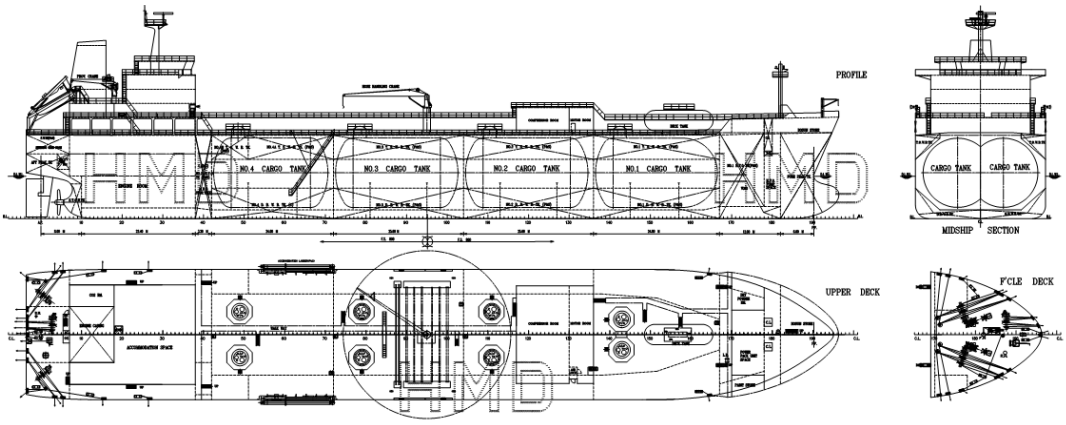
FORM C GAS

HULL NO. HMD 8009

REV 1 - DATE: 24 Sep 2009

NAVIGATOR TAURUS



20.550 CBM LPG CARRIER

BUILT AT

HYUNDAI MIPO
KOREA

Specifications of the vessel and the gas installations are believed to be correct as per design specifications and capacities, but not guaranteed, and consequently Owners are not to be held accountable for such. We further reserve our rights for normal wear and tear on cargo equipment in respect of loading-, discharging-, cooling-rates and time for changing cargo grades etc., including but not limited to capacity of cargo re-heaters, compressors, pumps and other equipment, as described in this form-C as these descriptions, as described above, refers to design capacities.

A. VESSELS' MAIN CHARACTERISTICS

A.1. PREAMBLE

Name:	Navigator Taurus
Type:	LPG / VCM / Ammonia - Carrier
Flag State:	Liberia
Port of Registry:	Monrovia
Owners:	Navigator Taurus LLC., Marshall Islands
Commercial Manager	Navigator Gas 21 Palmer street London SW1H 0AD
Technical Managers	Northern Marine Shipmanagement
Building Shipyard:	Hyundai Mipo Korea
Delivered:	24th September 2009
Keel laid:	18th May 2009
Classification Society:	Lloyds Reg. Of Shipping (LRS)
Classification:	Lloyds + 100A1, Liquefied Gas Carrier Type 2G + LMC, UMS, + Lloyds RMC (LG), *IWS
Iceclass:	E
Call Sign:	A8RE2
Inmarsat ID - Code:	Voice : + Fax : + E-mail : NavigatorTaurus@nnm.stena.com Sat C : MMSI : 636014078
Gross Tonnage:	18311 MT
Net Tonnage:	5493 MT
Suez Canal Tonnage:	15941 MT
Panama Canal Tonnage:	15306 MT
IMO Type:	II G
Approval received from / for:	IMO, USCG, MOT, MARPOL and SOLAS

A.2. DIMENSIONS AND MAIN DATA

Length overall:		159.97 m
Moulded Breadth:		25.626 m
Moulded Depth:		16.4 m
Distance Keel - Top Antenna:		44.75 m
Design Draft		8.3 m
Lightship Weight:		9945 mts
Parallel Mid-Body Length on Ballast Draft:		abt. 64.43 m
Parallel Mid-Body Length on Summer Draft:		abt. 78.73 m
Canal passages:	Kiel	yes
	Suez	yes
	Panama	yes

A.3. DECK MACHINERY EQUIPMENT

Derricks / Cranes: Cargo / bunker - Hose handling crane

Maker: Oriental Precision & Engineering Ltd.
Hoisting Capacity: SWL 5 MT
Outreach 19 m.

Windlasses:	
No:	2
Maker:	Friedrich Kochs GmbH
Driven by:	Hydraulic Pumpsets (Auto tension type)
BHL:	135 MT
	2 drums (One warping head)
Mooring winches:	
No:	4
Maker:	Friedrich Kochs GmbH
Driven by:	Hydraulic Pumpsets (Auto tension type)
BHC:	350 kN

A.4. MACHINERY EQUIPMENT

Main Engine:	MAN B&W
Number of cylinders:	6
Type:	1 x S46MC-C
Power:	7860 kW / 129.0 rpm
	7070 kW / 124.5 rpm
Fuel Grade:	HFO 380 CST at 50°C

Auxiliary Engines

Number:	3
Type:	Hyundai Himsen 5H21/32
Power:	780 kW (per engine)
Fuel Grade:	HFO 380 CST at 50°C
Electrical Current:	440 V - 60 cycles

Propeller

Type/Maker:	4 blade propeller / Dalian DMD
	Pitch: 4.4715 m dia: 5.60m

A.5. **TANK CAPACITIES**

A.5.1. **CARGO TANKS**

Tank	Vol.100 (Incl domes)	Vol. 98 %
1	abt. 4227.753 cbm	4143.198 cbm
2	abt. 5649.001 cbm	5536.021 cbm
3	abt. 5639.020 cbm	5526.330 cbm
4	abt 5233.986 cbm	5129.306 cbm
Ttl	abt 20749.760 cbm	20334.855 cbm

DECK TANKS

No.:	1
Size:	155 cbm at 100 %
Max. Pressure Setting:	18.0 Bar (g)
Suitable for:	LPG,VCM, NH3
Minimum Cargo Temperature:	-48 C

A.5.2. **BUNKER**

HFO 100% = 1993 cbm
98% = 1934 cbm = 1930 mts @ SG 0.998

MDO 100% = 250 cbm
98% = 222.7 CBM = 189 mts @ SG 0.850

Flanges located at cargo manifold fore & aft.

A.5.3. **BALLAST**

Storage capacity	9200 cbm
Pumps	2
Capacity per unit:	600 + 300 cbm / hour
Location	Engine room

A.5.4. **FRESH WATER**

Capacity of domestic water tanks:	385 mts
Generator:	Average daily production abt 20 mts/d

A.6. **CONSUMPTION**

A.6.1. **SHIP AT SEA (LOADED)**

Cargo:	LPG	NH3	VCM
Mean Draft:	8.3 m	9.06 m	10.88 m
Speed:	abt 16.0 kn	abt 16.0 kn	abt 15.7 kn
Fuel consumption - HFO /M/E	abt 31.0 mts/d	abt 31.0 mts/d	abt 31.0 mts/d
No. aux. eng. Needed			
Loaded voyage (Maintaining temps)	1-2	1-2	1-2
Fuel consumption - HFO/AE	abt 3 mts/d/e	abt 3 mts/d/e	abt 3 mts/d/e
Cooling down cargo / In port discharging:	2	2	2
Fuel consumption - HFO/AE	abt 6 mts/d	abt 6 mts/d	abt 6 mts/d

A.6.1. **SHIP AT SEA (BALLAST)**

Mean Draft:	7.4 m (Full bunkers)
Speed:	16.0 kn
Fuel consumption - HFO /M/E:	31.0 mts/d
No. aux. eng. needed	1
Fuel consumption - HFO/AE	abt 3 mts/d

A.6.2. **SHIP IN PORT**

	No. of Generators	Consumption	
- Loading LPG/NH3/VCM at atm. Pressure	2	abt 6	mts/d
- Inert gas plant:	1	abt 5.4	mts/d

Boiler: - in port 3.0 mtons / day HFO
- at sea heating by means of exhaust gas

MDO/MGO NEEDED FOR EMERGENCY OPERATION, FUEL CHANGES IN/OUT FROM SECA AREAS, MAINTENACE AND/OR INERT GAS PRODUCTION.

B. **CARGO INSTALLATION MAIN CHARACTERISTICS**

B.1. **TRANSPORTABLE PRODUCTS AND TRANSPORT CONDITIONS**

The gas handling and reliquefaction plant is provided for the transportation of following liquefied gases, their saturated pressure (absolute) ranging between 1 and 5.3 bar and their saturated temperature between + 45° and - 48° C.

B.1.1. **EXTRACT FROM THE LIST OF CARGOES FOR TYPE IIG CARRIER**

- Propane (C3)
- Propane */ Butane Mixtures (LPG mix / C3/C4 mix)
- Propene (Propylene / PPL)
- Propene Oxide (P.O.)
- Butane (C4)
- Butene (Butylene)
- Iso-Butane (Iso C4)
- Butadiene (C-C4)
- Acetaldehyde
- Anhydrous Ammonia
- Isoprene Monomer (I.P.M.)
- Ethylamin
- Dimethylamine
- Diethyl ether
- Vinyl ethyl ether
- Vinyl Chloride Monomer (V.C.M.)

* Maximum Ethane percentage in Commercial Propane during liquid phase at saturated temperature is 2,5 Mole-% Ethane at liquid phase

B.1.2. **TRANSPORT CONDITIONS**

Fully refrigerated		
Semi-refrigerated	5.3 bar (g)	IMO + Class
	3.6 bar (g)	USCG

B.2. **SIMULTANEOUS TRANSPORT OF DIFFERENT GRADES**

B.2.1. **GRADES WHICH CAN BE TRANSPORTED SIMULTANEOUSLY**

Two products as per B.1., all re-liquefied insofar as IMO regulations will be observed.
Two products can be cooled down simultaneously.

B.2.2 **GRADES WHICH CAN BE LOADED / DISCHARGED SIMULTANEOUSLY**

Two grades can be loaded and discharged simultaneously if done without the use of booster pumps or cargo re-heater.

B.3. **TRANSPORTABLE PRODUCTS, RESPECTIVE QUANTITIES (MTS) AND CORRESPONDING DRAFT**

Product	d	t	Total		Max. Draft
Ammonia	0.680	-33,5	13,767	mts	9.10 m
Butadiene	0.650	-4,5	13,159	mts	9.00 m
Butane (n)	0.600	-0,5	12,147	mts	8.70 m
Propane	0.580	-42,1	11,742	mts	8.60 m
Propylene (pmg)	0.610	-47,3	12,349	mts	8.70 m
Propylene Ox.	0.820	34,4	16,601	mts	9.80 m
V.C.M.	0.970	-13,4	19,638	mts	10.85 m

d= specific density in metric tons / cubic metre at temperature t

t= cargo temperature in degrees centigrade

Cargo tank quantities calculated in metric tons excluding gas phase at 98% filling, at 1 bar absolute pressure and including the tank dome volumes

Departure condition at full bunkers and stores

Ballast water included: 300 mts for VCM, 1.500 mts for other cargoes

B.3.1. **LOADING CAPACITY OF A FULL CARGO PROPYLENE AT DIFFERENT TEMPERATURES**

Temperature	Density t/cbm	Quantity mts (20 245cbm (98.0%))
-40°C	0,5993	12 132
-30°C	0,5865	11 873
-20°C	0,5731	11602
-10°C	0,5592	11 321

d = density (mts/cbm)

t = cargo temperature (degrees centigrade)

Quantities in mts excluding gas phase 98.0 % filling

1 bar absolute pressure volume calculated including tank dome

B.4. **CARGO TANKS CHARACTERISTICS**

Number of tanks:	4
Type:	bi-lobe - independent Type C
Max. Tank Pressure IMO:	5.3 bar (g)
Max Tank Pressure USCG:	3.6 bar (g)
Max. Permissible Vacuum:	0.75 bar (abs.)
Min. Cargo Temperature:	-48°C
Max. Cargo Density:	972 kg/cbm

B.5. **CARGO DECK TANK**

No.:	1
Tank Size:	155 cbm
Max. Pressure:	18.2 Bar (g)
Min Cargo Temperature:	-48°C
Max. Cargo Density:	972 kg/cbm

B.6. **LOADING**

B.6.1. **LOADING IN CBM/HR FROM A FULLY REFRIGERATED STORAGE WITHOUT COOLING DOWN**

Butane	2.000	cbm/hr
Propane	2.000	cbm/hr
Ammonia	2.000	cbm/hr
VCM	2.000	cbm/hr
Propene (Propylene)	2.000	cbm/hr

B.6.2. **LOADING IN CBM/HR FROM A SEMI-REFRIGERATED STORAGE AT A CARGO TEMPERATURE OF + 18°C ACCORDING IMO SAFETY VALVE SETTING**

		Without vapour return
Butane	2.000	cbm/hr
Propane	420	cbm/hr
Ammonia	400	cbm/hr
VCM	2.000	cbm/hr
Butadiene	2.000	cbm/hr

RELIQUEFACTION CAPACITIES (IN KCAL/HR)

B.6.4. **COOLING DOWN PMG PROPYLENE AT SEA WATER TEMPEARTURE OF + 20 °C**

Cooling down a full cargo of Polymer Grade Propylene starting at -45°C will take approximately 24 hours per 1°C with all cargo compressors in operation.

B.6.4. **COOLING DOWN PMG PROPYLENE AT SEA WATER TEMPEARTURE OF + 32 °C**

Cooling down a full cargo of Polymer Grade Propylene starting at -45°C will take approximately 30 hours per 1°C with all cargo compressors in operation.

B.6.5. **HEAT LOSS DUE TO TANK INSULATION**

Average K-Value: $K = 0.16$ kcal/m^2h°C

	Tank 1	**Tank 2, 3, 4 (each)**
Propane at -42 °C	65.000 kcal/h	74.500 kcal/h
Ammonia at -34 °C	58.500 kcal/h	67.000 kcal/h

B. 6.6. **DISCHARGING**

against 120 m. L.C.	against 240 m L.C.

Propane	2.000 cbm/hr	500	cbm / hr
Propene	2.000 cbm/hr	500	cbm / hr
Butane	2.000 cbm/hr	500	cbm / hr
Ammonia	2.000 cbm/hr	500	cbm / hr
VCM	2.000 cbm/hr	500	cbm / hr

No. of pumps able to work simultaneously: in series: 2 deep well pumps and one booster
in parallel: all deep well pumps

No. of Cargo Grades that can be discharged simultaneously: 2

Time to discharge a full cargo using all pumps: about 11 hours

ADDITIONAL INFORMATION

Normal unpumpables at the end of unloading (at atmospheric conditions):

Vapour mass/Two Tanks	(P/S)	Total 4 tanks (P/S)
Propane	abt. 12 mts	48 mts
Butane	abt. 14 mts	56 mts
Ammonia	abt. 4.5 mts	18 mts
VCM	abt. 15 mts	61 mts

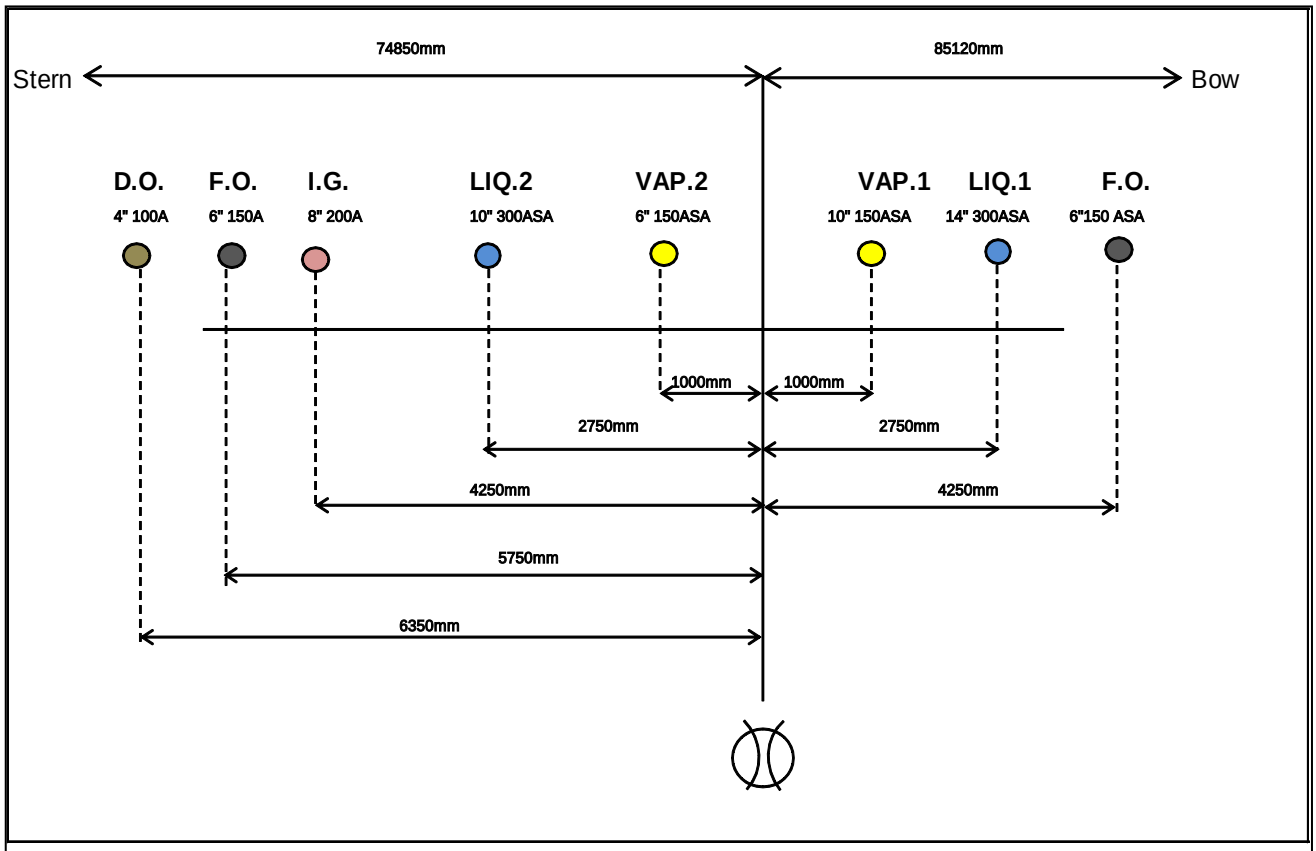
B.7. CARGO WARMING UP

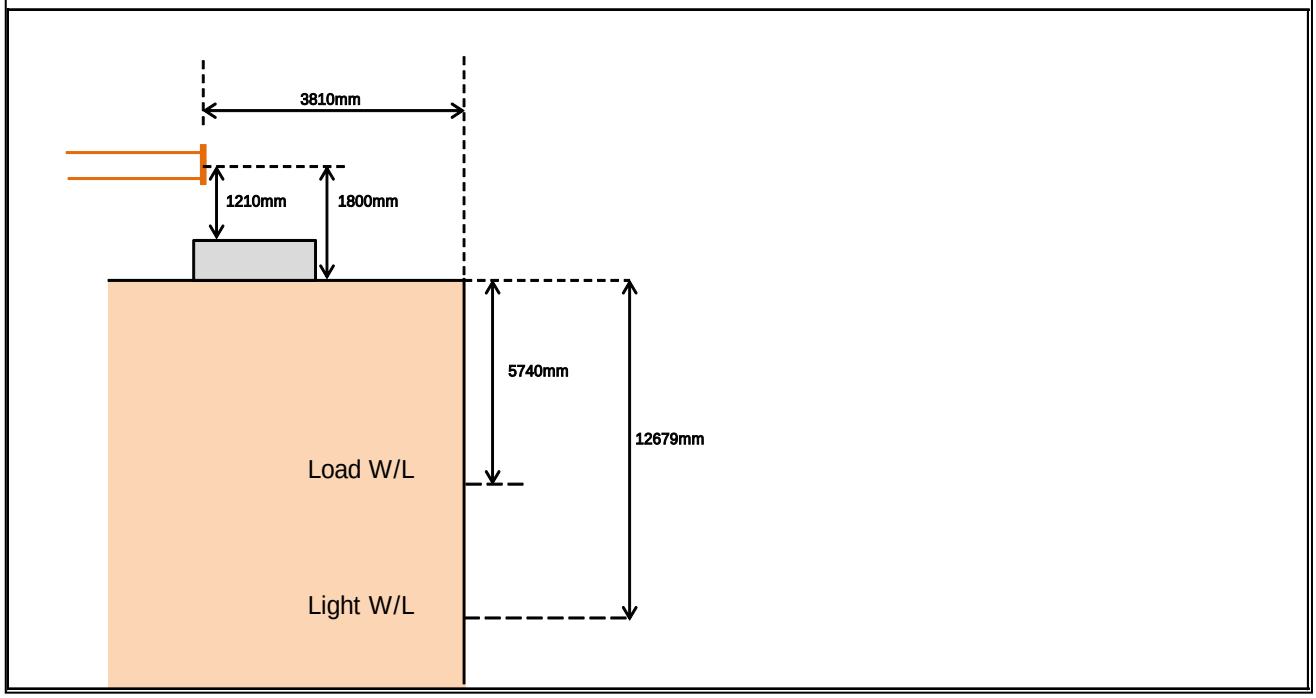
Number of heaters: 1
Type: direct cargo heater / vaporiser on open deck
Heating medium: sea water (on Shell side)

From inlet temperature at -48 C to 0 °C (Sea water temperature abt. +15°C):

Capacities:		
	Propane	500 cbm/hr
	Propene (Propylene)	500 cbm/hr
	Propane / Butane mix.	500 cbm/hr
	Anhydrous Ammonia	210 cbm/hr

B.8. LOADING / DISCHARGING LINES AND MANIFOLD ARRANGEMENTS





B.8.1. **CROSSOVER**

Sequence of manifold from bow to stern:	L1 - V1 - V2 - L2
Liquid connections (N'size):	L1: 1 x 10“ / 300 lbs L2: 1 x 14“ / 300 lbs
Vapour connections (N'size):	V1: 1 x 6 “ / 150 lbs V2: 1 x 10 “ / 150 lbs
Cantilever length (First support to flange) :	642 mm
Distance of centre of L1 from bow:	82.37 m
Distance of centre of L1 from stern:	77.60 m
Distance of manifold from ship's side:	3.81 m
Distance of manifold above waterline summer:	VCM :7,38 / Amm : 9,13
Distance of manifold above waterline ballast:	10.756 m
Parallel mid-body length (ballast):	64.4 m
Parallel mid-body length (scantling):	78.7 m
Parallel body Fwd of manifold (Ballast)	40.78 m
Parallel body Aft of manifold (Ballast)	30.35 m
Parallel body Fwd of manifold (Scantling)	47.4 m
Parallel body aft of manifold (Scantling)	37.02 m

Distances are based from manifold centre and quoted as approximate.

B.8.2. **REDUCERS**

PS Platform 1

Reducer Size	Quantity
10” 150 x 12”150	**1**
10” 150 x 10” 150	**1**
10” 150 x 8” 150	**1**
10” 150 x 6” 150	**1**
6” 150 x 8” 150	**1**
6” 150 x 6” 150	**1**
6” 150 x 4” 150	**1**
6” 150 x 3” 150	**1**

PS Platform 2

Reducer Size	Quantity
14” 300 x 14”150	**1**
14” 300 x 12” 150	**1**
14” 300 x 10” 150	**1**
14” 300 x 8” 150	**1**
10” 300 x 10” 150	**1**
8” 300 x 10” 150	**1**

Starboard Platform

Reducer Size	Quantity
14” 300 x 16” 300	1
14” 300 x 12” 300	1
14” 300 x 10” 300	1
14” 300 x 8” 300	1
10” 300 x 12” 300	1
10” 300 x 10” 300	1
10” 300 x 8” 300	1
10” 300 x 6” 300	1

Manifolds

System No.	Liquid	Vapour
System I	14” 300	10” 150
System II	10” 300	6” 150

B.9. **CARGO PUMPS**

Pumps	Deepwell	Booster
Number:	8	2
Maker:	Svanehoj	Svanehoj
Max. density kg/cdm:	0,972	0,972
Capa. cbm/h nominal:	250	250
Location:	Tank dome	near crossover
Speed RPM:	1.750	1.750
Driven by:	E-Motor	E-Motor
Power consumption:	117 kW	170 kW

B.10. **CARGO COMPRESSORS**

	Cargo
Number:	3
Maker:	Sulzer
Type:	2K-160-2Q_1
Oil Free:	Yes

B.11. **GAS FREEING AND INERTING**

Producing inert gas and dry air for gas freeing of cargo tanks resp. gas plant and feeding the hold spaces.

Deck Fans :

2 x Deck fans 2 x 6000m3/h for drying and venting by fresh/dry air void spaces.
Model : HRV 300B1
Air Flow : 6000 M3/h (each)
Pressure : 20000 Pa/Ps
Motor Power : 73 Kw
Fans Speed : 3564 Rpm

B.11.1 **INERTGAS PLANT**

The I.G. Plant is based on an application of flue gas production:

Capacity (fixed) – inert gas 2000 Nm3/h
Capacity measured on dry basis at 15 grC and atmospheric pressure.
Discharge pressure 6 bar(g)
Typical gas composition (on dry basis)
Oxygen O2 max. 0.5% or 1.5%
Carbon-dioxide CO2 abt. 15 %
Carbon-oxide CO max. 1000 ppm at 0.5% O2 or 100 ppm at 1.5% O2
Sulphur-oxides SOx max. 10 ppm
Nitrogen N2 balance

Soot (on Bacharach scale) 0 (= complete absence)
Temperature about 15 grC above cooling-water inlet temperature
Dewpoint minus 40grC after expansion to atmospheric Pressure

MGO Requirement: 5.4 MT/24h

B.11.2.**NITROGEN BOTTLES**
None

B.12. **MEASURING APPARATUS**

B.12.1.**CARGO LEVEL**

Number:	1 per Tankhalf
Reading:	Tank dome/Cargo Control Room/Bridge
Accuracy:	+/- 1 mm

B.12.2.**CARGO TEMPERATURE**

Number:	2 Analog Thermometers, 3 (PT 100) per tank
Reading:	Tank, Cargo Control Room, Bridge
Accuracy:	+/- 1°C
Location:	Liquid (200 mm), Vapour (14.000 mm), Point 1 (100 mm), Point 2 (6000 mm), Point 3 (12.000 mm)

B.12.3.**CARGO TANK WALL**

B.12.4.**CARGO PRESSURE**

Number:	1 per tank
Reading:	Tank dome, Cargo Control Room, Bridge
Accuracy:	+/- 0,2 bar

B.13. **SAMPLES**

B.13.1.**GAS SAMPLES**
Location: Tank dome

Number: 3 per tank (0%, 50%, 98%)
Sump (100 mm), Middle (7.000 mm), Top (14.000 mm)

(Double valve segregation.)

B.13.2. **LIQUID CARGO SAMPLES**

Number: 1 per Tank dome

C. CREW

C.1. CREW MANAGER

BSSM Isle of Man

C.2. CREW COMPLEMENT

Rank	**Nationality**	**No.**
Master		1
Chief Officer		1
2nd Officer		1
3rd Officer		1
Chief Engineer		1
2nd Engineer		1
3rd / Gas Engineer		1
Gas Engineer *(Depending on trade)*		1
Electrician		1
D/E Cadet		1-2
Bosun		1
Fitter		1
Able Seaman		3
Ordinary Seaman		1
Oiler		1
Cook		1
Messman		1
Total Complement		18-19