Principal Particulars 170k MkIII DFDE 2x2stage

Ship's name **:** LNG Carrier

Type of cargo : Methane (LNG)

Cargo containment system : Four (4) membrane cargo tanks according to the design of GTT Mark III system which uses stainless steel (ASTM/ASIS 304Lcorrugation

Insulation : Reinforced PU foam panels,
Secondary Insulation Thickness: 0.170 m
Primary Insulation Thickness: 0.100 m
Total Insulation Thickness: 0.270 (excluding mastic & hull)
Insulation Space Volume: 1,020 m3 occupied by N2

Boil off Rate : 0.15 % of full loaded cargo volume per day
Laden Condition = 3,977 kg/hour (98.5% tanks filling)
Ballast Condition = 1,789 kg/hour (45 % of laden condition)

Overall Heat Capacity 195,290 MJ
Overall Heat Transfer Coefficient : 0.104 W/m2*K

: External Ambient Condition: IGC Code
Air Temperature: 45.0 C
Sea Water Temperature: 32.0 C
Aft Cofferdam steel plating temperature: 26.6
Frwd cofferdam steel plating temperature: 29.2 C
Central cofferdam steel plating temperature: 2.7 C
Methane and Operating data
Cargo temperature: - 161.5 C
Density: 425 kg/m3
Latent Heat of Vaporization: 511 kJ/kg
Tank Filling Ratio: 98.5 %

Classification (Fitness Cert.) Tanker Liquefied Gases - LNG Carrier
Maximum Pressure (MARVS) 25 kPaG,
Design Cargo Specific gravity up to 500kg/m3,
Minimum Temperature ï 163 C,
Maximum Specific Weight 500 kg/m3,
Ships Type 2G

Designed Criteria Use : Ambient air Temperature 5 C
: Ambient Water Temperature 0 C

The vessel, including her hull, machinery, equipment built under the survey of the Classification Society of the Bureau VERITAS and classes and registered as BV I *Hull, *Mach, unrestricted navigation, Liquefied Gas Carrier, *AUT-UMS, +VeriSTAR-HULL, SYS-NEQ-1 CLEANSHIP(C), INWATERSURVEY, MON-SHAFT

Length overall (LOA)		m	298.430
Length between perpendiculars (LPP)		m	285.00
Breadth Moulded		m	46.00
Depth Moulded		m	26.80
Draft	**Design (Moulded)**	m	11.900
	Summer (Ext.)	m	11.925
	Scantling Draft (Moulded)	m	13.000
	Laden (Arrival)	m	11.60
	Ballast (Departure)	m	9.45
Height above Keel		m	62.495
International Gross tonnage		Rton	114,277
International Net tonnage		Rton	34,283
Lightweight		ton	34,258
Deadweight	**Design (Moulded)**	ton	87,165
	Summer	ton	87,194
	Laden (Arrival)	ton	
Displacement	**Design (Moulded)**	ton	
	Summer	ton	
	Laden (Arrival)	ton	
Cargo capacity (100%)		m^3	173,242

FILLING LIMITS AND ALARM SETTINGS

DESCRIPTION		CTK # 4	CTK # 3	CTK # 2	CTK # 1	Total:
100 % VOLUME	m3	49,340.1 m3	49,340.1 m3	49,340.1 m3	25,222.0 m3	173,242.3 m3
100 % LEVEL	m	28.90 m	28.90 m	28.90 m	28.90 m	
99.5% VOLUME - ESD Activated (VHI Alarm)	m3	49,093.4 m3	49,093.4 m3	49,093.4 m3	25,095.9 m3	172,376.1 m3
99.5% LEVEL - ESD Activated (VHI Alarm)	m	28.64 m	28.64 m	28.64 m	28.71 m	
99.0% VOLUME - FILLING V/V CLOSE (HIHI ALARM) - TPS - 2	m3	48,846.7 m3	48,846.7 m3	48,846.7 m3	24,969.8 m3	171,509.9 m3
99.0% LEVEL - FILLING V/V CLOSE (HIHI ALARM) - TPS - 2	m	28.40 m	28.40 m	28.40 m	28.54 m	
98.5% - Normal LOADED VOLUME	m3	48,600.0 m3	48,600.0 m3	48,600.0 m3	24,843.7 m3	170,643.7 m3
98.5% - Normal LOADED LEVEL	m	28.16 m	28.16 m	28.16 m	28.37 m	
97.0% VOLUME (HI Tank Level ALARM)	m3	47,859.9 m3	47,859.9 m3	47,859.9 m3	24,465.3 m3	168,045.0 m3
97.0% LEVEL (HI Tank Level ALARM)	m	27.48 m	27.48 m	27.48 m	27.87 m	

1CT	24,844 m3	28.37 m	98.50%
4CT	48,600 m3	28.16 m	98.50%
2CT	48,600 m3	28.16 m	98.50%
3CT	48,600 m3	28.16 m	98.50%
	170,644 m3		

LOADING / FILLING RESTRICTIONS

CARGO TANK	CTK 4			CTK 3			CTK 2			CTK 1		
	m	m3	Fill ratio	m	m3	Fill ratio	m	m3	Fill ratio	m	m3	Fill ratio
70% High (UPPER) LIMIT	18.76 m	34,538 m3	70.00%	18.76 m	34,538 m3	70.00%	18.76 m	34,538 m3	70.00%	20.83 m	17,655 m3	70.00%
2.0 m (LOWER) LIMIT	2.00 m	3,103 m3	6.30%	2.00 m	3,103 m3	6.30%	2.00 m	3,103 m3	6.30%	2.00 m	1,268 m3	5.00%

Principal Particulars of Cargo Equipment

Main Cargo Pumps

Two cargo pumps are installed in each cargo tank (total 8 cargo pumps). The cargo pump are electric motor-driven, of the single-stage, centrifugal submerged types. The cargo pumps must be operated In LNG liquid and must not be operated when dry, as the pump bearings are lubricated by LNG drawn in by the pump. The cargo pumps are located at the bottom of the center pipe tower. The pump suctions arelocated approximately 75mm from the tank bottom and are protected by a suction screen.

Maker	: Ebara International Corporation
No. of sets	: Eight (8) total, Two (2) in each tank
Type	: 12Ec-24; Vertical, centrifugal, submerged single stage
Liquid pumped	: LNG (S.G-0.5)
Capacity rated flow	: 17000m3/h
Discharge head rated	: 155mth
Power required rated	: 522.2KW
Electric Power Source	: 6,600 V, 60 Hz
Rated Current	: 62 A
Starting Current	: 400 A
RPM rated	: 1800
Starting Method	: Soft Start
No. of stages	: 1
Minimum Continuous Flow	: 563 m3/h
Maximum Flow	: 2,040 m3/h
Designed Pressure	: 1.0 MPaG
Designed Temperature	: - 163 C

Minimum Liquid for initial start-up from tank bottom : 2.0 m

Minimum Liquid for restarting from tank bottom : 0.70 m

Preset Opening of the pump discharge valve : 25 % (adjustable)

AURTO SEQ “START DISCHARGE” – Pump Set Point = 53 Amps and Discharge Valve Open app. 38 %

Protection

Over Current Relay	: >62 A (instantaneous)
Low Current Relay	: <40A ((instantaneous)

The Cargo pumps should not be re-started if the tank level is below approximately 2.0m.
If the initial start fails, for a second attempt at pump starting, wait 17 minutes in order to avoid overheating of the motor windings.
The cargo pumps are primarily operated using AUTO SEQUENCE START controls, though can be operated manually if preferred.

Spray / Stripping Cargo Pumps

One spray pump is installed in each cargo tank (total 4 pumps). The spray pumps areelectric motor-driven, of the two-stage, centrifugal submerged type (similar to main cargopumps). The spray pump must be operated In LNG liquid and must not be operated whendry as the pump bearings are lubricated by LNG drawn in by the pump.

Maker	: Ebara International Corporation
No. of sets	: Four (4) total, One (1) in each tank
Type	: 2EC-092vertical, centrifugal, submerged single stage
Liquid pumped	:LNG (S.G-0.5)
Capacity rated flow	: 50m3/h
Discharge head rated	: 145mth
Power required rated	: 22.4 kW
Electric Power Source	: 440 V
Rated Current	: 42 A
Starting Current	: 300 A
RPM rated	: 3600
Efficiency	: 54.7%
Starting Method	: Direct on Line
No. of stages	: 2
Minimum Flow	: 20 m3/hr
Designed Pressure	: 1.0 MPaG
Designed Temperature	: - 163 C
Minimum Liquid for initial start up from tank bottom	: 1.30
Minimum Liquid ffor restarting from tank bottom	: 0.59
Preset Opening of the pump discharge valve	: 15 % (adjustable)

Protection

Over Current Relay	:>30 A(instantaneous)
Low Current Relay	:<50 A((instantaneous)

The spray pumps are located at the bottom of the center pipe tower. The pump suctions are located approximately 25mm from the tank bottom and are protected by a suction screen.

Emergency Cargo Pump

Maker	: Ebara International Corporation
No. of sets	: One (1)
Type	: 8ECR-12, Retractable, vertical, centrifugal, submerged, single stage
Rated flow	: 550m3/h at 155mth
Minimum flow	: 220m3/h (continuous)
Power required	: 223.8 kW
Electric Power Source	: 440 V
Rated Current	: 355 A
Starting Current	: 2,500 A
Starting Method	: Direct on Line
No. of stages	: 1
Minimum Liquid for initial start up from tank bottom	: 1.72
Minimum Liquid ffor restarting from tank bottom	: 0.97

Ballast Pumps

Three electric driven ballast pumps are provided together with a small stripping eductor.The Water Spray pump is used to provide the drive for the eductor. The system is designedso that the vessel can be ballasted/de-ballasted within 12 hrs

Maker	: Shinko Industries
No. of esets	: 3
Type	: Vertical centrifugal, self-priming
Capacity	: 3,000 m3/h x 30mth
Rotation	: Clockwise viewed from the coupling

Ballast Stripping Eductors

No. of sets	: 1
Type	: Sea water driven by Water Pump from Engine Room
Capacity	: 300 m3/h
Driving Pressure	: 400 kPa

Inert Gas Generator

No. of sets	: One (1)
Type	: Gas Oil Fires
Inert gas capacity	: 14,000 Nm3/h
Discharge pressure	: 25 kPa (G)
Temperature Average after generator	: +17$_o$C
Dewpoint after expansion Maximum to atmospheric pressure	: ï45$_o$C

Cooling Water Supply by Water Ballast Pump

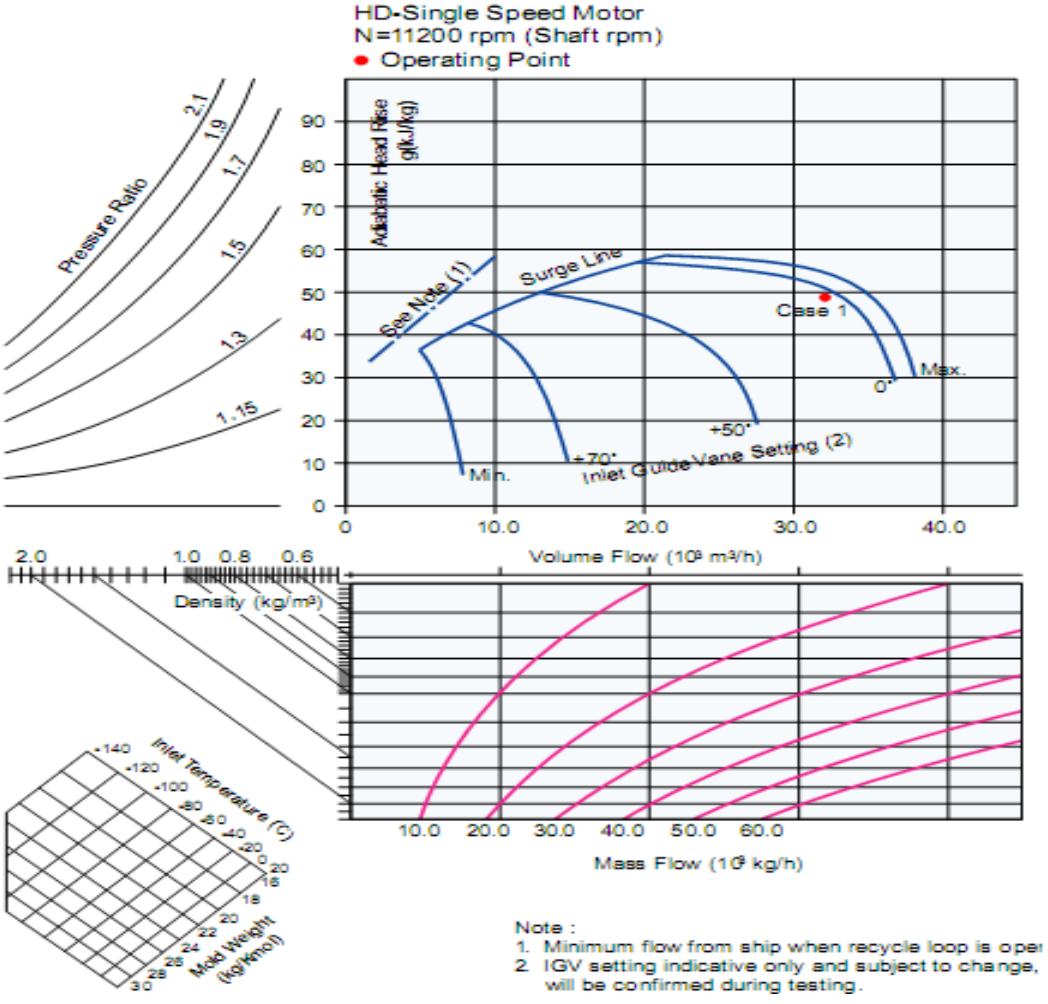
Dry inert gas composition is as follows:

Oxygen	0_2	: Maximum 1.0 %
Carbon-dioxide	$C0_2$	: Maximum 14.0 vol*
Carbon-monoxide	CO	: Maximum 100 ppm
Sulphur-oxides	SOX :	: Maximum 2 ppm
Nitrogen	N2 :	: balance

H/D - High Duty Compressors

Specification	
Manufacturer	Cryostar
Model	CM 400/55
Type	Centrifugal, Single stage, Fixed speed with adjustable guide vanes
No. of Sets	2
Volume flow	32000 m^3/h
Capacity (Mass flow)	48818 kg/h
Inlet pressure	103 kPaA
Outlet pressure	196 kPaA
Inlet temperature	-140°C
Outlet temperature	-111°C
Shaft speed	11200 rpm
Motor speed	3580 rpm
Rated motor power	6600 V, 900kW

HD compressor Design flow rate based on ñTotal calculated Maximum displaced vapor volume during Loading operationò such that individual HD compressor rating will take 60 % of such maximum (both HD compressor = 120 %)



HD Compressor usage:

1. NG Return to Shore during LNG Loading
2. NG Displacement & Venting for Warming Up --- PRE-DOCKING
3. NG Return during initial Cooling ï Down --- POST DOCKING
4. Inert Gas Return during Gas Up Operation (if required by Terminal) --- POST DOCKING

The Following conditions trip the compressors:

- ESDS
- Differential pressure: vapour header / atmospheric pressure = 0.3 Kpa
- Differential pressure: vapour header / IBS pressure header = 0.0 Kpa
- Tank No. 1, 2, 3, 4 ï very high liquid level
- Electric Power Failure
- Ventilation flow failure in electric motor room

L/D – Low Duty Compressor

Specification	
Manufacturer	Cryostar
Model	CM 2-200
Type	Centrifugal, Two stage, Dual speed with variable diffuser vans
No. of Sets	2

Performance Data		Design	Laden 4500	Laden 4000	Ballast 1500	Ballast 1900	Min. flow
Volume flow	m^3/h	4600	4500	4000	1550	1900	1200
Capacity (Mass flow)	kg/h	7084	6930	5271	2387	2503	1848
Inlet pressure	kPaA	103	103	103	103	103	103
Outlet pressure	kPaA	650	650	650	650	650	650
Inlet temperature	°C	-120	-120	-120	-120	-120	-120
Outlet temperature	°C	69.5	69.5	41.8	85.8	50.7	91.5
Efficiency	%	47	47	53	43	50	42
Shaft speed	rpm	29775	29775	29775	29775	29775	29775
Shaft power	kW	658	644	500	243	252	194
Coupling power	kW	738	724	580	323	332	274
Driver system		Two-speed electric motor					

The compressor capacity control is as follows;

The capacity of the L/D compressor is controlled by adjusting the **V**ariable **D**iffuser **V**anes

ÅThe stable operating range of the compressor is restricted by the surge limit.

Safety Device of L/D compressor

(1) L.O. Inlet pressure low 78 kPa
(2) L.O. Inlet temp.high 60 ℃
(3) Rotor excess vibration 45 εm
(4) Discharge gas temp.high 100℃
(5) Bearing temp.high 75℃
(6) Bulkhead seal oil temp. high 80℃
(7) ESDS active Active

The Following conditions trip the compressors:

- ESDS
- Differential pressure: vapour header / atmospheric pressure = 0.3 Kpa
- Differential pressure: vapour header / IBS pressure header = 0.0 Kpa
- Tank No. 1, 2, 3, 4 ï very high liquid level
- Electric Power Failure
- Ventilation flow failure in electric motor room

LNG Vaporiser

Manufacturer: Cryostar
Model: 65-UT-38/34-5.9
Type: Shell & Tube

Tube Side (Process Fluid)	Unit	Operating Case				
		Vapour purge	LNG discharge	Em'cy Forcing	Em'cy Forcing	N2 ref only
Process fluid		Methane	Methane	Methane	Methane	Nitrogen
Mass Flow	kg/h	13000	24500	7200	6500	18396
Inlet Volume Flow	m^3/h	29	54	16	14	23
Outlet Volume Flow	m^3/h	14973	12809	964	871	12150
Inlet Temperature	°C	-163				-196
Outlet Temperature (uncontroller)	°C	29	-20	66	72	45
Outlet Temperature (controller)	°C	20	-140	-100	-100	20
Inlet Pressure	kPa	300	300	800	800	200
Outlet Pressure	kPa					
Pressure Drop (Calculated)	kPa	30	30	560	560	30
Heat Exchange (Actual)	kW	3351	3833	1309	1182	2270

Inlet Temperature	°C	179				
Outlet Temperature	°C	174				
Inlet Pressure	kPa	900				
Outlet Pressure	kPa	900				

LNG Vaporiser alarm set points are as follows:

ÅGas outlet temperature high.:. : 80°C
ÅGas outlet temperature low : : -70°C
ÅDrain pot level high : : 195mm

Forcing Vaporiser

Specification

Manufacturer: Cryostar
Model: 34-UT-25/21-3.6
Type: Shell & Tube

Tube Side (Process Fluid)	Unit	Operating Case	
		Sizing case	Forcing
Process fluid		Methane	Methane
Mass Flow	kg/h	6500	6500
Inlet Volume Flow	m^3/h	14	14
Outlet Volume Flow	m^3/h	1173	871
Inlet Temperature	°C	-163	-163
Outlet Temperature (uncontroller)	°C	-27	-27
Outlet Temperature (controller)	°C	-40	-100
Inlet Pressure	kPa	800	800
Outlet Pressure	kPa	560	560
Pressure Drop (Calculated)	kPa	112	112
Heat Exchange (Actual)	kW	1428	1182

Shell Side (Saturated Steam)	Unit	Operating Case	
		Sizing case	Forcing
Steam Consumption	kg/h	2549	2108
Inlet Temperature	°C	179	179
Outlet Temperature	°C	174	174
Inlet Pressure	kPa	900	900
Outlet Pressure	kPa	900	900

Gas Heater (boil off / Warm up heater)

Specification

Manufacturer: Cryostar
Model: 65-UT-38/34-4.4
Type: Shell & Tube
No. Of sets: 2

Performance data		Design	Beginning Warm-up	End Warm-up	BOG (laden)	BOG (ballast)
TUBE side (process fluid)						
Process fluid		Methane	Methane	Methane	Methane	Methane
Mass flow	Kg/h	18600	21400	11700	6500	7200
Inlet volume flow	M^3/h	8697	8913	8161	884	979
Outlet volume flow	M^3/h	27961	21862	12415	1524	1688
Inlet temperature	°C	-90	-110	0	-100	-100
Outlet temperature (uncontrolled)	°C	82	67	130	111	108
Outlet temperature (controlled)	°C	80	-	80	40	40
Supply inlet pressure	kPa	100	160	100	550	550
System outlet pressure	kPa					
Pressure drop, calculated	kPa	20	70	70	550	550
Heat exchange	kW	2002	2396	593	514	570
SHELL side (Saturated steam)						
Steam consumption	Kg/h	3572	4275	1057	918	1017
Inlet temperature	°C	179	-	-	-	-
Outlet temperature	°C	174 appx.	-	-	-	-
Inlet pressure	kPa	900	-	-	-	-
Outlet pressure	kPa	900	-	-	-	-

Nitrogen Gas (N2) Generator

Plant Specific Data:

Description	Unit	Min.	Design	Max.
No. of Generator Units			2	
Ambient Temp.	°C	10	45	50
Relative humidity at ambient temperature	%RH		60	80
Feed Air Supply Capacity	Nm^3/h		450	
Feed Air Temp.	°C	20	50	65

Service:

Description	Unit	Min.	Design	Max.
Product Flow Rate	Nm^3/h		125	149
Product Purity	Vol%O_2		<3	3.0
Product Dewpoint @ atm. pressure	°C	<-70	<-65	<-60
Delivery Pressure	kPa	500	900	1000
Module Outlet Temperature	°C	40	45	50

Feed Air Requirement:

Description	Unit	Min.	Design	Max.
Feed Air Flow Rate	Nm^3/h		380	470
Module Inlet Pressure	kPa	1000	1050	1200
Module Inlet Temperature	°C	25	60	65
Particle Size	micron		0.01	
Particle Concentration	mg/m^3		0.1	
Oil Content	mg/m^3		<0.01	
Dew Point at 700 kPa	°C		5	

Electric Power Requirement:

Description	Unit	Design
Voltage (i)	V/Hz/ph	440 / 60 / 3
Feed Air Compressor	kW/(A)	5
Voltage (ii)	V/Hz/ph	220 / 60 / 1
Control panel(s)	kW	2

Nitrogen Buffer Tank

No. of sets : 1
Capacity : 24m3
Working pressure : 300/800 kPa (min/max)
Start supply to tank : 300KPa,
Stop supply to tank : 800KPa.

Nitrogen Generation Alarms and Shutdowns

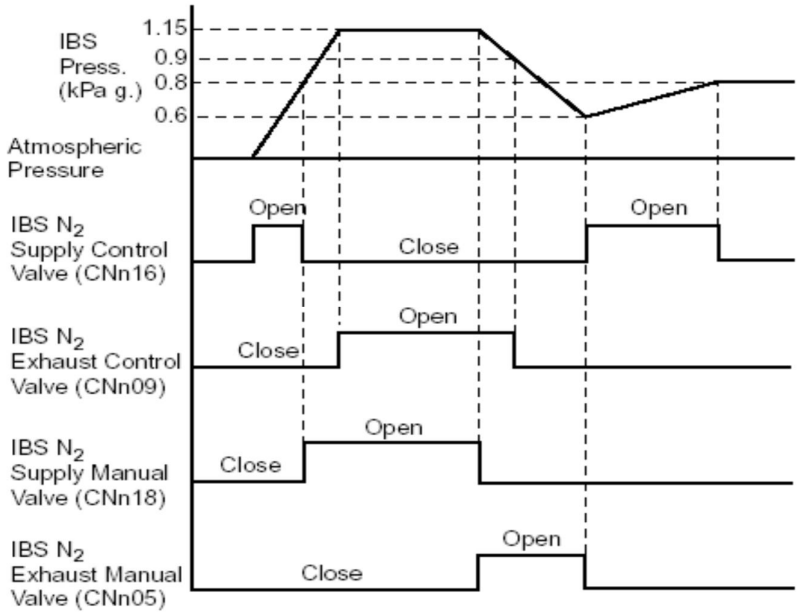
Air heater high temperature (System shut down) : 200°C
Feed air high high temp. (System shut down) : 80°C
Feed air temperature high : 65°C

Dew point level high	: -60°C
Oxygen content high	: 3.5%
Oxygen content high high	: 4.0%
Feed air pressure low	: 700kPa g.
Nitrogen flow high	: 103Nm3/h
Nitrogen buffer tank pressure low	: 300 kPa g.
Nitrogen buffer tank pressure high	: 800 kPa g.
Differential pressure high	: 0.08kPa g.

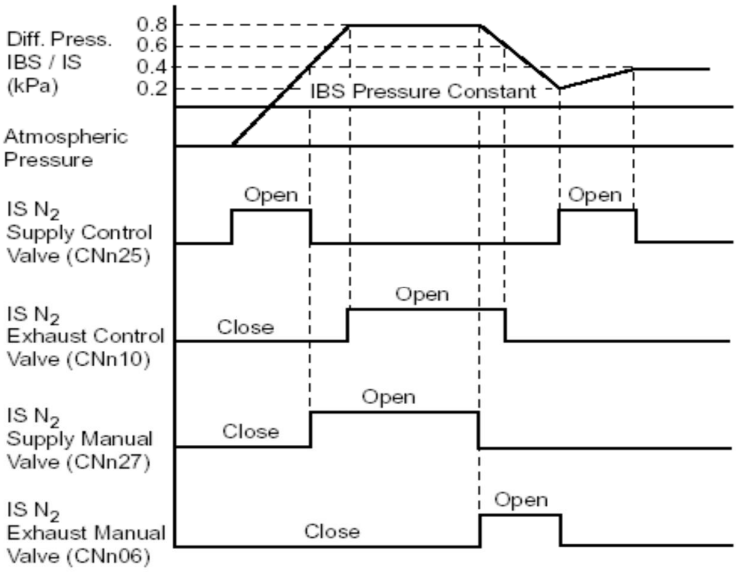
Barrier Space Header and IBS/IS Alarms

No.1 cargo tank IBS pressure	
No.1 cargo tank IBS pressure high/low	: 1.3 / 0.2 kPa
No.1 cargo tank IS/IBS differential pressure h/l	: 1.2 / 0.0 kPa
No.1 cargo tank IS pressure high/low	: 2.5 / 0.3 kPa
IS/IBS header pressure	**: 50 kPa**
IS/IBS header pressure high / low	: 70 / 20 kPa
Nitrogen to barrier space total flow	
No.2 cargo tank IBS pressure	
No.2 cargo tank IBS pressure high/low	: 1.3 / 0.2 kPa
No.2 cargo tank IS/IBS differential pressure h/l	: 1.2 / 0.0 kPa
No.2 cargo tank IS pressure high/low	: 2.5 / 0.3 kPa
No.3 cargo tank IBS pressure	
No.3 cargo tank IBS pressure high/low	: 1.3 / 0.2 kPa
No.3 cargo tank IS/IBS differential pressure h/l	: 1.2 / 0.0 kPa
No.3 cargo tank IS pressure high/low	: 2.5 / 0.3 kPa
No.4 cargo tank IBS pressure	
No.4 cargo tank IBS pressure high/low	: 1.3 / 0.2 kPa
No.4 cargo tank IS/IBS differential pressure h/l	: 1.2 / 0.0 kPa
No.4 cargo tank IS pressure high/low	: 2.5 / 0.3 kPa

IBS Pressure Control



IS Pressure Control



Summary of Custody Transfer Measuring System

Tank Level Measurement System

Primary Unit	: Radar
Number	: Four (4) - One (1) per Tank
Manufacturer	: SAAB
Accuracy	: +- 7,5 mm
Displays	: 1 x 23 inch Instant Level Monitor
	: 1 x 23 inch CTS Monitor
	: 1 x 50ò Plasma Screen display units
Secondary Unit	: Float Level Gauges
Number	: Four (4) - One (1) per Tank
Manufacturer	: Whessoe
Type	: Figure 3304
Quantity	: 4 (1 per tank)
Accuracy	: ±7.5mm
Repeatability	: ±4.0mm
Transmitter type	: 2047MT

Independent High Level Alarm System

Manufacturer	: Omicron
Model	: OAS-5
Sensor	: HHL 8903A
Number	: 4

Overfill Protection Device

Manufacturer	: Omicron
Number	: Eight (8) - Two (2) float switches per Tank
	: 1 @ 99.5 % Tank Volume
	: 1 @ 99.0 % Tank Volume
Accuracy	: ±5.0mm (cargo Density 0.45)

Temperature Measuring Devices

Manufacturer	: SAAB						
Number	: One (1) set per Tank as follows						
	: Top	2 pcs:	95 % height	2 pcs:	70 % height	2 pcs	
	: 50 % height	2 pcs:	25 % height	2 pcs:	Bottom	2 pcs	
Type	: PT-100 resistance thermometers						
Accuracy	: ± 0.2°C from ï 165°C to ï 145°C						
	: ± 0.3°C from ï 145°C to ï 120°C						
	: ± 1.5°C from ï 120°C to + 80°C						

Pressure Measuring Devices

Manufacturer	: SAAB
Number	: One (1) unit per Tank located inside Radar Housing
Type	: Electronic pressure transmitters
Spec	: Gauge pressure measurement (-200 to + 400 mbar g / -20 KPa to + 40 KPa)
Accuracy	: ± 0.5 % of range (i.e. +- 3 mbar for LNG)

Trim / List gauge

Number	: One (1) unit
Type	: Electric
Manufacturer	: Utsuki Keiki

Emergency Shutdown System (ESD)

Ship / Shore ESD link system

- Pneumatic System
- Optical Fibre System
- Electric System

The ESDS is activated by the following conditions.

• **Manual activation**

- Manual switches are provided on the cargo control console,
- fire safety &control center,
- manifold (port &stbd),
- each tank dome
- cargo motor room and
- Cargo machine room.

• **Fire**

- Melting plugs designed to melt at a temperature between 98$_o$C and 100$_o$C are provided at each
- tank dome area,
- shore connections (port &stbd) and
- cargo machinery room.

• **Very high level in cargo tank**

- The system is activated when the level in any one of cargo tank reaches 99.5% vol.

• **Power failure**

- The system is activated in the event of power failure,
- such as black out or
- loss of hydraulic pressure in the cargo valve remote control system.

• **Actuation of ESDS from shore.**

- Following connections can be used between the ship and the shore
- Fiber optic,
- electric (intrinsically safe type) and
- pneumatic lines

.

- ***Actions when ESD is activated***

ÅIf operational the following are stopped:

- Cargo compressors
- Cargo Pumps
- Spray Pumps
- Inert Gas Plant

ÅIf open the following are closed:

- Tank filling valve
- Manifold ESD valve
- Fuel Gas Supply to boiler valve (BOG)

Note: *On some vessels, the shutting of the tank filling valve may not be included within theESD actions but will close as part of the 'Tank Protection System'.*

ESD1/ESD2

In some terminals two levels of ESD activation may be implemented.

ÅESD1

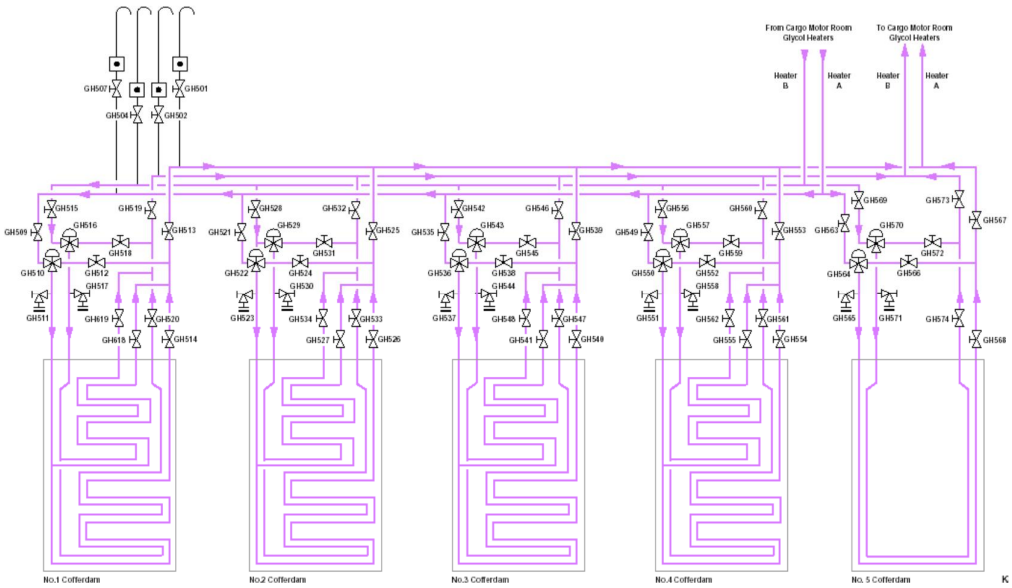
When activated this will shutdown shipboard equipment but may leave valves in the open condition.

ÅESD2

This is a full shutdown situation, with all equipment and valves on vessel being stopped and closed, equipment within the shore plant stopped and valves closed on

Other Systems on board

Glycol Steam Heaters



No. of sets : 2

The maximum heating condition is determined by the following extreme operating conditions:-

External air temperature : -18°C
Sea water temperature : 0°C
Capacity : 30m3/h of glycol/water
Inlet temperature : 77.5°C
Outlet temperature : 90°C (maximum)
Heating steam : 700kPa

Glycol Electric Heater

Manufacturer : Aset
No. of set : 2
Type : TB160+20E
Capacity : 30m3/h of glycol/water
Outlet temperature : 70°C
Heating : 180kW total (80kW, 40kW, 20kW, 20kW + 20kW in reserve elements): 440V Tri 60Hz
Operating pressure : 450kPa

Glycol Water Circulating Pump

Manufacturer : Teikoku Industries
No. of sets : 2
Type : Vertical centrifugal
Capacity : 30m3/h at 30mth
Motor : 7.5 kW at 1,800 rpm

Side Trunk Exhaust Fans

Manufacturer *: Hi-Pres Korea Co. Ltd*
Type *: MNA-1400/578*
Quantity *: 2*
Air volume *: 73,500m3/h*

Electric Motor

Type *: EC30 225M6*
Pole *: 6*
Power *: 30.0kW*
Revolutions *: 1,182 rpm*
Rating current *: 55.0A*

Pipe Duct Keel Exhaust Fan

Manufacturer *: Hi-Pres Korea Co. Ltd*
Type *: MNA-1000/410*
Quantity *: 1*

Electric Motor

Type *: EC30 180M4*
Pole *: 4*
Power *: 18.5kW*

Portable Water-Driven Gas Freeing Fan

Manufacturer *: Dasic Marine Ltd.*
Type *: Jetfan 125*
Quantity *: 2*

Fixed Gas Sampling and Gas Detection Systems

Manufacturer : Consilium Marine AB
Location : CCR
System : Salwico
Model : SW2020
Manufacturer : Consilium Marine AB
Location : EER
Model : GS3000

Cargo Tank pressure protection

Vent mast No. 1 – "AUTO" Valve setting

Opening pressure : 23 kPa(G)
Closing pressure : 21 kPA (G)

Cargo Tank Relief Valves

Cargo Tanks:
Manufacturer : Fukui Seisakusho

Type : Pilot Operated
Model : PSL-MD13-131-NS1(B)
No. of units : 8
No. per tank : 2
Operated pressure : 25 kPaG Open, and 22kPaG close
Capacity : 27,630 Nm2/h

Primary Interbarrier Space

Manufacturer : Fukui Seisakusho
Type : Pilot Operated
Model : PSL-MD13-131-S1(B)
No. of units : 8
No. per tank : 2
Operated pressure : 3 kPa G Open, and 1.8 kPaG close
Capacity : 409 Nm2/h

Secondary Interbarrier Space

Manufacturer : Fukui Seisakusho
Type : Pilot Operated
Model : PSL-MD13-131-S1(B)
No. of units : 8
No. per tank : 2
Operated pressure : 3.5 kPa G Open, and 2.1 kPaG close
Capacity : 449 Nm2/h

HI Tank Pr	22 kPa (G)
HIHI Tank Pr	25 kPa (G)
LO Tank Pr	1 kPa (G) Alarm
LOLO Tank pr	0 kPa(G) ESD
HI Tank Level	97 %
HIHI Tank Level	99 %

HI Tank Pr	22 kPa (G)
HIHI Tank Pr	25 kPa (G)
LO Tank Pr	1 kPa (G) Alarm
LOLO Tank pr	0 kPa(G) - ESD
HI Tank Level	97 %
HIHI Tank Level	99 %

HI Tank Pr	22 kPa (G)
HIHI Tank Pr	25 kPa (G)
LO Tank Pr	1 kPa (G)-Alarm
LOLO Tank pr	0 kPa(G)-ESD
HI Tank Level	97 %
HIHI Tank Level	99 %

HI Tank Pr	22 kPa (G)
HIHI Tank Pr	25 kPa (G)
LO Tank Pr	1 kPa (G)-Alarm
LOLO Tank pr	0 kPa(G)-ESD
HI Tank Level	97 %
HIHI Tank Level	99 %

Rising (kPa)	Falling (kPa)	Alarm	Location	Action
25			Two per tank	Pressure relief valves open
23			Vapour main	Open forward vent valve 100%
22		HH	Each cargo tank	Close spray valves (Spray pump is not stopped because it may be required for the NBO spray cooler)
	21		Vapour main	Close forward vent valve
20		HH	Vapour main	Trip LNG and forcing vaporisers
20		H	Each cargo tank	
19		H	Vapour main	
18 ballast 15 laden		Pre H	Vapour main	Alarm informs operator that he has to: • Increase the engine load (if possible) or • Start the GCU (if GCU control is not in GCU mode)
				Normal operating zone BOG consumption controlled by: • LD compressor if FV running • Gas engine load if FV not running
	6	Pre L	Vapour main	Alarm informs operator that he has to start the forcing vaporiser (gas only mode only)
5			Vapour main	Reset MDO backup
	4	L	Vapour main	MDO backup (some engines change to MDO)
	3	L	Each cargo tank	Pump start interlock
	2	LL	Vapour main	Trip LD compressors Close master gas valves for MDO boost up
	7	LL	Each cargo tank	TPS1 : Shut down of tank cargo pumps (main em'cy and spray), HD compressors and tank spray valves
	0.3	VL	Vapour main	ESD
	-1		Two per tank	Vacuum relief valves open

Principal Particulars of Machinery

Propulsion Motor	Type / Units	Electric / 2 units
	MCO	14520 kW e/o
	NOR	14520 kw e/o
Generator	D/G	2 units Wartsila 12V50DF
	D/G	2 units Wartsila 9L50DF
	Emergency D/G	740 kW x 1 Set
Service Speed	Vs (at dd)	**19.7 knots**
	Vs (at Ballast)	**20.3 knots**
Propeller	Type	5 blades NACA section
	Dia / Pitch	8.60 m/0.853