiffror / fribordsring.

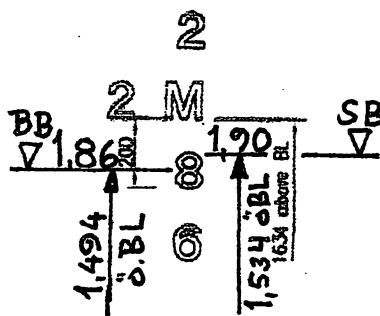


TRANSOM 4



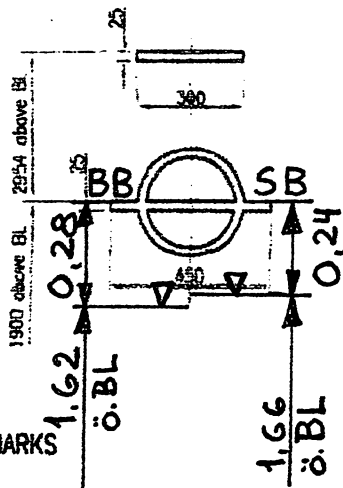
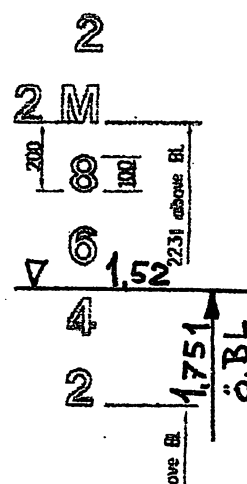
Freeboard Mark

FRAME 0 4



$$d_{A.P.} = \frac{1.494 + 1.534}{2} = 1.514 \text{ m}$$

FRAME 43 4

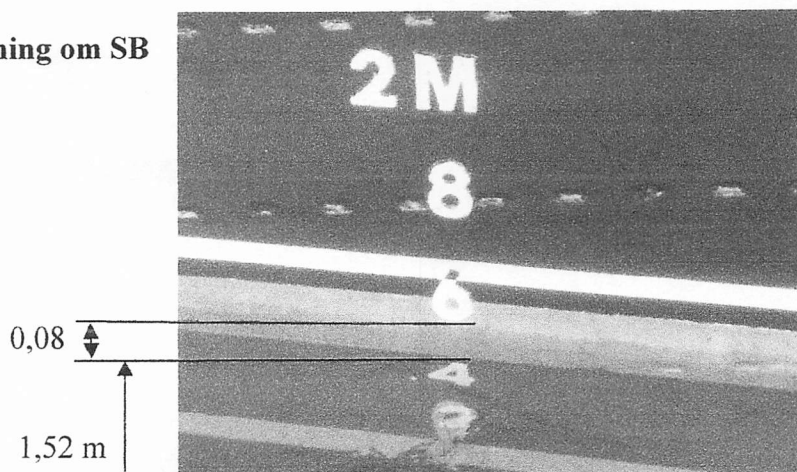


$$d_{L/2} = \frac{1.62 + 1.66}{2} = 1.640 \text{ m}$$

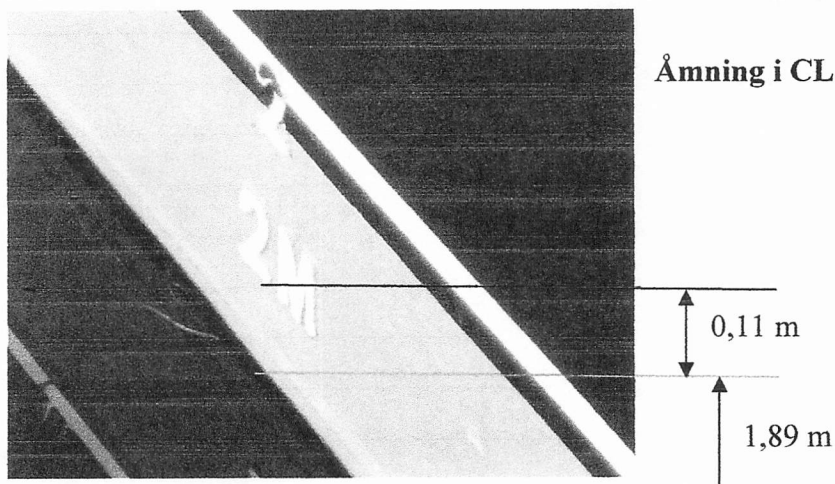
DRAFT MARKS

DRG. NO. 1206-02-12

### Förlig åmning om SB



### Åmning i CL på akterspegeln



I ritningen på föregående sida är uppmätta djupgåenden omräknade till djupgående över baslinjen. Fartyget är byggt med styrlasten 0,597 m. Den är fördelad, så att:

Baseline aft draft = Bottom of keel draft aft - 0,366 m

Baseline forward draft = Bottom of keel draft forward + 0,231 m

I aktern är åmningen placerad på AP, men i fören är åmningen placerad 0,72 m akter om FP. Vid provet hade fartyget förligt trim 0,24 m, varför djupgåendet vid spant 43 = 1,751 m har omräknats till djupgående vid FP = 1,743 m

Efter korrigering av uppmätta värden gäller således:

$d_{AP}$	= 1,51 m
$d_{FP}$	= 1,74 m
$d_{medel}$	= 1,63 m
trim	= 0,23 m förligt

## 2) Displacement:

Krängningsvikten var placerad ombord, BB akter, vid djupgåendeavläsningen.

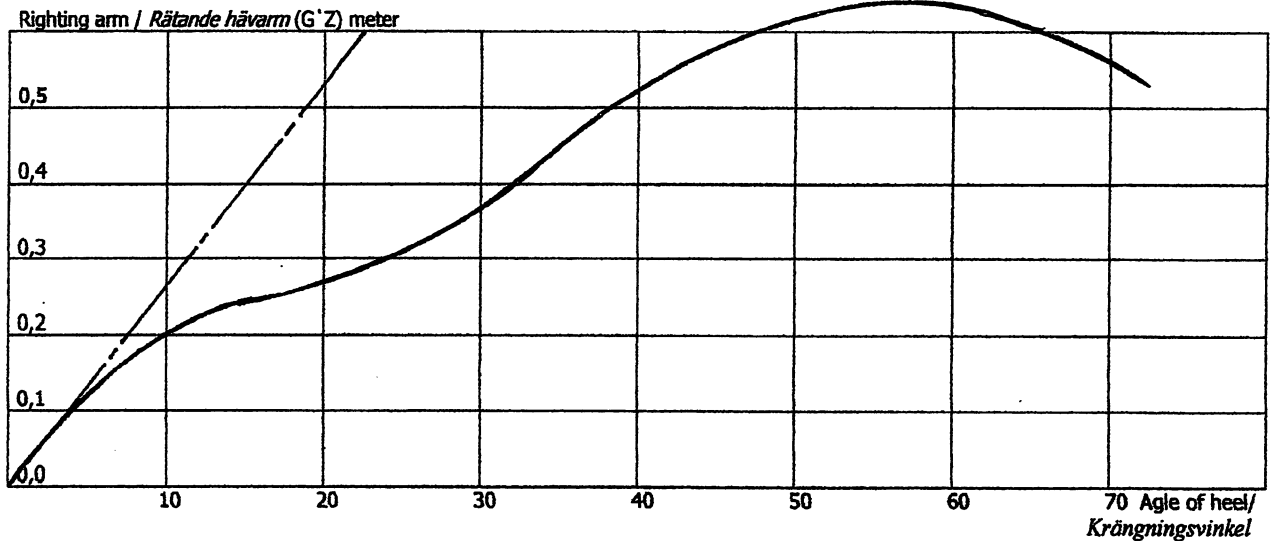
Vid krängningen var endast en avläsare ombord vid pendeln, som var placerad i maskinrummet.

Övrig personal gick i land vid varje avläsning.

Condition.....**Lätt fartyg**

<b>Trim</b>	Displacement (Total weight)	(Page 30)	$\Delta$ =	47,10 ton
<b>Trim</b>	Mean draught (from base line)		d =	1,53 m
	Centre of buoyancy from AP (Even keel)		LCB =	10,17 m
	Centre of gravity from AP	(Page 30)	LCG =	9,98 m
	Trimming lever	LCB - LCG	h =	0,19 m
	Total trim		t =	0,10 m (akterligt)
	Centre of flotation from AP		LCF =	8,86 m
	Trim forward	$t(0,5L-LCF)/L =$	$t_f =$	0,06 m
	Trim aft	$t(0,5L+LCF)/L =$	$t_a =$	0,04 m
	Draught forward (from baseline)		$d_f =$	1,47 m
	Draught aft (from baseline)		$d_a =$	1,57 m

<b>Stability</b>	Transverse metacentre above B.L.		KM =	4,09 m
<b>Stabilitet</b>	Centre of gravity above B.L.	(Page 30)	KG =	2,57 m
	Transverse metacentric height	KM - KG	GM =	1,52 m
	Correction for free surfaces		GG' =	0
	Corrected metacentric height	GM - GG' =	<b>G'M =</b>	<b>1,52 m</b>



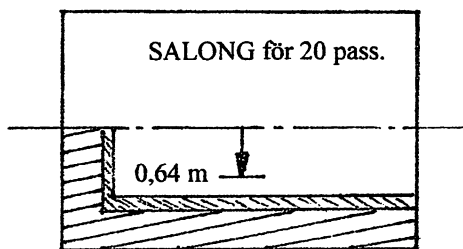
$\varphi^\circ$	10	20	30	40	50	60	70
KN / MS	0,645	1,151	1,657	2,172	2,586	2,862	2,973
$G'M \sin \varphi^\circ / KG' \sin \varphi^\circ$	0,446	0,879	1,285	1,652	1,969	2,226	2,451
Righting lever: $G'Z = KN - KG' \sin \varphi^\circ$ Rätande hävarm: $= MS + G'M \sin \varphi^\circ$	<b>0,20</b>	<b>0,27</b>	<b>0,37</b>	<b>0,52</b>	<b>0,62</b>	<b>0,64</b>	<b>0,56</b>
Dynamic arm, e: Dynamisk hävarm, e:	Up to 30° = <b>0,116</b>		Up to 40° = <b>0,164</b>		Between 30° and 40° = <b>0,048</b>		

För att uppfylla kravet i TSFS 2009:114, Bilaga 4, Regel 4:1.1 att krängningsvinkeln ej får överstiga 10° när passagerarna samlas på ena sidan, förses fartyget med fast barlast, som ingår i lättvikten vid beräkning av passagerarlastfallen.

**Omräkning av lättvikten från krängningsprovet pga utökat passagerarantal**

Detalj	Vikt	LCG från AP	Mom. om AP	VCG över BL	Mom. om BL
Lättvikt enl kr.prov	47,1	9,978	469,9638	2,567	120,9057
Avgår: 2 st 16-mansflotte	-0,298	9,100	-2,7118	6,600	-1,9668
Tillkommer: 2 st 25-mflotte	0,378	9,100	3,4398	6,600	2,4948
Tillkommer: 2 st 25-mflotte	0,378	9,100	3,4398	6,500	2,457
Tillkommer: Fast barlast vid # 14	3,000	6,750	20,25	1,350	4,050
Tillkommer: Fast barlast vid # 12	3,000	5,250	15,75	1,500	4,500
Tillkommer: Fast barlast vid # 28	1,600	13,800	22,08	0,400	0,640
Tillkommer: Fast barlast vid # -1	2,200	-0,960	-2,112	1,750	3,850
<b>Ny lättvikt</b>	<b>57,358</b>	<b>9,242</b>	<b>530,100</b>	<b>2,387</b>	<b>136,931</b>

## Passagerarmoment



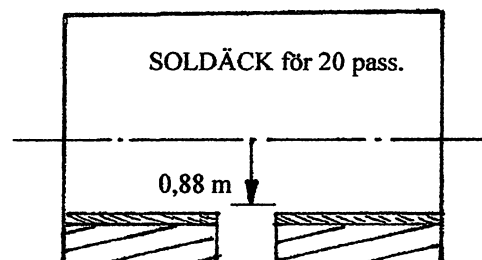
Passagerarantalet i salongen är begränsat till 20 personer eftersom, vid beräkning av det krängande momentet, alla passagerarna måste vara på ena sidan om centerlinjen. När passagerarna kompakteras med tätheten 4 stående passagerare per m<sup>2</sup> och 0,6 m bänklängd med 0,15 m knäutrymme för sittande passagerare, ryms i salongen 20 passagerare, varav 11 stående och 9 sittande.

Passagerarnas gemensamma tyngdpunkter: LCG = 3,20 m framför AP,  
VCG = 2,99 m över BL  
TCG = 0,64 m från CL

Dessa passagerare ger upphov till ett krängande moment  $M_{KR\ Salong} = 0,96$  tonmeter

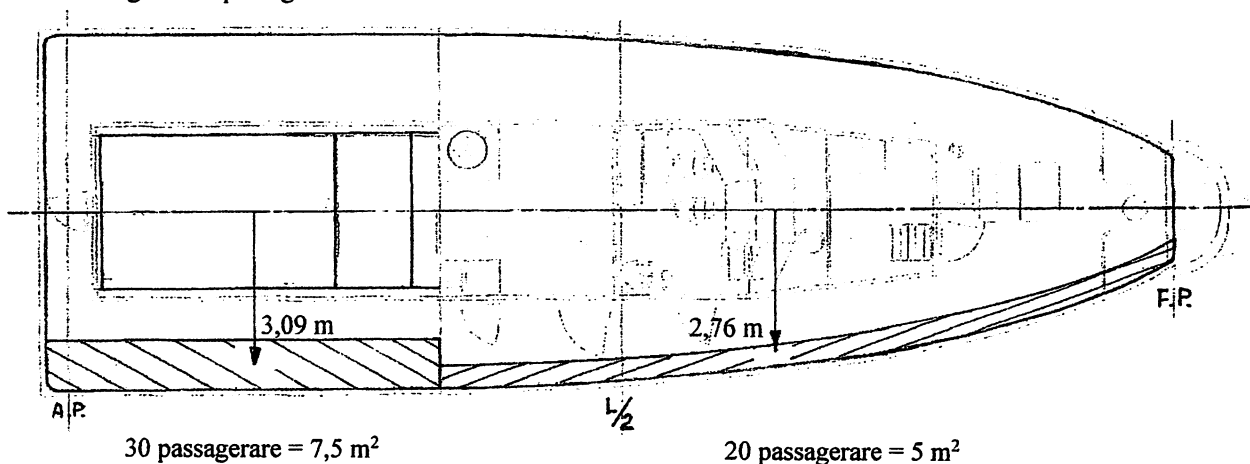
Passagerarantalet på salongstaket (soldäck) är av samma skäl likaledes begränsat till 20 personer. När dessa passagerare samlas på ena sidan och kompakteras med tätheten 4 stående passagerare per m<sup>2</sup> och 0,6 m bänklängd med 0,15 m knäutrymme för sittande passagerare, ryms på soldäcket 10 sittande och 10 stående passagerare.

Passagerarnas gemensamma tyngdpunkter: LCG = 3,90 m framför AP,  
VCG = 5,28 m över BL  
TCG = 0,88 m från CL



Dessa passagerare ger upphov till ett krängande moment  $M_{KR\ Soldäck} = 1,32$  tonmeter

Antalet passagerare på väderdäck är 50, varav 30 på akterdäck och 20 på fördäck. Inga sittplatser finns på väderdäck, varför samtliga dessa passagerare antas vara stående.



När de 30 passagerarna på akterdäck kompakteras vid relingen på ena sidan med tätheten 4 passagerare per m<sup>2</sup> blir tyngdpunkterna:

$$\begin{aligned} \text{LCG} &= 3,55 \text{ m framför AP} \\ \text{VCG} &= 3,97 \text{ m över BL} \\ \text{TCG} &= 3,09 \text{ m från CL} \end{aligned}$$

Dessa passagerare ger upphov till ett krängande moment  $M_{\text{KR Akterdäck}} = 6,95$  tonmeter

När de 20 passagerarna på fördäck kompakteras vid relingen på ena sidan med tätheten 4 passagerare per m<sup>2</sup> blir tyngdpunkterna:

$$\begin{aligned} \text{LCG} &= 14,20 \text{ m framför AP} \\ \text{VCG} &= 4,72 \text{ m över BL} \\ \text{TCG} &= 2,76 \text{ m från CL} \end{aligned}$$

Dessa passagerare ger upphov till ett krängande moment  $M_{\text{KR Fördäck}} = 4,14$  tonmeter

Krängande moment från alla passagerarna:

$$M_{\text{KR Passagerare}} = 0,96 + 1,32 + 6,95 + 4,14 = 13,37 \text{ tonmeter}$$

Detta moment ger upphov till en krängande arm, som inte får kränga fartyget mer än 10 grader. Den uppgår till:

- a) Vid 90 passagerare och 100 % bunker och förråd  $\frac{13,37}{69,498} = 0,192$  tonmeter,
- b) Vid 90 passagerare och 10 % bunker och förråd  $\frac{13,37}{68,268} = 0,196$  tonmeter,

## HYDROSTATIC DATA - TRIM = 0.000 m

Tkm [m]	DISV [m <sup>3</sup> ]	DISM [t]	VCB [m]	KMt [m]	TPC [t/cm]	MTC [tm/cm]	XB [m]	XF [m]	Cb
1.300	33.41	34.24	0.864	4.022	0.54	0.59	10.478	9.593	0.156
1.320	34.51	35.38	0.878	4.031	0.55	0.62	10.456	9.578	0.159
1.340	35.62	36.51	0.892	4.041	0.56	0.64	10.433	9.563	0.161
1.360	36.72	37.64	0.905	4.050	0.57	0.67	10.411	9.548	0.164
1.380	37.83	38.78	0.919	4.060	0.58	0.69	10.388	9.533	0.166
1.400	38.94	39.91	0.933	4.069	0.58	0.71	10.366	9.518	0.169
1.420	40.12	41.12	0.947	4.070	0.59	0.74	10.338	9.425	0.172
1.440	41.30	42.33	0.961	4.071	0.60	0.77	10.311	9.333	0.174
1.460	42.48	43.54	0.974	4.073	0.61	0.79	10.283	9.240	0.177
1.480	43.66	44.75	0.988	4.074	0.62	0.82	10.256	9.148	0.179
1.500	44.84	45.97	1.002	4.075	0.63	0.84	10.228	9.055	0.182
1.520	46.15	47.30	1.016	4.066	0.64	0.88	10.187	8.922	0.185
1.540	47.45	48.64	1.030	4.057	0.66	0.92	10.147	8.789	0.187
1.560	48.76	49.98	1.044	4.049	0.67	0.96	10.106	8.656	0.190
1.580	50.06	51.32	1.058	4.040	0.68	1.00	10.066	8.523	0.192
1.600	51.37	52.65	1.072	4.031	0.69	1.04	10.025	8.390	0.195
1.620	52.73	54.04	1.085	3.984	0.69	1.05	9.984	8.396	0.198
1.640	54.08	55.43	1.099	3.939	0.69	1.05	9.945	8.403	0.200
1.660	55.44	56.83	1.112	3.895	0.70	1.05	9.906	8.409	0.203
1.680	56.80	58.22	1.126	3.853	0.70	1.06	9.870	8.416	0.205
1.700	58.15	59.61	1.139	3.813	0.70	1.06	9.836	8.422	0.208
1.720	59.52	61.01	1.152	3.776	0.70	1.06	9.804	8.428	0.210
1.740	60.89	62.41	1.165	3.741	0.70	1.07	9.774	8.435	0.212
1.760	62.25	63.81	1.177	3.706	0.70	1.07	9.745	8.441	0.215
1.780	63.62	65.21	1.190	3.673	0.70	1.07	9.717	8.448	0.217
1.800	64.98	66.61	1.203	3.640	0.70	1.08	9.689	8.454	0.219
1.820	66.36	68.02	1.215	3.612	0.70	1.08	9.666	8.460	0.221
1.840	67.73	69.43	1.228	3.584	0.70	1.08	9.642	8.466	0.223
1.860	69.11	70.84	1.240	3.556	0.70	1.09	9.619	8.473	0.226
1.880	70.48	72.25	1.253	3.528	0.71	1.09	9.595	8.479	0.228
1.900	71.86	73.65	1.265	3.500	0.71	1.09	9.572	8.485	0.230
1.920	73.24	75.07	1.277	3.480	0.71	1.10	9.553	8.492	0.232
1.940	74.62	76.49	1.289	3.460	0.71	1.10	9.534	8.498	0.234
1.960	76.01	77.91	1.301	3.441	0.71	1.10	9.516	8.505	0.235
1.980	77.39	79.32	1.313	3.421	0.71	1.11	9.497	8.511	0.237
2.000	78.77	80.74	1.325	3.401	0.71	1.11	9.478	8.518	0.239
2.020	80.16	82.17	1.337	3.383	0.71	1.11	9.463	8.524	0.241
2.040	81.55	83.59	1.349	3.366	0.71	1.12	9.448	8.530	0.243
2.060	82.94	85.02	1.360	3.348	0.71	1.12	9.432	8.535	0.244
2.080	84.34	86.44	1.372	3.331	0.71	1.12	9.417	8.541	0.246

## HYDROSTATIC DATA - TRIM = -0.300 m

Tkm [m]	DISV [m <sup>3</sup> ]	DISM [t]	VCB [m]	KMft [m]	TPC [t/cm]	MTC [tm/cm]	XB [m]	XF [m]
1.300	34.67	35.54	0.884	4.374	0.57	0.66	9.929	9.098
1.320	35.84	36.74	0.898	4.398	0.59	0.71	9.896	8.965
1.340	37.01	37.94	0.913	4.421	0.60	0.76	9.863	8.831
1.360	38.19	39.14	0.927	4.445	0.62	0.82	9.829	8.697
1.380	39.36	40.34	0.942	4.468	0.64	0.87	9.796	8.563
1.400	40.53	41.55	0.956	4.492	0.66	0.93	9.763	8.429
1.420	41.86	42.91	0.971	4.436	0.66	0.94	9.721	8.402
1.440	43.19	44.27	0.986	4.379	0.67	0.96	9.679	8.375
1.460	44.51	45.63	1.001	4.323	0.67	0.97	9.637	8.348
1.480	45.84	46.99	1.016	4.266	0.68	0.99	9.595	8.321
1.500	47.17	48.35	1.031	4.210	0.69	1.01	9.553	8.294
1.520	48.51	49.72	1.045	4.159	0.69	1.01	9.522	8.303
1.540	49.85	51.10	1.059	4.107	0.69	1.02	9.491	8.312
1.560	51.19	52.47	1.073	4.056	0.69	1.02	9.461	8.321
1.580	52.54	53.85	1.087	4.004	0.69	1.03	9.430	8.330
1.600	53.88	55.23	1.101	3.953	0.69	1.03	9.399	8.339
1.620	55.23	56.61	1.114	3.909	0.69	1.03	9.374	8.347
1.640	56.59	58.00	1.127	3.867	0.69	1.04	9.350	8.355
1.660	57.94	59.39	1.140	3.825	0.69	1.04	9.326	8.364
1.680	59.29	60.77	1.153	3.786	0.70	1.05	9.304	8.372
1.700	60.65	62.16	1.166	3.749	0.70	1.05	9.283	8.380
1.720	62.01	63.56	1.179	3.714	0.70	1.05	9.264	8.388
1.740	63.37	64.96	1.191	3.681	0.70	1.06	9.245	8.396
1.760	64.74	66.35	1.204	3.649	0.70	1.06	9.228	8.403
1.780	66.10	67.75	1.216	3.618	0.70	1.06	9.211	8.411
1.800	67.46	69.15	1.229	3.587	0.70	1.07	9.194	8.419
1.820	68.83	70.56	1.241	3.561	0.70	1.07	9.180	8.425
1.840	70.21	71.96	1.253	3.535	0.70	1.07	9.166	8.432
1.860	71.58	73.37	1.266	3.509	0.70	1.08	9.152	8.438
1.880	72.95	74.77	1.278	3.483	0.70	1.08	9.138	8.445
1.900	74.32	76.18	1.290	3.457	0.70	1.09	9.124	8.451
1.920	75.70	77.59	1.302	3.439	0.71	1.09	9.113	8.458
1.940	77.08	79.01	1.314	3.420	0.71	1.09	9.102	8.465
1.960	78.46	80.42	1.325	3.402	0.71	1.10	9.090	8.473
1.980	79.84	81.83	1.337	3.383	0.71	1.10	9.079	8.480
2.000	81.22	83.25	1.349	3.365	0.71	1.10	9.068	8.487
2.020	82.64	84.70	1.361	3.360	0.72	1.13	9.055	8.416
2.040	84.06	86.16	1.373	3.356	0.72	1.16	9.043	8.345
2.060	85.48	87.62	1.384	3.351	0.73	1.18	9.030	8.275
2.080	86.90	89.07	1.396	3.347	0.74	1.21	9.018	8.204

## HYDROSTATIC DATA - TRIM = 0.300 m

Tkm [m]	DISV [m <sup>3</sup> ]	DISM [t]	VCB [m]	KMt [m]	TPC [t/cm]	MTC [tm/cm]	XB [m]	XF [m]
1.300	32.68	33.49	0.858	3.510	0.52	0.56	11.008	10.333
1.320	33.73	34.57	0.871	3.528	0.53	0.58	10.985	10.276
1.340	34.78	35.65	0.884	3.547	0.53	0.59	10.961	10.220
1.360	35.83	36.72	0.898	3.565	0.54	0.61	10.938	10.163
1.380	36.88	37.80	0.911	3.584	0.55	0.62	10.914	10.107
1.400	37.93	38.88	0.924	3.602	0.55	0.63	10.891	10.050
1.420	39.04	40.02	0.937	3.639	0.56	0.65	10.865	9.974
1.440	40.16	41.16	0.950	3.676	0.57	0.67	10.839	9.898
1.460	41.27	42.30	0.964	3.714	0.57	0.69	10.812	9.823
1.480	42.38	43.44	0.977	3.751	0.58	0.71	10.786	9.747
1.500	43.49	44.58	0.990	3.788	0.59	0.73	10.760	9.671
1.520	44.67	45.79	1.003	3.781	0.60	0.75	10.731	9.612
1.540	45.85	47.00	1.016	3.773	0.60	0.76	10.701	9.553
1.560	47.03	48.21	1.028	3.766	0.61	0.78	10.672	9.494
1.580	48.21	49.42	1.041	3.758	0.61	0.80	10.642	9.435
1.600	49.39	50.63	1.054	3.751	0.62	0.82	10.613	9.376
1.620	50.65	51.92	1.067	3.754	0.63	0.85	10.580	9.249
1.640	51.92	53.21	1.080	3.756	0.64	0.88	10.546	9.130
1.660	53.18	54.51	1.093	3.758	0.65	0.91	10.511	9.022
1.680	54.44	55.80	1.106	3.757	0.66	0.94	10.476	8.925
1.700	55.70	57.10	1.119	3.754	0.67	0.97	10.439	8.838
1.720	57.07	58.50	1.132	3.748	0.68	0.99	10.400	8.761
1.740	58.44	59.90	1.145	3.739	0.68	1.02	10.359	8.690
1.760	59.80	61.30	1.158	3.727	0.69	1.04	10.316	8.622
1.780	61.17	62.70	1.171	3.713	0.70	1.06	10.272	8.557
1.800	62.53	64.10	1.184	3.698	0.70	1.09	10.227	8.492
1.820	63.91	65.51	1.197	3.668	0.70	1.09	10.193	8.497
1.840	65.29	66.92	1.209	3.638	0.71	1.09	10.159	8.502
1.860	66.67	68.33	1.222	3.609	0.71	1.10	10.124	8.508
1.880	68.04	69.74	1.234	3.579	0.71	1.10	10.090	8.513
1.900	69.42	71.16	1.247	3.549	0.71	1.10	10.056	8.518
1.920	70.81	72.58	1.259	3.528	0.71	1.11	10.028	8.524
1.940	72.19	74.00	1.271	3.507	0.71	1.11	10.001	8.530
1.960	73.58	75.42	1.283	3.485	0.71	1.11	9.973	8.536
1.980	74.96	76.84	1.295	3.464	0.71	1.12	9.946	8.542
2.000	76.35	78.26	1.307	3.443	0.71	1.12	9.918	8.548
2.020	77.74	79.69	1.319	3.424	0.71	1.12	9.895	8.555
2.040	79.14	81.11	1.331	3.405	0.71	1.13	9.873	8.561
2.060	80.53	82.54	1.342	3.386	0.72	1.13	9.850	8.568
2.080	81.93	83.97	1.354	3.367	0.72	1.13	9.828	8.574

## FORM STABILITY DATA Lk - TRIM = 0.000 m

Tkm [m]	DISM [t]	KMit [m]	Lk for Angle of Heel in degrees							
			10	20	30	40	50	60	70	80
1.300	34.24	4.022	0.623	1.112	1.598	2.166	2.716	3.006	3.101	3.072
1.320	35.38	4.031	0.625	1.113	1.600	2.166	2.705	2.995	3.090	3.069
1.340	36.51	4.041	0.626	1.113	1.602	2.166	2.695	2.983	3.079	3.066
1.360	37.64	4.050	0.628	1.114	1.604	2.166	2.684	2.972	3.069	3.064
1.380	38.78	4.060	0.629	1.114	1.606	2.166	2.674	2.960	3.058	3.061
1.400	39.91	4.069	0.631	1.115	1.608	2.166	2.663	2.949	3.047	3.058
1.420	41.12	4.070	0.632	1.117	1.611	2.165	2.651	2.937	3.036	3.056
1.440	42.33	4.071	0.633	1.118	1.615	2.165	2.640	2.924	3.025	3.054
1.460	43.54	4.073	0.633	1.120	1.618	2.164	2.628	2.912	3.013	3.052
1.480	44.75	4.074	0.634	1.121	1.622	2.164	2.617	2.899	3.002	3.050
1.500	45.97	4.075	0.635	1.123	1.625	2.163	2.605	2.887	2.991	3.048
1.520	47.30	4.066	0.635	1.126	1.630	2.162	2.594	2.873	2.980	3.047
1.540	48.64	4.057	0.635	1.130	1.635	2.161	2.583	2.860	2.969	3.046
1.560	49.98	4.049	0.636	1.133	1.641	2.159	2.573	2.846	2.957	3.046
1.580	51.32	4.040	0.636	1.137	1.646	2.158	2.562	2.833	2.946	3.045
1.600	52.65	4.031	0.636	1.140	1.651	2.157	2.551	2.819	2.935	3.044
1.620	54.04	3.984	0.635	1.145	1.655	2.155	2.542	2.805	2.925	3.045
1.640	55.43	3.939	0.634	1.149	1.660	2.154	2.533	2.790	2.916	3.046
1.660	56.83	3.895	0.633	1.154	1.664	2.152	2.524	2.776	2.907	3.047
1.680	58.22	3.853	0.631	1.158	1.668	2.151	2.515	2.762	2.899	3.048
1.700	59.61	3.813	0.630	1.163	1.672	2.149	2.506	2.749	2.891	3.049
1.720	61.01	3.776	0.628	1.168	1.676	2.147	2.498	2.736	2.884	3.051
1.740	62.41	3.741	0.626	1.173	1.679	2.145	2.490	2.723	2.878	3.052
1.760	63.81	3.706	0.624	1.177	1.682	2.143	2.482	2.711	2.872	3.054
1.780	65.21	3.673	0.622	1.182	1.685	2.141	2.474	2.698	2.866	3.056
1.800	66.61	3.640	0.620	1.187	1.688	2.139	2.466	2.686	2.861	3.058
1.820	68.02	3.612	0.619	1.191	1.691	2.137	2.459	2.676	2.857	3.060
1.840	69.43	3.584	0.617	1.195	1.694	2.135	2.452	2.666	2.853	3.062
1.860	70.84	3.556	0.616	1.199	1.696	2.133	2.445	2.656	2.850	3.063
1.880	72.25	3.528	0.614	1.203	1.699	2.131	2.438	2.646	2.846	3.065
1.900	73.65	3.500	0.613	1.207	1.702	2.129	2.431	2.636	2.842	3.067
1.920	75.07	3.480	0.613	1.210	1.704	2.127	2.425	2.629	2.839	3.068
1.940	76.49	3.460	0.612	1.213	1.706	2.125	2.419	2.622	2.836	3.069
1.960	77.91	3.441	0.612	1.216	1.708	2.123	2.412	2.614	2.834	3.071
1.980	79.32	3.421	0.611	1.219	1.710	2.121	2.406	2.607	2.831	3.072
2.000	80.74	3.401	0.611	1.222	1.712	2.119	2.400	2.600	2.828	3.073
2.020	82.17	3.383	0.613	1.224	1.713	2.116	2.395	2.595	2.825	3.074
2.040	83.59	3.366	0.615	1.226	1.714	2.114	2.390	2.590	2.822	3.075
2.060	85.02	3.348	0.616	1.229	1.714	2.111	2.385	2.586	2.820	3.075
2.080	86.44	3.331	0.618	1.231	1.715	2.109	2.380	2.581	2.817	3.076

## FORM STABILITY DATA Lk - TRIM = -0.300 m

Tkm [m]	DISM [t]	K Mt [m]	Lk for Angle of Heel in degrees							
			10	20	30	40	50	60	70	80
1.300	35.54	4.374	0.671	1.165	1.665	2.216	2.747	3.031	3.125	3.100
1.320	36.74	4.398	0.672	1.167	1.668	2.215	2.733	3.017	3.112	3.096
1.340	37.94	4.421	0.672	1.169	1.671	2.213	2.719	3.003	3.099	3.092
1.360	39.14	4.445	0.673	1.170	1.675	2.212	2.704	2.988	3.085	3.087
1.380	40.34	4.468	0.673	1.172	1.678	2.210	2.690	2.974	3.072	3.083
1.400	41.55	4.492	0.674	1.174	1.681	2.209	2.676	2.960	3.059	3.079
1.420	42.91	4.436	0.673	1.177	1.685	2.206	2.661	2.944	3.045	3.076
1.440	44.27	4.379	0.672	1.181	1.689	2.204	2.646	2.928	3.031	3.073
1.460	45.63	4.323	0.671	1.184	1.694	2.201	2.631	2.913	3.016	3.069
1.480	46.99	4.266	0.670	1.188	1.698	2.199	2.616	2.897	3.002	3.066
1.500	48.35	4.210	0.669	1.191	1.702	2.196	2.601	2.881	2.988	3.063
1.520	49.72	4.159	0.666	1.194	1.704	2.193	2.589	2.865	2.977	3.063
1.540	51.10	4.107	0.664	1.197	1.706	2.190	2.577	2.849	2.965	3.062
1.560	52.47	4.056	0.661	1.201	1.709	2.186	2.566	2.832	2.954	3.062
1.580	53.85	4.004	0.659	1.204	1.711	2.183	2.554	2.816	2.942	3.061
1.600	55.23	3.953	0.656	1.207	1.713	2.180	2.542	2.800	2.931	3.061
1.620	56.61	3.909	0.653	1.211	1.714	2.177	2.533	2.784	2.923	3.062
1.640	58.00	3.867	0.650	1.214	1.716	2.174	2.523	2.768	2.915	3.063
1.660	59.39	3.825	0.647	1.218	1.717	2.171	2.514	2.753	2.907	3.064
1.680	60.77	3.786	0.644	1.221	1.719	2.168	2.505	2.739	2.900	3.066
1.700	62.16	3.749	0.641	1.224	1.720	2.165	2.496	2.725	2.893	3.067
1.720	63.56	3.714	0.639	1.227	1.721	2.162	2.488	2.712	2.887	3.069
1.740	64.96	3.681	0.636	1.229	1.722	2.159	2.479	2.700	2.882	3.070
1.760	66.35	3.649	0.634	1.232	1.724	2.156	2.472	2.688	2.876	3.072
1.780	67.75	3.618	0.632	1.234	1.725	2.153	2.464	2.677	2.872	3.074
1.800	69.15	3.587	0.630	1.236	1.726	2.150	2.456	2.666	2.867	3.076
1.820	70.56	3.561	0.629	1.238	1.727	2.147	2.449	2.657	2.863	3.077
1.840	71.96	3.535	0.628	1.240	1.727	2.144	2.442	2.649	2.859	3.078
1.860	73.37	3.509	0.628	1.241	1.728	2.141	2.436	2.640	2.856	3.080
1.880	74.77	3.483	0.627	1.243	1.728	2.138	2.429	2.632	2.852	3.081
1.900	76.18	3.457	0.626	1.245	1.729	2.135	2.422	2.623	2.848	3.082
1.920	77.59	3.439	0.627	1.246	1.729	2.132	2.416	2.617	2.844	3.083
1.940	79.01	3.420	0.628	1.247	1.729	2.129	2.410	2.611	2.840	3.084
1.960	80.42	3.402	0.630	1.249	1.728	2.126	2.405	2.605	2.837	3.085
1.980	81.83	3.383	0.631	1.250	1.728	2.123	2.399	2.599	2.833	3.086
2.000	83.25	3.365	0.632	1.251	1.728	2.120	2.393	2.593	2.829	3.087
2.020	84.70	3.360	0.635	1.252	1.727	2.117	2.388	2.589	2.826	3.088
2.040	86.16	3.356	0.638	1.252	1.726	2.114	2.384	2.585	2.822	3.088
2.060	87.62	3.351	0.640	1.253	1.724	2.110	2.379	2.581	2.819	3.089
2.080	89.07	3.347	0.643	1.253	1.723	2.107	2.375	2.577	2.815	3.089

## FORM STABILITY DATA Lk - TRIM = 0.300 m

Tkm [m]	DISM [t]	KMt [m]	Lk for Angle of Heel in degrees							
			10	20	30	40	50	60	70	80
1.300	33.49	3.510	0.575	1.059	1.538	2.114	2.671	2.972	3.069	3.038
1.320	34.57	3.528	0.578	1.060	1.540	2.116	2.664	2.963	3.061	3.036
1.340	35.65	3.547	0.581	1.061	1.541	2.118	2.657	2.954	3.052	3.034
1.360	36.72	3.565	0.583	1.063	1.543	2.119	2.650	2.946	3.044	3.031
1.380	37.80	3.584	0.586	1.064	1.544	2.121	2.643	2.937	3.035	3.029
1.400	38.88	3.602	0.589	1.065	1.546	2.123	2.636	2.928	3.027	3.027
1.420	40.02	3.639	0.591	1.066	1.549	2.124	2.628	2.918	3.018	3.026
1.440	41.16	3.676	0.593	1.068	1.552	2.125	2.620	2.908	3.009	3.025
1.460	42.30	3.714	0.595	1.069	1.556	2.127	2.613	2.899	3.001	3.024
1.480	43.44	3.751	0.597	1.071	1.559	2.128	2.605	2.889	2.992	3.023
1.500	44.58	3.788	0.599	1.072	1.562	2.129	2.597	2.879	2.983	3.022
1.520	45.79	3.781	0.600	1.074	1.567	2.129	2.589	2.868	2.974	3.022
1.540	47.00	3.773	0.602	1.076	1.571	2.129	2.581	2.857	2.965	3.021
1.560	48.21	3.766	0.603	1.079	1.576	2.130	2.572	2.847	2.955	3.021
1.580	49.42	3.758	0.605	1.081	1.580	2.130	2.564	2.836	2.946	3.020
1.600	50.63	3.751	0.606	1.083	1.585	2.130	2.556	2.825	2.937	3.020
1.620	51.92	3.754	0.607	1.086	1.590	2.130	2.548	2.813	2.928	3.020
1.640	53.21	3.756	0.608	1.089	1.596	2.129	2.540	2.802	2.919	3.021
1.660	54.51	3.758	0.608	1.092	1.601	2.129	2.531	2.790	2.910	3.021
1.680	55.80	3.757	0.609	1.096	1.606	2.128	2.523	2.779	2.902	3.022
1.700	57.10	3.754	0.609	1.100	1.612	2.128	2.515	2.767	2.894	3.023
1.720	58.50	3.748	0.609	1.105	1.618	2.127	2.507	2.755	2.887	3.025
1.740	59.90	3.739	0.609	1.110	1.624	2.127	2.499	2.743	2.880	3.027
1.760	61.30	3.727	0.609	1.116	1.630	2.126	2.492	2.731	2.873	3.029
1.780	62.70	3.713	0.608	1.123	1.636	2.126	2.484	2.719	2.866	3.031
1.800	64.10	3.698	0.608	1.129	1.642	2.125	2.476	2.707	2.860	3.034
1.820	65.51	3.668	0.607	1.135	1.647	2.124	2.469	2.696	2.855	3.036
1.840	66.92	3.638	0.606	1.141	1.653	2.123	2.462	2.685	2.851	3.038
1.860	68.33	3.609	0.606	1.146	1.658	2.123	2.455	2.675	2.846	3.040
1.880	69.74	3.579	0.605	1.152	1.664	2.122	2.448	2.664	2.842	3.042
1.900	71.16	3.549	0.604	1.158	1.669	2.121	2.441	2.653	2.837	3.044
1.920	72.58	3.528	0.603	1.163	1.673	2.120	2.435	2.645	2.834	3.046
1.940	74.00	3.507	0.602	1.168	1.677	2.119	2.428	2.636	2.831	3.048
1.960	75.42	3.485	0.601	1.174	1.681	2.118	2.422	2.628	2.828	3.049
1.980	76.84	3.464	0.600	1.179	1.685	2.117	2.415	2.619	2.825	3.051
2.000	78.26	3.443	0.599	1.184	1.689	2.116	2.409	2.611	2.822	3.053
2.020	79.69	3.424	0.599	1.188	1.692	2.114	2.403	2.605	2.820	3.054
2.040	81.11	3.405	0.600	1.192	1.695	2.112	2.398	2.599	2.818	3.055
2.060	82.54	3.386	0.600	1.196	1.697	2.111	2.392	2.594	2.815	3.056
2.080	83.97	3.367	0.601	1.200	1.700	2.109	2.387	2.588	2.813	3.057

**Tank Capacities for FOREPEAK.C containing WATER BALLAST (1.025)**

No Trim, No Heel

Ref Ht (m)	Load (%)	Volume (m <sup>3</sup> )	Weight (MT)	Lcg (m)	Tcg (m)	Vcg (m)	FSMt (MT-m)	FSMI (MT-m)
	0.00%	0.00	0.00					
1.38	5.00%	0.18	0.18	21.347f	0.000	1.061	0.01	0.03
1.78	10.00%	0.35	0.36	21.407f	0.000	1.328	0.01	0.06
2.35	20.00%	0.71	0.72	21.476f	0.000	1.705	0.02	0.12
2.79	30.00%	1.06	1.09	21.524f	0.000	1.996	0.03	0.19
3.11	40.00%	1.41	1.45	21.555f	0.000	2.240	0.17	0.33
3.30	50.00%	1.77	1.81	21.580f	0.000	2.435	0.47	0.55
3.44	60.00%	2.12	2.17	21.607f	0.000	2.591	0.84	0.80
3.54	70.00%	2.47	2.54	21.632f	0.000	2.720	2.73	1.34
3.61	80.00%	2.83	2.90	21.662f	0.000	2.827	3.35	1.71
3.68	90.00%	3.18	3.26	21.686f	0.000	2.917	3.35	1.71
3.71	95.00%	3.36	3.44	21.696f	0.000	2.958	3.35	1.71
3.73	98.00%	3.46	3.55	21.701f	0.000	2.982	3.35	1.71
	100.00%	3.54	3.62	21.706f	0.000	2.997		

Reference Point

Part	Long.(m)	Trans.(m)	Vert.(m)
FOREPEAK.C	0.000	0.000	0.000

**Tank Capacities for FUEL\_1.C containing FUEL OIL (0.850)**

No Trim, No Heel

Ref Ht (m)	Load (%)	Volume (m <sup>3</sup> )	Weight (MT)	Lcg (m)	Tcg (m)	Vcg (m)	FSMt (MT-m)	FSMI (MT-m)
	0.00%	0.00	0.00					
0.38	5.00%	0.06	0.05	19.745f	0.000	0.306	0.00	0.13
0.48	10.00%	0.12	0.10	19.786f	0.000	0.369	0.01	0.18
0.63	20.00%	0.24	0.20	19.809f	0.000	0.463	0.02	0.24
0.74	30.00%	0.36	0.30	19.819f	0.000	0.537	0.03	0.29
0.84	40.00%	0.48	0.40	19.825f	0.000	0.601	0.05	0.33
0.93	50.00%	0.59	0.50	19.829f	0.000	0.658	0.06	0.36
1.01	60.00%	0.71	0.61	19.832f	0.000	0.711	0.07	0.39
1.09	70.00%	0.83	0.71	19.835f	0.000	0.760	0.09	0.42
1.16	80.00%	0.95	0.81	19.837f	0.000	0.806	0.10	0.44
1.23	90.00%	1.07	0.91	19.839f	0.000	0.850	0.12	0.47
1.27	95.00%	1.13	0.96	19.840f	0.000	0.871	0.12	0.47
1.29	98.00%	1.16	0.99	19.841f	0.000	0.883	0.13	0.48
	100.00%	1.19	1.01	19.841f	0.000	0.891		

Reference Point

Part	Long.(m)	Trans.(m)	Vert.(m)
FUEL_1.C	0.000	0.000	0.000

**Tank Capacities for FUEL\_2.C containing FUEL OIL (0.850)**

No Trim, No Heel

Ref Ht (m)	Load (%)	Volume (m <sup>3</sup> )	Weight (MT)	Lcg (m)	Tcg (m)	Vcg (m)	FSMt (MT-m)	FSMI (MT-m)
	0.00%	0.00	0.00					
0.32	5.00%	0.16	0.14	15.699f	0.000	0.234	0.05	0.18
0.44	10.00%	0.32	0.27	15.709f	0.000	0.310	0.14	0.26
0.60	20.00%	0.64	0.55	15.755f	0.000	0.419	0.40	0.81
0.72	30.00%	0.97	0.82	15.821f	0.000	0.500	0.68	1.32
0.81	40.00%	1.29	1.09	15.872f	0.000	0.567	0.94	1.67
0.90	50.00%	1.61	1.37	15.910f	0.000	0.625	1.21	1.94
0.98	60.00%	1.93	1.64	15.941f	0.000	0.677	1.44	2.14
1.07	70.00%	2.25	1.92	15.967f	0.000	0.727	1.70	2.37
1.15	80.00%	2.58	2.19	15.990f	0.000	0.774	1.88	2.53
1.22	90.00%	2.90	2.46	16.010f	0.000	0.820	2.02	2.64
1.26	95.00%	3.06	2.60	16.019f	0.000	0.842	2.07	2.68
1.29	98.00%	3.15	2.68	16.024f	0.000	0.855	2.10	2.70
	100.00%	3.22	2.74	16.027f	0.000	0.864		

**Reference Point**

Part	Long.(m)	Trans.(m)	Vert.(m)
FUEL_2.C	0.000	0.000	0.000

**Tank Capacities for ROLLDAMP.C containing WATER BALLAST (1.025)**

No Trim, No Heel

Ref Ht (m)	Load (%)	Volume (m <sup>3</sup> )	Weight (MT)	Lcg (m)	Tcg (m)	Vcg (m)	FSMt (MT-m)	FSMI (MT-m)
	0.00%	0.00	0.00					
2.48	5.00%	0.15	0.16	0.035a	0.000	2.467	17.06	0.59
2.51	10.00%	0.30	0.31	0.035a	0.000	2.480	16.82	0.59
2.56	20.00%	0.61	0.62	0.035a	0.000	2.505	16.35	0.58
2.61	30.00%	0.91	0.94	0.035a	0.000	2.531	15.88	0.58
2.66	40.00%	1.22	1.25	0.035a	0.000	2.557	15.41	0.57
2.71	50.00%	1.52	1.56	0.035a	0.000	2.582	14.95	0.56
2.76	60.00%	1.83	1.87	0.035a	0.000	2.608	14.50	0.56
2.82	70.00%	2.13	2.18	0.035a	0.000	2.635	14.05	0.55
2.87	80.00%	2.43	2.50	0.035a	0.000	2.661	13.60	0.55
2.93	90.00%	2.74	2.81	0.035a	0.000	2.687	13.16	0.54
2.95	95.00%	2.89	2.96	0.035a	0.000	2.701	12.95	0.54
2.97	98.00%	2.98	3.06	0.035a	0.000	2.709	6.36	0.42
	100.00%	3.04	3.12	0.035a	0.000	2.714		

**Reference Point**

Part	Long.(m)	Trans.(m)	Vert.(m)
ROLLDAMP.C	0.000	0.000	0.000

### Tank Capacities for FW.S containing FRESH WATER (1.000)

No Trim, No Heel

Ref Ht (m)	Load (%)	Volume (m <sup>3</sup> )	Weight (MT)	Lcg (m)	Tcg (m)	Vcg (m)	FSMt (MT-m)	FSMI (MT-m)
	0.00%	0.00	0.00					
1.33	5.00%	0.02	0.02	15.660f	0.753s	1.320	0.04	0.14
1.35	10.00%	0.04	0.04	15.660f	0.753s	1.330	0.04	0.14
1.39	20.00%	0.08	0.08	15.660f	0.753s	1.350	0.04	0.14
1.43	30.00%	0.12	0.12	15.660f	0.753s	1.370	0.04	0.14
1.47	40.00%	0.16	0.16	15.660f	0.753s	1.390	0.04	0.14
1.51	50.00%	0.20	0.20	15.660f	0.753s	1.410	0.04	0.14
1.55	60.00%	0.23	0.23	15.660f	0.753s	1.430	0.04	0.14
1.59	70.00%	0.27	0.27	15.660f	0.753s	1.450	0.04	0.14
1.63	80.00%	0.31	0.31	15.660f	0.753s	1.470	0.04	0.14
1.67	90.00%	0.35	0.35	15.660f	0.753s	1.490	0.04	0.14
1.69	95.00%	0.37	0.37	15.660f	0.753s	1.500	0.04	0.14
1.70	98.00%	0.38	0.38	15.660f	0.753s	1.506	0.04	0.14
	100.00%	0.39	0.39	15.660f	0.753s	1.510		

#### Reference Point

Part	Long.(m)	Trans.(m)	Vert.(m)
FW.S	0.000	0.000	0.000

### Tank Capacities for SEWAGE.P containing MISC (1.000)

No Trim, No Heel

Ref Ht (m)	Load (%)	Volume (m <sup>3</sup> )	Weight (MT)	Lcg (m)	Tcg (m)	Vcg (m)	FSMt (MT-m)	FSMI (MT-m)
	0.00%	0.00	0.00					
1.33	5.00%	0.02	0.02	15.988f	0.462p	1.320	0.04	0.14
1.35	10.00%	0.04	0.04	15.988f	0.462p	1.330	0.04	0.14
1.39	20.00%	0.08	0.08	15.988f	0.462p	1.350	0.04	0.14
1.43	30.00%	0.11	0.11	15.988f	0.462p	1.370	0.04	0.14
1.47	40.00%	0.15	0.15	15.988f	0.462p	1.390	0.04	0.14
1.51	50.00%	0.19	0.19	15.988f	0.462p	1.410	0.04	0.14
1.55	60.00%	0.23	0.23	15.988f	0.462p	1.430	0.04	0.14
1.59	70.00%	0.27	0.27	15.988f	0.462p	1.450	0.04	0.14
1.63	80.00%	0.31	0.31	15.988f	0.462p	1.470	0.04	0.14
1.67	90.00%	0.34	0.34	15.988f	0.462p	1.490	0.04	0.14
1.69	95.00%	0.36	0.36	15.988f	0.462p	1.500	0.04	0.14
1.70	98.00%	0.38	0.38	15.988f	0.462p	1.506	0.04	0.14
	100.00%	0.38	0.38	15.988f	0.462p	1.510		

#### Reference Point

Part	Long.(m)	Trans.(m)	Vert.(m)
SEWAGE.P	0.000	0.000	0.000

**Tank Capacities for WB\_AFT\_P containing WATER BALLAST (1.025)**

No Trim, No Heel

Ref Ht (m)	Load (%)	Volume (m <sup>3</sup> )	Weight (MT)	Lcg (m)	Tcg (m)	Vcg (m)	FSMt (MT-m)	FSMI (MT-m)
	0.00%	0.00	0.00					
2.48	5.00%	0.07	0.07	0.970a	2.037p	2.463	2.46	0.14
2.50	10.00%	0.14	0.14	0.970a	2.037p	2.476	2.46	0.14
2.56	20.00%	0.28	0.28	0.970a	2.037p	2.503	2.46	0.14
2.61	30.00%	0.41	0.42	0.970a	2.037p	2.529	2.46	0.14
2.66	40.00%	0.55	0.56	0.970a	2.037p	2.556	2.46	0.14
2.71	50.00%	0.69	0.71	0.970a	2.037p	2.582	2.46	0.14
2.77	60.00%	0.83	0.85	0.970a	2.037p	2.608	2.46	0.14
2.82	70.00%	0.96	0.99	0.970a	2.037p	2.635	2.46	0.14
2.87	80.00%	1.10	1.13	0.970a	2.037p	2.661	2.46	0.14
2.93	90.00%	1.24	1.27	0.970a	2.037p	2.688	2.46	0.14
2.95	95.00%	1.31	1.34	0.970a	2.037p	2.701	2.07	0.13
2.97	98.00%	1.35	1.38	0.970a	2.028p	2.709	0.81	0.10
	100.00%	1.38	1.41	0.970a	2.014p	2.714		

Reference Point

Part	Long.(m)	Trans.(m)	Vert.(m)
WB_AFT_P	0.000	0.000	0.000

**Tank Capacities for WB\_AFT\_S containing WATER BALLAST (1.025)**

No Trim, No Heel

Ref Ht (m)	Load (%)	Volume (m <sup>3</sup> )	Weight (MT)	Lcg (m)	Tcg (m)	Vcg (m)	FSMt (MT-m)	FSMI (MT-m)
	0.00%	0.00	0.00					
2.48	5.00%	0.07	0.07	0.970a	2.037s	2.463	2.46	0.14
2.50	10.00%	0.14	0.14	0.970a	2.037s	2.476	2.46	0.14
2.56	20.00%	0.28	0.28	0.970a	2.037s	2.503	2.46	0.14
2.61	30.00%	0.41	0.42	0.970a	2.037s	2.529	2.46	0.14
2.66	40.00%	0.55	0.56	0.970a	2.037s	2.556	2.46	0.14
2.71	50.00%	0.69	0.71	0.970a	2.037s	2.582	2.46	0.14
2.77	60.00%	0.83	0.85	0.970a	2.037s	2.608	2.46	0.14
2.82	70.00%	0.96	0.99	0.970a	2.037s	2.635	2.46	0.14
2.87	80.00%	1.10	1.13	0.970a	2.037s	2.661	2.46	0.14
2.93	90.00%	1.24	1.27	0.970a	2.037s	2.688	2.46	0.14
2.95	95.00%	1.31	1.34	0.970a	2.037s	2.701	2.07	0.13
2.97	98.00%	1.35	1.38	0.970a	2.028s	2.709	0.81	0.10
	100.00%	1.38	1.41	0.970a	2.014s	2.714		

Reference Point

Part	Long.(m)	Trans.(m)	Vert.(m)
WB_AFT_S	0.000	0.000	0.000

**Tank Capacities for WB\_AFT\_C containing WATER BALLAST (1.025)**

No Trim, No Heel

Ref Ht (m)	Load (%)	Volume (m <sup>3</sup> )	Weight (MT)	Lcg (m)	Tcg (m)	Vcg (m)	FSMt (MT-m)	FSMI (MT-m)
	0.00%	0.00	0.00					
1.66	5.00%	0.12	0.12	0.806a	0.000	1.625	1.76	0.09
1.71	10.00%	0.24	0.25	0.885a	0.000	1.656	1.99	0.13
1.81	20.00%	0.48	0.49	0.927a	0.000	1.709	1.99	0.13
1.91	30.00%	0.72	0.74	0.942a	0.000	1.759	1.99	0.13
2.01	40.00%	0.96	0.98	0.949a	0.000	1.809	1.99	0.13
2.11	50.00%	1.20	1.23	0.953a	0.000	1.859	1.99	0.13
2.21	60.00%	1.44	1.47	0.956a	0.000	1.909	2.02	0.13
2.30	70.00%	1.68	1.72	0.958a	0.000	1.958	2.41	0.14
2.39	80.00%	1.92	1.97	0.959a	0.000	2.007	2.83	0.15
2.58	90.00%	2.16	2.21	0.961a	0.000	2.056	0.03	0.03
2.79	95.00%	2.28	2.34	0.961a	0.000	2.089	0.03	0.03
2.91	98.00%	2.35	2.41	0.961a	0.000	2.112	0.03	0.03
	100.00%	2.40	2.46	0.961a	0.000	2.129		

**Reference Point**

Part	Long.(m)	Trans.(m)	Vert.(m)
WB_AFT_C	0.000	0.000	0.000

**MANUAL CALCULATION OF STABILITY AND TRIM**

	A	B	C	D	E	F	G
	Item	Weight [t]	XG [m]	= B · C Long.Mom. [tm]	ZG [m]	= B · E Vert.Mom. [tm]	F.S.Mom [tm]
1	Light ship	44.00	9.84	433.0	2.50	110.0	-
2	Consumables						
3	Ballast						
4	Cargo						
5	Miscellaneous						

6	DISPLACEMENT						
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= SUM(B1-B5)    = D6/B6    = SUM(D1-D5)    = F6/B6    = SUM(F1-F5)    = SUM(G1-G5)

DISM = Displacement mass = B6 = \_\_\_\_\_ m

With calculated DISM, obtain XB from hydrostatic tables, for all trim values.

Select the table with trim, where the distance between XG and XB is minimum, and obtain the following values:

Tkm = \_\_\_\_\_ m; MTC = \_\_\_\_\_ tm/cm; XB = \_\_\_\_\_ m; XF = \_\_\_\_\_ m

Calculate the following values:

t = Trim = [ DISM · ( XG - XB ) ] / ( MTC · 100 ) = \_\_\_\_\_ m

Tka = Draught at AP = Tkm - ( t · XF / Lpp ) = \_\_\_\_\_ m

Tkf = Draught at FP = Tkm - [ t · ( XF - Lpp ) / Lpp ] = \_\_\_\_\_ m

KG of Displacement = Vertical moment / DISM = C6 = \_\_\_\_\_ m

FSmom = Free Surface Moment = G6 = \_\_\_\_\_ tm

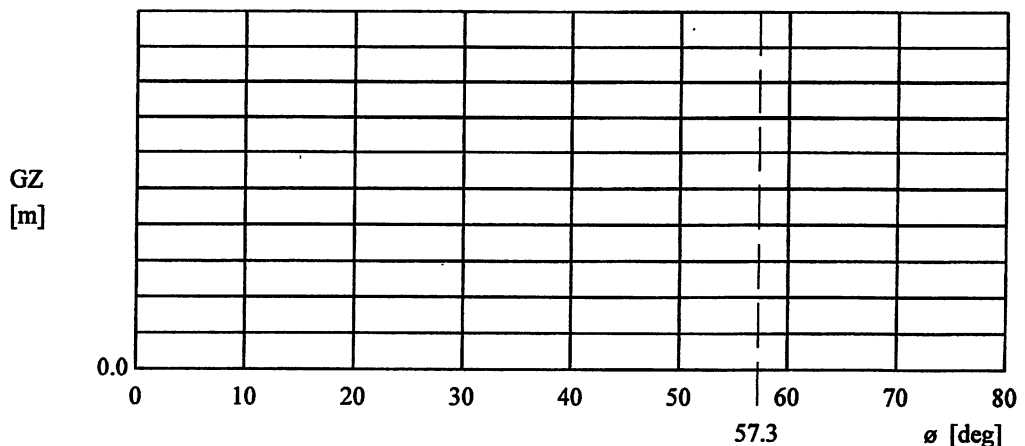
KGc = KG + FSmom / DISM = \_\_\_\_\_ m

MAX PERMISSIBLE KGc from tables, interpolating for trim = \_\_\_\_\_ m

KGc must be less than this value!

Forms for calculation and plotting the righting lever curve:

ø [deg]	10	20	30	40	50	60	70	80
Lk [m]								
KGc · sin(ø) [m]								
GZ [m]								
GZ = Lk - KGc · sin(ø); KM = _____ m; KGc = _____ m; GMc = KM - KGc = _____ m								



MANUAL CALCULATION OF WEIGHT AND C.G. FOR \_\_\_\_\_

	A	B	C	D	E	F	G
	Item	Weight [t]	XG [m]	-B · C Long.Mom. [tm]	ZG [m]	-B · E Vert.Mom. [tm]	F.S.Mom [tm]
1							
2							
3							
4							
5							
6							
7							
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37							
38							
39							

40	TOTAL						
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= SUM(B1-B39) = D40/B40      = SUM(D1-D39)      = F40/B40      = SUM(F1-F39)      = SUM(G1-G39)