

Ballast Water Management System

PURIMAR™



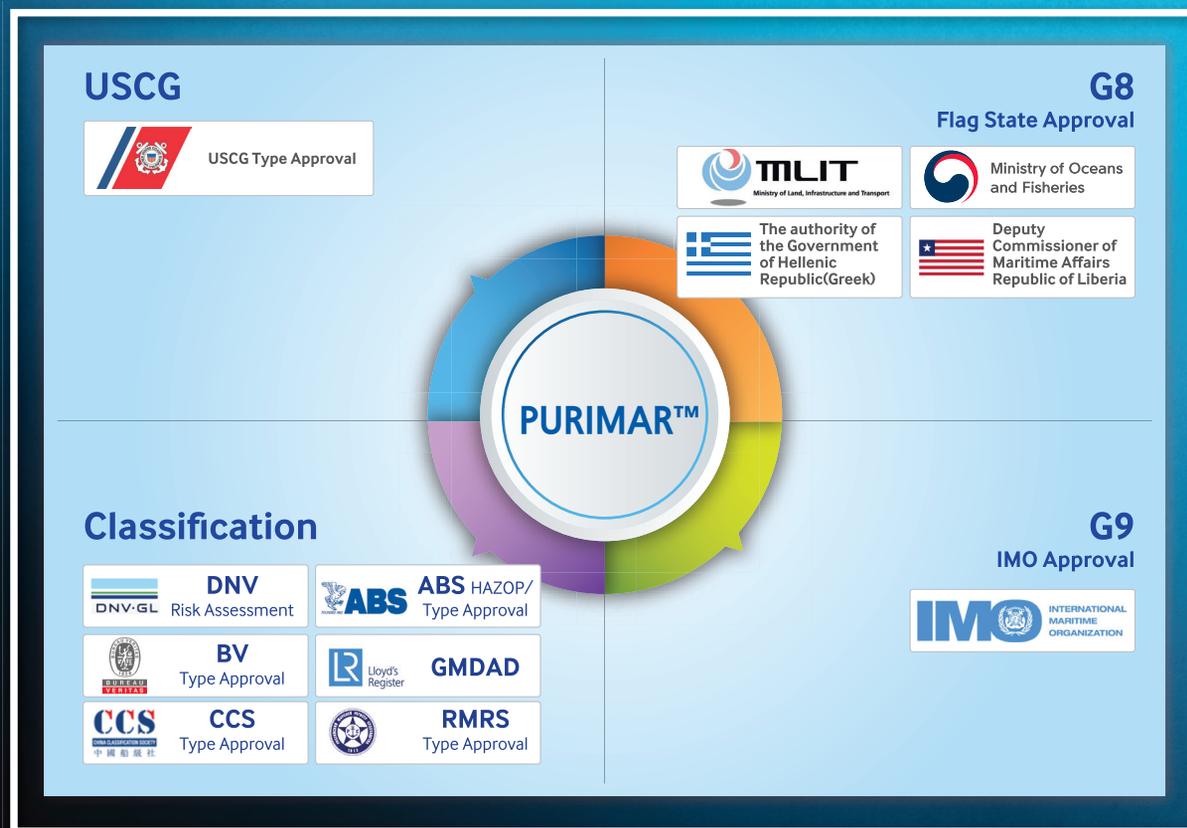


PURIMAR™ Ballast Water Management System

PURIMAR™, Ballast Water Management System is a safe and eco-friendly system to meet IMO's regulations, as it effectively eliminates organisms harmful to ecosystem and underwater environment.

At the same time, it reduces active substances used in the process of neutralization process to the harmless level for environment and discharges them thereafter.

Certification & Approval Status



USCG Certificate of Approval on June 15, 2018

Operation Limitation	Solutions & Advantages
Salinity : N/A	-
Ambient Temp : 0 - 55°C	-
Electrolyte Feed Temp : 4 - 40°C	Below 5°C, a heater is used.
Hold Time N/A (Marine Water) N/A (Brackish Water) 24 Hours (Fresh Water)	24 hours Hold time limitation only for Fresh Water.
Electrolyte Feed Salineity : 10 PSU	Sea water is stored and utilized from AP tank in fresh water area.
Filter Inlet Pressure : 0.5 bar	With lower inlet pressure, more flexibility in filter installation level.
Total Residual Oxidant (TRO) : 2.5-3mg/L(PPM)	Low TRO enables to consume lower power in ballasting and little neutralizer during de-ballasting.

- Coast Guard Approval Number : 162.060 /8/0
- Capacity : 250 - 10,000 m³/h

USCG TA

PURIMAR
USCG TA



U. S. Department of Homeland Security
United States Coast Guard
Certificate of Approval

Coast Guard Approval Number: 162.060/8/1

Expires: 15 June 2023

BALLAST WATER MANAGEMENT SYSTEM
 Filtration/Electrochlorination

Samsung Heavy Industries Co., Ltd.
 89, Gongdaseo 2-gil, Chilseo-myeon,
 Haman-gun, Gyeongsangnam-do, KOREA, REPUBLIC OF

Purimar BWMS

Capacities: 250-10,000 m³/h

This is to certify that the above listed BWMS, with the listed treatment capacities, has been satisfactorily examined and tested by Independent Lab Korean Register in accordance with the requirements contained in 46 CFR 162.060. The system shall be installed and operated in accordance with the Samsung Purimar Operation, Maintenance, and Safety Manual (OMSM), Rev. 1, dated July 12, 2018.

Operational Limitations:

- Salinity: Not Applicable
- Ambient Temperature: 0-55°C
- Hold Time: N/A (Marine Water)
N/A (Brackish Water)
>24 Hours (Fresh Water)
- Electrolyte Feed Temperature: 4-40°C
- Electrolyte Feed Salinity: >10 Practical Salinity Units (PSU)
- Filter Inlet Pressure: >.5 bar
- Total Residual Oxidant (TRO): 2.5-3 mg/L

The Samsung Purimar-Ex models may be installed in hazardous locations on foreign flagged vessels subject to approval of the foreign administration. The BWMS does not meet the requirements of 46 CFR Subchapter F or 46 CFR Subchapter J, and may not be installed on a U.S. flag vessel. The BWMS does not meet the requirements of 46 CFR 111.105 and may not be installed in hazardous locations on a U.S. flag vessel. The BWMS must be marked in accordance with 46 CFR 162.060-22. A copy of this Type Approval Certificate shall be carried on board a vessel fitted with the ballast water management system at all times.

This certificate supersedes Approval number 162.060/8 dated June 15, 2018; update approves new hold time limitation. All equipment manufactured under Approval number 162.060/8 before July 20, 2018 remains approved.

*** End ***

THIS IS TO CERTIFY THAT the above named manufacturer has submitted to the undersigned satisfactory evidence that the item specified herein complies with the applicable laws and regulations as outlined on the reverse side of this Certificate, and approval is hereby given. This approval shall be in effect until the expiration date hereon unless sooner canceled or suspended by proper authority.



GIVEN UNDER MY HAND THIS 20th DAY OF
 JULY 2018, AT WASHINGTON D.C.

Jodi Min

J. J. MIN
 Chief, Engineering Division
 BY DIRECTION OF THE COMMANDANT

PURIMAR™ Model & Mode

PURIMAR™ MODEL

MODEL	BALLAST WATER FLOW (m ³ /hr)	POWER CONSUMPTION (KW)	FOOTPRINT (m)	MODEL	BALLAST WATER FLOW (m ³ /hr)	POWER CONSUMPTION (KW)	FOOTPRINT (m)
SP-50	500	16.2	11.0	SP-500	5,000	117.2	19.8
SP-100	1,000	26.3	11.8	SP-600	6,000	136.5	22.4
SP-150	1,500	38.1	13.3	SP-700	7,000	164.9	27.7
SP-200	2,000	47.8	14.1	SP-800	8,000	184.2	19.4
SP-250	2,500	59.2	15.1	SP-900	9,000	203.6	30.8
SP-300	3,000	69.6	15.2	SP-1000	10,000	222.9	32.3
SP-400	4,000	92.1	17.0				

Power Consumption : Operating condition 20deg.C, 30PSU, excluding backflushing pump power.
 Power Consumption was calculated on the base of Bulk Carrier standard design.
 • S&SYS has the explosion-proof model for each treatment capacity.

Ballasting / Deballasting Mode

Ballasting Mode



Filter Unit

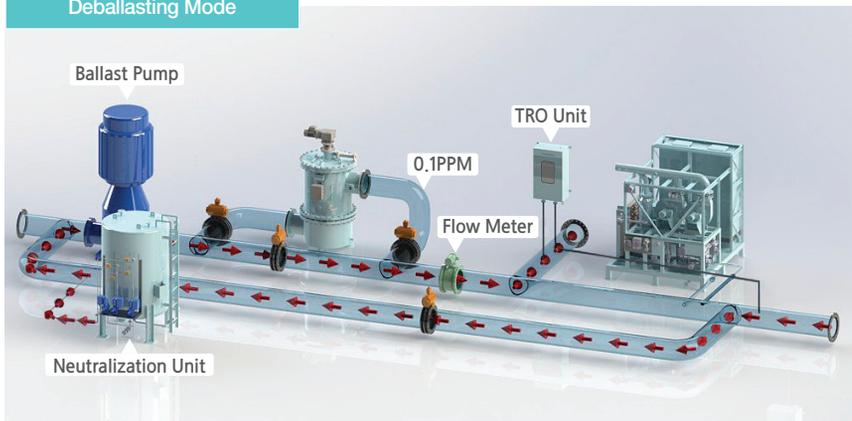
Remove particles or organisms > 50µm



Electrolysis Unit

Disinfect, Pathogenic bacteria and other organisms < 50µm

Deballasting Mode



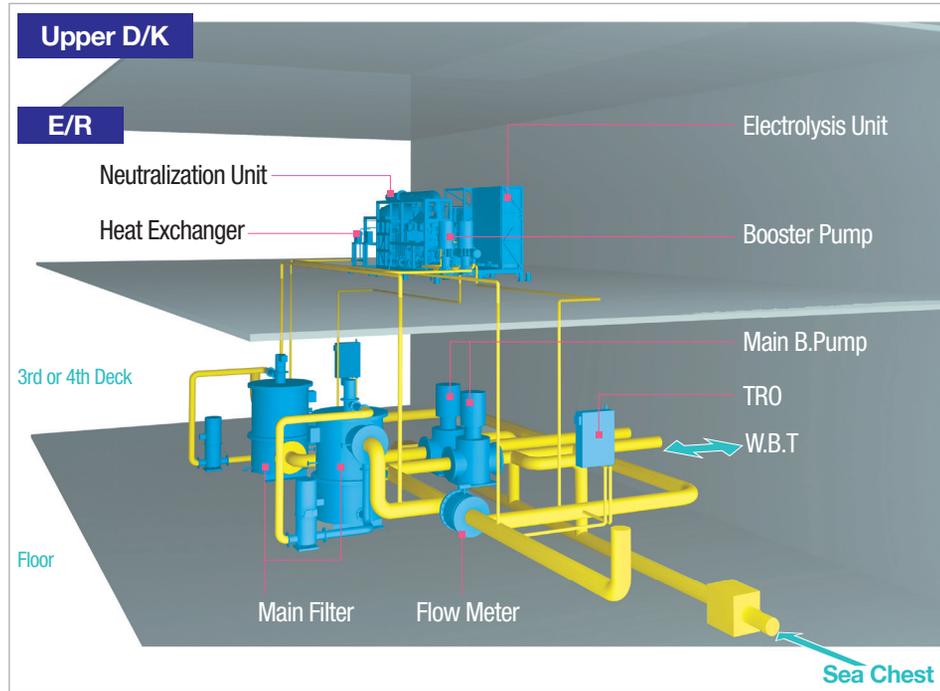
Neutralization Unit

Decrease Total Residual Oxidants(TRO)

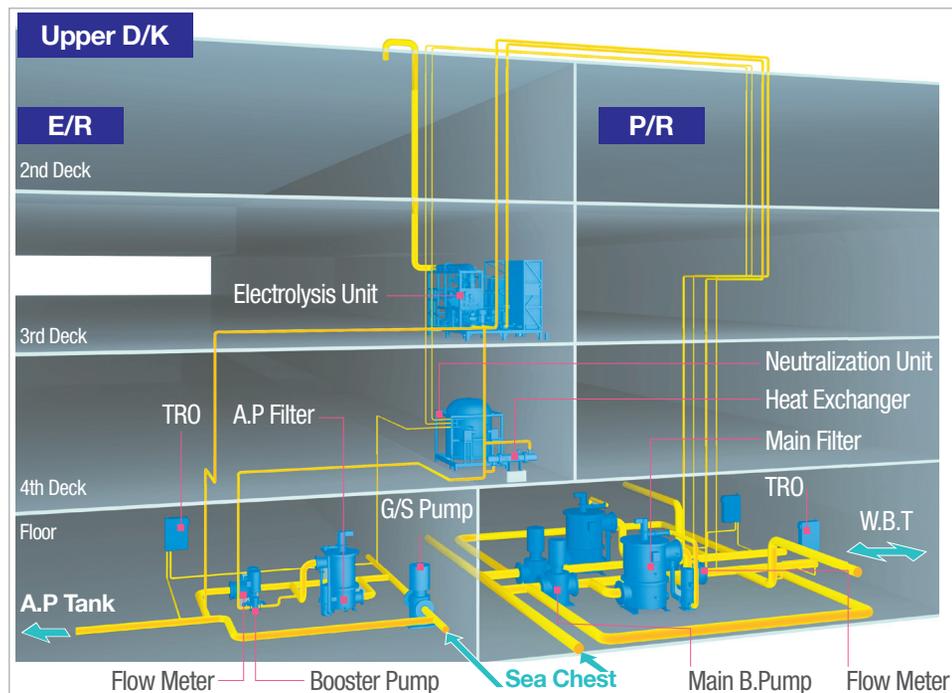
PURIMAR™ Arrangement

Arrangement in Vessel Type

LNGC, Container & Bulker

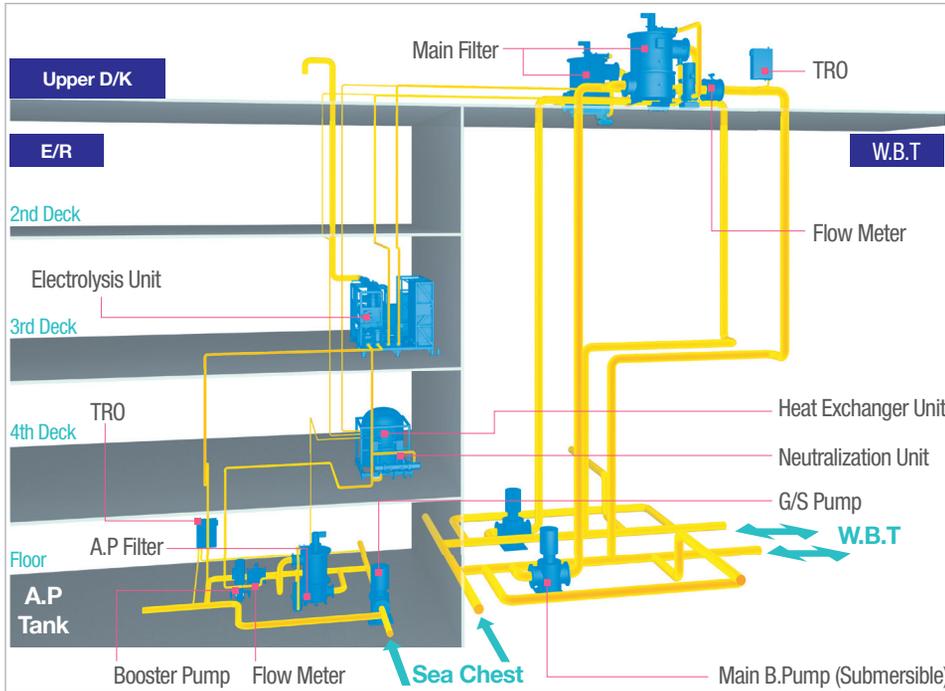


Tanker with Conventional Ballast Pump



PURIMAR™ Arrangement

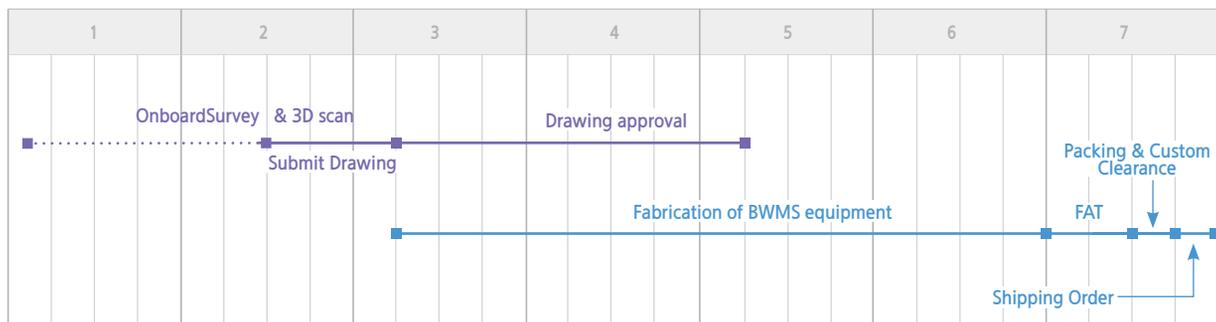
Tanker with Submerged Ballast Pump



PURIMAR™ Master schedule

Lead time for BWMS (based on ETD Busan port)

- 7.0 Months after contract when we supply equipment & engineering
- 5.5 Months after contract when we supply equipment only



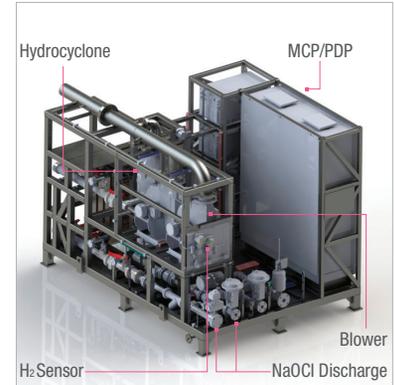
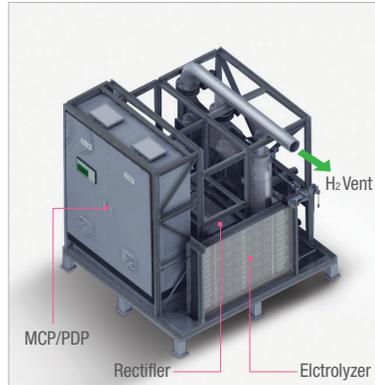
- Installation & Transportation periods depend on retrofit shipyard location.
- Installation period could be changed according to the repair shipyard ability or D/D period.
: 2 weeks for installation (1 week for dry-docking, 1 week for quay side) assumed.
- Installation & Fabrication of Installation Material is out of scope.

PURIMAR™ Main Components

Electrolysis Unit

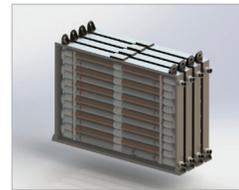
Best Performance for high flow ballast water

- Modularized Design
- Low Power Consumption
- Small Footprint / Weight
- Easy Maintenance



Electrolyzer

- Module capacity : 500m³/h, 1000m³/h
- Use the MOS-FET Rectifier
- Module Connection : Parallel
- Capacity Range : 250~10,000m³/h



Advantage

- Prevent scales : LSE (Low Scale Electrode) system
- Pressure-resistant construction : Over 10 Bar
- No dead space area : the four corners of a square electrode
- Electrode monitoring system
- Performance verification check → Alarm signal
- Easy maintenance : Replaceable each electrodes

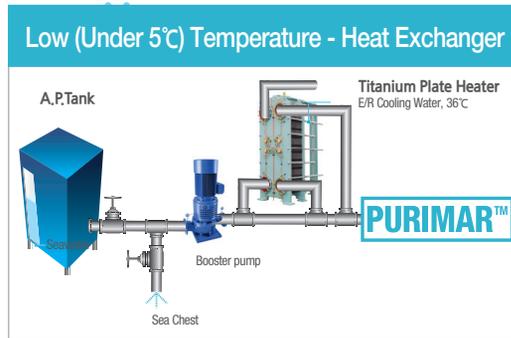
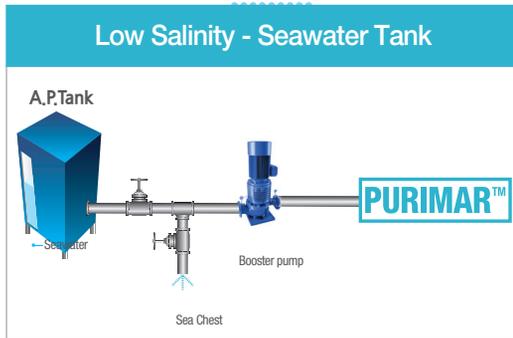
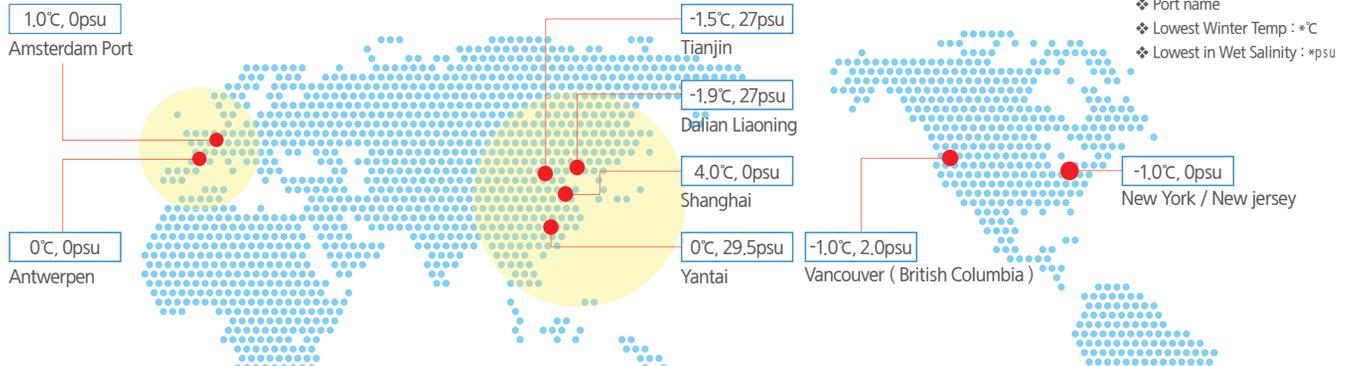
Filter

- Filter Capacity (m³/hr) : 250,500,750,1000,1500,2000,2500,3000,3500,4000,4500
- Back-flushing pump : Enforced self cleaning
- Removal rate : Over 99.9%
- Pressure ranges : 5bar, 16bar

Auto Backflushing Filter	Element	Item	Description
		Model	11 model
		Filter Capacity (m ³ /hr)	250,500,750,1000,1500,2000,2500,3000,3500,4000,4500
		Back-flushing pump	Enforced self cleaning
		Filtration ratings	Mesh 50µm Crease
		Removal rate	Over 99.9%
		Housing materials	Carbon steel
		Material of elements	SUS316L
		Internal corrosion protection	PE Coating
		Pressure drop	Normal 0.2bar, Max 0.5 bar (Back flushing)
		Back flushing pressure	Filter Outlet Pressure + 3bar
		Electrical protection class	IP44, IP55, IP56
		Pressure ranges	5bar, 10bar, 16bar

PURIMAR™ Solution

Low Temperature & Low Salinity Solutions



• World Port Ranking - 2008 (American Association Port Authorities - Total Cargo Volume)

PURIMAR™ is installed in various vessels (Bulk Carrier, Tanker, Product Oil Carrier, LNGC & Container, etc.)

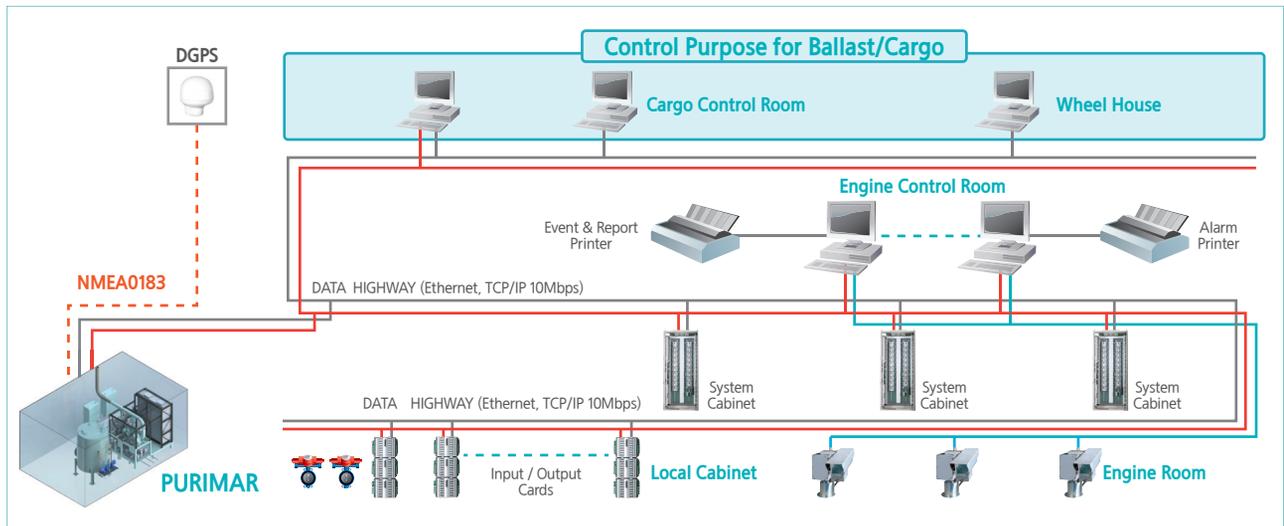


Easy installation for
New vessels and
Existing vessels



PURIMAR™ Control System

System integration with Vessel Automation System



The Integration with Vessel Automation System

- PURIMAR™ system that consists of SSAS-Pro can be interworked with Vessel's Automation system.
- Integration package based on SSAS-Pro can achieve cost reduction and optimization of system configuration.

User Interface of PURIMAR™

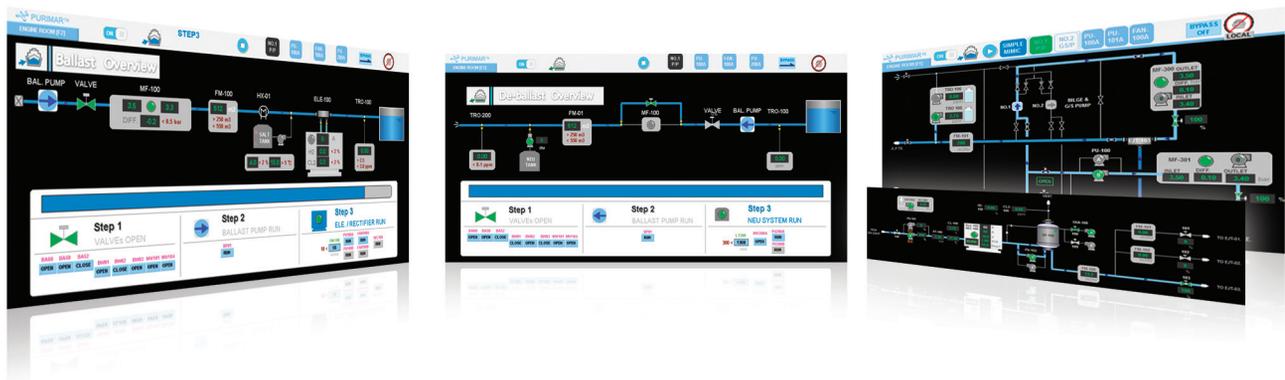
PURIMAR's UI is designed user-friendly by GITOS(Graphic Intelligent Tools of Systems) which is a process control system of SSAS-Pro and provides the most optimized automation system. Through the UI, it is able to build an environment in which a user can operate PURIMAR in a simple and easy way.

Main Function

- Various user interface
- Ballast / Deballast mode function
- Monitoring & Alarm function
- Data logging function
- Global position indication function by user command

Ballast / Deballast Mode

- User selection function by ballast / deballast mode
- Automatic control by ballast pump driving
- Automatic control by optimum solution





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KOREA	S&SYS Co.,Ltd. (HQ)	JAPAN	 Tsuneishi Co.,Ltd.	BRAZIL	METALOCK Brazil Ltd.
KOREA	STK Engineering Co.,Ltd.	SINGAPORE	Treys Ple Ltd.	BRAZIL	DZETA Marine & Offshore
KOREA	JEWON Engineering Co.,Ltd.	SINGAPORE	 AEROTEC Pte.Ltd.	EUROPE	
KOREA	STA	TAIWAN	 Yimaritime Co.,Ltd.	GERMANY	Mare systems
KOREA	DEX	CENTRAL AMERICA		ITALY	MASTER CONTROL
CHINA	Seven Seas Electronic Co.,Ltd.(Shanghai)	PANAMA	PASRAS S.A	GREECE	 D.C.S.I Ltd.
CHINA	Seven Seas Electronic Co.,Ltd.(Qingdao)	MIDDLE EAST		NETHERLAND	 Euronavig Holdings
CHINA	Seven Seas Electronic Co.,Ltd.(Dalian)	U.A.E	MARITRONICS	TURKEY	 Ozay Marine Group
CHINA	SAMSUN Marine Technology(HK) Co.,Ltd.	U.A.E	 Tensosys	AFRICA	
CHINA	 Health Lead Development Co.,Ltd.	NORTH AMERICA		Nigeria	Radial Circle
CHINA	 SJE Engineering Co.,Ltd.	USA	MarineBCTec(LA)		
CHINA	SSMT	USA	MarineBCTec(NJ)		
INDIA	 Indostan Corporation	OCEANIA			
JAPAN	 Orient Marine Co.,Ltd.	Australia	UNION		

**  Sales Agency