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REVISIONS

YFMARINE Goltens Singapore Pte Ltd.

SHIP

ORKIM POWER

TITLE

BALLAST WATER MANAGEMENT PLAN

SCALE	DRAWN	MCM	DRAWING NUMBER	HULL NUMBER	REV
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BALLAST WATER MANAGEMENT PLAN

Vessel Name: ORKIM POWER
IMO No: 9546825

REVISION HISTORY

Rev. No	Date	Reason for issue	Prepared by	Verified by	Approved By
A	30/10/2024	For Approval	VJ	TT	GC

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1 INTRODUCTION

Ballast water is essential to control trim, list, draught, stability, or stresses of the vessel. However, ballast water may contain aquatic organisms or pathogens which, if introduced into the sea including estuaries, or into freshwater courses, may create hazards to the environment, human health, property, or resources, impair biological diversity or interfere with other legitimate uses of such areas.

This plan is written in accordance with the requirements of Regulation B-1 of the International Convention for the Control and Management of Vessels' Ballast Water and Sediments, 2004 (the Convention) and the associated Guidelines.

The purpose of the plan is to meet the requirements for the control and management of vessel’s ballast water and sediments in accordance with the Guidelines for Ballast Water Management and the Development of Ballast Water Management Plans (G4) resolution MEPC.127(53). It provides standard operational guidance for the planning and management of vessels' ballast water and sediments and describes safe procedures to be followed.

The selection of appropriate methods of Ballast Water Management should consider the need to ensure that Ballast Water Management practices used to comply with the Convention do not cause greater harm to the environment, human health, property or resources of any States and the safety of vessels, than they prevent.

This plan has been approved by the ABS and no alteration or revision shall be made to any part of it without the prior approval of ABS.

This plan may be inspected on request by an authorized authority. This plan should be kept available for inspection on request by a port state control officer or by a port state quarantine officer.

2 VESSEL PARTICULARS

VESSEL NAME	JP88 STORK
IMO NO	9546825
Vessel type	Oil / Clean Product Tanker
Flag	Malaysia
Port of registry	Port Kelang
Owner	ORKIM SHIP MANAGEMENT
International call sign	9MIS8
Classification Society	ABS
Dimensions	
Length O.A	106.65 m
Length B.P	99.00 m
Breadth (MLD)	18.80 m
Depth, Moulded	9.60 m
Gross Tonnage	5081 Tonnes
Total ballast water capacity	3159.42 m^3
Deepest Ballast Draught	3.989 m
Designated ballast water management officer(rank of officer)	Chief officer
Main ballast water management method(s):	D-2: Ballast water treatment – Filtration & UV

3 PURPOSE

The ballast water management plan aims to assist governments, appropriate authorities, vessel's Masters, operators, owners, port authorities as well as other interested parties, in preventing, minimizing, and ultimately eliminating the risk of introducing harmful aquatic organisms and pathogens from vessels' ballast water and associated sediments while protecting vessel's safety.

Good record keeping is critical to the success of a sound ballast water management program. The appointed ballast water management officer is responsible for ensuring the maintenance of appropriate records and that the ballast water management and treatment procedures are followed and recorded.

It is the owners/managers or master's responsibility to regularly review the plan and ensure that the information contained therein is accurate and updated.

RECORD OF CIRCULATION

This document is to be circulated to ships staff that will be responsible for Ballast Water Management. After reading, the Ballast Water Management Plan it is to be signed and returned to the Ballast Water Management Officer.

Name	Rank	Date Joined	Signature and date

MASTERS MONTHLY VERIFICATION OF LOG AND PROCEDURES

The Master shall verify the correct implementation of the procedures and the log records at monthly intervals in the table below.

Date	Masters Signature	Date	Masters Signature

RECORD OF AMENDMENTS

No	Date	Revised Part	Revision details/description	Signature

4 DESCRIPTION OF THE BALLAST SYSTEM

Ballast water is essential to control trim, list, draught, stability or stresses of the vessel. The following is a description the ballast system used onboard.

4.1 Overview of BWM Method applied

BW treatment is applicable for all ballast tanks. Fore Peak Tank disconnected from ballast system and modified to void tank. Aft peak tanks converted to only fresh water tanks.

4.2 Ballast Tanks

Tank Description	Frame pos.	Capacity(m^3)	Pumps Available
No.1 W.B.T (P)	FR.105 - FR.142	579.10	No.1 Ballast Pump & No.2 Ballast Pump
No.1 W.B.T (S)	FR.105 - FR.142	579.10	
No.2 W.B.T (P)	FR.71 - FR.105	450.84	
No.2 W.B.T (S)	FR.71 - FR.105	450.84	
No.3 W.B.T (P)	FR.34 - FR.71	549.77	
No.3 W.B.T (S)	FR.34 - FR.71	549.77	
TOTAL		3159.42	

4.3 Pump Data

No	Pumps	Rated Capacity	Type	Location
1.	No.1 Ballast Pump	200 m3/h	EHS - 201 MD	Pump Room
2.	No.2 Ballast Pump	200 m^3/h	EHS - 201 MD	Pump Room

5 BALLAST WATER MANAGEMENT OPERATION

5.1 General

Ballast Water Management System (BWMS) means any system which processes ballast water such that it meets or exceeds the ballast water performance standard in regulation D-2. The BWMS includes ballast water treatment equipment, all associated control equipment, monitoring equipment and sampling facilities.

BWMS means equipment which mechanically, physically, chemically, or biologically processes, either singularly or in combination, to remove, render harmless, or avoid the uptake or discharge of harmful aquatic organisms and pathogens within ballast water and sediments. Ballast water treatment equipment may operate at the uptake or discharge of ballast water, during the voyage, or at a combination of these events.

It must be ensured that the ballast water treatment system installed is approved in accordance with Regulation D-2 of the Convention. All systems (type) approved by (or on behalf of) the relevant administration and physically inspected by Class's surveyor after installation on behalf of the administration should fulfil this requirement.

The system should only be operated in accordance with the system design criteria and manufacturer's operational and maintenance instructions. When the system encounters malfunctions or failure, these are to be recorded in the ballast water record book.

6 BALLAST WATER TREATMENT

6.1 Treatment system details

No	Parameter	Specification
1	Manufacturer	LeesGreen
2	Model Name	LS - 350Ex
3	Technology	Mechanical Filtration & Ultraviolet Radiation
4	Operation required	Ballasting & De-Ballasting
5	Installation location.	Cargo Pump Room
6	Number of Ballast pumps to be used	Two ballast pumps

Ballast water treatment system's operation manual

The system should only be operated in accordance with the system design criteria and manufacturer's operational and maintenance instructions given in "LS-OM LeesGreen BWMS Operation Manual V2.4.4".

7 GENERAL DESCRIPTION OF LEESGREEN SYSTEM

7.1 Definition

LeesGreen is a treatment system specifically designed for inactivation and elimination of organisms contained in ballast water, in order to comply with the IMO D-2 and USCG standards for discharge of such water by vessels during their operations

The system is composed of two treatment steps:

- Step 1 **: Mechanical Filtration**

It aims at reducing the amount of total suspended particles, organic or not, present in the sea water, through filtration with a 50 µm screen.

- Step 2 : **Ultraviolet Disinfection**

Without any addition of chemicals, nor creation of active substances, the UV light inactivates the microorganisms present in the water (bacteria, phytoplankton, zooplankton).
The entire operation of the LeesGreen system is automated (valves opening and closing, filter cleaning, UV intensity regulation, event recording, etc).
The use of the LeesGreen system should be integrated to the Ballast Water Management Plan of the ship.

7.2 Process Description

The treatment includes two steps while ballast water is treated both in ballasting intake and de-ballasting discharge to fulfill the complete disinfection.

The start-up procedure and selection of control unit shall be done first as following:

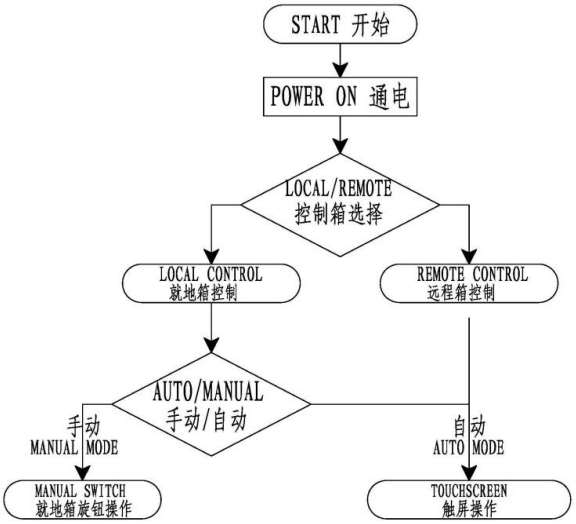


Figure 7- 1 Start-up procedure.

7.2.1 Treatment Process Description

7.2.1.1 Treatment During Ballasting

In ballasting mode, seawater is pumped into LeesGreen BWMS from sea chest. Impurities and microbe with size above 50um are filtered at first and then remaining organisms are disinfected by UV. Meanwhile the backflush water drained from filter is purged out overboard.

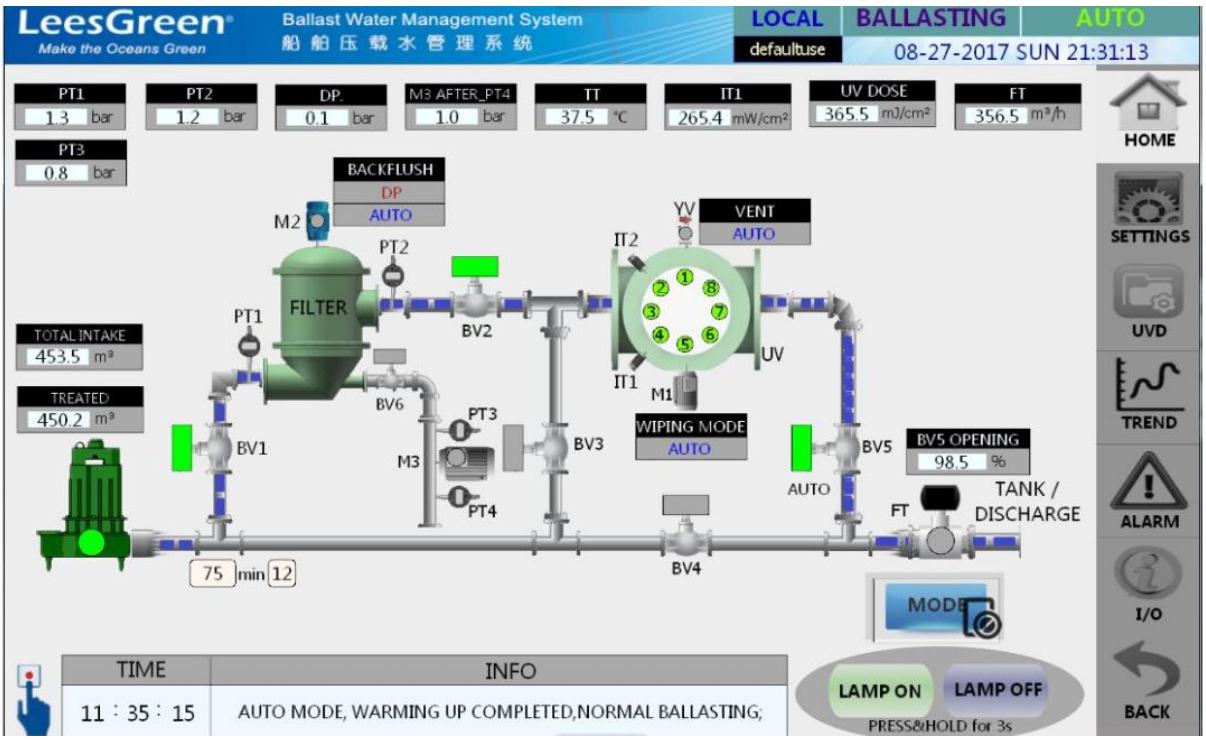


Figure 7- 3 Ballasting Operation.

Seawater > Filter > Removes microbe and other impurities with size ≥50microns > Automatic self-cleaning UV irradiation disinfects smaller organisms > Ballast tank.

7.2.1.2 Treatment During Deballasting

During deballasting, only UV disinfection is completed (the filter is by-passed).
This allows retreating the water, after retention and/or mixing with other managed water volumes in the ship's ballast tanks during voyage, in order to eliminate any possible biological recontamination, and to ensure compliance with the regulations for discharge of ballast water.

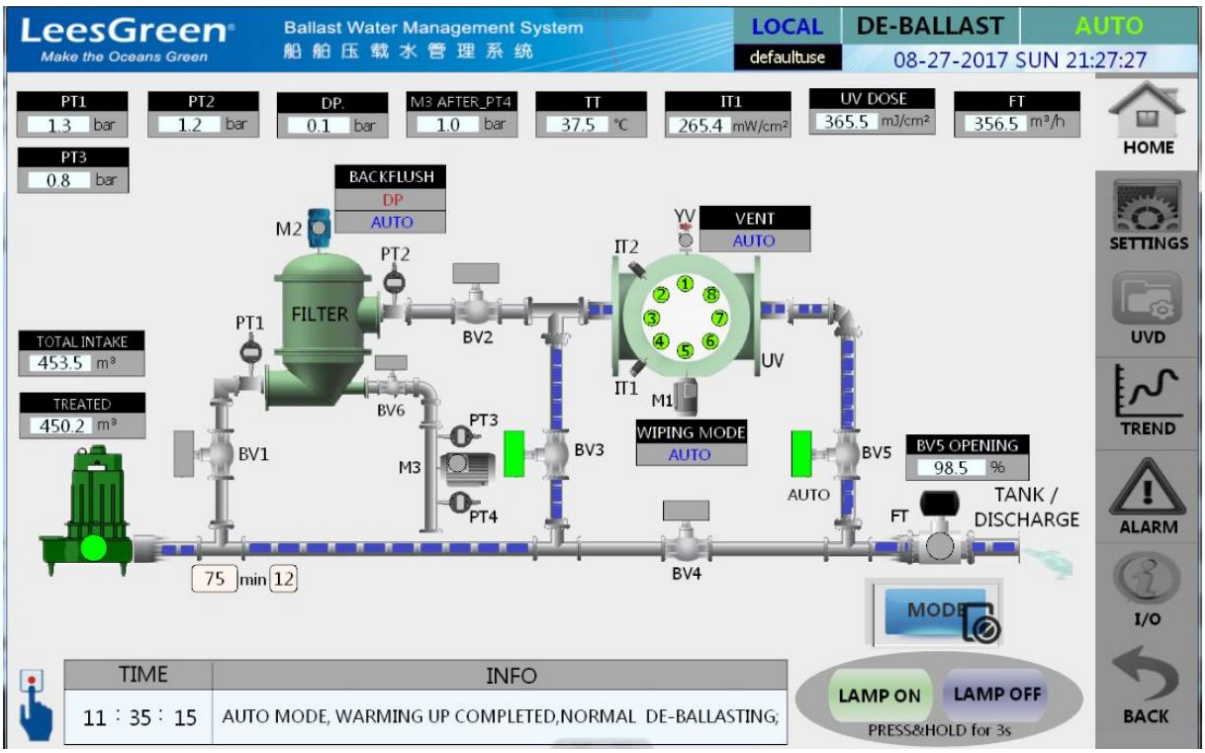


Figure 7- 4 Deballasting Operation

7.2.1.3 Bypass Procedure

The system can be isolated in “BY-PASS” mode when it fails. Meanwhile emergency ballasting or de-ballasting can still be satisfied.
Bypass is only allowed in case of emergency, and all operations will be recorded. Please proceeds under permission by authorities.

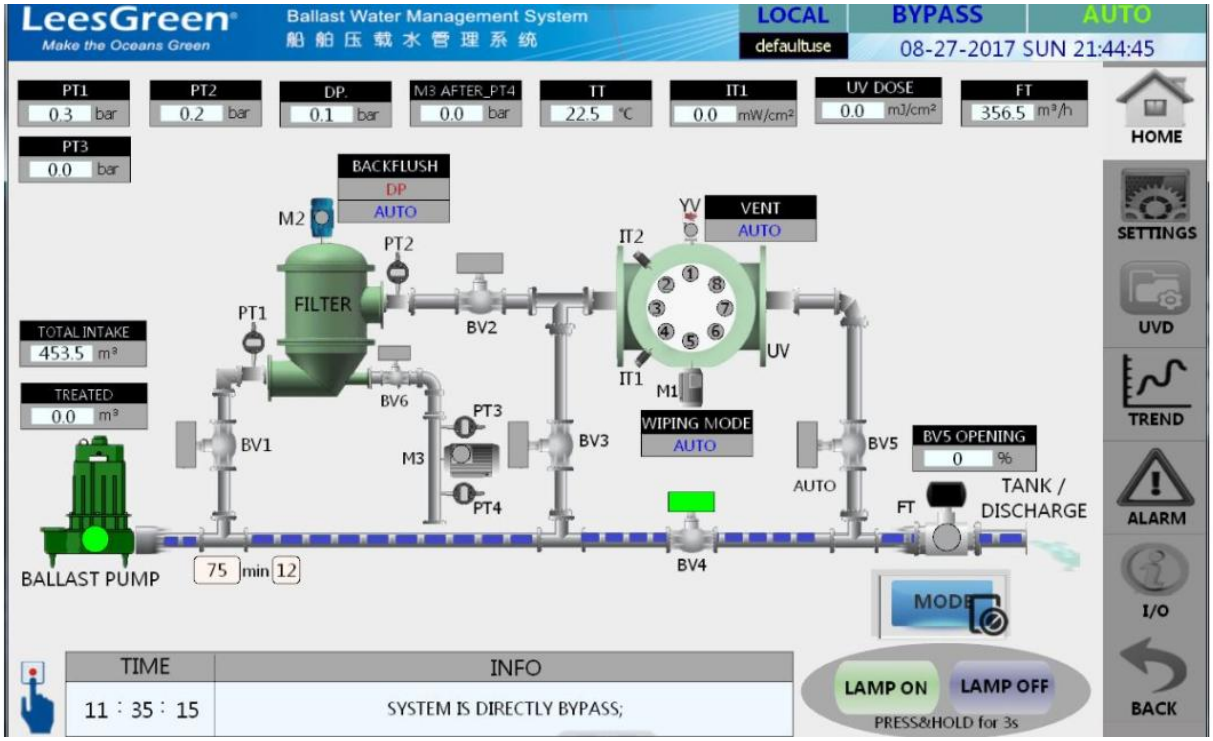


Figure 7- 5 Bypass Procedure

8 PRECAUTIONARY PRACTICES

8.1 Minimizing uptake or transfer of harmful aquatic organisms, pathogens and sediments

Wherever possible, ballast water should be taken outside of port waters and as far from the coast as practicable. Consideration should also be given to the use of dockside water supplies (water not taken directly from the harbour, such as fresh water, potable water etc.). as source for ballast water.

When loading ballast water, every effort should be made to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediments that may contain such organisms. The uptake of ballast water should be minimized or, where practicable, avoided in areas and situations such as:

1. Areas identified by the port state in connection with warnings provided by ports concerning ballast uptake and any other port contingency arrangements in the event of emergency situations.
2. In darkness when organisms may rise in the water column
3. In very shallow water
4. Where propellers may stir up sediment
5. Areas with current large phytoplankton blooms (algal blooms such as red tides)
6. Nearby sewage outfalls
7. where a tidal stream is known to be more turbid
8. Where tidal flushing is known to be poor
9. In areas close to aquaculture
10. Where dredging is or recently has been carried out.

If it is necessary to take on and discharge ballast water in the same location, care should be taken to avoid unnecessary discharge of ballast water that has been taken up in another location.

8.2 Non – release/minimal release of ballast water

The requirements to ballast water management differ from port state to port state. Some have no requirements; some require reporting of ballast water practice and record book, and others require ballast water exchange before arrival in their waters. In case ballast water exchange is requested by the port states, this will be applicable to ballast tanks planned to be discharged in their waters. For some loading conditions not, all tanks need to be discharged, hence these will not have to be exchanged prior to arrival.

8.3 Discharge to reception facilities

If reception facilities for ballast water and/or sediments are provided by a port state, they should, where appropriate, be utilized.

8.4 Procedure for safe tank entry

8.4.1 Confined space entry procedure

8.4.1.1 General

Societies should include in their procedures the requirements that Surveyors should refuse to enter a confined space (or should exit the space) if:

1. Safe entry procedures (such as entry permit, “safe for workers” certificate, “safe for hot work

certificate, etc.) are not in place, have time expired or are not being followed.
2. The Responsible and Competent Persons are not identified.
3. The access and exit arrangements to and within the confined space are not considered safe (where available, multiple entry and exits ways should be opened).
4. Communications arrangements are not adequate.
5. The confined space is not adequately clean to allow safe working.
6. Lighting is not adequate for entry and exit and to allow safe working in the confined space.
7. The atmosphere has not been demonstrated as being safe (safe limits are atmospheric oxygen the range of 20.6% to 22% by volume, combustible gases less than 5% of lower explosive limit, toxics within acceptable limits).
8. Adequate ventilation arrangements are not in place or not functioning.
9. Isolation of the confined space, as applicable, from other tanks, cargo spaces, pipes, etc. .and of machinery in the space, is not confirmed.
10. They are required to wear breathing apparatus.
11. The surveyor may wear a respirator or other escape device if required by an Owner's policy but only if sufficiently trained in the use of such equipment. However, the space should be safe first.
12. Effective communication is adversely impacted by the surrounding noise.
13. Extreme temperature effects are not adequately considered.
14. Electrical equipment in the confined space is not suitable or not in acceptable condition.
15. 15 Toxic Product is contained in an adjacent space, until the followings are carried out:
    - A risk assessment is completed by the vessel's Management Company and the risk is mitigated.
    - All identified controls are confirmed in place prior to tank entry.
16. A dedicated Attendant is not provided by the vessel's management or the management of the facility where the surveyor's activities are carried out for the complete duration of the time spent working in the confined space and/or the Attendant does not have suitable means of initiating emergency response.
17. Adequate emergency response arrangements are not in place.
18. In any other situation where the surveyor has a valid concern over the safety of the confined space.

The points addressed above should be considered and reviewed as changes occur during any Confined Space Entry.

No surveyor should be the first to enter a confined space, and they should be always accompanied where the size of the space permits.

No surveyor should be part of a rescue team.

Surveyors should immediately leave a confined space, by the nearest safe exit, if any alarms sound, or any physical impairment or distress is experienced by the surveyor.

In addition to the above prior to entry into a confined space the following procedure should be adopted:

1. A Safety meeting should be held prior to the survey to discuss all aspects of safety measures.
2. Entry Permit should be obtained for the space to be entered.
3. Identify potentially unsafe conditions by reviewing the following information provided by the owner:
    - Latest content of the spaces to be surveyed.
    - Contents of adjacent spaces.
    - For Gas Carriers: a data sheet for the last cargo.
    - For Chemical Tankers: a data sheet for the previous three cargoes.
4. Evaluate ventilation of the space:
    - Check that the confined space or tank is empty, cleaned, and ventilated.
5. Evaluate need for isolation of the space.
6. Ensure that an Attendant is in place.

7. Ensure that a standby person and/or a rescue team is in place.
8. It is strongly recommended that Emergency Escape Breathing Devices (EEBD) are placed at the entry points of the space to be entered for use in emergency or recovery of a surveyor from the space.
9. Check and evaluate gas measurements taken by the Owner Representative. For testing limit values see item 4 below.
    - As a minimum, oxygen measurements should be carried out before entry into the enclosed space. The Surveyor may request to carry out measurements under his supervision, when deemed necessary.
    - A set of additional control measures should be evaluated depending on what type of confined space is to be surveyed. See Annex, Checklist for Entry into confined space. The surveyor should always use their personal gas measuring equipment during the survey, but this is not intended to substitute the measurements taken by the Owner or Owner Representative.
10. Evaluate need for precaution against extreme temperature. See Part two.
11. Evaluate the lighting arrangements. See Part two.
12. Evaluate if special clothing and/or equipment is required.

A checklist with the items above is recommended to be used for evaluation if the space is safe to enter.

If extensive work is to be carried out within a large space, such as a cargo tank, it is recommended that a full assessment of the tank atmosphere is undertaken after the initial tests have been satisfactorily carried out and recorded. The tank atmosphere should be checked frequently during this entry, with particular attention being placed on testing the work location(s) and places that are inaccessible for testing from the entry point.

8.4.1.2 Entering confined space adjacent to loaded tanks.

It is important to be aware that confined spaces may be, or have been, subject to leakage from the adjacent space. The risk is that such leakage often remains undetected because the space is not subject to regular gas measurements and ventilation.

Confined spaces adjacent to loaded tanks may be entered provided the procedure for entry as given in item 4 below is completed.

Spaces adjacent to cargo tanks, like cofferdams and double bottom tanks may contain accumulated residues from previous cargoes and information about these cargoes is needed to determine proper test methods for the atmosphere in the adjacent spaces.

If a tank is loaded with cargoes having a toxic product hazard identified, or with a toxic symbol in the Data Sheet, no survey should be carried out in a confined space adjacent to that tank. Be aware that toxicants produced by work (like coating, sandblasting and hydro blasting) in a confined space can enter and accumulate in the confined space.

8.4.1.3 Entering confined spaces adjacent to inert tanks

When other tanks in an inert condition are either adjacent or interconnected (e.g. pipeline) to the space to be entered, personnel should be alert to the possibility of inert gas leaking into that space through, for example, bulkhead fractures or defective valves. The risk of this occurring can be minimized by maintaining a small but positive pressure in the space to be entered relative to the inert gas pressure. At all times the procedures on the vessel are to be followed.

8.4.1.4 Permit-to-work and permit-to-enter

The ISM code requires the Company to establish safe practices in ship operation and a safe working environment. This is commonly provided for by a permit-to-work system that is drawn up to provide a formal written safety control system. Non conventional vessels, new construction shipyards and repair facilities, etc. not covered by ISM code may have a similar

permit-to-work system.

A permit-to-work should:

- set out the work to be done, the location and the precautions to be taken.
- Predetermine safe methods of work.
- Provide a clear record that all foreseeable risks have been considered.
- Define the precautions to be taken and their sequence.
- Provide written authority for the confined space to be entered and the work to start and
- the time when the work should cease.

Entry into a confined space should only be allowed after a separate permit-to-enter has been issued. This permit should only be issued after tests have taken place to ensure that the atmosphere is safe for entry.

Note: Use of non-explosion proof equipment like cameras, torches, chipping hammers, may be allowed provided that it is stated in the entry permit issued and the space is safe for hot work or safe for workers and LEL is measured to 0%.

8.4.1.5 Training

All surveyors who are expected to enter and work in confined spaces should be trained in Occupational Safety and Health requirements for such activities. This should include the following:

- Recognizing a confined space
- Role of the Competent Person, Responsible Person, Attendant and Marine Chemist
- How to recognize the hazards and manage the risks associated with Confined Space
- Entries
- PERMIT TO ENTER (PTW or PTE) systems/control procedures at the workplace.
- Requirements for atmosphere testing and the interpretation of their results
- Use of personal multi gas meter.
- Access, exit and safe working requirements.
- Emergency arrangements.

Competency in the areas covered by the training identified above should be periodically assessed and appropriate refresher training should be provided.

9 SEDIMENT MANAGEMENT

Water taken up as vessels' ballast can contain solid alluvial matter that, once the water is becalmed in a vessel's ballast tank, will settle out onto the bottom of the tank and other internal structures.

Aquatic organisms can also settle out of the ballast water and can continue to exist within the sediment. These organisms can survive for long periods after the water they were originally in has been discharged. They may thereby be transported from their natural habitat and discharged in another port or area where they may cause injury or damage to the environment, human health, property and resources.

9.1 General requirements

All practical steps should be taken during ballast uptake to avoid sediment accumulation, it is however recognized that sediment will be taken on board and settle on tank surfaces. The volume of the sediment should be monitored on a regular basis.

Sediment in ballast tanks should be removed in a timely basis and as found necessary. The frequency and timing of removal will depend on factors such as sediment build up, vessel's trading pattern, availability of reception facilities, workload of the vessel's personnel and safety considerations.

9.2 Disposal of sediments to shore

Removal of sediment from ballast tanks should preferably be undertaken under controlled conditions in port, at a repair facility or in dry dock. The removed sediment should preferably be disposed of in a sediment reception facility if available, reasonable and practicable.

One should be aware that sediments lying undisturbed for some time may give off toxic gases and appropriate measures must be taken to protect the crew carrying out the job.

9.3 Disposal of sediments at sea

When sediment is removed from the vessel's ballast tanks and is to be disposed of by that vessel at sea, such disposal should only take place in areas outside 200nm from land and in water depths of over 200m.

Part of the mud may be removed by water movement within a tank to bring sediments to suspension. In double bottom tanks this is achieved by filling clean water 0.5-1 meter sounding in mild weather conditions and keeping it for about 6 hours before pumping it out. In addition the Master may decide to store the sediments onboard the vessel when this will not hamper the security and operational maintenance of the vessel, her cargo and the crew. Special care is to be taken if ballast water has been carried in spaces designated for other purposes, such as fuel, oil, freshwater tanks etc. Disposal of the sediments then depends upon the final mixture, e.g. if ballast water is carried in the fuel tanks, more stringent requirements than described above are to be considered. When sediment is removed from the vessel's ballast tanks and is to be disposed of by that vessel at sea, such disposal should only take place in areas outside 200 nm from land and in water depths of over 200 m.

9.4 Details of the sediment management system on board

Manual cleaning of BW tanks at dry-docking.

10 BALLAST WATER SAMPLING

Sampling of ballast water is primarily a matter for the authorized inspection officers during port state control. For crew members there is unlikely any need to take samples except at the express request and under the supervision of authorized inspection officers.

10.1 General

The table below indicates sampling and access points in pipelines and tanks, to enable crew members to quickly assist the authorized officers of a party that have reasons to obtain samples.

No.	Sample Point	Position	Type
1	Discharge Line (Port side)	FR30 - 158; CL + 3449 ; ER Platform - 2513;	Sampling Facility
2	Discharge Line (Stbd side)	FR30 - 167; CL - 3408 ; ER Platform - 1776;	Sampling Facility

For practical recommendations regarding sampling techniques and procedures, refer to annex to MEPC.173 (58) – G2 Guidelines, addressing the following:

- Sampling from the ballast water discharge line
- Sampling and analysis protocols
- Sample data forms
- Health and safety aspects
- Recommendation for a port state control ballast water sampling kit
- Maintenance, storage, labeling and transportation
- Chain of custody record

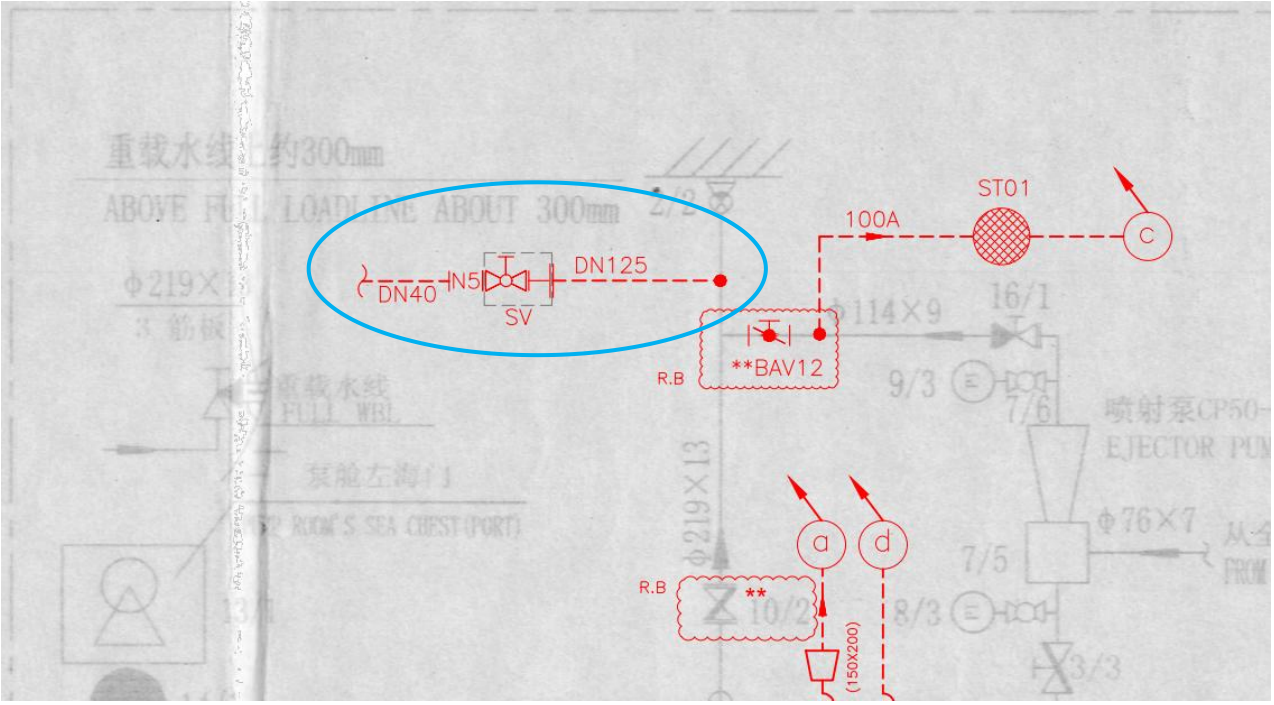
10.2 Sampling for compliance with the performance standard (Regulation D-2)

Compliance with ballast water performance standard (D-2) should be assessed at ballast water discharge, as near to the point of discharge as practicable, during ballast water discharge whenever this is possible.

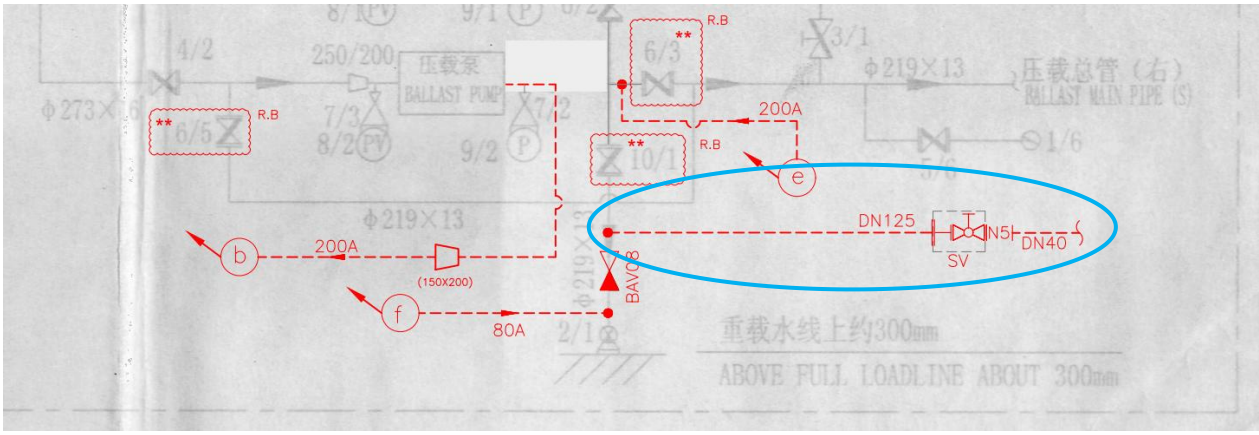
For this vessel, sampling for compliance with the ballast water discharge standard is provided through the following:

For provision of sampling of treated ballast water, sampling points are provided at main ballast discharge overboard .

- Sampling valves at BWTS After treatment (Port)



- Sampling valves at BWTS After treatment (Stbd)



11 METHODS OF COMMUNICATION

This section contains procedures to assist the Master in coordinating the discharge of ballast in waters of a coastal state, local government, or other involved parties. The quick and effective communication between the vessel and coastal state or other involved party becomes vital in mitigating the effects of an unnecessary delay. The requirements and roles of the various national and local authorities involved vary widely between states and even from port to port. Approaches to the responsibility for ballast water exchange also vary. In the majority of coastal states, responsibility for compliance with port state requirements is placed on the vessel owner and the vessel. The port state authorities should be contacted for specific ballast water discharge requirements and reporting, prior to the vessel's arrival in port state's territorial waters. Therefore, the Master with the responsible officer should timely obtain all necessary information and prepare the vessel, accordingly, taking into consideration the safety and operational restrictions as described in this plan and relevant sections. Information on specific port state procedures can be obtained by consulting the company and local agent for latest information and requirements.

The Master is to contact the relevant parties such as coastal state, etc. to operate her ballast water in case of the emergency (fail of power, malfunction of BWTS, etc.).

11.1 Action to be taken by the vessel where coastal state has specific procedures for discharge of ballast water

1. Follow agreed reporting procedures.
2. Contact vessel's agent and/or company to ascertain latest information on ballast discharge.
3. Requirements in the water of respective state.
4. Ensure to timely plan for above actions and that safety and operational restrictions are met.
5. Keep proper records and have them readily available for possible inspection.

11.2 Action to be taken by the vessel where coastal state has no specific procedures for discharge of ballast water

1. Contact vessel's agent and/or company to obtain latest information on ballast discharge requirements in the water of respective state.
2. Carry out discharge of ballast water as per the ballast water management plan.
3. Take into consideration safety and operational procedures related to respective discharge.
4. Keep proper records and have them readily available for possible inspection.

12 DUTIES OF THE BALLAST WATER MANAGEMENT OFFICER

The ballast water management officer is responsible for implementing the procedures of the ballast water management plan.

Duties of the ballast water management officer:

- Ensure the safety of the vessel and crew.
- Ensure that ballast water management and/or treatment procedures are followed and recorded.
- Ensure adequate personnel and equipment is available for the execution of the planned ballast water management operations.
- Ensure all required ballast water management records are maintained and up to date, including the ballast water record book.
- Prepare the ballast water declaration form prior to arrival in port.
- Maintain the ballast water handling log.
- Where required, prepare the appropriate national or port ballast water declaration forms prior to arrival.
- Assist the port state control or quarantine officers for any sampling that may need to be taken.
- Undertake familiarization and training of crew in ballast water management requirements and applicable shipboard systems and procedures.
- Other duties, as specified by the company.

The Master must ensure that the ballast water management plan is clearly understood by the appointed officer and by any other vessel staff that may need to be involved. The ballast water management officer must keep the Master advised on the progress of the ballast water management operations and any envisaged deviations from the agreed plan. Should there be any doubt or if the management plan is not in line with the schedule, the Master shall be advised accordingly.

13 CREW TRAINING AND FAMILIARIZATION

It is essential that the Master, vessel's officer, and crew have an understanding of the need for ballast water management. If crew members understand the reasons for the treatment or exchange of ballast water and associated sediments, they are more likely to ensure that it is carried out effectively and efficiently. Owners, managers, operators and others involved in officer and crew training for ballast water management should consider the following:

- Training for vessels' Masters and crews as appropriate should include instructions on the requirements of the Convention, the ballast water and sediment management procedures and the ballast water record book, drawing particular attention to matters of vessel safety, maintenance of records and reporting requirements in accordance with the Convention.

Vessels' officers and ratings engaged in ballast water exchange at sea must be aware of what is expected of them and should be familiarized and trained in the following:

- Vessel’s pumping arrangements including ballast arrangements.
- Location of air and sounding pipes of all ballast tanks.
- Positions of all ballast tank suctions and pipelines.
- Overboard discharge arrangements and openings for release of water on deck.
- Inspection and maintenance for ensuring that sounding pipes are clear and that air pipes and non-return devices are in good order.
- Methods used for ballast water treatment at sea, the related safety precautions and associated hazards.
- Location and suitable access points for sampling purposes; and
- The method of on-board ballast water record keeping, reporting and recording of routine soundings.

The Master and ballast water management officer should ensure that the personnel assigned key responsibilities in any ballast water treatment procedures are suitable and well trained according to the above. Special attention should be given to the safety aspects related with the subject procedures. All records relating to training are maintained on board for 2 years to identify trainee. That is any document relating to the plan. Provisions for crew training and familiarization include the following:

1. General requirements for ballast water management.
2. Training and information on ballast water management practices.
3. Ballast water treatment systems installed on board.
4. General safety considerations.
5. The ballast water record book and maintenance of records.
6. The operation and maintenance of installed ballast water treatment systems.
7. Safety aspects associated with the systems and procedures used on board the vessel which affect the safety or human health of crew and passengers and/or the safety of the vessel.
8. Precautions for entering tanks for sediment removal.
9. Procedures for the safe handling and packaging of sediment; and 10 Storage of sediment.

Sample crew training record can be referred below.

Training Record for Ballast Water Management Manual

It is hereby confirmed that I/We have been informed by the Vessel's ECO on the IMO's Resolution A.868(20) Guidelines for the control and management of ship's ballast water to minimize the transfer of harmful aquatic organisms and pathogens, Furthermore I have been informed on the Company's "Ballast Water Management Manual" and relative procedures established on board.

Date	Name	Rank	Signature	Remarks	Verified By

Vessel shall prepare two copies of this record, one copy shall keep on board in training file and copy shall sent to Company every three months period .The training shall be carried out in the concept of Specific Familiarization (one week period after the embarkation of the vessel) in accordance with STCW95 Convention A-VI/14 .In addition to Familiarization trainings, Ballast Water Management Training shall carried out and reviewed for officers in three months period.

14 BALLAST WATER HANDLING RECORD BOOK -PARTS 1 & 2

PART 1

Record of ballast water management on board (to be maintained in separate logbook as well, as per flag requirement)

Ship ..... Port of Registry ..... IMO number .....

TANK LOCATION	DATE	INITIAL CONTENT (tonnes)	FINAL CONTENT (tonnes)	GEOGRAPHIC LOCATION OF SHIP (Port or Lat. & Long.)	PUMPS USED, or GRAVITATE	DURATION OF OPERATION	DENSITY	SIGNATURE OF OFFICER IN CHARGE	RANK

Ballast Water Management Officer .....

Page.....

PART 2

Narrative record of events related to ballast water management on board.

Ship ..... Port of Registry .... IMO number .....

Record here events which are relevant to ballast management, and which will be of interest to quarantine officers, such as sediment removal during dry-dock, or tank flushing at sea. Each entry should be completed with the signature and rank of the officer making the entry.

Date	Activity	Comments	Signature/ Rank

Ballast Water Management Officer.....

Page.....

15 CONTINGENCY MEASURES

Vessel Name: ORKIM POWER
IMO Number: 9546825
BWMS Manufacturer: LEESGREEN
BWMS Model: LS-350Ex

PART 1: Reporting – In case of BWMS failure.

1. The responsible officer should report to the Company using the BWMS failure reporting form.
2. The company should report the BWMS failure to the Flag Administration, the BWMS manufacturer and, if the failure is significant, the Class Society.
3. Based on feedback from the Flag Administration and the BWMS manufacturer, the company should agree on a BWMS Repair Plan which would include all relevant supporting information, including historical failure and a schedule with a specific timeline for the repair to be completed (see Part 3 for guidance on the BWMS Repair Plan).
4. The company should submit a Ballast Water Contingency Measure Request Form to the Port State authority where the ballast water is intended to be discharged. The Ballast Water Contingency Measure Request Form should include a copy of the BWMS Failure Reporting Form, the BWMS Repair Plan and any other relevant documentation regarding the incident (see Annex I: Ballast Water Contingency Measure Request Form).
5. Based on the previous points, the company will confirm to the ship which Contingency Measure is to be undertaken and provide any additional guidance or instructions necessary to fulfil the requirements of the Port State authority, Flag Administration or Class Society, as necessary.

PART 2: Contingency Measures

In case of any failure of the installed treatment system sequential method shall be followed. Contingency measures are to be taken in the event a BWMS fails which is detailed in appendix E.

PART 3: BWMS Repair Plan

The BWMS Repair Plan should be prepared by the BWMS manufacturer in consultation with the company.

The BWMS Repair Plan should provide a schedule with a specific timeline from the BWMS manufacturer as to when the BWMS will be repaired. The schedule for repairs is important as it will allow the owner and the Port State to determine whether this is short term fix or a longer-term issue that may impact future port calls.

As a minimum, the BWMS Repair Plan should provide details of

- the BWMS, its repairs and all previous maintenance and failure history
- the length of time the system has been inoperable.
- the suspected cause of failure
- repairs that have already been completed
- details relating to the attempts to repair the BWMS
- the schedule for the proposed repair (corrective action)
- communications between the company and the manufacturer

- other relevant operational data.

ANNEX – I

Ballast Water Contingency Measure Request Form

1 COMPANY INFORMATION

1.1 Company name: _____

1.2 Designated officer: _____

1.3 Email: _____ 1.4 Tel. _____

2 SHIP'S PARTICULARS

2.1 Name of ship: _____

2.2 IMO Number: _____

2.3 Master: _____

3 BALLAST WATER MANAGEMENT SYSTEM

3.1 BWMS Manufacturer: _____

3.2 BWMS Model: _____

4 PORT/LOCATION OF BWMS FAILURE

4.1 Country: _____

4.2 Name of port or area: _____

4.3 Longitude/Latitude: _____

4.4 Time and date of occurrence: _____hrs __/__/____ (dd/mm/yyyy)

5 INTENDED BALLAST WATER DISCHARGE

5.1 Country: _____

5.2 Name of port or area: _____

5.3 Quantity of ballast water to be discharged (m3): _____

7 ADDITIONAL REMARKS AND INFORMATION

8 PROPOSED CONTINGENCY MEASURE

Insert description of the proposed contingency measure including all relevant details on how the measure will be conducted, as per the details provided in the ship's BWMP.

Insert additional details relating to the time and location the measure will be conducted, as per the Ballast Water Report Form.

9 ADDITIONAL INFORMATION

The following documents are appended to this Form:

1. A completed **Ballast Water Report Form** as per the recommended format provided in the 2017 Guidelines for Ballast Water Exchange (G6) – Resolution MEPC.288 (71)

   For the US, this should be in the format of the National Ballast Information Clearinghouse (NBIC) reporting form.

2. The **BWMS Failure Report** as submitted by the designated officer in charge on the vessel.

3. **BWMS Repair Plan** as developed by the BWMS manufacturer in consultation with the company.

4. **Certificate of Compliance** (IBWMC) with the IMO Ballast Water Management Convention

5. Copy of the **BWMS Type Approval Certificate**

6. Copies of the **Ballast Water Record Book** covering at least the previous three ballast water management operations.

7. *For the US, USCG approval letter for the system or a USCG Alternate Management System (AMS) letter issued to the vessel.*

8. *For the US, reference to the relevant crew training documentation as provided in the BWMP should also be included with a clear description of the training for both operation and maintenance of the BWMS.*

We invite you to review the information provided together with the proposed contingency measure and advise the undersigned as soon as possible of your consent to undertake the procedure described above.

In the event an alternative measure is proposed or more details are required, please contact the undersigned.

Company representative: _____ Date: __/__/____ (dd/mm/yyyy)

ANNEX – II

Ballast Water Management System (BWMS) Failure Reporting Form

1. SHIP'S PARTICULARS

1.1 Name of ship: _____

1.2 IMO Number: _____

1.3 Responsible officer: _____

2. BALLAST WATER MANAGEMENT SYSTEM

2.1 BWMS Manufacturer: _____

2.2 BWMS Model: _____

3. PORT/LOCATION OF BWMS FAILURE

3.1 Country: _____

3.2 Name of port or area: _____

3.3 Longitude/Latitude: _____

3.4 Time and date of occurrence: _____hrs __/__/____ (dd/mm/yyyy)

4 INFORMATION ON THE BWMS FAILURE

4.1 Description of failure (please include any details of the components that failed):

_____

_____

_____

_____

4.2 Details of actions taken to repair BWMS:

_____

_____

_____

_____

4.3 Total volume of ballast pumped prior to failure: _____

4.4 Hours BWMS in use prior to failure: _____

4.5 Tanks treated/partially treated/untreated (TT/PT/UT):

Tank*									
TT/PT/UT									

** Refer to vessel BWMP for ballast tank coding*

5 PROPOSED CONTINGENCY MEASURE(S)

Based on the Contingency Measures listed in the ships' BWMP, the following Contingency Measures are
proposed for this event:

Contingency Measures listed in the BWMP	Proposed Measure*
ECM.1 Repair BWMS at the ballast loading port	
ECM.2 Repair the BWMS en route	
ECM.3.1 Mid-ocean ballast water exchange (BWE) – without BWMS	
ECM.3.2 Mid-ocean ballast water exchange (BWE) – with BWMS	
ECM.4 Ballast water exchange in a designated ballast water exchange area	
ECM.5 Shore based mobile treatment systems at the ballast discharge port	
ECM.5.1 Ballast water treatment boat or barge	
ECM.5.2 Mobile treatment facility transported on a barge or truck	
ECM.5.3 Mobile ballast water treatment equipment	
ECM.6 Discharge to a port reception facility at the ballast discharge port	
ECM.7 Retain ballast water onboard	
ECM.8 Use water from a Public Water System	
ECM.9 Partial ballast water discharge at 12nm from nearest land (US only)	

** Tick as appropriate*

6 ADDITIONAL REMARKS AND INFORMATION

_____

_____

_____

Master's signature _____ Date: __/__/____ (dd/mm/yyyy)

16 RECORDING REQUIREMENTS

The ballast water management officer is to ensure that the Ballast Water Record Book and any other necessary documentation and forms are kept up to date.

The Ballast Water Record Book may be an electronic record system or may be integrated into another record book or system.

The Ballast Water Record Book entries shall be maintained on board the vessel for a minimum period of two years after the last entry has been made. Thereafter, the record book should be maintained in the company's control for a minimum period of three years.

In the event of discharging of ballast water pursuant to regulations A-3, A-4 or B-3 or in the vent of the accidental or exceptional discharge of ballast water not otherwise exempted by the Convention, an entry shall be made in the Ballast Water Record Book describing the circumstances, and the reason for, the discharge.

Each operation concerning ballast water shall be fully recorded without delay in the Ballast Water Record Book.

In the event of discharging of ballast water pursuant to regulations A -3, A-4 or B-3 or in the event of the accidental or exceptional discharge of ballast water not otherwise exempted by the Convention, an entry shall be made in the Ballast Water Record Book describing the circumstances, and the reason for, the discharge.

Each operation concerning ballast water shall be fully recorded without delay in the Ballast Water Record Book.

When the systems encounter failure and/or malfunctions, these are to be also recorded in the Ballast Water Record Book.

The control equipment of the ballast water treatment system is able to store data for at least 24 months.

The requirements for type approval are that the control equipment should be able to display or print a record for official inspections as required.

In the event the control equipment is replaced, means should be provided to ensure the data recorded prior to replacement remains available on board for 24 months

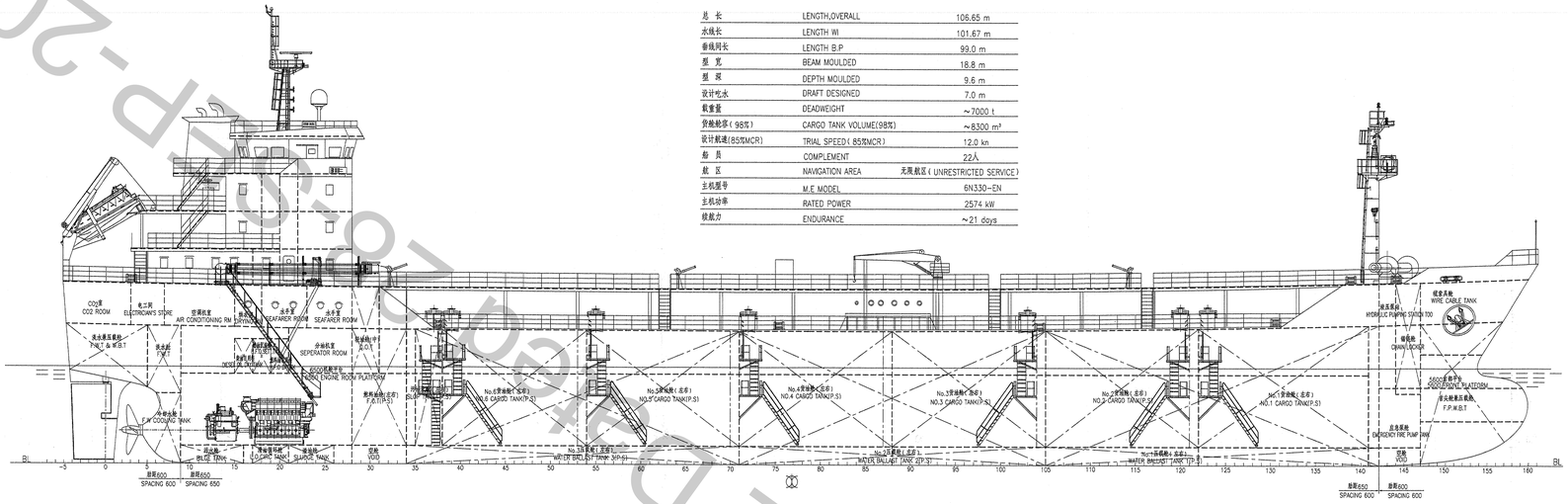
APPENDIX

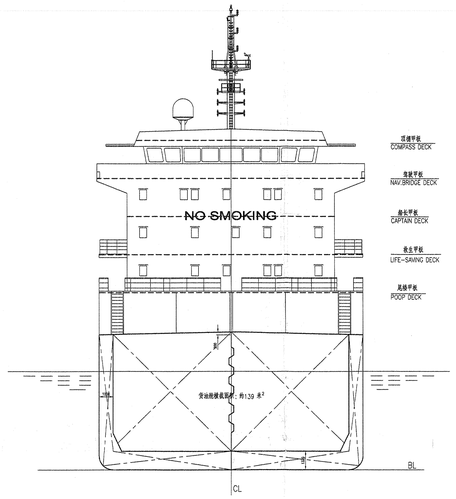
Appendix-A: General Arrangement

XS501-020-01

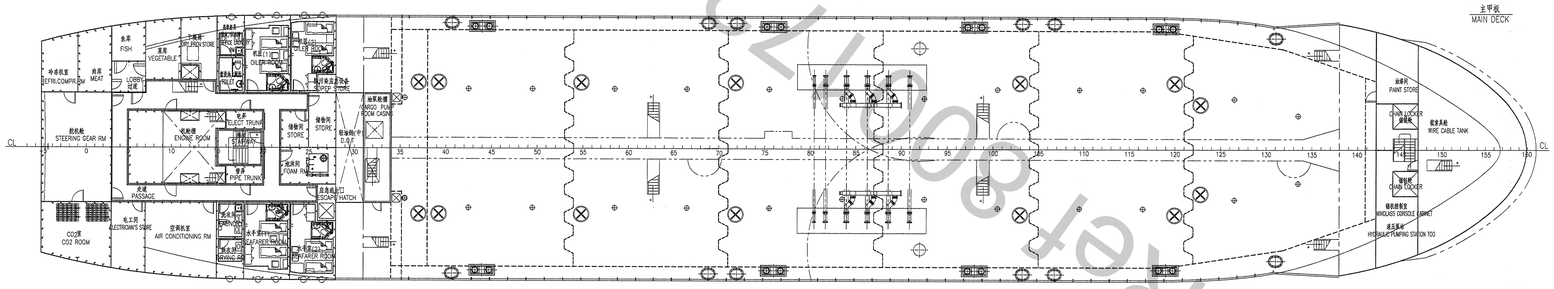
主要数据(PRINCIPAL PARTICULARS)

总长	LENGTH,OVERALL	106.65 m
水线长	LENGTH WI	101.67 m
垂线间长	LENGTH B.P	99.0 m
型宽	BEAM MOULDED	18.8 m
型深	DEPTH MOULDED	9.6 m
设计吃水	DRAFT DESIGNED	7.0 m
载重量	DEADWEIGHT	~7000 t
货舱舱容(98%)	CARGO TANK VOLUME(98%)	~8300 m³
设计航速(85%MCR)	TRIAL SPEED(85%MCR)	12.0 kn
船员	COMPLEMENT	22人
航区	NAVIGATION AREA	无限航区(UNRESTRICTED SERVICE)
主机型号	M.E MODEL	6N330-EN
主机功率	RATED POWER	2574 kW
续航力	ENDURANCE	~21 days

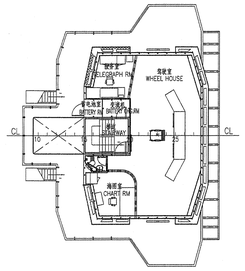




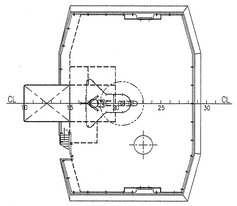
主甲板 MAIN DECK



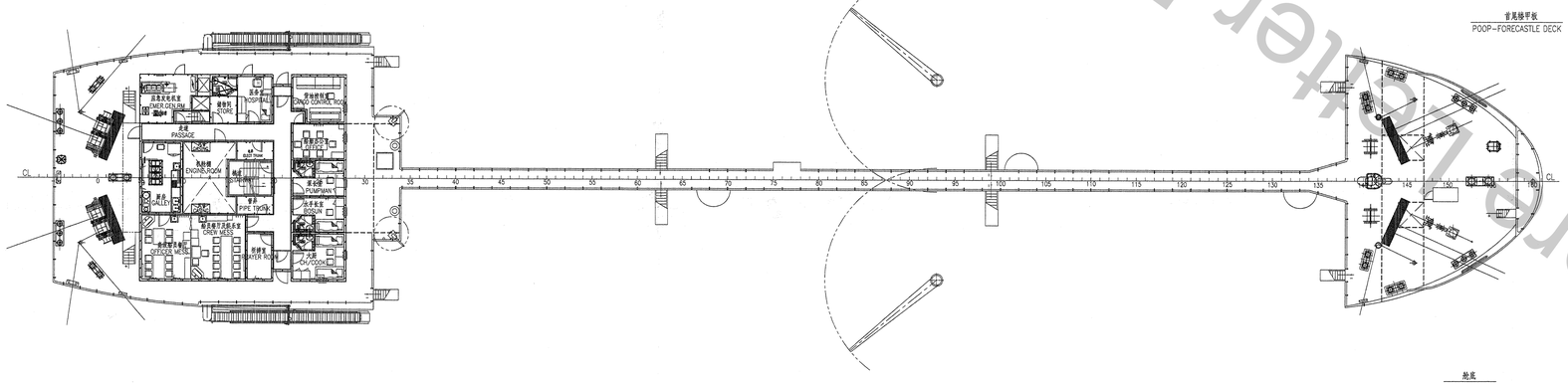
驾驶甲板 NAV.BRIDGE DECK



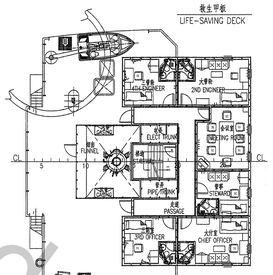
顶棚甲板 COMPASS DECK



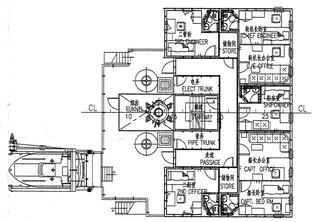
首尾楼甲板 POOP-FORECASTLE DECK



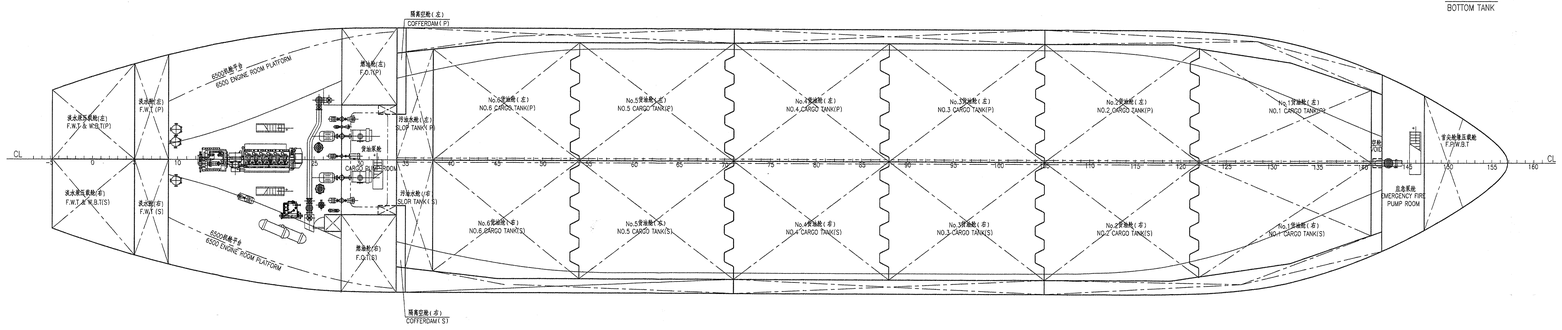
救生甲板 LIFE-SAVING DECK



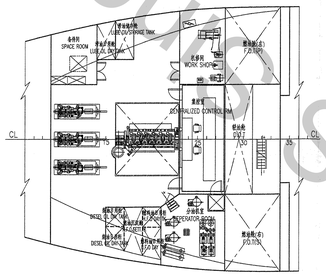
船长甲板 CAPTAIN DECK



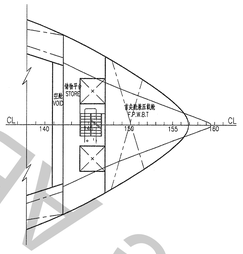
船底 BOTTOM TANK



6500机舱平台 6500 ENGINE ROOM PLATFORM



5600首楼平台 5600 FRONT PLATFORM



KOSMO NAURA
INV.NO.022057 | CERT.NO.333876
HULL NO.YX06-7000-01

总布置图 GENERAL ARRANGEMENT					7000 DWT CLEAN PRODUCT TANKER	
DES.	CHE. 1	CHE. 2	APPR.	DRW.	DATE	FINAL DRAWING	XS501-020-01
SCALE 1:150	W(kg)	CLASS ABS	REV.	SHEET 1/1		JIUJIANG XIANGSHENG SHIPYARD CO., LTD.

AREA: 1.0m²

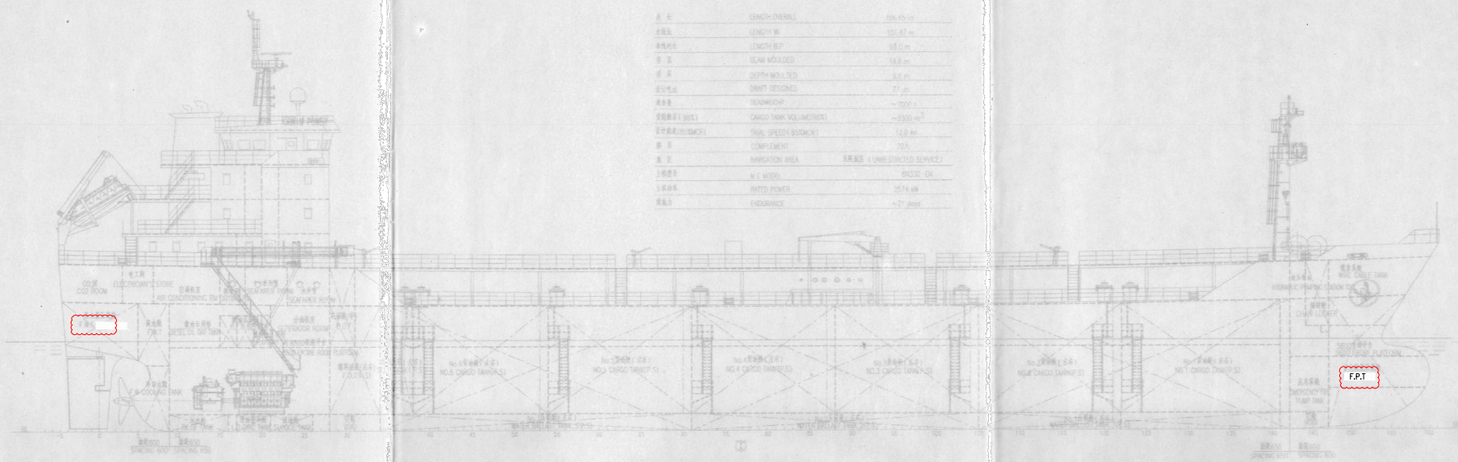
Ref. 8021 Date 2020-07-17 Buyer Singapore VBS

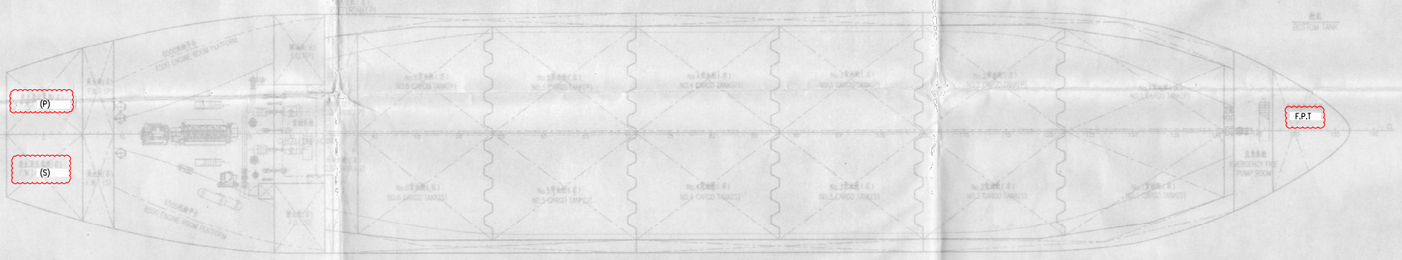
Appendix-B: Capacity Plan

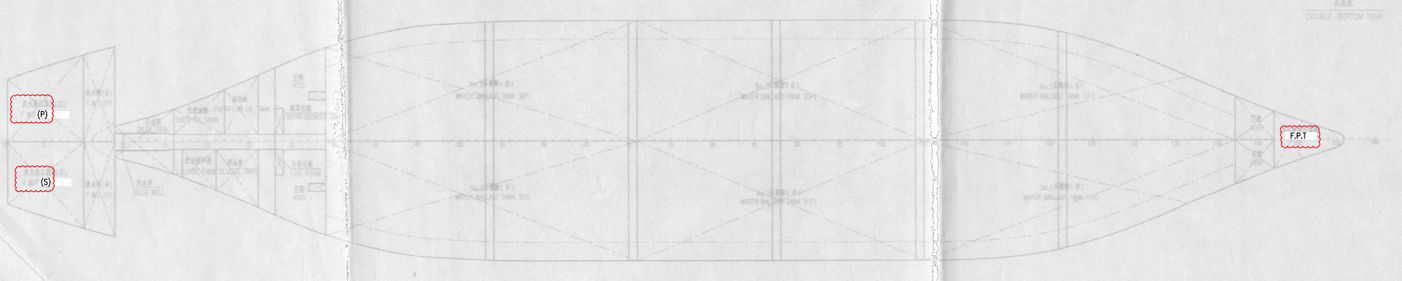
YX506-020-11

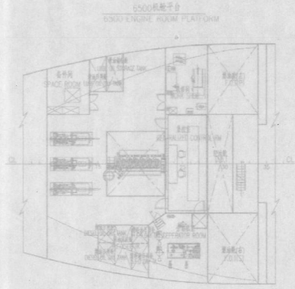
主要尺度 (PRINCIPAL PARTICULARS)

总长	LENGTH OVERALL	109.45 m
水线长	LENGTH W/L	101.47 m
垂线长	LENGTH B/P	98.0 m
型宽	BEAM MOULDED	16.8 m
型深	DEPTH MOULDED	9.0 m
设计吃水	DRAFT DESIGNED	7.7 m
满载吃水	SCANTLING	~7.9 m
货油舱容积(散装)	CARGO TANK VOL.(METRIC)	~2300 m^3
试航速度(空载/满载)	TRIAL SPEED (B/S&MCR)	12.0 kn
船员	COMPLEMENT	19人
航区	NAVIGATION AREA	无限航区 (UNRESTRICTED SERVICE)
主机型号	M.E. MODEL	6N330C-EVI
主机功率	RATED POWER	2574 kW
续航力	ENDURANCE	~27 days









DENSITY OF LIQUID

LIQUID	DIESEL OIL	LUBE OIL	FUEL OIL	FRESH WATER	SEA WATER
DENSITY(t/m³)	0.84	0.9	0.96	1.00	1.025

CARGO OIL TANK

TANK NAME	FRAM	CAPACITY (m³)	CENTRE OF FLOUR(CM) TO AMIDSHIP	TO BASELINE	LIQUID SURFACE INERTIAL MOMENT (m⁴)
NO.1COR(P/S)	FR122-FR141	557.55x2	34.493	6.028	319.2
NO.2WBT(P/S)	FR105-FR122	717.47x2	23.287	5.870	493.0
NO.2CORE	FR99-FR105	155.57x2	17.474	5.524	534.9
NO.4CORE	FR57-FR66	154.30x2	3.416	5.517	534.9
NO.5CORE	FR54-FR57	154.59x2	-3.454	5.518	534.9
NO.6CORE	FR46-FR54	626.14x2	-10.054	5.708	465.6

BALLAST TANK

TANK NAME	FRAM	CAPACITY (m³)	CENTRE OF FLOUR(CM) TO AMIDSHIP	TO BASELINE	LIQUID SURFACE INERTIAL MOMENT (m⁴)
NO.1BALLAST(P/S)	FR105-FR142	579.10x2	30.413	3.624	1047.0
NO.2BALLAST(P/S)	FR79-FR105	930.84x2	12.246	3.409	1497.5
F.P.T (VOID)	FR147-FR160	196.38	47.679	5.693	344.8
F.W.T (P/S)	FR147-FR160	196.38	47.679	5.693	344.8

FRESH WATER TANK

TANK NAME	FRAM	CAPACITY (m³)	CENTRE OF FLOUR(CM) TO AMIDSHIP	TO BASELINE	LIQUID SURFACE INERTIAL MOMENT (m⁴)
F.W.T(P/S)	FR-FR0	52.24x2	-45.258	8.143	61.7
F.W.T(S.T)	FR14-FR0	9.96	58.475	2.903	3.3

FUEL OIL/ASSIGNATE OIL TANK

TANK NAME	FRAM	CAPACITY (m³)	CENTRE OF FLOUR(CM) TO AMIDSHIP	TO BASELINE	LIQUID SURFACE INERTIAL MOMENT (m⁴)
LU OIL TANK(P)	FR14-FR16	5.79	-40.174	6.743	1.4
LU OIL TANK(P)	FR16-FR18	7.32	-38.635	6.577	1.9
S.T.(P/S)	FR5-FR11	95.42	-33.710	3.501	23.6
NO.1 D.O.DAY TK(S)	FR15-FR17	1.11	-38.548	7.757	0.2
NO.2 D.O.DAY TK(S)	FR15-FR17	3.07	-39.507	8.158	0.7
H.F.O.(P/S)	FR28-FR34	144.42	-23.241	6.013	51.6
HFO SETTLING TK(S)	FR17-FR19	8.43	-34.235	7.865	4.3
NO.1HFO DAY TK(S)	FR19-FR21	4.62	-36.950	7.759	0.7
NO.2HFO DAY TK(S)	FR19-FR21	4.86	-36.928	7.943	1.2

OTHER LIQUID TANK

TANK NAME	FRAM	CAPACITY (m³)	CENTRE OF FLOUR(CM) TO AMIDSHIP	TO BASELINE	LIQUID SURFACE INERTIAL MOMENT (m⁴)
OVERFLOW OIL TK(P)	FR22-FR26	8.58	-4.271	8.763	12.3
DIRTY OIL TK(P)	FR16-FR22	8.26	-37.197	9.801	33.3
BILGE TK(S)	FR10-FR16	10.54	-41.163	0.72	10.4
SLUDGE TK(S)	FR21-FR26	111.08	-34.569	0.758	12.1
L.O.SET TK(S)	FR17-FR21	5.47	-33.479	0.803	3.2
SLOP TK(P/S)	FR34-FR38	121.45x2	-26.386	3.910	104.9

ORKIM POWER
IMO NO.9546825 OFF.NO. 334116
HULL NO.YX06-7000-03

舱容图 CAPACITY ARRANGEMENT					7000 DWT CLEAN PRODUCT TANKER	
		APPR.	DWN.	DATE	FINAL DRAWING	YX506-020-11
					JIUJIANG YINXING SHIPYARD CO., LTD.	

Appendix-C: Machinery Arrangement

REV.	DATE	DESCRIPTION	MOD.BY	CKD.BY	APP.BY
B	29.10.2024	TEMPLATE UPDATED	DPM	TT	GLEN
A	23.10.2024	ISSUED FOR CONSTRUCTION.	DPM	TT	GLEN

REVISIONS

YFMARINE Goltens Singapore Pte Ltd.

SHIP

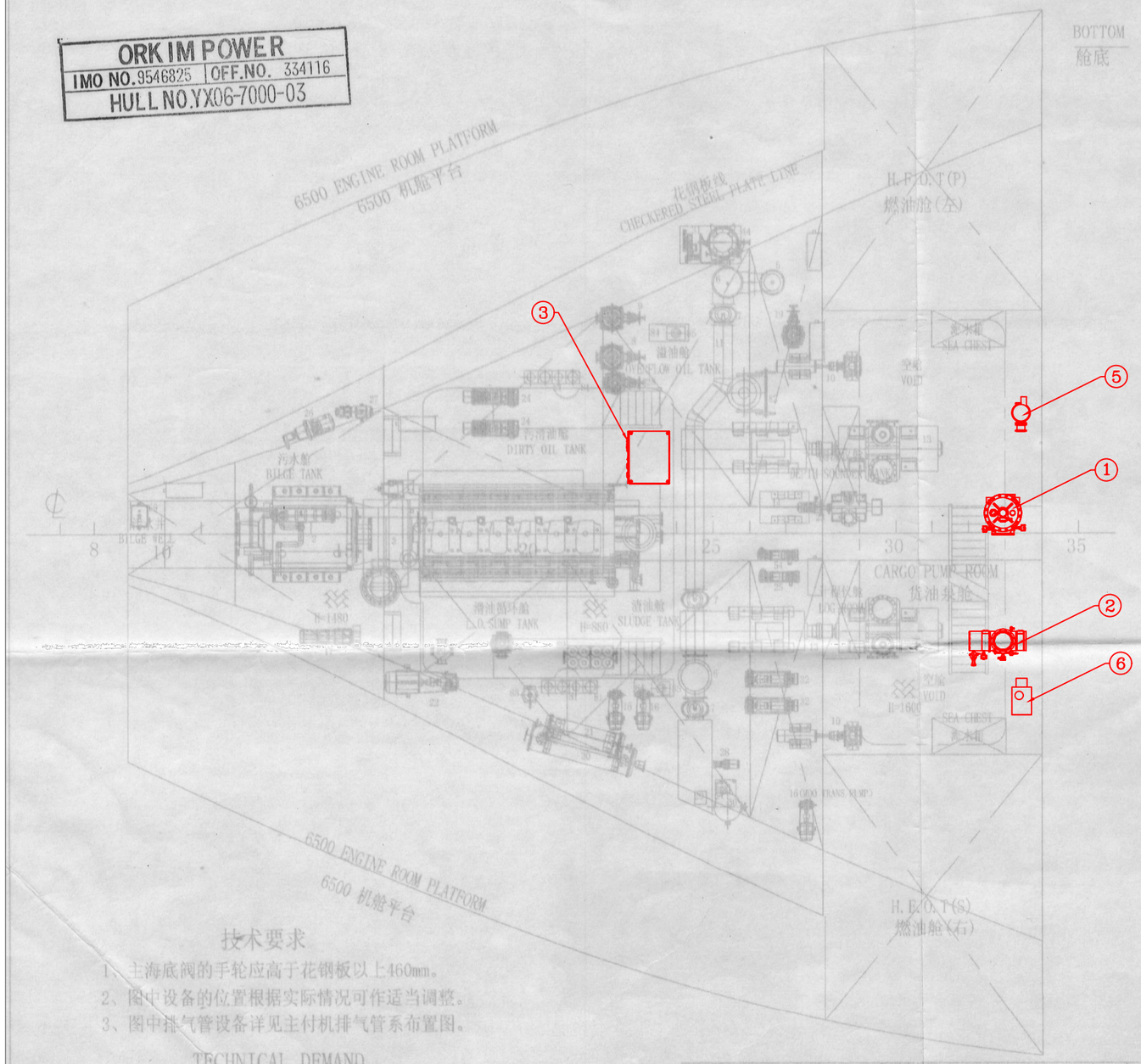
ORKIM POWER

TITLE

BWTS EQUIPMENT ARRANGEMENT DRAWING

SCALE	DRAWN	DPM	DRAWING NUMBER	HULL NUMBER	REV
N.T.S.	CHECKED	TT	GSPL-P1513-ME-0201	--	B
SIZE: A4	VERIFIED	GLEN	DATE:-29.10.2024	SHEET:- 01 OF 04	

ORKIM POWER
IMO NO.9546825 | OFF.NO. 334116
HULL NO.YX06-7000-03



技术要求

1、主海底阀的手轮应高于花钢板以上460mm。
2、图中设备的位置根据实际情况可作适当调整。
3、图中排气管设备详见主付机排气管系布置图。

TECHNICAL DEMAND

1、THE HANDWHEEL OF MAIN SEA BOTTOM VALVE SHOULD BE 460 mm ABOVE CHECKERED STEEL PLATE .
2、THE POSITION OF THE EQUIPMENT CAN BE AJUSTED PROPERTLY ACCORDING TO THE ACTUAL CONDITION.
3、EXHAUST PIPE FROM THE DRAWING IS DETAILED TO M/E AUX/E EXHAUST PIPE SYSTEM ARRANGEMENT PLAN.

SHIPYARD :JIUJIANG YINXING SHIPYARD CO., LTD
SHIP NOS:YX06-7000-03

序号 NO.	代号 CODE	名称 NAME	数量 Q'TY	材料 MATERIAL	单件 EACH	总计 TOTAL	备注 REMARKS
50	A0.16-1 CB*493-87	装用空气瓶 SERVICE AIR BOTTLE	1				
49	A0.16-1 CB*493-87	控制用空气瓶 CONTROL-AIR BOTTLE	1				
48		主空气瓶 MAIN AIR BOTTLE	2				
47	VLH-43	主空压机组 AIR COMPRESSOR GROUP	2				
46	2ZF-0.34/30-B	应急空压机组 EM.AIR COMPRESSOR GROUP	1				
45	SBT-25	生活污水处理装置 SEWAGE HANDLING DEVICE	1				
44	USH/C-10	舱底油污水分离器 BILGE WASTE OIL SEPERATOR	1				
43		柴油分油机 M.D.O PURIFIER	1				
42		燃油分油机加热器 H.F.O PURIFIER HEATER	2				
41	1300L/h	燃油分油机 F.O PURIFIER	2				
40		主机燃油供应单元 M/E F.O PROVISION UNIT	1				
39		废气锅炉给水泵 EXHAUST GAS BOILER FEEDING PUMP	2				
38	TXHJ067B-00	组装式热井模块 ASSEMBLED-SHAPE HOT WELL MODULE	1				
37	ZDR-0.5	蒸汽电加热热水柜(500L) STEAM ELECTRIC HEATY HOT WATER TANK (500L)	1				
36	B0.5 CB455-91	淡水压力水柜 FRESH WATER PRESSURE WATER TANK	1				
35	1.5CWX-4A	日用淡水泵 DOMESTIC SEA WATER PUMP	1				
34	1.5CWX-4A	日用淡水备用泵 DOMESTIC SEA-FRESH WATER STANDBY PUMP	1				
33	1.5CWX-4A	热水循环泵 HOT WATER CIR.PUMP	1				
32	EMC-80MD-C5.5×2	中央空调冷却水泵 CENTRE AIR-CONDITION C.W.P	1				
31		舱底油污水输送泵 BILGE WASTE OIL TRANSFER PUMP	1				
30		滑油分油机 L.O.PURIFIER	1				
29		滑油分油机加热器 L.O PURIFIER HEATER	1				
28		滑油分油机输送泵 L.O.PURI.TRANS.PUMP	1				
27	KCB-83.3	滑油输送泵 L.O.TRANSFER PUMP	1				
26	2CY-14.2/2.5D	齿轮箱滑油备用泵 G/B L.O.PRIMING PUMP	1				
25	TMC-32M-C1.5×2	集控室空调冷却水泵 CCR A/C C.W.P	1				
24	TMC-80MD-C7.5×2	付机海水泵 AUX/E SEA WATER PUMP	2				
23		排油监控取样泵 ODME SAMPLING PUMP	1				
22	YCB50-0.6	主机滑油备用泵 M/E L.O SPARE PUMP	1				
21		主机滑油冷却器 M/E L.O COOLER	1				
20		主机淡水冷却器 M/E FRESH WATER COOLER	1				
19	EMC-125MF-C18.5	主机海水冷却泵及备用泵 M/E SEA WATER COOLING PUMP & SPARE PUMP	2				
18	EMC-125MF-C18.5	主机淡水冷却备用泵 M/E FRESH WATER COOLING SPARE PUMP	1				
17	GCN40-1V-W102	渣油泵 SLUDGE PUMP	1				
16	KCB-200	燃油输送泵 H.F.O.TRANSFER PUMP	3				一台用于轻油 ONE FOR MARINE DIESEL
15		机舱斜梯 E/R INCLINED LADDER	1				
14	CSL-200P	货油舱扫舱泵组 C.P.I SEPTN TANK PUMP GROP	1				
13	CSE-1000P	货油泵组 CARGO OIL PUMP GROUP	2				
12	CSD	变压器 MARINE TRANSFORMER	2				
11	φ325×6.5	海水总管 SEA WATER MAIN PIPE	1				
10	EHS-201MD-C37	专用压载泵组 SPECIAL BALLAST PUMP GROUP	2				
9	EMC-100ME-C37×2	消防总用泵 FIRE FIGHTING GENERAL PUMP	1				
8	EMC-100ME-C37×2	舱底总用泵 BILGE GENERAL PUMP	1				
7	4300 CBM1090-81	闸阀 GATE VALVE	3				
6	A B 300 CBM1061-81	粗水滤器 STRAINER	各1				
5	CB/T 4021-2005 J300	铸钢吸入通海阀 CAST STEEL SEA SUCTION VALVE	1				
4	CCFJ-380HCM	柴用柴油发电机组 DIESEL GENERATOR GROUP	3				
3	HGT6320HID	高弹联轴节 COUPLING	1				
2	GWC60.66	船用齿轮箱 GEAR BOX	1				
1	6N330-EN	主机 MAIN DESIFEL ENGINE	1				

ENGING ROOM & CARGO OIL PUMP ROOM ARRANGEMENT

7000 DWT
CLEAN PRODUCT TANKER

DES.	CHE.1	CHE.2	APPR.	DRW.	DATE
					09-10-24

SCALE	W(kg)	CLASS	REV.	SHEET
1:60		ABS	A	1/6

FINAL DRAWING | YX506-400-02

Jiujiang Yinxing Shipyard Co.,Ltd

SH. SIZE	A3	DRAWING TITLE	DRAWING NO.	REV.	SH. NO.
SCALE	N.T.S	BWTS EQUIPMENT ARRANGEMENT DRAWING	GSPL-P1513-ME-0201	B	02

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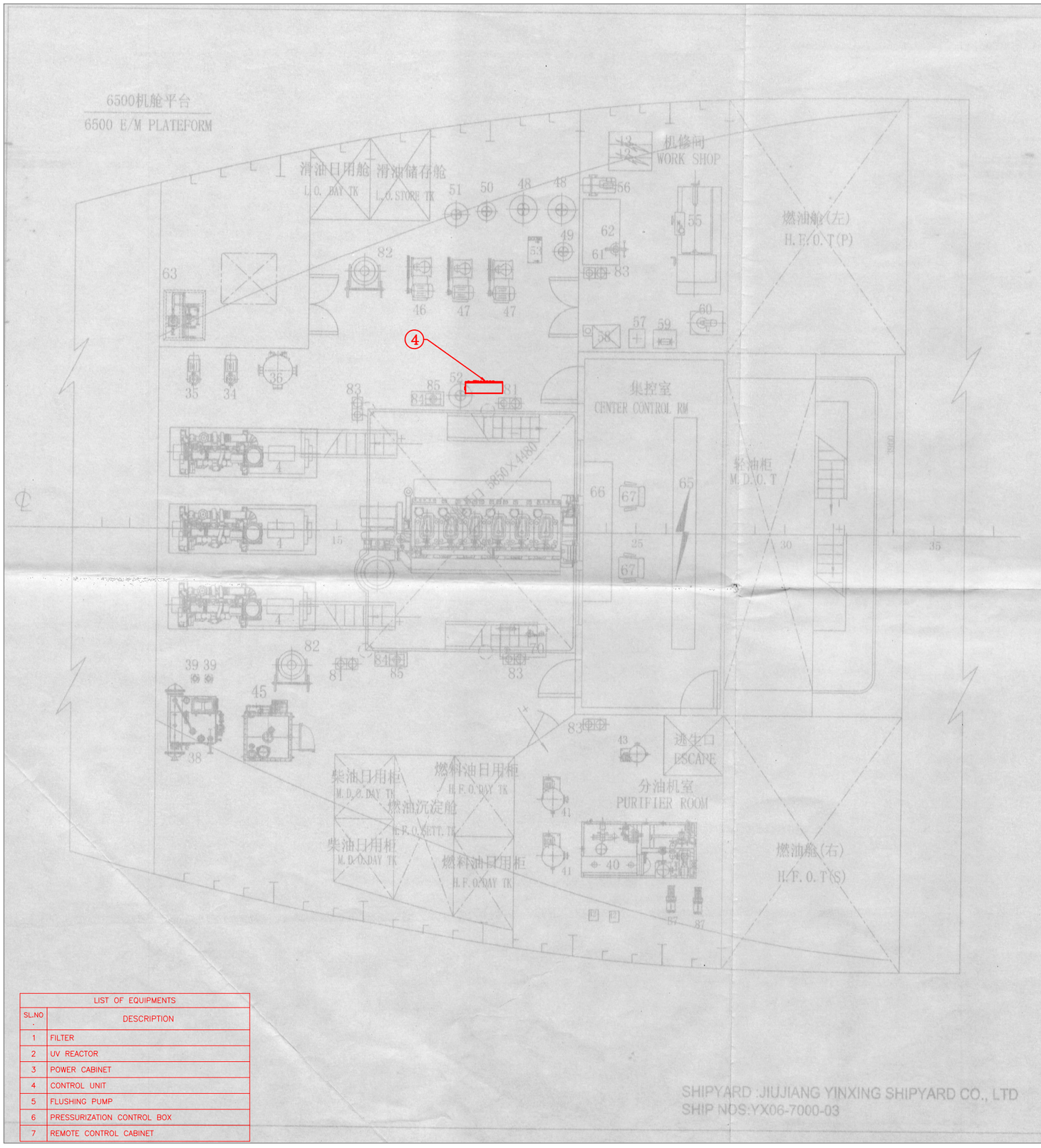

序号 NO.	代号 DESCRIPTION	名称 DENOMINATION	数量 Q'TY	材料 MATERIAL	单件 重量 Single Weight (kg)	总重量 Total Weight (kg)	备注 NOTE
90		滑油粗滤器 L.O.STRAINER	1				
89		滑油半自动清洗滤器 L.O.AUTO FILTER	1				
88		滑油自清滤器 L.O.AUTO FILTER	1				
87		燃油分油机供给泵 FFO FUEL TRANS. PUMP	2				
86	CBZ-50B（Ⅱ型）	货油泵舱风机 CARGO OIL PUMP ROOM FAN	1				
85		船用法兰消火栓 MARINE FLANGE HYDRANT	4				
84		消防水带箱 FIRE FIGHTING WATER HOSE BOX	4				
83		干粉灭火器(5KG) DRY POWDER FIRE EXTINGUISHER(5KG)	8				
82		大型泡沫灭火器 LARGE FOAM EXTINGUISHER	3				
81		泡沫灭火器 FOAM EXTINGUISHER	6				
80	DS454-200	英森空气火星熄灭器 A/E SPARK TRAP SILENCER	1				
79	DS454-150	付机火星熄灭消音器 A/E SPARK TRAP SILENCER	3				
78	DS454-500	主机火星熄灭消音器 M/E SPARK TRAP SILENCER	1				
77	WA1.0	机舱单轨行车 E/R TRAVELLING CRANE	1				
76		焚烧炉烟气风扇 FLUE GAS FAN	1				
75		焚烧炉烟气风门 FLUE GAS DAMPER	1				
74		污油泥柜 DIRTY OIL TANK	1				
73		焚烧炉油柜 OIL TANK FOR INCINERATOR	1				
72	OG120C	焚烧炉 INCINERATOR	1				
71	GFL70-0.7	废气锅炉 EXHAUST BOILER	1				
70		主机膨胀水箱 M/E EXPANSION TK	1				
69		艉轴前密封油柜 STERN SHAFT FOR SEALING OIL TANK	1				
68		艉轴油柜 STERN SHAFT OIL TANK	1				
67		扶手椅 HANDRAIL CHAIR	2				
66		监控台 MONITORING STATION	1				
65		主配电板 MAIN SWITCHBOARD	1				
64		主机膨胀水箱 M/E EXPANSION WATER TANK	1				
63		细水雾组合单元 WATER MIST FIRE EXT. UNIT	1				
62		工作台及工具箱 WORKTABLE AND TOOLBOX	1				
61		台虎钳 TABLE VICE	1				
60	Z512-2	台式钻床 DESK-SHAPE DRILL PRESS	1				
59	S3ST-200H	砂轮机 GRINDING WHEEL MACHINE	1				
58		喷油嘴校验器（主机） ME INJECTOR NOZZLE CHECKER (ME)	1				
57		喷油嘴校验器（付机） FOR INJECTOR NOZZLE CHECKER (AE)	1				
56	AX-320-1	电焊机 ELECTRIC WELDING MACHINE	1				
55	CD6142B	小型车床 MINI TYPE LATHE	1				
54	TMC-32M-C1.5×2	冷藏装置冷却水泵 REFRIGERATION DEVICE C.W.P	1				
53		控制空气干燥器 CONTROL AIR DRYER	1				
52	A0.25-1 CB*493-87	付机空气瓶 A/E COMPRESSED AIR BOTTLE	1				
51	A0.25-3 CB*493-87	甲板用空气瓶 DECK COMPRESSED AIR BOTTLE	1				

LIST OF EQUIPMENTS	
SL.NO.	DESCRIPTION
1	FILTER
2	UV REACTOR
3	POWER CABINET
4	CONTROL UNIT
5	FLUSHING PUMP
6	PRESSURIZATION CONTROL BOX
7	REMOTE CONTROL CABINET

ENGING ROOM & CARGO OIL PUMP ROOM ARRANGEMENT

DES.	CHE. 1	CHE. 2	APPR.	DRW.	DATE
					09-10-24
SCALE	W(kg)	CLASS	REV.	SHEET	
1:60		ABS	A	2/6	

7000 DWT
CLEAN PRODUCT TANKER

FINAL DRAWING | YX506-400-02

Jiujiang Yinxing Shipyard Co.,Ltd

SHIPYARD :JIUJIANG YINXING SHIPYARD CO., LTD
SHIP NOS:YX06-7000-03

SH. SIZE	A3	DRAWING TITLE	DRAWING NO.	REV.	SH. NO.
SCALE	N.T.S	BWTS EQUIPMENT ARRANGEMENT DRAWING	GSPL-P1513-ME-0201	B	03

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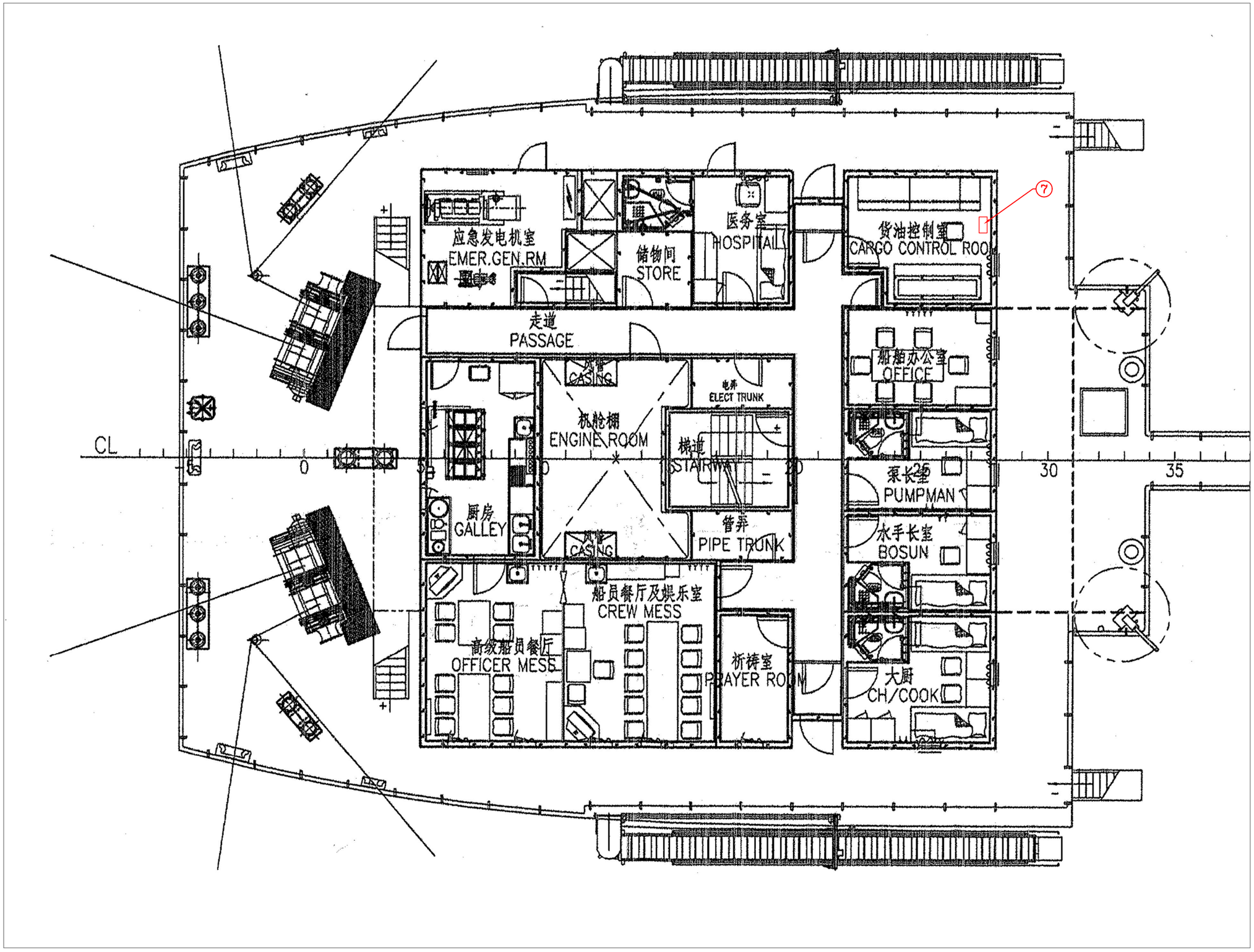

SH. SIZE	A3	DRAWING TITLE	DRAWING NO.	REV.	SH. NO.
SCALE	N.T.S	BWTS EQUIPMENT ARRANGEMENT DRAWING	GSPL-P1513-ME-0201	B	04

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Appendix-D: Type Approval Certificate

中国船级社
CHINA CLASSIFICATION SOCIETY

证书编号/Certificate No.
SH23PTB00216_01

型式认可证书
CERTIFICATE OF TYPE APPROVAL

兹证明本证书所述制造厂具备按照下列标准的要求生产本证书所列产品的能力和条件。
This is to certify that the manufacturer stated in the certificate meets the requirements of the standards listed below and is available with the ability and conditions to produce the products described in the certificate.

制造厂/Manufacturer

上海李氏复大机电科技有限公司
SHANGHAI LEE'S FUDA ELECTROMECHANICAL TECHNOLOGY CO.,LTD.

地址/Address

上海市松江区小昆山镇彭丰路145号
No.145, Pengfeng Road, Xiaokunshan Town, Songjiang District, Shanghai

产品名称/Product

压载水管理系统
Ballast Water Management System

附加标志/Notations

无/Nil.

认可标准/Approval Standard

1. 2004年国际船舶压载水及沉积物控制和管理公约
International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004
2. MEPC.300(72)决议-压载水管理系统认可规则
MEPC.300(72) Code For Approval of Ballast Water Management Systems

用于/Intended for

船舶/Ships

产品明细/Product Description

压载水管理系统/Ballast Water Management System(M0001)

名称/Name	属性（值）/Value	单位/Unit
型号/Type	LS-150(Ex)，LS-250(Ex)，LS-350(Ex)，LS-500(Ex)，LS-700(Ex)，LS-850(Ex)，LS-1150(Ex)，LS-1500(Ex)	
额定容量/Rated Capacity	150/250/350/500/700/850/1150/1500	m^3/h
滤器过滤精度/Filter Filtration Grade	50	μm
额定功率/Rated Power	18/26/38/50/62/74/98/123	kw

证书有效期至/This Certificate is valid until 2028年01月10日/ Jan. 10,2028

发证机构 中国船级社上海分社
Issued by CCS Shanghai Branch

签发日期 2024年01月11日
Date Jan. 11,2024

本证书根据中国船级社规范和相关规定签发。所有证书页为一个整体，必须同时使用。纸质证书每页均须由本社盖章方为有效，电子证书含数字签名方为有效，本证书复印件无效。任何单位和个人均不应摘录或节选本证书的部分内容。有关方对所持证书的真实性有疑问时，可以向我社检验机构咨询。
This Certificate is issued pursuant to the Rules of the Society and related regulation. All pages of the certificate are taken as a whole and are used simultaneously. No paper certificate page is valid without bearing the stamp of the Society, no electronic certificates is valid without the digital signature, and no copied form of the certificate is regarded as valid. Any part of the certificate is not to be extracted or abridged by any unit or individual in any form. Related parties who are doubted about the authenticity of the certificate may inquire of the Society or its offices.

系统组成/System Component	过滤器，紫外反应器，电源柜，控制箱，远程控制箱（可选）|Filter, UV Reactor, Power Cabinet, Control Unit, Remote Control Unit (optional)	

批准的图纸/Approved Drawings

图纸批准号/ Drawings Approval No.: SH14A00348 / SH19PPP20715 / SH20PPP20458 / SH21PPP20645

产品认可试验报告/ Approval Test Report

试验报告编号/ Test Report No.： SHOU-LSFD-2015020
试验报告日期/ Test Report Date： 2015-12-08
试验单位/ Laboratory: 上海海洋大学船舶压载水检测实验室 Ballast Water Detecting Lab of Shanghai Ocean University
试验单位地址/ Test Address: 上海市浦东新区临港新城沪城环路999号 No.999, Hucheng Huanlu, Lingang New city, Pudong, Shanghai

试验报告编号/ Test Report No.： SHOU-LSFD-2015019
试验报告日期/ Test Report Date： 2015-12-08
试验单位/ Laboratory: 上海海洋大学船舶压载水检测实验室 Ballast Water Detecting Lab of Shanghai Ocean University
试验单位地址/ Test Address: 上海市浦东新区临港新城沪城环路999号 No.999, Hucheng Huanlu, Lingang New city, Pudong, Shanghai

试验报告编号/ Test Report No.： LS-TA-2021001
试验报告日期/ Test Report Date： 2021-11-30
试验单位/ Laboratory: 上海李氏复大机电科技有限公司 Shanghai LEE'S FUDA Electromechanical Technology Co.,Ltd.
试验单位地址/ Test Address: 上海市松江区小昆山镇彭丰路145号 No.145 Pengfeng Rd. Xiaokunshan,Songjiang,Shanghai□China

试验报告编号/ Test Report No.： S654A-2019
试验报告日期/ Test Report Date： 2020-01-20
试验单位/ Laboratory: 中国船舶重工集团公司第七〇四研究所船舶环境工程与可靠性实验室 The Marine Environment Engineering and Reliability Laboratory of No.704 Research Institute of CSIC
试验单位地址/ Test Address: 上海市松江区新蟠路160号 160 Xinpan Road, Songjiang District, Shanghai

试验报告编号/ Test Report No.： LS-TA-2020002
试验报告日期/ Test Report Date： 2020-11-18
试验单位/ Laboratory: 上海李氏复大机电科技有限公司 Shanghai Lee's FUDA Electromechanical Technology Co.,Ltd.
试验单位地址/ Test Address: 上海市松江区小昆山镇彭丰路145号 No.145 Pengfeng Road, Xiaokunshan, Songjiang District, Shanghai

试验报告编号/ Test Report No.： S081-GW-2015
试验报告日期/ Test Report Date： 2015-04-07
试验单位/ Laboratory: 中国船舶重工集团公司第七〇四研究所船舶环境工程与可靠性实验室 The Marine Environment Engineering and Reliability Laboratory of No.704 Research Institute of CSIC
试验单位地址/ Test Address: 上海市衡山路10号 10 Hengshan Road Shanghai

试验报告编号/ Test Report No.： SHOU-LSFD-2015018
试验报告日期/ Test Report Date： 2015-12-08
试验单位/ Laboratory: 上海海洋大学船舶压载水检测实验室 Ballast Water Detecting Lab of Shanghai Ocean University
试验单位地址/ Test Address: 上海市浦东新区临港新城沪城环路999号 No.999, Hucheng Huanlu, Lingang New city, Pudong, Shanghai

试验报告编号/ Test Report No.： SHOU-LSFD-2019001
试验报告日期/ Test Report Date： 2019-09-05
试验单位/ Laboratory: 上海海洋大学船舶压载水检测实验室 Ballast Water Detecting Lab of Shanghai Ocean University
试验单位地址/ Test Address: 上海市浦东新区临港新城沪城环路999号 No.999, Hucheng Huanlu, Lingang New City, Pudong, Shanghai

试验报告编号/ Test Report No.： S015-DC-2017

试验报告日期/ Test Report Date： 2017-01-18
试验单位/ Laboratory: 中国船舶重工集团公司第七〇四研究所船舶环境工程与可靠性实验室 The Marine Environment Engineering and Reliability Laboratory of No.704 Research Institute of CSIC
试验单位地址/ Test Address: 上海市衡山路10号 10 Hengshan Road, Shanghai

试验报告编号/ Test Report No.： LS-TA-2020001
试验报告日期/ Test Report Date： 2020-02-28
试验单位/ Laboratory: 上海李氏复大机电科技有限公司 Shanghai Lee's FUDA Electromechanical Technology Co.,Ltd.
试验单位地址/ Test Address: 上海市松江区小昆山镇彭丰路145号 No.145 Pengfeng Road, Xiaokunshan, Songjiang District, Shanghai

试验报告编号/ Test Report No.： S320-FC-2018
试验报告日期/ Test Report Date： 2018-06-29
试验单位/ Laboratory: 中国船舶重工集团公司第七〇四研究所船舶环境工程与可靠性实验室 The Marine Environment Engineering and Reliability Laboratory of No.704 Research Institute of CSIC
试验单位地址/ Test Address: 上海市松江区新蟠路160号 160 Xinpan Road, Songjiang District, Shanghai

试验报告编号/ Test Report No.： S320-FS-2018
试验报告日期/ Test Report Date： 2018-06-29
试验单位/ Laboratory: 中国船舶重工集团公司第七〇四研究所船舶环境工程与可靠性实验室 The Marine Environment Engineering and Reliability Laboratory of No.704 Research Institute of CSIC
试验单位地址/ Test Address: 上海市松江区新蟠路160号 160 Xinpan Road, Songjiang District, Shanghai

试验报告编号/ Test Report No.： LS-TA-2019001
试验报告日期/ Test Report Date： 2019-11-10
试验单位/ Laboratory: 上海李氏复大机电科技有限公司 Shanghai Lee's FUDA Electromechanical Technology Co.,Ltd.
试验单位地址/ Test Address: 上海市松江区小昆山镇彭丰路145号 No.145 Pengfeng Road, Xiaokunshan, Songjiang District, Shanghai

试验报告编号/ Test Report No.： SH14T00125
试验报告日期/ Test Report Date： 2015-12-10
试验单位/ Laboratory: 上海李氏复大机电科技有限公司 Shanghai Lee's FUDA Electromechanical Technology Co.,Ltd.
试验单位地址/ Test Address: 上海市松江区小昆山镇彭丰路145号 No.145 Pengfeng Road, Xiaokunshan, Songjiang District, Shanghai

认可后的产品检验方式/ Method of Product Inspection after Approval

按规范认可后应进行产品检验的产品/The product should be inspected in term of the rules:
认可后的产品检验应由本社验船师根据本社规范规定按批准的产品检验计划进行检验，经检验合格后由本社颁发船用产品证书。
After approval, product inspection should be carried out by the Surveyor of the Society in accordance with the approved product inspection scheme, and the Marine Product Certificate will be issued by the Society upon satisfactory inspection.

认可保持条件/ Maintenance Requirements of Approval

1.型式认可后，如果产品及其重要零部件的设计、所用材料或制造方法有所改变，且影响到产品的主要特性、特征；或产品的性能指标有所更改，且超过认可的范围，则有关图纸和文件应经检验机构审批。并在检验机构认为必要时，经本社检验人员见证有关试验和进行检查，其结果应能证实仍符合认可条件。
After type approval, if there are changes to the design, materials used or manufacturing method of the product and important components and such changes affect major characteristics and properties of the product, or property indexes of the product are changed and exceed the scope of approval, related drawings and documents are to be examined and approved by the concerned survey office. Where deemed necessary by the survey office, the surveyor to the Society will go to witness relevant tests and conduct inspection and the results should be able to demonstrate compliance with the approval conditions.
2.工厂的质量管理体系应保持有效运行，并且与认可时一致。如果质量管理体系发生改变，应经原体系认证机构审核并报本社批准。
The quality management system of the factory shall be ensure effective operation, and shall be the same as the situation of approval. If there are any changes to the quality management system, auditing of the original certification organization for quality management system and the society's approval shall be obtained.
3.认可证书有效期内，如果出现可能导致本社取消认可的情况，工厂应及时采取有效的纠正措施。
Within the validity of the approval certificate, if cases occur that may cause the Society to

withdraw the approval, the manufacturer should take corrective actions in a prompt and effective manner.
4.在认可证书有效期内，本社检验人员可在未经事先通知的情况下对工厂的产品制造过程进行审核，以验证产品的生产是否符合业经本社批准的图纸和文件。工厂应予以配合。
Within the validity of the approval certificate, the surveyor to the Society may pay unannounced audit to the manufacturing process of the product in order to confirm whether it is in compliance with the drawings and documents approved by the Society. The factory should provide an active cooperation and necessary for the surveyor.
5.如果属于获得型式认可B 模式证书，且无需颁发船用产品证书/等效证明文件的情况，证书获得者应接受本社每年一次的定期审核，定期审核日为认可证书期满之日对应的每一周年日，检查工作应在周年日的前后三个月内进行。
If belong to the situation of the product has type approval mode B certificate, and marine product certificate/equivalent document is not necessary, those who have obtained the certificate should be subject to periodical audit every year. The date of periodical audit shall be each anniversary date which corresponds to the date of expiry of the relevant certificate and the periodical audit shall be done within a time span of three months before and after the annual surveillance date.

备注/Remarks

本证书由原型式认可证书（No.SH21PTB00193_01）换新并替代原证书。
This certificate is renewed from the previous Type Approval Certificate No. SH21PTB00193_01.

本社已审核了产品厂无石棉声明，但本社的审核不免除产品厂按照合同关系向订货方保证产品无石棉的责任。
The declaration of asbestos-free submitted by manufacturer has been reviewed by the Society. However, liability of the manufacturer to guarantee the products are asbestos-free to purchaser under contract will not be exempted.

规定的操作限制条件：
Limiting Operating Conditions imposed are described in this document.
过滤器进口压力 Filter Inlet Pressure ： ≥ 0.15 MPa
紫外线透射率 UVT ： ≥50%（100%TRC）
紫外线辐射强度 UVI ：≥ 250 W/m2 （100%TRC）
温度 Temperature ：无限制 Not Applicable
盐度 Sailinity : 无限制 Not Applicable
存储时间 Holding Time : ≥24小时 hour

防爆型/Explosion-proof：
防爆型压载水管理系统在对应普通产品型号后加注"Ex"。
They are Explosion-proof type when the "Ex" was added after the type of ordinary products.
该系统防爆部分可以用于船舶危险区域，防爆等级应满足船级社对其安装在船上位置的要求。
The Explosion-proof part of Ballast Water Management System is approved for use in hazardous area. Explosion-proof grade of electrical control parts should meet the classification society requirements of the installation position in ship.
本认可产品的防爆性能参数基于制造厂提交的防爆合格证（签发机构：国家级仪器仪表防爆安全监督检验站，证书号：GYB21.3553X、GYB21.3554、GYB23.1988，防爆标准：GB3836.1-2021、GB3836.2-2021、GB3836.3-2021、GB3836.4-2021、GB/T3836.5-2017、GB3836.9-2014、GB/T3836.18-2021），非中国船级社认可。
The Explosion-proof parameters of the approved products originate from Ex-proof certificates received from manufacturer (Issuring Body: National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation, Ex-certificate No.GYB21.3553X, GYB21.3554 and GYB23.1988, Standards for Ex-proof: GB3836.1-2021、GB3836.2-2021、GB3836.3-2021、GB3836.4-2021、GB/T3836.5-2017、GB3836.9-2014、GB/T3836.18-2021) , not approved by CCS.
本认可产品应持有有效的防爆合格证，否则本证书将自动失效。
The approved products should have valid explosion-proof certificates of conformity, otherwise this certificate will be automatically invalid.

中国船级社上海分社
CCS Shanghai Branch

有使用限制条件
Limiting Operating Conditons Apply

本证书经中华人民共和国政府授权签发
THIS CERTIFICATE IS ISSUED UNDER THE AUTHORITY OF GOVERNMENT OF THE PEOPLE'S REPUBLIC OF CHINA

格式/Form: CP384.2

中 国 船 级 社
CHINA CLASSIFICATION SOCIETY

编号/No. **SH23PTB00216_02**

压载水管理系统型式认可证书
TYPE APPROVAL CERTIFICATE OF BALLAST WATER MANAGEMENT SYSTEM

兹证明，已按压载水管理系统认可规则（MEPC.300(72)决议）要求和规定，对下列压载水管理系统进行了检查和试验。本证书仅对下列压载水管理系统有效。

This is to certify that the ballast water management system listed below has been examined and tested in accordance with the requirements of the specifications contained in the Code for Approval of Ballast Water Management Systems(resolution MEPC.300(72)). This certificate is valid only for the Ballast Water Management System referred to below.

压载水管理系统名称：**LeesGreen压载水管理系统**

Name of Ballast Water Management System:
LeesGreen Ballast Water Management System

压载水管理系统制造商：**上海李氏复大机电科技有限公司**

Ballast Water Management System manufactured by:
SHANGHAI LEE'S FUDA ELECTROMECHANICAL TECHNOLOGY CO.,LTD.

指定类型和型号：**LS-250(Ex) / LS-850(Ex)**

Under type and model designation(s) **LS-150(Ex)/LS-350(Ex)/LS-500(Ex)/LS-700(Ex)/LS-1150(Ex)/LS-1500(Ex)**

并包括：

and incorporating:

设备/组件图号 **LFS-AZ/LFS150-AZ/LFS350-AZ/LFS700-AZ/LFSEx-AZ** 日期 **2015-10-14/2020-1-20,10-14/2021-11-11**

To equipment/assembly drawing No.: date:

其他设备制造商：

Other equipment manufactured by :

设备/组件图号：

To equipment/assembly drawing No.: 日期 date:

额定处理能力：

Treatment Rated Capacity (m3/h): **150-1500**

安装了压载水管理系统的船上应备有一份型式认可证书的副本供船上检查。如果型式认可证书的签发是基于另一国主管机关的认可，则应参照该型式认可证书。

A copy of this Type Approval Certificate shall be carried on board a ship fitted with this ballast water management system, for inspection on board the ship. If the Type Approval Certificate is issued based on approval by another Administration, reference to that Type Approval Certificate shall be made.

规定的操作限制条件：

Limiting Operating Conditions imposed are described in this document.

过滤器进口压力 Filter Inlet Pressure： ≥ 0.15 MPa
紫外线透射率 UVT： ≥50%（100%TRC）
紫外线辐射强度 UVI： ≥ 250 W/m2（100%TRC）
温度 Temperature ：无限制 Not Applicable
盐度 Sailinity : 无限制 Not Applicable
存储时间 Holding Time : ≥24小时 hour

其他的限制包括：

Other restrictions imposed include the following:

防爆型/Explosion-proof:
防爆型压载水管理系统在对应普通产品型号后加注"Ex"。
They are Explosion-proof type when the "Ex" was added after the type of ordinary products.
该系统防爆部分可以用于船舶危险区域，防爆等级应满足船级社对其安装在船上位置的要求。
The Explosion-proof part of Ballast Water Management System is approved for use in hazardous area. Explosion-proof grade of electrical control parts should meet the classification society requirements of the installation position in ship.
本认可产品的防爆性能参数基于制造厂提交的防爆合格证（签发机构：国家级仪器仪表防爆安全监督检验站，证书号：GYB21.3553X、GYB21.3554、GYB23.1988，防爆标准：GB3836.1-2021、GB3836.2-2021、GB3836.3-2021、GB3836.4-2021、GB/T3836.5-2017、GB3836.9-2014、GB/T3836.18-2021），非中国船级社认可。
The Explosion-proof parameters of the approved products originate from Ex-proof certificates received from manufacturer (Issuring Body: National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation, Ex-certificate No.GYB21.3553X, GYB21.3554 and GYB23.1988, Standards for Ex-proof: GB3836.1-2021、GB3836.2-2021、GB3836.3-2021、GB3836.4-2021、GB/T3836.5-2017、GB3836.9-2014、GB/T3836.18-2021) , not approved by CCS.
本认可产品应持有有效的防爆合格证，否则本证书将自动失效。
The approved products should have valid explosion-proof certificates of conformity, otherwise this certificate will be automatically invalid.

本设备的设计满足下列运行条件的要求：

This equipment has been designed for operation in the following conditions:

发证日期
Date of issue **2024年01月11日**

有效期
valid until **2028年01月10日**

验船师
Surveyor **(Ni Zhiyong)**

中 国 船 级 社
China Classification Society

UTN:P023-94658178

Appendix-E: Existing BWMP

ORKIM SHIP MANAGEMENT SDN. BHD

M.V. " ORKIM POWER".

BALLAST WATER MANAGEMENT PLAN

DWT 7000 TON CLASS OIL/CLEAN PRODUCT TANKER

REVIEWED
as indicated in
ABS letter
ABS

To meet the recommendations of the

INTERNATIONAL MARITIME ORGANIZATION
ASSEMBLY RESOLUTION A.868 (20)

GUIDELINES FOR THE CONTROL AND MANAGEMENT OF SHIP'S BALLAST WATER TO MINIMISE THE TRANSFER OF HARMFUL AQUATIC ORGANISMS AND PATHOGENS

Adopted on 27th November 1997

AS AMENDED
on pages: P2,5,6,8,9,18,21.

See ABS Shanghai Letter Ref 57451 Dated 24-DEC-2010

CAUTION

The function of the Ballast Water Management Plan is to assist in complying with quarantine measures intended to minimise the risk of transplanting harmful aquatic organisms and pathogens from ships' ballast water and associated sediments, while maintaining ship safety.

As part of this function the plan will provide information to quarantine officers who wish to learn about a ship's ballast handling system, or to confirm that ballast management has been effectively planned.

The plan should not be used or regarded as a guide to ballasting. Training and shipboard operational practices should already be well established.

ORKIM SHIP MANAGEMENT SDN. BHD

Ballast Water Management Plan (BWMP)

Preliminary

Authorization

This Ballast Water Management Plan (BWMP) is authorized for use on board those **OSM** vessels.

The Master and all Officers/Engineers shall acquaint themselves with the contents and comply with the procedures.

Introduction SEE COMMENT L-033.

The plan has been developed along the lines of the INTERTANKO/ICS Model Ballast Water Management Plan as accepted by IMO. References were made to the following while developing the Ballast Water Management Plan:

- IMO RESOLUTION A.868 (20) adopted 27-Nov-1997.
- Safety Study by the International Association of Classification Societies (IACS).
- Safety study by Lloyds Register of Shipping published Jun-2000.
- IMO Circular LL.3/Cric130, Unified Interpretations of Load Line Convention.
- IMO MEPC 44/WP.6 Draft Report dated 09-Mar-2000.

The function of the Ballast Water Management Plan is to assist in complying with quarantine measures intended to minimise the risk of transplanting harmful aquatic organisms and pathogens from ships' ballast water and associated sediments, while maintaining ship safety.

As part of this function the plan will provide information to quarantine officers who wish to learn about a ship's ballast handling system, or to confirm that ballast management has been effectively planned.

The plan should not be used or regarded as a guide to ballast handling.

Distribution and Control

A hard copy (paper based) shall be printed onboard and kept on board. Records required to be maintained shall be filed with the BWMP hard copy.

The BWMP is subject to revision, and updates shall be distributed to the vessel electronically or any other convenient means.

The Master is responsible for updating the BWMP when revisions are received from the Company.

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

ORKIM SHIP MANAGEMENT SDN. BHD

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See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

ORKIM SHIP MANAGEMENT SDN. BHD

COMPLIANCE STATEMENTS

The responsibility for the content and maintenance of this Ballast Water Management Plan lies with the Company.

The Company understands that the steps in the ballast exchange plan contained herein should only be carried out within the defined operational limits, and failure to observe this restriction may result in damage to the ship's structure.

Only those options of handling ballast, which are suitable and known to be safe for use on this ship, appear on the plan.

The overall responsibility for the execution of this Ballast Water Management Plan lies with the ship's Master.

The Appointed Ballast Water Management Officer is the **Chief Officer**.

Procedure will always check for conformity with the ship's specific assessment criteria.

Crew training and familiarization with the operational procedures and related risks will be undertaken by ship's Master and appointed Ballast Water Management Officer.

This plan will be included in the ship's operational documentation and be kept available for inspection upon request by a port state control or quarantine officer.

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

ORKIM SHIP MANAGEMENT SDN. BHD

Section 1 : Ship's Particulars

Ship's name : ORKIM POWER

Ship type : Oil / Clean Product Tanker

Flag : Malaysia

Port Of Registry : Port Kelang

Call Sign : 9MIS8

IMO number : 9546825

Owner : Orkim Power Sdn. Bhd.

Manager : Orkim Ship Management Sdn. Bhd

Gross Tonnage : 5081 Tonnes

Length Overall : 106.65 m

Breadth ~~Extreme~~ MOULDED : 18.80 m

Moulded Depth : 9.60 m

Builder : JiuJiang Yin Xing Shipyard Co. Ltd. China

Keel laid : 30th January 2008

Delivery : 26th December 2009

Class : American Bureau of Shipping (ABS)

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

TOTAL BALLAST WATER CAPACITY: 3512.6 M^3
NUMBER OF BALLAST WATER TANKS: 9
NUMBER OF BALLAST WATER PUMPS: 3
BALLAST WATER EXCHANGE METHOD:
FLOW-THROUGH METHOD. (FOR F.P.T.(?) NO.1 W.B.T. (P&S),NO.2 W.B.T.(P&S). NO.3 W.B.T.(P&S)
SEQUENTIAL METHOD. (FOR F.P.T(?), F.W.T & W.B.T. (P&S).)

ORKIM SHIP MANAGEMENT SDN. BHD

Section 2 : Ballast Water Arrangements.

The following plans, which are provided, illustrate the ballast water system arrangements and ship's capabilities and are to be used to assist the crew in understanding and following the Ballast Water Management Plan:

1. General Arrangement
2. Ballast Tank Data
3. Pumping and Piping Diagrams of Ballast System
4. Ballast Water Sampling Points Diagram

TO BE INCLUDED IN THE BOOKLET.

See ABS Shanghai letter Ref 514451 Dated 24-DEC-2010

Table 1.1 Pump Data

Pump	Rated Capacity (m3/hr)	Type	Location
No.1 BALLAST PUMP	200	EHS – 201 MD	FR No 28 - 34
No.2 BALLAST PUMP	200	EHS – 201 MD	FR No 28 - 34
FWD BALLAST PUMP	130	EHS – 130 MD	FR No 142- 147

Table 1.2: Loading Manual / Trim & Stability Booklet Information

LOADING MANUAL / TRIM & STABILITY BOOKLET - INFORMATION

SHIP PLAN / DRAWING NUMBER: LOADING MANUAL / YX506-101-03JS

LOCATION WHERE STOWED / AVAILABLE: SHIP'S OFFICE / CAPTAIN'S OFFICE

STATED LIMITATIONS / RESTRICTIONS IF ANY:

CARGO HOLD / TANK FILLING LEVELS: 98%

MINIMUM REQUIRED DRAFT FORWARD : 3.20 MTR

REQUIRED DRAFT AFT FOR FULL PROPELLER IMMERSION: 4.36 MTR (MOULDED) AT PROPELLER LOCATION

MAXIMUM ALLOWED TRIM BY STERN: ~~1.589~~ MTR
1.492

MINIMUM MOULDED DRAUGHT AMIDSHIPS : 3.989 M.

Table – 1.3: Ballast tanks, piping and pumping arrangements

PLAN TITLE	DRAWING NUMBER	LOCATION AVAILABLE
BALLAST WATER PIPING ARRANGEMENT PLAN	YX 506-515-02	SHIP'S OFFICE / CAPTAIN'S CABIN
SOUNDING TABLE	YX 506-103-01JS	SHIP'S OFFICE / CAPTAIN'S CABIN/ CH.ENG'S OFFICE

Table – 1.4: Typical ballast distribution arrangement for all full, part load and heavy weather sea-going arrival/departure conditions as indicated in the ship's Trim / Stability Booklet or Loading Manual:

LOAD CONDITION	TOTAL BALLAST	HOLDS/ TANKS WITH BALLAST
BALLAST DEPARTURE	3439.6 T	WBT FPK/ 1P/ 1S/ 2P/ 2S/ 3P/ 3S
BALLAST ARRIVAL	3439.6 T	WBT FPK/ 1P/ 1S/ 2P/ 2S/ 3P/ 3S

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2020

Table – 1.5 Overflow and Filling line data

Tank	No. of Overflow Lines per Tank (air vents or overflow lines per tank)	Overflow line nominal diameter (mm)	Overflow lines *Total cross Sectional area (cm^2)*	Filling line Nominal diameter (mm)	Filling line Total *Cross Sectional area (cm^2)*	Ratio of Overflow/ Filling line *Total cross sectional area*
F.P.T	3	100	100	125	156.25	1.56
No.1 W.B.T. (P)	2	125	156.25	150	225	1.44
No.1 W.B.T. (S)	2	125	156.25	150	225	1.44
No.2 W.B.T. (P)	2	125	156.25	150	225	1.44
No.2 W.B.T. (S)	2	125	156.25	150	225	1.44
No.3 W.B.T. (P)	2	125	156.25	150	225	1.44
No.3 W.B.T. (S)	2	125	156.25	150	225	1.44

Table – 1.6 Ballast tank data

Tank	Location (Frame No.)	Capacity (m^3)	Pumps available
F.P.T	FR 147 – FR160	196.26	1
No.1 W.B.T. (P)	FR 105 – FR 142	579.10	2
No.1 W.B.T. (S)	FR 105 – FR 142	579.10	2
No.2 W.B.T. (P)	FR 71 – FR 105	450.84	2
No.2 W.B.T. (S)	FR 71 – FR 105	450.84	2
No.3 W.B.T. (P)	FR 34 – FR 71	549.77	2
No.3 W.B.T. (S)	FR 34 – FR 71	549.77	2
F.W.T. & W.B.T (P)	FR-5 - FR.5	78.493	
F.W.T. & W.B.T (S)	FR-5 - FR.5	78.429	

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

ORKIM SHIP MANAGEMENT SDN. BHD

SEDIMENT SAMPLING POINTS TO BE SPECIFIED AND REFERENCE DRAWING IS TO BE INCLUDED IN THE BOOKLET.

Table – 1.7 Sediment control and removal methods

Tank	Bottom Flush	Water Jet	De- mucking
F.P.T	YES	YES	YES
No.1 (P/S)	YES	YES	YES
No.2 (P/S)	YES	YES	YES
No.3 (P/S)	YES	YES	YES

DETAILED INFORMATION SUCH AS STABILITY CALCULATION , LONGITUDINAL STRENGTH CALCULATION IS TO BE INCLUDED. SEE COMMENT L-032.

Table – 1.8 Ballast Water Exchange (Ballast Co dition with 50% Bunker)

TANK	CAPACITY (M^3)	CAPACITY TO BE EXCHANGE	PUMPS		ESTIMATED TIME	METHOD
			NO.1	NO.2		
F.P.T	196.26	588.78	FWD B. P/P		4.53 HRS	FLOW
No.1 W.B.T. (P)	579.10	1737.3	YES	YES	4.34 HRS	FLOW
No.1 W.B.T. (S)	579.10	1737.3	YES	YES	4.34 HRS	FLOW
No.2 W.B.T. (P)	450.84	1352.52	YES	YES	3.38 HRS	FLOW
No.2 W.B.T. (S)	450.84	1352.52	YES	YES	3.38 HRS	FLOW
No.3 W.B.T. (P)	549.77	1649.31 ~~1949.31~~	YES	YES	4.12 ~~4.87~~ HRS	FLOW
No.3 W.B.T. (S)	549.77	1649.31	YES	YES	4.12 ~~4.87~~ HRS	FLOW

? SEE PAGE 21.

See ABS Shanghai Letter Ref 574451 Dated 24 DEC-2010

ORKIM SHIP MANAGEMENT SDN. BHD

Section 3: Explanation of The Requirements for Ballast Water Management, Record Keeping and Reporting to Port States and Compliance Monitoring

Introduction

Studies carried out in several countries have shown that many species of bacteria Studies carried out in several countries have shown that many species of bacteria, plants and animals can survive in a viable form in the ballast water and sediment carried in ships, even after journeys of several weeks duration. Subsequent discharge of ballast water or sediment into the waters of port states may result in the establishment of colonies of harmful species and pathogens which can seriously upset the existing ecological balance. Although other methods have been identified by which organisms are transferred between geographically separated sea areas; ballast water discharge from ships appears to have been prominent among those identified.

The potential for ballast water discharge to cause harm has been recognized not only by the International Maritime Organization (IMO), but also by the World Health Organization which is concerned about the role of ballast water as a medium for the spreading of epidemic disease bacteria.

Requirements

Some states have established controls on the discharge of ships' ballast water that will minimise the potential for colonization of their rivers and estuaries by non-native species. The preferred option is mid-ocean ballast water exchange prior to arrival. Accordingly, the countries most concerned have promulgated advice to ships for ballast management, together with a request for their co-operation in applying the techniques either by mandatory regulations or voluntarily participation. Standard procedures have been developed that will be accepted by quarantine authorities as achieving the level of acceptability desired by the port state.

Conflict with Safety

Unless applied carefully some of the measures being urged for ballast management can affect a ship's safety, either by creating forces within the hull that are greater than the design parameters, or by compromising the stability of the ship. It is because of concern about this that the IMO became involved in what would otherwise be a purely quarantine matter. It has been recognized by governments and the shipping industry that individual countries' needs should be harmonized with the greater need to ensure the safety of ships, their crews and passengers.

IMO recommends that each ship should be provided with a Ballast Water Management Plan, detailing the way that the ship can comply with any measures demanded by a port state. Once it has been established that the management of ballast is necessary to meet the quarantine requirements of a port state, preparation for it should be treated with the same seriousness as preparation of a cargo plan. All concerned with the operation and safe passage of the ship can thereby be assured that they are both protecting the marine environment and ensuring the safety of the ship and crew.

See ABS Shanghai Letter Ref 57445 Dated 24-DEC-2010

Summary of Records required

Good record keeping is critical to the success of a sound ballast water management program. Compliance can be verified and managed more effectively if accurate records are maintained and stored in an organized manner.

The ship's records should be accessible and readily available for review by Port State Authorities to minimise any problems arising from compliance inspections.

Records that should be maintained include:

a) Any permits, certificates, exemptions, waivers, or compliance reports issued by Port State Authorities
b) Records of training and qualification received by the ship's crew.
c) Correspondence related to unusual circumstances or incidents where ballast water management practices could not be diligently carried out.
d) Reports of condition, issued by Classification Societies, shipyards, or repair facilities (in respect to ballast system).
e) Ballast Water Handling Log.
f) Sediment Removal and Tank Flushing log.
g) Ballast Water Reporting Form.

Reporting to Port States

Several countries have become aware of the potential, through discharge of ship's ballast water, for the transfer into their coastal areas of what are found to be harmful aquatic organisms. Governments have recognized that, before devising mandatory controls on ships, it is necessary to know the scale of what has, until very recently, been an unrecorded procedure.

As a result, a number of countries require that ships shall report in advance to the National Monitoring Authority, the amount of ballast on board on arrival, where and when this was taken on board, and finally if a Ballast Water Management Plan was implemented.

Furthermore, to be able to demonstrate at the arrival port that the correct measures have been completed, it will be necessary to maintain a full and accurate Ballast Log. Pre-formatted Ballast Water Reporting Forms, Handling Log Forms and Sediment Removal Log Forms provided. The ship's Master and the Ballast Water Management Officer should be familiar with the requirements of Port State Authorities with respect to ballast water and sediment management and treatment procedures, if any, including information that will be needed to obtain port entry clearance.

Depending to Port State, where a Ballast Water Reporting Form is completed after arrival at port in the presence of a Port State Officer This may attract additional fee.

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

Compliance Monitoring

Port State Authorities have the right to manage ballast water by national legislation; however it is expected that any ballast discharge restriction will be notified to IMO.

One method of compliance monitoring that will be undertaken by Port State Authorities will be through the taking and analysing of ballast water and sediment samples to test for the continued survival of harmful aquatic organisms and pathogens, and by verifying the accuracy of data provided on the Ballast Water Reporting Form.

Ballast Water Sampling Points

There is unlikely to be any need for crewmembers to take samples except at the express request, and under the supervision, of a quarantine officer.

As a guide, to obtain samples of the ballast water from the tanks filled with ballast, samples from the fore peak, cofferdams, double bottom tanks, upper and lower hopper tanks and after peak should be taken through sounding pipes. Samples from double hull wing tanks should be taken through ullage plugs or other sighting ports.

Quarantine officers must be advised of all safety procedures to be observed when entering enclosed spaces.

Table 2.1

REFER TO DRAWING OF AIR PIPES AND SOUNDING PIPES

SHIP'S PLAN / DRAWING NO. (YX 506-514-01)

LOCATION WHERE ABOVE PLANS ARE AVAILABLE: (CAPTAIN'S OFFICE/ CH.ENG OFFICE)

See ABS Shanghai letter Ref 57445 Dated 24-DEC-2010

ORKIM SHIP MANAGEMENT SDN. BHD

Section 4: Purpose, Scope and Responsibility

Purpose

The Ballast Water Management Plan addresses the safety and pollution prevention program implemented by OrkimShip Management Sdn Bhd. This Plan shall serve not only as guideline and plan for compliance to IMO Assembly Resolution A-868 (20) and World Health Organization, which is concerned about the role of ballast water as medium for the spreading of epidemic disease bacteria, but also as a guide for Orkim Ship Management Sdn Bhd. Plan to enhance the environmental through management initiatives.

Scope

The Ballast Water Management Plan shall be applied to all office locations and vessels managed and operated by Orkim Ship Management Sdn Bhd.

Responsibility

1. The Manager, Operations and Engineering are responsible for reviewing and approving this Plan.
2. The Master is responsible for the maintenance and distribution of this Plan.
3. The Master is responsible for the administration of this Plan on the vessel.
4. The Ballast Management officer is responsible for ensure that the ballast water treatment or exchange follows procedure in the BWMP.
5. The Master is responsible for notifying the vessel that needs to perform the ballast water exchange.

Section 5 : Safety And Operation

The ship's certificate describes the ballast water management method(s) which should be used.

IMO Resolution A. 868 (20), reproduced in Appendix 3, Guidelines for the Control and Management of Ship's Ballast Water to minimise the Transfer of Harmful Aquatic Organisms and Pathogens, published in November 1997, includes guidance on safety aspects of ballast water exchange at sea.

The exchange of ballast water in open sea is a new practice and has to be distinguished from any ballast operation carried out in ports or in sheltered waters. Practices therefore which are well established in a normal ballast operation should be well pre-planned.

Taking into consideration that adverse weather and sea conditions can be established in a short time while under way in an open sea, ballast water exchange has to be well pre-planned.

See ABS Shanghai Letter Ref. 574451 Dated 24-DEC-2010

The safety points outlined below simply emphasize the fact that an error at sea can have more serious consequences than those emanating from the same error in port.

* Hull girder damage due to insufficient longitudinal strength as a result of unsuitable ballast exchange steps.

* Reduction in ship's stability due to free surface effects resulting, in a reduction of ship's GM or increase in heeling angle while emptying ballast water tanks or holds originally in a filled or partially filled condition in order to achieve exchange.

* Structural damage to ship bottom forward caused by insufficient forward draught, as a result of emptying forward ballast water tanks or holds originally in a filled condition or filling partially filled aft water ballast tanks in order to achieve exchange.

* Reduction of manoeuvrability and/or ability to make headway; caused by insufficient after draught, as a result of emptying after ballast water tanks or holds originally in a filled condition or filling partially filled forward water ballast tanks in order to achieve exchange.

* Reduction of bridge visibility forward caused by insufficient forward draught, as a result of emptying forward ballast water tanks or holds originally in a filled condition or filling partially filled aft water ballast tanks in order to achieve exchange.

* Structural damage to topside and hopper side tanks caused by inertia loading, as a result of full ballast hold with empty adjacent wing tanks.

* Structural damage to partially filled ballast water tanks or holds caused by sloshing as a result of resonance with ship motion.

* Over pressurisation damage of ballast water tanks when filling empty or partially filled tanks caused by blockages in air pipes or using excessive pumping capacity relative to the design of the ballast system. Blockages may result from lack of proper maintenance, ball failure, freezing, sabotage, or unintended closure.

* Under pressurisation damage of ballast water tanks when deballasting tanks by gravity to an empty or partially filled condition caused by blockages of air pipes or insufficient design.

The procedures for managing ballast water have been specifically designed to minimise the hazards mentioned above. It is therefore imperative that the procedures contained in this manual be followed when conducting ballast water exchange at sea.

The use of the pumps should be clearly stated in ballast exchange plans. It is recommended that a statement is exhibited in the ship's Control Room to the effect that two pumps must not be employed together for one ballast tank due to risk of over pressurisation.

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

This ballast water management plan includes Ballast Exchange Plan(s) prepared specifically for the ship.

A Ballast Exchange Plan (BEP) contains step-by-step instructions for the safe exchange of ship's ballast water. A BEP indicates that status of the ballast tank with relevant assessment criteria.

A BEP is prepared on the basis of ship's capabilities and occasionally contains specific advice and limitations which need to be observed and adhered to.

A BEP is intended for typical ballast conditions. It is at the discretion of the ship's master to follow one of the prepared BEPs or to prepare a new BEP for the ship's specific condition, taking into account the relevant assessment criteria. If in doubt the Master should seek assistance by shore management.

A BEP is to be followed with a great degree of thoroughness. Pre-planning and familiarisation is essential in order to ensure the safety of the ship and those on board.

Where a Port State has designated areas for ballast exchange or has accepted or imposed other ballast water management options or contingency measures, the operation should be planned and conducted accordingly.

The ship's position, sea state, weather forecast, equipment performance, hull condition and degree of crew fatigue should be considered before proceeding with ballast exchange. If any factors are considered unfavourable, the ballast exchange operation should not commence or should be suspended.

Within the limitations imposed by overall safety and operational constraints, efforts should be made as follows:

* Where practicable, ballast exchange should be conducted in deep water, in open ocean and as far as possible from shore. Where this is not possible, requirements developed within regional agreements may be in operation, particularly in areas within 200 nautical miles from shore.

* Where the flow-through method is employed by pumping ballast water into the tank or hold and allowing the water to overflow, at least three times the tank volume should be pumped through the tank.

* When the sequential method is employed, all of the ballast water should be discharged until suction is lost, and stripping pumps or educators should be used if possible.

* Where practicable, routine cleaning of the ballast tank to remove sediments should be carried out in mid-ocean or under controlled arrangements in port or dry dock.

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

* Sediment resulting from tank or hold cleaning or stripping, should not be disposed in Port State territorial waters.

* Where one or more of the recommended approaches for ballast water discharge has been followed, and loose sediment which is likely to be discharged in an initial flush, (e.g. in the bridge well of a hold space), such sediment should be drawn off by a suitable means (e.g. an initial "suck" to flush out any sediment that may have accumulated in hat boxes or suction bays during the voyage), the discharge from this operation should be placed into a holding tank or by carrying out initial release into an approved discharge area, or at sea outside territorial limits, before full discharge overboard takes place.

* The uptake of ballast water should be minimized or, where practicable, avoided in areas and situations such as:

- areas with outbreaks, infestations or known populations or harmful organisms and pathogens;
- areas with current phytoplankton blooms(algal blooms, such as red tides);
- nearby sewage outfalls;
- nearby dredging operations;
- when a tidal stream is known to be the more turbid; and areas where tidal flushing is known to be poor;

- in darkness when bottom-dwelling organisms may rise up in the water column;
- in very shallows water; or
- where propellers may stir up sediment.

* If it is necessary to take on and discharge ballast water in the same port to facilitate safe cargo operations, care should be taken to avoid unnecessary discharge of ballast water that has been taken up in another port.

* Minimise departure and arrival ballast quantities but always within the constraints of safe navigation.

* Take additional good house keeping measure to minimise the risk, such as rinse anchors and anchor chain when retrieving to remove organisms and sediment at their place of origin, remove fouling organisms from hull, piping and tanks on a regular basis.

Ballast Water exchange at sea should not be undertaken in any weather condition that would jeopardise the safety of crew members operating equipment on the upper deck. As a guide, ballast exchange at sea should not be carried out or, if under progress, interrupted under the following conditions:

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2016

* When wind strength exceeds Beaufort 4 and sea state exceeds moderate.

* When there is indication that weather and sea conditions will deteriorate prior to completing ballast exchange program or a step thereof, adequate time margin should always be included in such cases.

* When sailing in areas which are known to be seasonally affected by cyclones, typhoons, hurricanes, or heavy icing condition.

* When any part of the power or ballast system (generators, pumps, level indicators, etc.) is inoperative or gives sign of under-performance.

* When sub-zero temperatures are encounter. Sub-zero weather, where weather decks are icing, is generally considered to be unsuitable for ballast water exchange operations. If deemed absolutely necessary, particular attention should be paid to hazards associated with the freezing of overboard discharge arrangements, air pipes, ballast system valves (together with their means of control and the accretion of ice on deck.

* When due to other important duties on board not enough trained officers and crew are available to perform the ballast exchange safely.

* When abnormal vibrations of the vessel's hull or equipment are experienced while progressing on a certain step of the ballast exchange.

* When other abnormal conditions are observed which, to the judgement to the Master, endanger the vessel's or the crew's safety.

It is noted that these conditions are guidelines only. It is the responsibility of the ship's Master to ensure the safety of his crew is not jeopardised.

Additionally, operational limits defined for specific ballast exchange conditions must be adhered to during operation. Therefore, it is considered imperative to plan for and find the appropriate weather Window to conduct safe sequential ballast exchange operations.

Ballast exchange operations are complex procedures and may last from several hours to days. All personnel engaged in ballast exchange should be well trained to respond to routine and emergency procedures.

It should always be considered that while performing a ballast exchange at sea, failure of power system or any part of ballast pumping and piping system could take place. Such incidents should be brought immediately to the attention of the Company's Safety Officer and emergency procedure

See ABS Sangria Letter Ref 574451 Dated 24-DEC-2010

should be activated to bring the ship back to her ballast seagoing condition as soon as possible. Such emergency procedures could be ballasting by gravity and even utilisation of the general service pump. Ships enrolled with the Ship Emergency Response Service (SERS) could, if necessary, activate the service.

Where a Port State Authority requires that specific ballast water procedures and/or treatment option(s) be undertaken, and due to weather, sea conditions or operational impracticability such action cannot be taken, the ship's Master should report this fact to the Port State Authority as soon as possible and, where appropriate, prior to entering seas under its jurisdiction.

IMO requires that Port States should not require any action of the Master which imperils the lives of those on board or the safety of the ship.
Flow-through method to be carried out with ballast water 3 times as much as tank capacity.

Safety and other general matters

1. It will be anticipated that the Ship will have no "dirty ballast" onboard when doing a ballast exchange at sea because at the load port it may not be possible to discharge this water ashore, and exchange at sea is not a practical proposition. However, if the Ship has "Dirty heavy weather ballast" then only SBT can be exchanged and the "Dirty heavy ballast" should be retained on board for either discharge to shore reception and treatment facilities, or if this is nor possible, then over carried to the next suitable port.
2. Longitudinal strength, all exchange sequences should be satisfied that the assigned permissible still water bending moment and shear forces.
3. Intact stability in according with applicable requirements of IMO Res.A749
4. Bridge visibility, the view of the sea surface is to be not more than two ship lengths or 500m whichever is the less.
5. Min. draught forward should be more than ~~3.633~~ 3.20m
6. Propeller immersion should be kept in the water at all times during the ballast exchange. Therefore aft draft should be more than ~~4.700m.~~ 4.36M(MOULDED) AT PROPELLER LOCATION.
7. Deck preparations must include the followings;
   (1) The relevant tank lids must be open. (All if the exchange is done in one operation)
   (2) The relevant purge pipes must be open. (All if the exchange is done in one operation)
   (3) The SBT over-board discharge valve must be in the open position should it be necessary to put the pump from sea to sea.
   (4) All scuppers on the main deck are to be out.
   (5) During ballast exchange operations, no one is allowed on the main deck due to the possible vast amounts of water flowing down the deck.

See ABS Shanghai Letter Ref-5445 Dated 24-DEC-2010

Base on any of the cases listed below or any other circumstance the Master considers that the ballast exchange can not be undertaken; he will notify the decision and the circumstances to Orkim Ship Management Sdn. Bhd. Moreover, it must be logged on the "Log Book".

Conditions in which ballast water exchange at sea is not to be undertaken

* When the Ship is affected by heavy weather.

* When the Ship is in sub-zero weather or icing conditions.

* When due to technical problems (water ballast pump break down, non-operational valve, etc.), it cannot be done.

* When the Master decides that it ca not be done due to crew availability and personal safety.

* When for any reason not stated above and that the Master considers reasonable not to do it.

See ABS Shanghai Letter Ref:5245 Dated 24-DEC-2010

Section 6: Procedures for Managing Ballast Water

A ballast handling plan for a ballast voyage should be prepared in advance, in a similar manner to the preparation of a cargo plan for a loaded voyage, and with the same degree of thoroughness. This pre-planning is necessary in order to maintain safety in case compliance with ballast exchange or other ballast water treatment or control options is required.

The safety information in **Section 4** should be taken into account when preparing the voyage plan.

This section gives guidance on ballast handling procedures to be followed at sea.

Informing Shore Management

The Master should be informed about the intension to change ballast at sea, stating the Ship's position, the present weather conditions and approximate time of completion.

Sediment Removal or Reduction

Where practical, cleaning of the ballast tanks to remove sediments should be undertaken at regular intervals, following inspections when in the loaded condition. When the Ship ballasts in areas where there is high sediment content in the water, then the tanks should be inspected as soon as practicable afterwards.

Retention of Ballast on board

Due to certain weather conditions, it may be necessary to take heavy weather ballast. It is not possible to exchange this ballast and would be therefore have to be retained onboard until it can be

discharged to shore facilities. If there is a need to take heavy weather ballast, the DPA must be first consulted as it may not be possible to discharge this water ashore.

Water Treatment

Since to date no Quarantine Authority has approved any, no water treatment will be used.

Exchange at Sea

1. Flow-Through Method

The flow-through method, whereby tanks are overfilled by pumping-in additional water, has the advantage that it can be used in weather conditions which would be marginal for use of the sequential method, since there is little change to the condition of the ship.

Research has established that it is necessary to pump in three times the volume of the tank to achieve a 95% change of water. For the record, pumping in only once the volume of the tank produces a 63% exchange, twice the volume produces 86% exchange, while three times the volume produces a 98% water exchange.

The flow-through method introduces certain other risks and problems which must be considered before using this procedure. Refer to the IMO Resolution A. 868(20), "Guidance on safety aspects of ballast water exchange at sea", In addition, note the items listed below:

- All openings used as outflow for the water should be inspected prior to start, to check that the water may flow freely out. Any flame screens fitted to air vent heads are to be removed.
- It should be ensured that no more pump pressure is applied on the tanks than can be handled by the outflow of water through the opening. Refer to next page "Operating procedures: found below.
- A water volume equal to 3 times the tank volume should be pumped to each ballast tank.
- The ship's normal procedure for use of the ballast system should be followed.
- The free flow of water through the openings should be visually checked at the start of the exchange, and at regular intervals.
- After each step, a positive decision should be made, taking account of the ship's position, weather forecast, machinery performance and degree of crew fatigue, before proceeding to the next step. If any factors are considered unfavourable the ballast exchange should be suspended or halted.

See ABS Shanghai Letter Ref 37445 Dated 24DEC-2010

- If, for some reason, the tank is not full before an exchange takes place, the filling up of the tank will change the loading condition. Prior to this, the condition with a full tank should be checked on the ship's loading computer for compliance with the strength limits.

? SEE P.9.

TYPICAL BALLAST WATER EXCHANGE PROCEDURE BY SEQUENTIAL METHOD INCLUDING THE DETAIL INFORMATION SUCH AS STABILITY AND LONGITUDINAL STRENGTH CALCULATION IS TO BE INCLUDED IN THE BOOKLET.

2.Sequential Method (F.P.T & FWBT PT & STBD ONLY)

F.W.T. & W.B.T.

Ballast water should be discharged until suction of the pumps is lost, and stripping pumps or eductors should be used, if possible. This is to avoid a possible situation, where organisms are left in the bottom part of the tank..

In order to ensure the vessel's operation, the following limitations should be considered.

- Maximum shear force and bending moment should be within allowable range for seagoing condition
- Maintenance of adequate intact stability in accordance with an approved trim and stability booklet.
- Propeller must be immersed fully.
- Minimum fore draft to avoid slamming in heavy sea.
- Visibility at wheelhouse is ruled by SOLAS Ch. V Reg.22 as far as possible.

A ballast water management plan must be prepared in advance, on ballast voyage.

This preplanning is necessary in order to maintain safety in case compliance with ballast exchange or other ballast water treatment or control options air required.

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

Section 7: Crew Training and Familiarisation

Ship's officer and rating engaged in ballast water exchange at sea must be aware of what is expected of them and why. If crew members understand the reasons for the exchange or treatment of ballast water and associated sediments, they are more likely to ensure that it is carried out effectively and efficiently.

Training for the master and crew, and appropriate, should include, should include instructions on the application of ballast water and sediment management and treatment procedures, based upon the information contained in the IMO Resolution A. 868(20) guidelines. Instruction should also be provided on the maintenance of appropriate records and logs. The application of processes and procedures concerning ballast water management are currently at the core of the solution to minimize the introduction of harmful aquatic organisms and pathogens.

Ship's officers and ratings engaged in ballast water exchange at sea should be trained in and familiarised with the following:

* The ship's pumping arrangements including ballast arrangements.
* The locations of air and sounding pipes of all ballast tanks.
* The positions of all ballast tank suctions and pipelines.
* The overboard discharge arrangements and openings for release of water on deck.

* Inspection and maintenance for ensuring that sounding pipes are clear and non-return devices and air pipes are in good order. The times and circumstances required to undertake the various ballast water exchange operations.
* The methods for ballast water exchange at sea used, the related safety precautions and associated hazards.
* The methods of on-board ballast water record keeping, reporting and recording of routine soundings.
* The location and suitable access points for sampling purposes.

The Master and Officer in charge should ensure that the personnel assigned KEY Responsibilities in any ballast exchange procedures are suitable and well trained according to the above. Special attention should be given to the safety aspects related with the subject procedures.

See ABS Shanghai Letter Ref 5/4451 Dated 24-DEC-2010

Section 8: Duties of Appointed Ballast Water Management Officer

Appointed Ballast Water Management Officer.

Duties of the appointed officer in charge of ballast water management:

* Where ballast exchange is required, follow the applicable Ballast Exchange Plan (BEP), or develop a BEP on the basis of ship's assessment criteria, condition of hull and equipment and weather forecast.

* Ensure adequate and enough personnel and equipment are available for the execution of the BEP.

* Ensure that the steps/sequences of the BEP are followed in the prepared order.

* Inform the shore management on commencement/interruption/completion of ballast water exchange, using the Notification Form.

* Maintain the Ballast Water Handling Log and Sediment Removal and Tank Flushing Log.

* Prepare the appropriate national or port Ballast Water Declaration Form prior to arrival at destination.

* Assist the port state control or quarantine officers for any sampling that may need to be undertaken.

* Undertake familiarisation and training of crew in ballast water management requirements and applicable shipboard systems and procedures.

The Master must ensure that the Ballast Water Management Plan is clearly understood by the appointed officer and by any other responsible Officer that may be involved and that the operations during execution strictly conform to the safety parameters at all times.

The duty Officer must keep the Master advised on the progress of the plan from time to time. Should there be any doubt, or if the management plan does not keep to the schedule, Master shall be advised accordingly.

Additionally, the appointed Duty Officer shall inform the Chief Officer when commencing/stopping Ballast Operation at each stage.

See ABS Shanghai Letter Ref: 37/451 Dated 24-DEC-2010

SECTION 9 : Ballast Water Reporting Form And Handling Log.

Format for ballast water reporting form

Guidelines for completing the ballast water reporting form

This form is an example developed in IMO, to serve as a guide for use when reporting to a national authority that request information in advance. To avoid misunderstandings, some guidance for completing it follow on the page opposite. It should be noted that question 3, "Total number of tanks on board" refers only to the total number of segregated ballast tanks.
Care should be taken before using this general form, that the country being approached does not have its own form for use when reporting.

Format for ballast water handling log

Record of loading and discharging ballast.
Narrative pages for recording unusual events.

These two forms have been created as a guide for recording the sort of information often requested by quarantine officers who wish to learn about the source of the ballast water on board.

Even if the ship is not currently trading in an area where ballast water information is required to be reported, it may later prove worthwhile to have a history of what water has been carried.

MANAGEMENT OF RECORDS:

The Chief Officer is the person responsible to manage the appropriate records.

RETENTION OF RECORDS:

The records must be retained for a period of 3 years after completion.

(As per MARPOL OIL RECORD BOOKS)

Section 10 : Forms

Appropriate forms are provided in Appendices.

It is recommended that blank forms are pre-formatted with all permanent information such as the Ship's Name, IMO No., Call Sign, Gross Tonnage, Owner, Total Ballast Capacity, Total number of Tanks, etc., so that work required is reduced and the possibilities for mistakes are minimised.

Ballast Water Reporting Form (Appendix 2)

The Ballast Water Reporting Form is to be used when reporting ballast water management to national or local authorities that request such information in advance. Guidance for completing the form is also included in the pages following the form. Before this general form is completed, the appointed ballast water management officer should ensure that the appropriate form required by the country or port of call is used.

Ballast Water Handling Log (Appendix 3-4)

The Ballast Water Handling Log is to be maintained in order to provide quarantine officers with historical they may require concerning the source of the ballast water on board the ship.

Sediment Removal and Tank Flushing Log (Appendix 8)

The Sediment Removal and Tank Flushing Log is to be maintained in order to provide quarantine officers with historical information they may require concerning sediment removal and tank flushing.

Ballast Exchange Notification Form (Appendix 9)

The Ballast Exchange Notification Form is to be used to notify shore management of ballast exchange prior to arrival at destination.

See ABS Shanghai Letter Ref 574451 Dated 22-DEC-2010

PART B – APPENDIX (FORMS)

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

ORKIM SHIP MANAGEMENT SDN. BHD

Appendix 1 IMO Assembly Resolution A.868 (20)

Guidance on Safety Aspects of Ballast Water Exchange at Sea

1. Introduction

1.1 This document is intended to provide guidance on the safety aspects of ballast water exchange at sea. The different types of ships which may be required to undertake ballast water exchange at sea make it presently impractical to provided specific guidelines for each ship type. Ship owners are cautioned that they should consider the many variables that apply to their ships. Some of these variables include type and size of ship, ballast tank configurations and associated pumping systems, trading routes and associated weather conditions, port state requirements and manning.

1.2 Ballast water exchange at sea procedures contained in relevant management plans should be individually assessed for their effectiveness from the environmental protection point of view as well as from the point of view of their acceptability in terms of structural strength and stability.

1.3 In the absence of a more scientifically based means of control, exchange of ballast water in deep ocean areas or open seas currently offers a means of limiting the provability that fresh water of coastal aquatic will be transferred in ballast water.

Two methods of carrying out ballast water exchange at sea have been identified.

1. The sequential method, in which ballast tanks are pumped out and refilled with clean water, and/or
2. The flow-through method, in which ballast tanks are simultaneously filled and discharged by pumping in clean water

2. Safety precaution

2.1 Ship engaged in ballast water exchange at sea should be provided with procedures which account for the following as applicable:

1. Avoidance of over and under-pressurization of ballast tanks :
2. Free surface effects on stability and sloshing loads in tanks that may be slack at any one time :
3. Admissible weather conditions :
4. Weather routing in areas seasonably affected by cyclones, typhoons, hurricanes, or heavy icing conditions :
5. Maintenance of adequate intact stability in accordance with an approved trim and stability

See ABS Shanghai Letter Ref 57445 Dated 24-DEC-2010

booklet:

6. Permissible seagoing strength limits of shear forces and bending moments in accordance with an approved loading manual:
7. Torsional forces, where relevant:
8. Minimum/maximum forward and aft draughts:
9. Wave-induced hull vibration
10. Documented records of ballasting and/or de-ballasting:
11. Contingency procedures for situations which may affect the ballast water exchange at sea, including deteriorating weather conditions, pump failure, loss of power, etc.
12. Time to complete the ballast water exchange or an appropriate sequence there of taking into account that the ballast water any represent 50% of the total cargo capacity for some ships : and
13. Monitoring and controlling the amount of ballast water.

2.2 If the through method is used, caution should be exercised, since:

1. Air pipes are not designed for continuous ballast water overflow:
2. Current research indicates that pumping of at least full volumes of the tank capacity could be needed to be effective when filling clean water from the bottom and overflowing from the top : and
3. Certain watertight and weather tight closures (e.g. manholes) which may be opened during ballast exchange should be re-secured.

2.3 Ballast water exchange at sea should be avoided in freezing weather conditions. However, when it is deemed absolutely necessary, particular attention should be paid to the hazards associated with freezing of overboard discharge arrangements, air pipes, ballast system valves together with their means of control and the accretion of ice on deck.

2.4 Some ships may need the fitting of a loading instrument to perform calculations of shear forces and bending moments induced by ballast water exchange at sea and to compare with the permissible strength limits.

2.5 An evaluation should be made of the safety margins for stability and strength contained in allowable seagoing conditions specified in the approved trim and stability booklet and the loading manual, relevant to individual types of ship and loading conditions. In this regard account should be taken of the following requirements:

See ABS Shanghai Letter Ref: 57451 Dated 24-DEC-2010

2.6 The ballast water management plan should include a list of circumstances in which ballast water exchange should not be undertaken, these circumstances may result from critical situations of an exceptional nature, force major due to stress of weather, or any other circumstances in which human life or safety of the ship is threatened.

3. Crew training and familiarization

3.1 The ballast water management plan should include the nomination of key shipboard control personnel undertaking ballast water exchange at sea

3.2 Ship's officers and ratings engaged in ballast water exchange at sea should be trained in and familiarized with the follows:

1. The ship's pumping plan, which should show ballast pumping arrangements, with positions of associated air and sounding pipes, positions of all compartment and tank suctions and pipelines connecting them
2. The method of ensuring that sounding pipes are clear and that air pipes and their non-return devices are in good other..
3. The different times required to undertake the various ballast water exchange operations.
4. The methods in use for ballast water exchange at sea if applicable with particular reference to required safety precautions : and
5. The method of on-board ballast water record keeping, reporting and recording of routine soundings.

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

ORKIM SHIP MANAGEMENT SDN BHD

Appendix 2

BALLAST WATER REPORTING FORM

(To be provided to the Port State Authority upon request)

1. SHIP INFORMATION

Ship's Name:	Type:	IMO Number:	
Owner:	Gross Tonnage:	Call Sign:	
Flag:	Arrival Date:	Agent:	
Last Port and Country:		Arrival Port:	
Next Port and Country:			

2. BALLAST WATER

Specify Units: M^3, MT, LT, ST
Total Ballast Water on Board:
Total Ballast Water Capacity:

3. BALLAST WATER TANKS Ballast Water Management Plan on board? YES NO Management Plan Implemented? YES NO

Total number of ballast tanks on board: _____ No. of tanks in ballast: _____ IF NONE IN BALLAST GO TO No. 5.

No. of tanks exchanged: _____ No. of tanks not exchanged: _____

4. BALLAST WATER HISTORY: RECORD ALL TANKS THAT WILL BE DEBALLASTED IN PORT STATE OF ARRIVAL; IF NONE GO TO No. 5.

Tanks/ Holds (List multiple sources per tank separately)	BALLAST WATER SOURCE				BALLAST WATER EXCHANGE Circle one: Empty/Refill or Flow Through					BALLAST WATER DISCHARGE			
	DATE DDMMYY	Port or Lat/Long	Volume (units)	Temp (units)	DATE DDMMYY	Endpoint Lat/Long.	Volume (units)	% Exch.	Sea Hgt. (m)	DATE DDMMYY	Port or Lat/Long	Volume (units)	Salinity (units)

Ballast Water Tank Codes: Forepeak = FP, Aftpeak = AP; Double Bottom = DB; Wing = WT; Topside = TS; Cargo Hold = CH; Other = O

IF EXCHANGES WERE NOT CONDUCTED, STATE OTHER CONTROL ACTION(S) TAKEN: _____

IF NONE STATE REASON WHY NOT: _____

5: IMO BALLAST WATER GUIDELINES ON BOARD (RES. A.868(20))? YES NO

RESPONSIBLE OFFICER'S NAME AND TITLE (PRINTED) AND SIGNATURE: _____

See ABS Shanghai Letter Ref 57445T Dated 24-DEC-2010

GUIDELINES FOR COMPLETING THE BALLAST WATER REPORTING FORM

SECTION 1: SHIP INFORMATION

Ship's Name: Print the name of the ship.
Owner: The registered owners or operators of the ship.
Flag: Country of the port of registry.
Last port and country: Last port and country at which the ship called before arrival in the current port - no abbreviations, please.
Next port and country: Next port and country at which the ship will call, upon departure from the current port - no abbreviations, please.
Type: The ship type is.....
GT: Gross tonnage.
Arrival Date: Arrival date at current port. Please use the European date format (DDMMYY)
IMO Number: Identification number of the ship used by the International Maritime Organization is.....
Call Sign: Official call sign is.....
Agent: Agent used for this voyage.
Arrival Port: This is the current port. No abbreviations, please.

SECTION 2: BALLAST WATER

(Note: Segregated ballast water = clean, non-oily ballast)

Total ballast water on board: Total segregated ballast water upon arrival at current port - with units.
Total ballast water capacity: Total volume of all ballastable tanks or holds - with units.

SECTION 3: BALLAST WATER TANKS

Count all tanks and holds separately (e.g. port and starboard tanks should be counted separately)

Total No. of Tanks on board: ( ) tanks and holds can carry segregated ballast water.
Ballast Water Management Plan on board?: Do you have a ballast water management plan, specific to your ship, onboard? Circle Yes or No.
Management Plan Implemented?: Do you follow the above plan? Circle Yes or No.
No. of Tanks in Ballast: Number of segregated ballast water tanks and holds with ballast at the start of the voyage to the current port. If you have no ballast water on board, go to section 5.
No. of Tanks Exchanged: This refers only to tanks and holds with ballast at the start of the voyage to the current port.
No. of Tanks Not Exchanged: This refers only to tanks and holds with ballast at the start of the voyage to the current port.

SECTION 4: BALLAST WATER HISTORY

BW Source: Please list all tanks and holds that you have discharged or plan to discharge in this port. Carefully write out, or use codes listed below the table. Follow each tank across the page, listing all source(s), exchange events, and/or discharge events separately. If the ballast water history is identical (i.e. the same source, exchange and discharge dates and locations), sets of tanks can be combined (example: wing tank 1 with wing tank 2, both water from Belgium, exchanged 02.11.97, mid ocean). Additional pages to include the arrival date, ship's name and IMO number at the top.
Date: Date of ballast water uptake. Use European format (DDMMYY).
Port or Latitude/Longitude: Location of ballast water uptake.
Volume: Volume of ballast water uptake, with units.
Temperature: Water temperature at time of ballast water uptake, in degrees centigrade (Celsius).

BW Exchange: Indicate Exchange Method: Circle empty/refill or flow through.
Date: Date of ballast water exchange. Use European format (DDMMYY).
Endpoint or Latitude/Longitude: Location of ballast water exchange. If it occurred over an extended distance, list the end point latitude and longitude.
Volume: Volume of ballast water exchanged, with units.
Percentage exchanged: Percentage of ballast water exchanged. Calculate this by dividing the number of units of water exchanged by the original volume of ballast water in the tank. If necessary, estimate this based on pump rate. (Note: For effective flow-through exchange this value should be at least 300%).
Sea Height (m): Record the sea height in metres at the time of the ballast exchange (Note: this is the combined height of the wind seas and swell, measured from crest to trough. It does not refer to the depth).

BW Discharge:
Date: Date of ballast water discharge. Use European format (DDMMYY).
Port or Latitude/Longitude: Location of ballast water discharge, no abbreviations for ports.
Volume: Volume of ballast water discharged, with units.
Salinity: Record salinity of ballast water at the time of discharge, with units, (i.e. specific gravity (sg) or parts per thousand (ppt)).
If exchanges were not conducted, state other control action(s) taken: If exchanges were not made on all tanks and holds to be discharged, what other actions were taken? E.g. transfer of water to a landbased holding facility, or other approved treatment.
If none, state reasons why not: List specific reasons why ballast exchange was not done. This applies to all tanks and holds being discharged.

SECTION 5:
IMO Ballast Water Guidelines On Board?: Do you have IMO Resolution A.868(20) on board your ship? Circle Yes or No.
Responsible Officer's name and title (Printed) and signature: e.g. The First Mate, Captain, or Chief Engineer must print his name and title and sign the form.

See ABS Shanghai Letter Ref 57445 Dated 24-Dec-2010

Appendix 3

ORKIM SHIP MANAGEMENT SDN. BHD

BALLAST WATER HANDLING LOG

Record of ballast water management on board

Ship..... Port of Registry ..... IMO Number.....

TANK LOCATION	DATE	INITIAL CONTENT (tonnes)	FINAL CONTENT (tonnes)	GEOGRAPHIC LOCATION OF SHIP (Port or Lat. & Long.)	PUMPS USED, or GRAVITAT E	DURATION OF OPERATION	SALINITY	SIGNATURE OF OFFICER IN CHARGE	RANK

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

Responsible Officer's name and title (Printed) and signature: _____ **Date:** _____

ORKIM SHIP MANAGEMENT SDN. BHD

Appendix 4

BALLAST WATER HANDLING LOG

Narrative record of events related to ballast water management on board

Ship..... Port of Registry..... IMO Number.....

Record here events which are relevant to ballast management, and which will be of interest to quarantine officers, such as sediment removal during dry-dock, or tank flushing at sea. Each entry should be completed with the signature and rank of the officer making the entry.

Date	Activity	Comments

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

Responsible Officer's name and title (Printed) and signature: _____ **Date:** _____

ORKIM SHIP MANAGEMENT SDN. BHD

Appendix 5

BALLAST WATER EXCHANGE PRE- PLANNING

Ship..... Port of Registry..... IMO Number.....

Step	Tank (S)	Capacity (m^3)	Total Volume Exchanged 300%	Time Required	Date/Time Start	Date/Time Complete	Pump Rate	Remarks

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

Responsible Officer's name and title (Printed) and signature: _____ **Date:** _____

Appendix 6

LIST OF BALLAST EXCHANGE PLANS (BEPs)

BEP No	Description of Condition	Condition Number from Approved Manual, upon which the BEP is based	Method of Ballast Exchanged examined

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

* A BEP need not be based only on the ship's pure ballast conditions.

Responsible Officer's name and title (Printed) and signature: _____ **Date:** _____

Appendix 7

The effects of combined Free Surface Moments on Ship's Stability have been determined on a conservative basis for the following cases.

Tank (S)	Assumed Status	%	FSM	BEP No. Step No.	BEP No. Step No.	BEP No. Step No.
	Near Full Near Empty					
	Near Full Near Empty					
	Near Full Near Empty					
	Near Full Near Empty					
	Near Full Near Empty					
	Near Full Near Empty					
	Near Full Near Empty					
	Near Full Near Empty					
	Near Full Near Empty					
	Near Full Near Empty					
	Near Full Near Empty					

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

A cross indicates the assumed status for each tank.

The Ship's Master and the Ballast Water Management Officer should pay attention to the results of the cases under consideration, with respect to stability.

ORKIM SHIP MANAGEMENT SDN. BHD

Appendix 8

SEDIMENT REMOVAL AND FLUSHING LOG

Ship..... Port of Registry..... IMO Number.....

TANK (S)	DATE	ACTIVITY	GEOGRAPHIC LOCATION (Port or Lat. & Long)	SIGNATURE OF OFFICER IN CHARGE	RANK

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

ORKIM SHIP MANAGEMENT SDN. BHD

Appendix 9

BALLAST EXCHANGE NOTIFICATION FORM

SHIP: _____ VOYAGE: _____ DATE: _____

TO: _____

ATTN: _____

FORM: Ballast Water Management Officer _____

NOTIFICATION OF BALLAST WATER EXCHANGE PRIOR ARRIVAL AT DESTINATION

LOCATION FOR BALLAST WATER EXCHANGE: Latitude: _____ Longitude: _____

BALLAST WATER EXCHANGE METHOD: SEQUENTIAL/FLOW-THROUGH

(Select one or both boxes, as appropriate)

BALLAST WATER EXCHANGE DURATION: COMMENTS WITH RESPECT TO SHIP SAFETY, IF ANY:

COMMENCED AT _____ _____

INTERRUPTED AT (if applicable) _____ _____

COMPLETED AT _____ _____

See ABS Shanghai Letter Ref 574451 Dated 24-DEC-2010

PART C – NATIONAL OR LOCAL QUARANTINE REQUIREMENTS

See ABS Shanghai Letter Ref 574451 Dated 24-FEB-2010

ORKIM SHIP MANAGEMENT SDN. BHD

NATIONAL OR LOCAL QUARANTINE REQUIREMENTS

COUNTRY	STATUS
Argentina-Buenos Aires	Mandatory application. Quarantine health authorities require ships arriving from WHO listed cholera areas to treat their ballast water with chlorine before discharge.
Australia	Mandatory application, including reporting, from 1 July 2001.
Canada	Voluntary application, although the Guidelines are treated As mandatory by Transport Canada.
Can ad a-Vancouver	Mandatory application affecting all ships arriving at port excluding those arriving from west Coast of USA, Canada and Alaska.
Chile	Mandatory application
Israel	Mandatory application for all ships destined for Israel ports wishing to exchange ballast in port or along the coast.
New Zealand Qatar-	Mandatory application
Ras Laffan	Mandatory application, ships are not allowed to discharge ballast in port apart from segregated ballast. Ballast to be discharged in this port will be subject to chemical analysis.
UK-Orkney Islands	Mandatory application. Ships wishing to discharge ballast at the Flotta Terminal can do so only to a shore-based reception facility.
USA	Voluntary application, but mandatory reporting affecting ships Carrying ballast and arriving from outside the US exclusive Economic zone.

See ABS Shanghai Letter Ref-574451 Dated 24-DEC-2010

Appendix-F: BWTS Piping Schematic

Symbol	Name
	BWTS Line
	BWTS Control & Auxiliary Air Line
	Maker Supply
	Butterfly valve
M	Actuater Valve
FT	Flowmeter
PI	Pressure indicator
PT	Pressure transmitter
IT	Irradiation transmitter
TT	Temperature transmitter
M1	Sleeve Wiper
M2	Backflush Motor
	Stop valve
	Stop check valve
	Flow control valve
	Pump
S	Solenoid valve
	Vent valve
	Diaphragm valve
	Reducer
	Manual Valve
	Ball Valve
	Check Valve

NOTES

1	FPT IS CONVERTED TO VOID TANK AND DISCONNECTED FROM "BOW PUMP TANK BILGE AND BALLAST PIPE SYSTEM"
2	AP TANKS ARE CONVERTED TO FRESH WATER TANKS
3	VALVE ACTUATION MEANS IS PROVIDED VIA INSTRUMENT AIR
4	QUALITY AND PRESSURE OF COMPRESSED AIR SHALL MEET BWTS MAKER STANDARDS
5	REFER LEESGREEN LS-350-EX
6	* VALVE INDICATES MAKER SUPPLY
7	VALVES MARKED WITH ** SYMBOL TO BE MONITORED DURING BWTS OPERATION.
8	THE TAPPING POINTS FOR THE SW INLET AND RETURN TO BE PROVIDED ONBOARD BASED ON EXISTING SHIP ARRANGEMENT.
9	THE SPILLAGE LINE SUITABLY ROUTED TO NEAR BILGE WELL/SCUPPER

SPECIFICATION

RATED CAPACITY: 350 m^3 /h
MAX. WORKING PRESSURE: 0.6MPa
MAX. WORKING TEMP.: 60
POWER SUPPLY: AC440V 60HZ 3P
RATED POWER: 45.5 kW

WORKING CONDITION

Humidity: 0~95%
Working pressure: 0~0.6MPa
Ambient temperature: 0~60
Seawater temperature: -2~35
Static: ≤ 22.5° (All direction)
Dynamic: ≤ 22.5° (All direction)
Voltage floating: ±10%
Frequency floating: ±10%
Applicable Medium: Marine, brackish, freshwater

EQUIPMENT/PUMP DETAILS

ITEM	TYPE	CAPACITY	DIFF. HEAD (BAR)	LOCATION
BALLAST PUMP	CENTRIFUGAL PUMP	200m³/hr	2	PUMP ROOM
BALLAST PUMP	CENTRIFUGAL PUMP	200m³/hr	2	
BWTS SYSTEM	UV TREATMENT	350m³/hr	–	

REFERENCE DRAWING/DOCUMENT

DRAWING No.	Rev.	DRAWING TITLE
GSPL-P1513-PI-0004	B	SANITARY & F.W SERVICE SYSTEM PIPING SCHEMATIC
GSPL-P1513-PI-0003	C	COMPRESSED AIR SYSTEM (CONTROL AIR) PIPING SCHEMATIC

SYSTEM	DESIGN CONDITION		CLASS	TESTING		NOM. DIA.	PIPE	FITTINGS/FLANGE			GASKET	COATING	VALVE		REMARKS
	PRESSURE (bar)	TEMP. (°C)		MEDIUM	PRESSURE (bar)		MATERIAL & SCHEDULE	MATERIAL (FITTINGS)	MATERIAL (FLANGES)	FLANGE RATING			MATERIAL BODY	MATERIAL TRIM	
BWTS	2	AMB	III	WATER	R.C 3.75	200A TO 250A	JIS G3454 STPG370,Sch80 SEAMLESS	JIS G3454 STPG370	R.C JIS B2220 SS400	JIS 5K/PN10	NON ASBESTOS	HOT-DIP GALVANIZED	CAST IRON	AL. BRONZE	
						50A TO 150A	JIS G3454 STPG370,Sch80 SEAMLESS	JIS G3454 STPG370	JIS B2220 SS400	JIS 5K/PN10	NON ASBESTOS	HOT-DIP GALVANIZED		BRONZE	
						15A TO 40A							BRONZE		

ITEM LIST

No.	ITEM	ITEM NO.	REMARKS
1	PIPE	BA01-BA06	
2	VALVE	BAV01-BAV12	R.B BAV04&BAV05 ARE REMOVED
3	SAMPLING DEVICE	SV	
4	FLOW METER	FT	

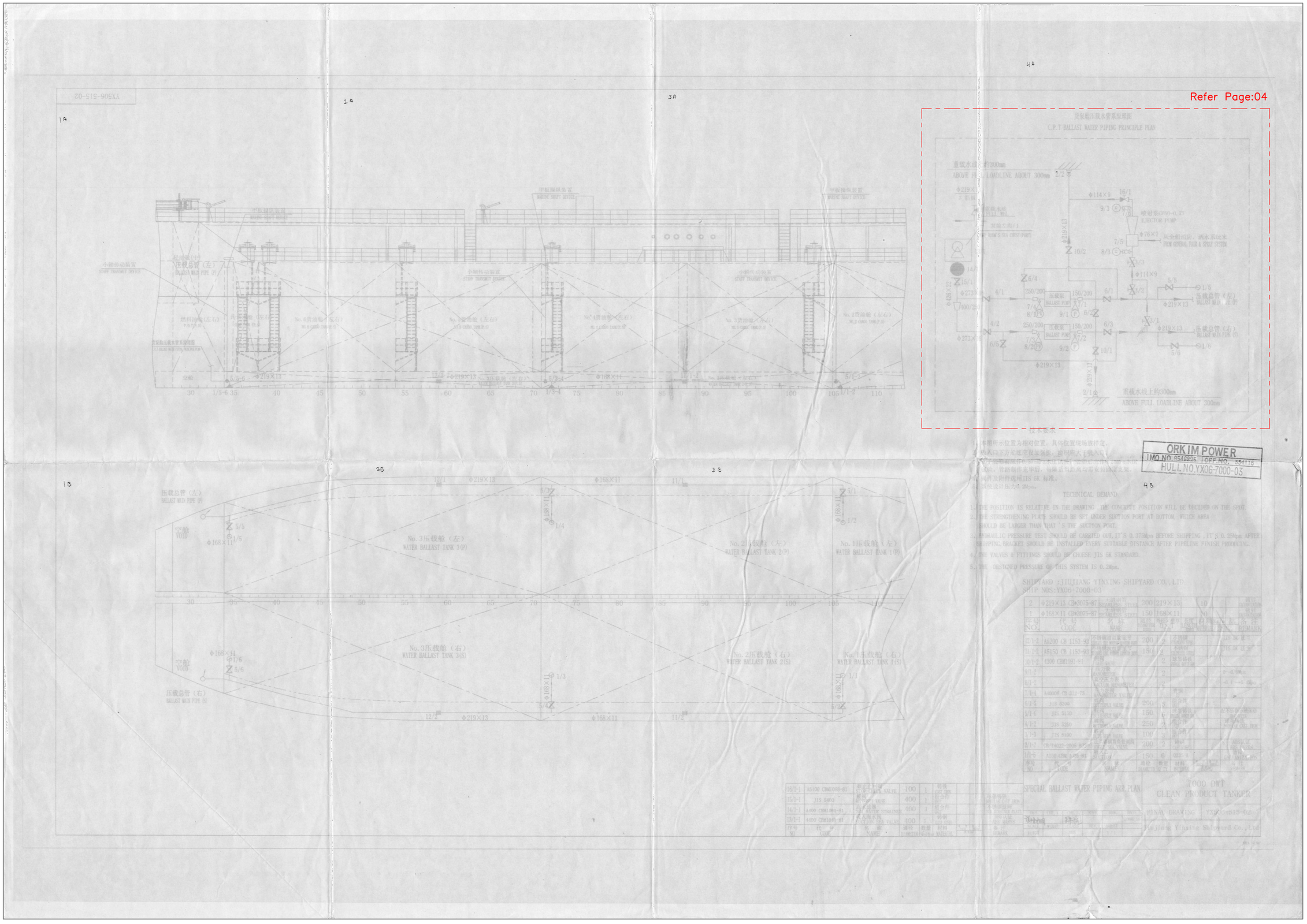
REV.	DATE	DESCRIPTION	DRAWN BY	CHKD BY	APPRD
D	29/10/2024	TEMPLATE UPDATED	SK	TT	GC
C	28/10/2024	SPEC. TABLE UPDATED	SK	TT	GC
B	22/10/2024	BYPASS VALVE CONFIG. UPDATED	SK	TT	GC
A	17/10/2024	ISSUED FOR APPROVAL	SK	TT	GC

YFMARINE

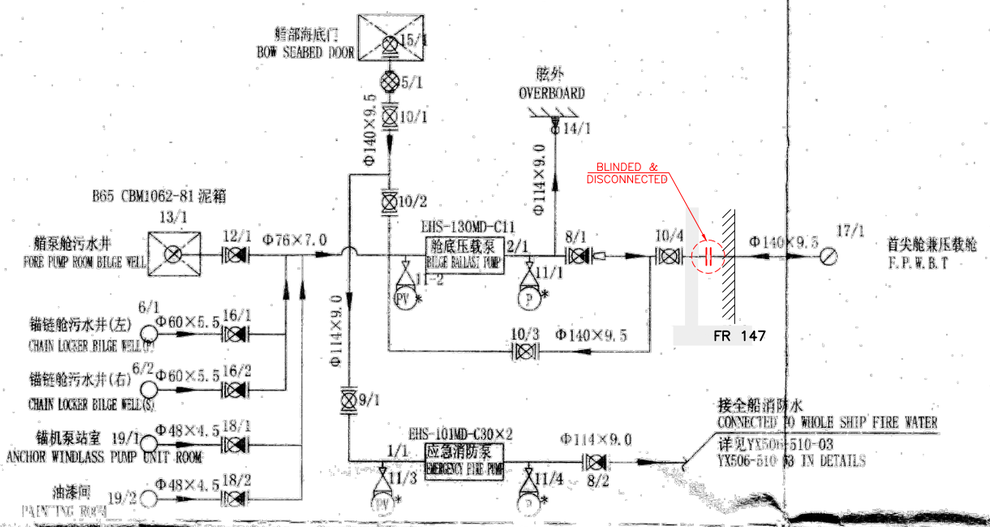
Designed By: Goltens Singapore Pte Ltd.

Client: Orkim Ship Management
BWTS Maker Name: LeesGreen
Location: -
IMO No.: 9546825
Project No: P1513
Project Name: ORKIM POWER
Drawing title: BWTS PIPING SCHEMATIC

Scale	Format	Sheet	Drawing No:	Revision No.
N.T.S	A3	1	GSPL-P1513-PI-0001	D


Refer Page:04
ORKIM POWER
IMO NO.9546825 IOEF NO. 8341116
HULL NO.YX06-7000-03
TECHNICAL DEMAND
SHIPYARD :JIUJIANG YINXING SHIPYARD CO.,LTD
SHIP NOS:YX06-7000-03
7000 DWT
CLEAN PRODUCT TANKER
SHEET: 2/5

艏泵舱压载管系系统图
BOW PUMP TANK BILGE AND BALLAST PIPE SYSTEM



SHIPYARD :JIUJIANG YINXING SHIPYARD CO., LTD
SHIP NOS:YX06-7000-03

ORKIM POWER
IMO NO.9546825 | OFF.NO. 334116
HULL NO.YX06-7000-03

技术要求

1、液压试验：

	装船前	装船后
舱底水管	0.45Mpa	0.3Mpa
消防水管	0.9Mpa	0.6Mpa

2、管子凡穿过水密舱壁，水密甲板时，应按CB M1063-81设置通舱管件。
3、海底门内应设防蚀锌块。

TECHNICAL DEMAND

1、HUDRAULIC PRESSURE TEST:

	BEFORE SHIPPED:	BEFORE SHIPPED:
BILGE WATER PIPE	0.45Mpa	0.3Mpa
FIRE CONTROL WATER PIPE	0.9Mpa	0.6Mpa

2、THE PIPE PENETRATING PIECE SHOULD BE INSTALLED TO ACCORD TO CB M1063-81, WHEN PIPE PENETRATE THROUGH THE W.T.DECK AND TEH W.T.BHd.
3、TEH ECTH-PROOF ZINC SHOULD BE INSTALLED INSIDE SEABED GATE.

序号 NO.	代号 CODE	名称 NAME	通径 DIAMETER	外径×壁厚 D×T	材料 MATERIAL	长度 LENGTH	单重	总重	备注 REMARKS
3	Φ140×9.5 CB*3075-87	无缝钢管 SEAMLESS STEEL	125	Φ140×9.5	10#				镀锌 GALVANIZATION
2	Φ114×9.0 CB*3075-87	无缝钢管 SEAMLESS STEEL	100	Φ114×9.0	10#				镀锌 GALVANIZATION
1	Φ76×7.0 CB*3075-87	无缝钢管 SEAMLESS STEEL	80	Φ76×7.0	10#				镀锌 GALVANIZATION

序号 NO.	代号 CODE	名称 NAME	通径 DIAMETER	数量 Q'TY	材料 MATERIAL	单重	总重	备注 REMARKS
		甲板排水口						
18/1-2	GB/T591 16040	截止止回阀 STOP CHECK VALVE	40	2	铸铁			
17/1	A125 CBM 1036-81	吸入口 SUCTION	125	1	Q235			镀锌
16/1-2	CB/T 4003-2005 AJ50	截止止回阀 STOP CHECK VALVE	50	2	铸 钢 CAST STEEL			
15/1	4125 CBM 1041-81	吸入通海阀 SUCTION HULL VALVE	125	1	铸 钢 CAST STEEL			ABS认证 ABS MARKS
14/1	CB/T 4022-2005 BJ100	舷侧阀 OUTSIDE VALVE	100	1	铸 钢 CAST STEEL			ABS认证 ABS MARKS
13/1-1	B65 CBM1062-81	泥箱 NUD BOX	65	2				
12/1-1	CB/T 4003-2005 AJ65	截止止回阀 STOP CHECK VALVE	65	1				
11/1-4	A 40006 CB 312-75	压力表阀 MANOMETER VALVE	6	4	铜 质 COPPER			
10/1-4	CB/T 4002-2005 AJ125	截止阀 CUT-OFF VALVE	125	4	铸 钢 CAST STEEL			
9/1-1	CB/T 4002-2005 AJ100	截止阀 CUT-OFF VALVE	100	1	铸 钢 CAST STEEL			
8/1-2	CB/T 4003-2005 AJ100	截止止回阀 STOP CHECK VALVE	100	2	铸 钢 CAST STEEL			
7/1		干粉灭火器(5kg) DRY POWER FIRE EXTINGUISHER		1	组合件 COMBIVATION	5	5	
6/1-2	B50 CBM1062-81	泥箱 NUD BOX	50	2	组合件 COMBIVATION			
5/1	A125 CBM1061-81	粗水滤器 FILTER	125	1	组合件 COMBIVATION			不锈钢板网滤芯
4/1	A250 CB/T615-95	吸入格栅 SUCTION GRID	250	1	钢质 STEEL			镀锌
3/1	ZAC-C9 GB4950-85	防腐蚀锌块 ECTH-PROOF ZINC		1	锌 ZINC	1.1	1.1	
2/1	EHS-130MD-C11	舱底压载泵 BILGE BALLAST PUMP		1	组合件 COMBIVATION			
1/1	EHS-101MD-C30×2	应急消防泵 EMERGENCY FIRE FIGHTING PUMP		1	组合件 COMBIVATION			

艏泵舱压载管系系统图
BOW PUMP TANK BILGE AND BALLAST PIPE SYSTEM

DES.	CHE. 1	CHE. 2	APPR.	DRW.	DATE
谢朝明		张强			09-10-06
SCALE	W(kg)	CLASS	REV.	SHEET	
1:40		ABS	A	1/1	

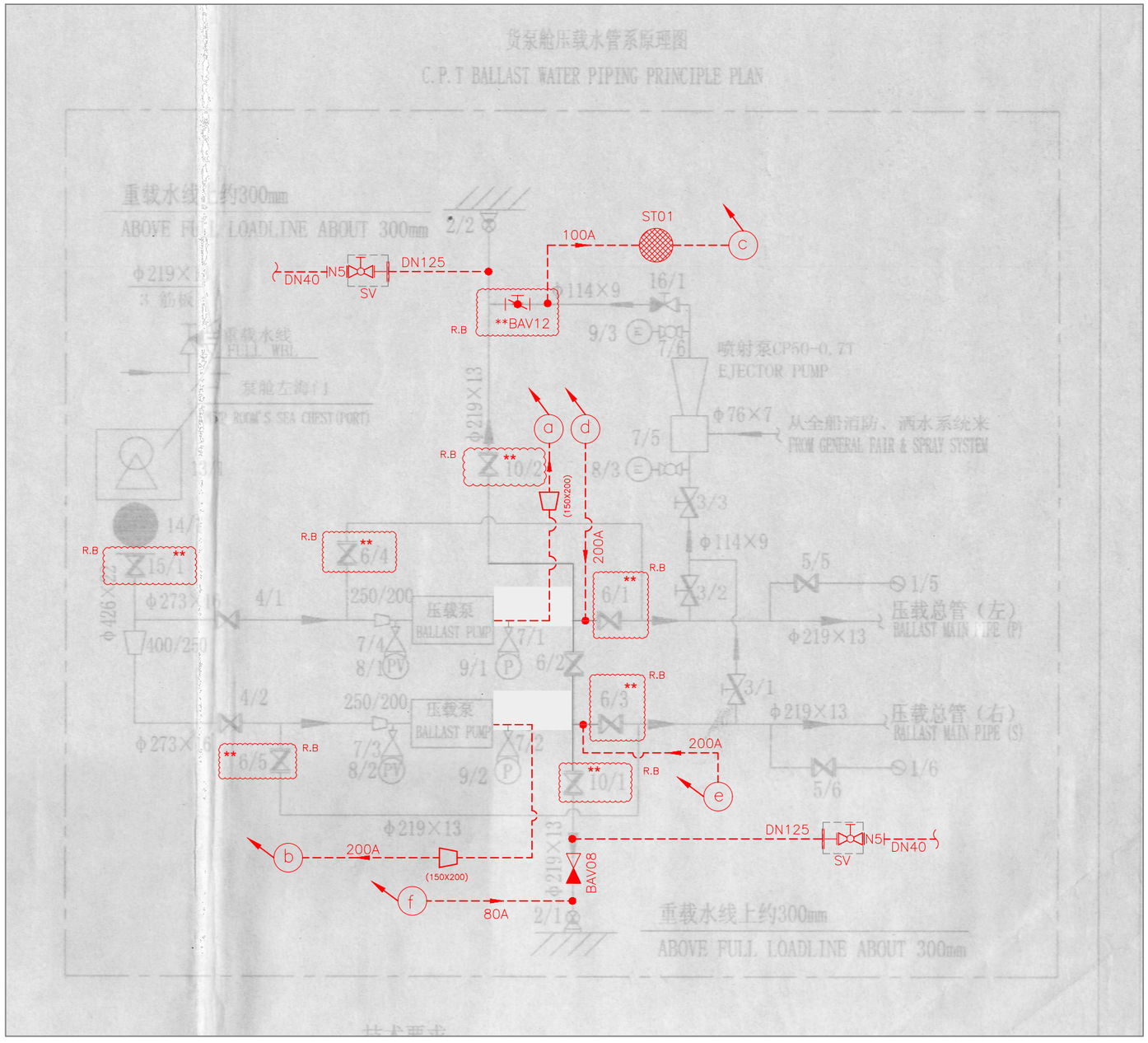
7000 DWT
CLEAN PRODUCT TANKER

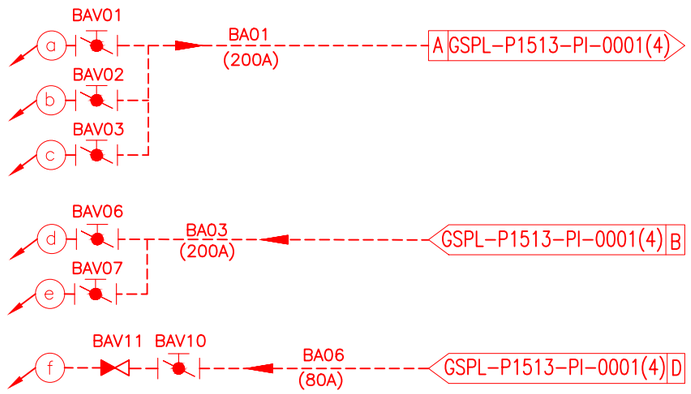
FINAL DRAWING | YX506-531-01

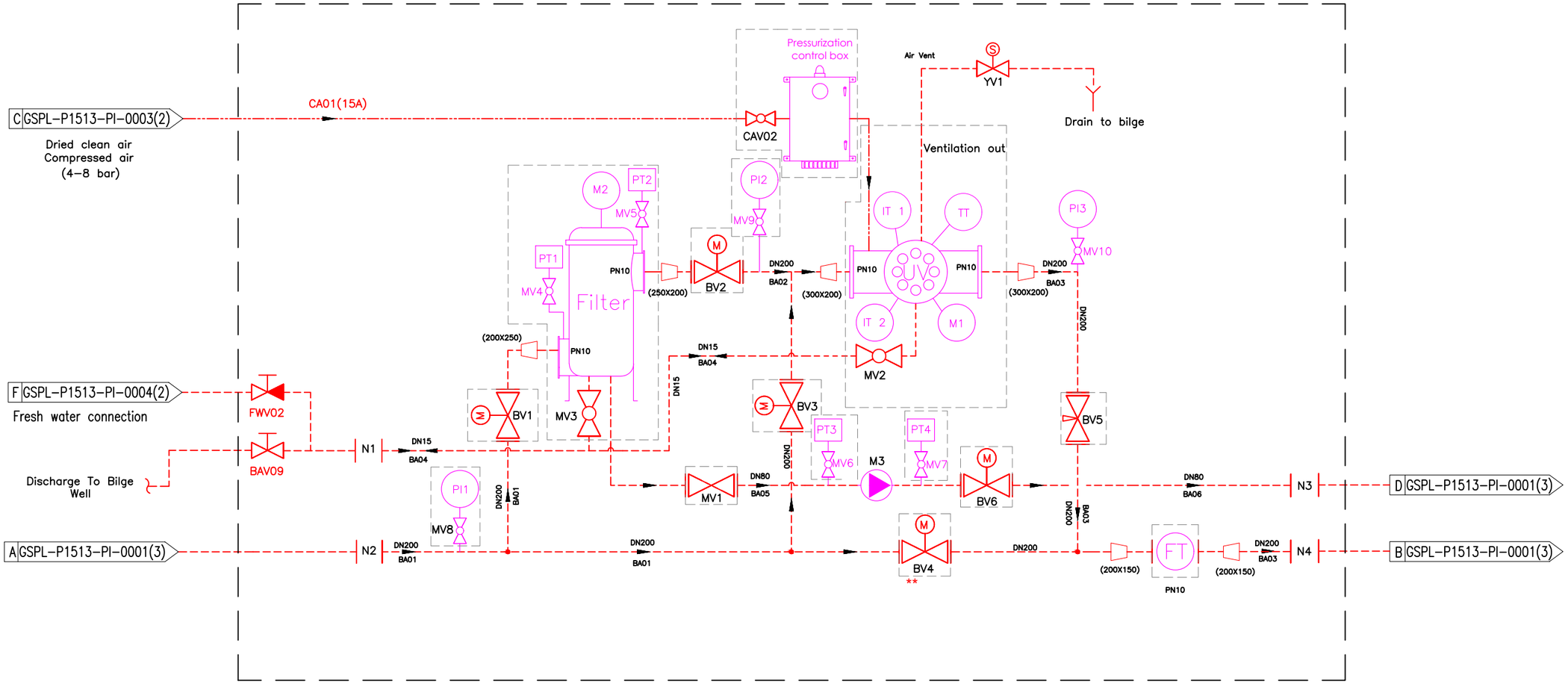
Jiujiang Yinxing Shipyard Co.,Ltd

R.B

SHEET: 3/5


货泵舱压载水管系原理图
C.P.T BALLAST WATER PIPING PRINCIPLE PLAN
重载水线上约300mm
ABOVE FULL LOADLINE ABOUT 300mm
ST01
100A
DN125
DN40
IN5
SV
**BAV12
R.B
喷射泵CP50-0.7T
EJECTOR PUMP
从全船消防、洗水系统来
FROM GENERAL FAIR & SPRAY SYSTEM
压载泵
BALLAST PUMP
压载总管（左）
BALLAST MAIN PIPE (P)
压载总管（右）
BALLAST MAIN PIPE (S)
200A
80A
(150X200)
BAV08
重载水线上约300mm
ABOVE FULL LOADLINE ABOUT 300mm


BAV01
BAV02
BAV03
BA01
(200A)
A GSPL-P1513-PI-0001(4)
BAV06
BAV07
BA03
(200A)
GSPL-P1513-PI-0001(4) B
BAV11
BAV10
BA06
(80A)
GSPL-P1513-PI-0001(4) D



BV1	Filter inlet valve
BV2	Filter outlet valve
BV3	Deballasting valve
BV4	By-pass valve
BV5	Flow control valve
BV6	Flushing valve
PI1	Filter inlet press. indicator
PI2	Filter outlet press. indicator
PI3	UV outlet press. indicator
M1	UV sleeve wiper
M2	Backflush motor
PT1	Filter inlet press.transmitter
PT2	Filter outlet press.transmitter
PT3	Purge outlet press. transmitter
PT4	Flushing pump outlet press.transmitter
SV	Sampling valve
IT1	UV irradiation transmitter 1#
IT2	UV irradiation transmitter 2#
TT	UV reactor temp. transmitter
FT	Flow transmitter
M3	Flushing pump

No.	NAME	MODEL	Code	Qty.	REMARKS
24	Pressurization control box	LSK-220Ex		1	Ex d e mb IIC T4 Gb
23	Sampling device	LSS-1s		1	
22	Remote control unit	LSC-2R		1	RKYP
21	Manual ball valve	G1/4	MV4-7	4	
20	Ex-proof Solenoid Vent valve	G1/2	YV1	1	Normally closed
19	Ex-proof Flushing Pump	DN80	M3	1	65m3/h, 20m
18	Ex-proof Pressure transmitter	G1/4	PT3	1	4~20mA, -0.1~0.5MPa
17	Ex-proof Flowrate Transmitter	DN150	FT	1	4~20mA, 30~300 m3/h
16	Ex-proof Temp. Transmitter	G1/2	TT	1	4~20mA, 0~100
15	Ex-proof UV intensity sensor	G3/4	IT1,IT2	2	4~20mA, 0~1000 mW/cm2
14	Ex-proof Pressure transmitter	G1/4	PT1, PT2, PT4	3	4~20mA, 0~1.0MPa
13	Ex-proof Flushing Motor		M2	1	
12	Wiper Motor		M1	1	
11	Pressure gauge	G1/2	PI1, PI2, PI3	3	
10	Manual ball valve	G1/2	MV2-3, MV8-10	5	
9	Manual butterfly valve	DN80	MV1	1	
8	Diaphragm valve	DN40	SV	1	
7	Ex-proof Actuater valve	DN80	BV6	1	220v
6	Ex-proof Actuater flow control valve	DN200	BV5	1	220v
5	Ex-proof Actuater valve	DN200	BV1~4	4	220v
4	Power cabinet	LSP-1		1	
3	Control unit	LSC-1L		1	KWP
2	Ex-proof UV Reactor	LSV-350Ex		1	Ex d e ib mb px IIC T4 Gb
1	Ex-proof Filter	LSF-350Ex		1	Ex d IIC T4 Gb

SHEET: 5/5

Appendix-G: BWMS Operation Maintenance and Safety Manual

LeesGreen®
Ballast Water Management System

船舶压载水管理系统
综合解决方案供应商

操 作 手 册 及 安 全 须 知

OPERATING

&

SAFETY

MANUAL

船名/ Vessel Name： ORKIM POWER

IMO 编号/ IMO No. 9546825

船级社/ Class： ABS/CCS

型号数量/ Type×Set： LS-350Ex

系统编号/BWMS No.： LFM24G1340Ex

李氏複大
Shanghai LEE'S FUDA

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1 安全须知 SAFETY INSTRUCTIONS

请在 *LeesGreen* 船舶压载水管理系统（以下简称“系统”）使用前仔细阅读“安全须知”并以正确方法使用。

本“安全须知”记载内容，可使操作人员安全，正确的使用产品，并预防对您造成人身伤害和系统出现严重故障。

Please carefully read “Safety Instructions” before using the *LeesGreen* ballast water management system (hereinafter referred to as the “system”) and use it in a correct approach.

The content recorded in this “Safety Instructions” could help the operators to safely and correctly use the products and prevent personal injuries and serious system faults.

1.1 安全符号说明 SAFETY SYMBOLMS

	1、注意（警告）； 2、此符号提示信息：不遵守规定可能会导致系统严重故障； 3、安全提醒必须严格遵守。	1. Attention (Caution); 2. This symbol indicates that: non-compliance with the provisions might lead to serious system faults; 3. Safety precautions must be strictly observed.
STOP	1、停止 (禁止危险)； 2、此符号提醒存在对人身的剧烈伤害的严重危险； 3、必须严格遵守。	1. Stop (Forbidden, Danger); 2. This symbol indicates that there is serious danger which might lead to serious personal injuries; 3. It must be strictly observed.
	1、信息； 2、此符号提示关键的可用信息，不遵守将会导致故障。	1. Information; 2. This symbol indicates critical available information and non-compliance might lead to faults.
	操作者应按手册内容进行观察和判断。	Operators shall observe and judge in accordance to content of the manual.
	操作者应按手册内容进行操作。	Operators shall operate in accordance to content of the manual.

1.2 系统的安全使用 SAFE USE OF THE SYSTEM

STOP	安装和调试工作须由专业电气人员进行。	Installation and commissioning shall be carried out by professional electricians.
STOP	禁止对系统自行拆卸修理或改装。	It is forbidden to dismantle, repair or modify the system without permission.
STOP	本处理系统运行过程中禁止打开操作箱和电源箱，有触电危险。	It is forbidden to open the operation cabinet and *Power Cabinet* while the system is running. There is risk of electric shock.

STOP	系统电气连接如发现松脱，损坏任何故障，禁止操作该系统。	It is forbidden to operate the system if loosening, damage or any other faults are discovered at the system electric connections.
STOP	安装舱室如若进水或箱体未安全接地，请勿进行操作。	Please do not operate if the installation compartment takes in water or the cabinet is not safely earthed.
⚠	手动操作须由受过操作培训的人员按照本手册所述规程进行操作。	Manual operation shall be carried out by trained personnel according to regulations specified in this manual.
⚠	系统自动运行操作默认为作业泵优先，即本系统自动运行将受到作业泵的状态的控制。	Ballast pump has higher priority over the system in automatic working mode, i.e. the system will be controlled by status of the ballast pump.
⚠	故障未排除或紧急状态未解除之前，请勿复位故障或急停按钮。	Do not reset the emergency stop before the fault is eliminated or emergency is released.
⚠	紧急压（排）水或消防需要时，请立即开启旁通模式。	Please initiate the bypass mode as soon as possible in case of emergency ballasting (de-ballasting) or firefighting.
☞	系统运行初始阶段包含预热过程，预热时须根据工作流程图操作系统外相应阀门，以确保系统有效工作；	The initial stage of the system operation includes *Warming Up* process, please operate the corresponding valves outside *LeesGreen* BWMS based on the working flowchart to ensure effective treatment.
☞	请参阅附录 2 “系统设计限制”，在要求范围内使用本系统，以满足压载水公约和规范要求。	Please refer to Appendix 2 "*System Design Limitations*" to use the system within the requirements to meet the ballast water Convention and requirements of BWMS Code.
⚠	禁止将本系统安装于露天甲板。	Installing the LeesGreen BWMS on the open decks of vessels are prohibited.

1.3 扩展用途 EXTENDED USE

STOP	在系统操作说明所规定之外的扩展用途是不被允许的。	Extended use not specified in the system operation instructions is not allowed.
☞	任何本手册之外的操作都将视为误使用，误使用所导致的系统故障和设备损坏，制造商将不承担责任。	Any operations not specified in this manual will be considered misuse, and the manufacturer will not take any responsibilities for any system faults and equipment damages caused there from.

2 系统概述 GENERAL

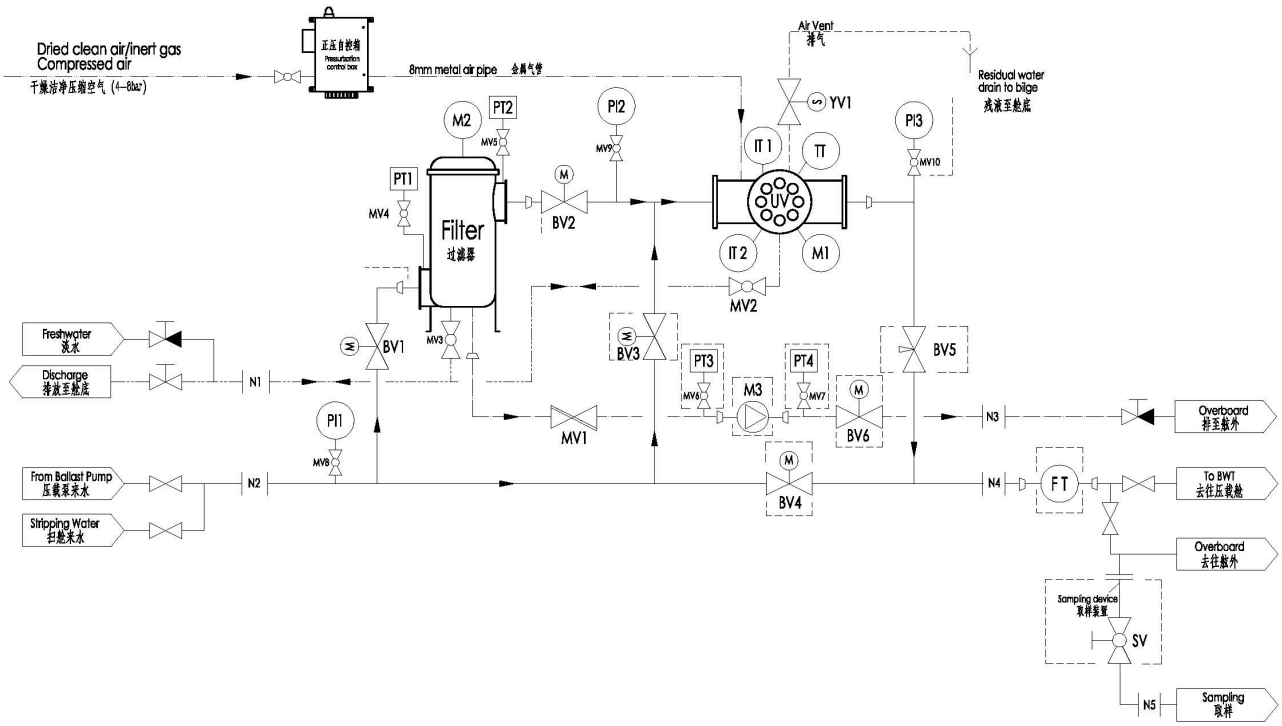


图 1 系统工艺流程图

Fig.1 Flowchart of LeesGreen BWMS

系统包括过滤器、紫外反应器、控制箱、电源柜、电动阀、监测设备、取样装置以及管路。系统正常工作分为压载和卸载两个流程。此外还包含扫舱和旁通作业流程，流程图详见附录 1。

The System includes Filter, UV Reactor, Control Unit, Power Cabinet, and Electric Valves, monitoring equipment, sampling device and pipeline. General working modes include ballasting and deballasting processes, as well as ballast stripping and emergency bypass. The detailed Ballast System Diagram refers to Appendix 1.

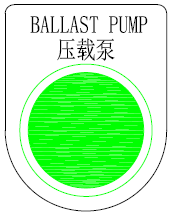
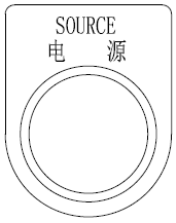
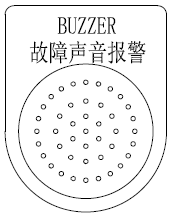
⚠	当旁通阀开启时，系统将发出声光报警并记录。 请参考附件 1 获取旁通阀信息	When bypass valve opened, BWMS will trigger visual&sound alarm and record accordingly. Please refer to Appendix 1 for details.

3 控制箱概述 CONTROL UNIT

3.1 就地控制箱 LOCAL CONTROL UNIT

图 2 就地控制箱

Fig.2 Local Control Unit

按钮与指示灯 BUTTONS & INDICATORS	说明 DESCRIPTION	
	👁	显示作业泵状态（绿灯亮：启动；灭：未启动）。 Indicates status of ballast pump (Green light ON: pump running; OFF: pump standby).
	👁	显示控制箱电源状态（白灯亮：启动；灭：未启动）。 Indicates status of power supply of *Control Unit*(White light ON: powered on; OFF: powered off).
	👁	声光提示报警 (黄灯亮并闪烁：有报警)。 Yellow flashing and buzzer ringing indicate fault alarm triggered.
	👆	按下可使报警声复位。 Press to reset alarm buzzer.

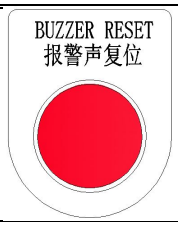
按钮与指示灯 BUTTONS & INDICATORS	说明 DESCRIPTION	
		按动急停按钮后亮起。 Red light on after Emergency Stop button pressed.
		紧急时按下可使系统停机并发出声光报警； 顺时针旋动按钮可解除急停状态。 Press down to shut down system in case of emergency and Emergency Stop signal light on and buzzer start ringing; Turn the button clockwise to release in case emergency status gone.

3.2 远程控制箱 REMOTE CONTROL UNIT

图 3 远程控制箱

Fig.3 Remote Control Unit

截图 SCREENSHOT	说明 DESCRIPTION	
		按下可进行触摸屏电源开关； Press the HMI power switch;
		声光提示报警 (黄灯亮并闪烁：有报警)。 Yellow flashing and buzzer ringing indicate fault alarm triggered.

截图 SCREENSHOT	说明 DESCRIPTION	
		按下可使报警声复位。 Press to reset alarm buzzer.
		按动急停按钮后亮起。 Red light on after Emergency Stop button pressed.
		紧急时按下可使系统停机并发出声光报警； 顺时针旋动按钮可解除急停状态。 Press down to shut down system in case of emergency and Emergency Stop signal light on and buzzer start ringing; Turn the button clockwise to release in case emergency status gone.

4 系统操作 SYSTEM OPERATION

LeesGreen 压载水处理系统对压载水的处理为两步式，即系统在压载时和卸载时分别对流进流出压载舱的海水进行一次处理。

控制箱开机后首先应选择操作箱（就地控制箱或远程控制箱），再进行操作模式的选择（手动操作或自动运行），如下图所示：

The treatment includes two steps while ballast water is treated both in ballasting intake and de-ballasting discharge to fulfill the complete disinfection.

The start-up procedure and selection of control unit shall be done first as following:

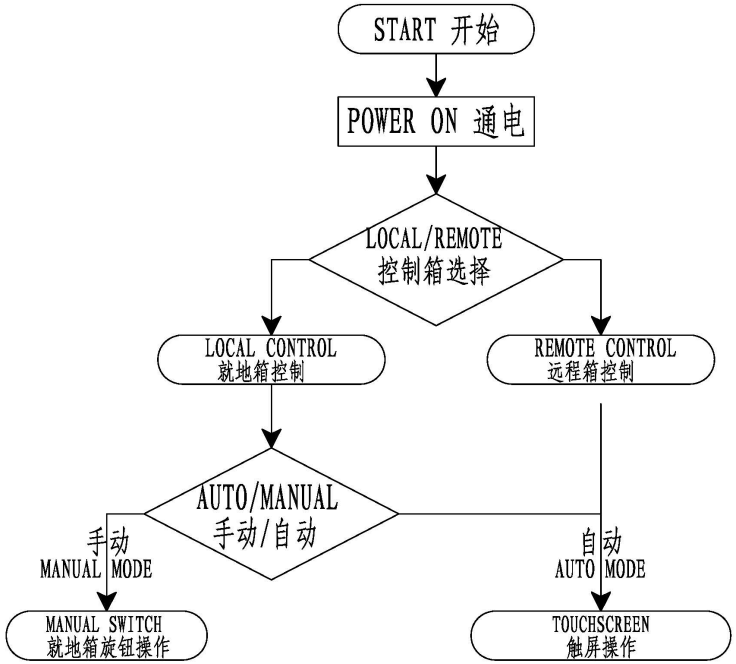


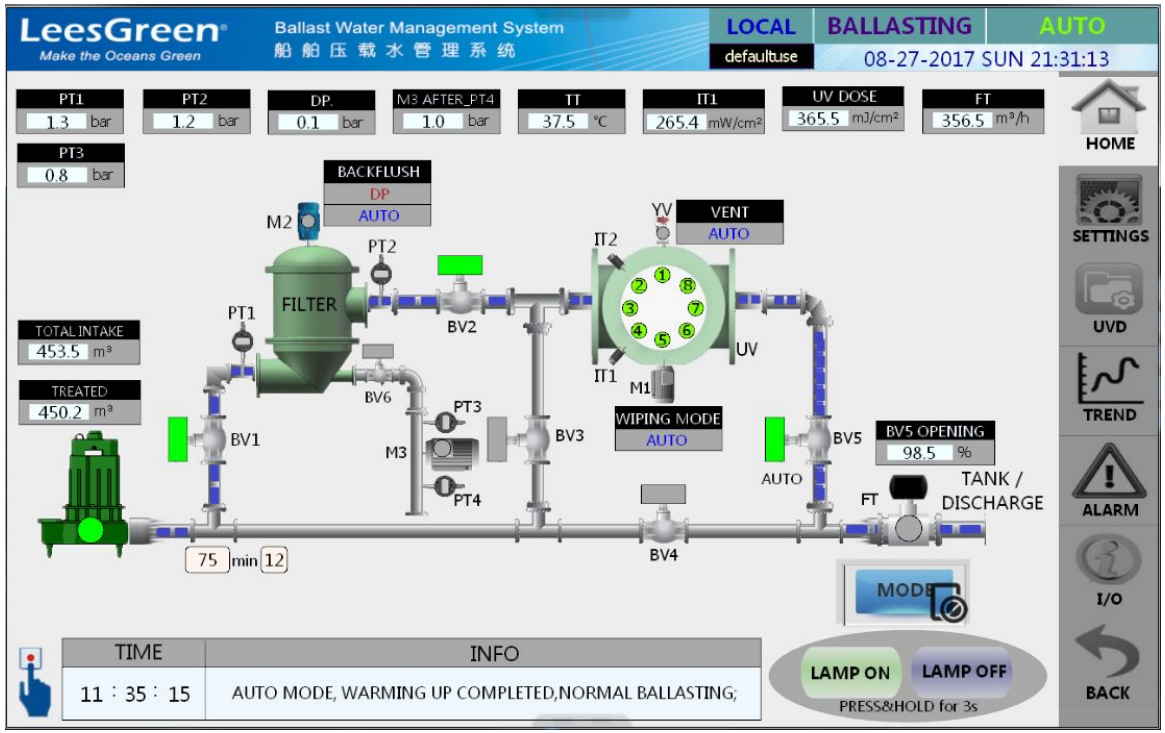
图 4 开机流程图

Fig.4 START-UP PROCEDURE

4.1 压载模式 BALLASTING MODE

压载流程运行时，海水由海底门经压载泵进入处理系统，经过滤单元滤除个体尺寸在 50 微米以上的杂质和生物，滤除物在排污时排回压载海域。过滤水随后进入紫外处理单元完成对生物的灭活，而后进入压载舱。

In ballasting mode, seawater is pumped into *LeesGreen* BWMS from sea chest. Impurities and microbe with size above 50um are filtered at first and then remaining organisms are disinfected by UV. Meanwhile the back-flush water drained from filter is purged out overboard.

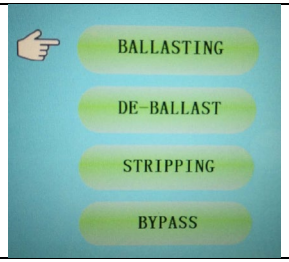
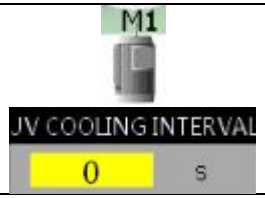


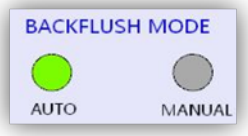
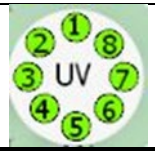
Seawater → Filter → Removes microbe and other impurities with size ≥50microns → Automatic self-cleaning → UV irradiation disinfects smaller organisms → Ballast tank

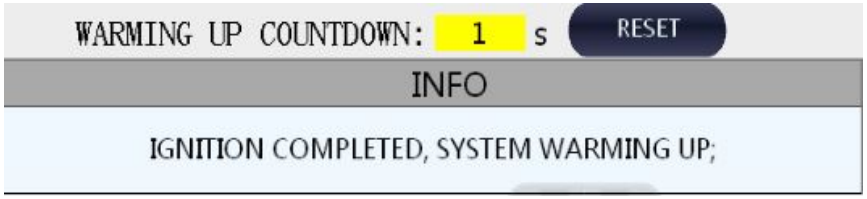
图 5 压载模式

Fig.5 BALLASTING MODE

4.1.1 自动压载模式启动操作 STARTING PROCEDURES IN AUTOMATIC BALLASTING MODE

步骤 STEP		截屏 SCREENSHOT	说明 DESCRIPTION	
1			作业泵关停状态下，点击 “系统工作模式”弹出框，点选“压载”； ☞ 系统开机默认运行模式为“压载”。	Press on “*Mode*” to initiate the working mode selection box and then press “*BALLASTING*” in the condition of pumps standing by; ☞ The default operating mode is “*BALLASTING*”.
				
			系统运行模式选择完毕后，BV1、BV2 阀门自动打开，直至“绿色”开启状态； BV5 根据流量进行调节阀门开度，应显示为“蓝色或绿色”非全关状态；BV3 和 BV4 阀门自动关闭，应显示为“灰色”关闭状态。	After operating mode selection, BV1 and BV2 valves will automatically open; BV5 will adjust valve opening according to target flowrate, and BV3 and BV4 valves will automatically close.
			刮板电机指示灯应显示为“灰色”停止状态，且紫外灯二次点灯剩余时间显示为“0”时，才可进行下一步骤操作。	The next step operation can be performed only when the indicator light for wiper shows as grey in the off-state and the remaining time is 0 for UV lamp cooling.
2			长按 “点灯运行”（约 3 秒）使紫外开始待机； ☞ 当作业泵开启且流量达到“点灯流量”时紫外灯才逐次点亮。	Press and hold for 3 seconds to initiate standby of UV lamps; ☞ Ignition of UV lamps will be only started when ballast pump’s on and ”ignition flowrate “reached. ☞ 长按 “关灯运行”（约 3 秒）可使紫外开始关灯； Press and hold LAMP OFF button for 3 seconds to turn off lamps.

步骤 STEP		截屏 SCREENSHOT	说明 DESCRIPTION	
	👁		作业泵启动后，作业泵指示灯显示为“绿色”起动运行状态； 紫外反应器在流量上升后开始点灯运行，同时过滤反冲洗响应系统启动。	After the ballast pump starts up, the indicator light for No. 19 ballast pump shows as green in the on-state. The UV unit starts lightening and the filter and backflush function is initiated.
3	👆		点击可切换反冲洗压差/时间控制模式； ☞ 系统默认压差模式。	Press to switch backflush mode either by different pressure or time interval; ☞ The default mode is *DP control*.
	👁		过滤反冲洗系统处于“自动模式”时，过滤反冲洗系统自动运行启动； 过滤反冲洗系统处于“手动模式”时，点击“反冲洗手动控制起停开关”可手动控制过滤反冲洗系统起停。	When the filter and backflush system function is in AUTO mode, it operates automatically; When in *MANUAL* mode, please press the backflush manual control start/stop switch to manually start or stop the filter and backflush process.
	👁		当 “滤前后压差”显示数值达到设定值（压差模式下）或“反冲洗倒计时”显示为“0”时（时间模式下）， BV6 排污阀将自动打开，开启完毕且显示为“绿色”开启状态后，系统自动起动 M2，23 号指示灯显示为“绿色”运行状态，过滤反冲洗系统开始运行； 运行达到“反冲洗时间”设定值后，BV6 和 M2 同时关闭结束该轮次反冲洗。	When pressure difference between pre and post-filter reach the set level (in *DP control* mode) or the backflush countdown shows 0 (in *time control* mode), BV6 backflush valve will automatically open; after BV6 opens and shows as green in the on-state, the system will automatically start backflush motor M2, then backflush starts; When the backflush duration reaches a set value, BV6 and M2 will simultaneously close and the backflush completes.
3	👁		紫外灯状态将在 1 分钟内逐个变为“绿色”,如遇故障则显示为“黄色”；	UV lamps will show as green one by one after successful ignition, and it will turn yellow if faults occur;

步骤 STEP		截屏 SCREENSHOT	说明 DESCRIPTION	
			当全部显示为“绿色”时，紫外反应器自动点灯完成，进入预热阶段。 注意：预热阶段系统的处理水尚不能达到处理标准，请参照附图开闭相关阀门外排，禁止入舱；	When all the lamps turn green, it means that the UV startup completes and the Ballasting starts.
4	👁			
			点灯完毕，预热开始，进行倒计时； 注意：预热阶段系统处理能力尚未达到最佳状态，此时处理水可能不能达到处理标准。	After all lamps ignited, warming up process starts with countdown indicating. Please be noted the treated water during warming up period may not meet the standard and should not be allowed to introduce.
5	👁			
			当预热过程结束，操作提示框内会出现相应信息，提示压载模式开始正常运行。 注意：此时系统处理能力达到要求，可切换至入舱阀门进行压载作业。	After warming up, a prompt message will be appeared in INFO box to indicate the ballasting normally starts. Please manually switch the valves to introduce the treated water into ballast tank.

4.1.2 自动压载模式停止操作 STOPPING PROCEDURES IN AUTOMATIC BALLASTING MODE

步骤 STEP		截屏 SCREENSHOT	说明 DESCRIPTION	
1			手动关闭作业泵； 作业泵图示转为“灰色”。	Power off ballast pump manually; The icon shall turn gray.
			紫外灯状态逐一显示为“灰色”； 当全部数字编号全部显示为“灰色”时，紫外灯管自动熄灭完成，正常结束压载处理； ☞ 作业泵关停、流量低于点灯流量或长按“点灯停止”3 秒均可关停紫外灯。	UV lamps will show as grey one by one; When all the lamps show as grey, it means that UV lamps complete turned off and the Ballasting mode stops normally; ☞ Turn off the ballast pump, decrease flowrate below ”ignition flowrate“or press&hold ”LAMP OFF“ for 3s all can turn off the UV lamps.

⚠ 长按“点灯停止”按钮 3 秒后可手动关闭紫外灯，此时水为未完全处理状态，请慎用！

⚠ Press and hold “Lamp Off” button for 3 seconds to manually switch off the UV lamp;
Please NOTE that is at this time the water is not fully treated so proceed with discretion.

若“设置”画面中“刮板运行模式”为“自动”档时，系统进入待机倒计时。如果压载泵在待机倒计时期间无任何操作动作，倒计时结束后将自动启动刮板电机(M1)进行紫外套管清洗，清洗时间约为 20 分钟。

若“设置”画面中“刮板运行自动/手动选择开关”为“手动”档时，系统运行主画面中会有“刮板启动” 闪烁提示可见，请手动起动套管清洗（即刮板电机 M1）。

系统上电后，若刮板不在原点位置，系统将在主画面将闪烁如下信息，并自动复位刮板至原点。

若刮板因手动操作或其他原因未停在原点位置，主画面将闪烁如下信息，请手动操作将刮板复位至原点。

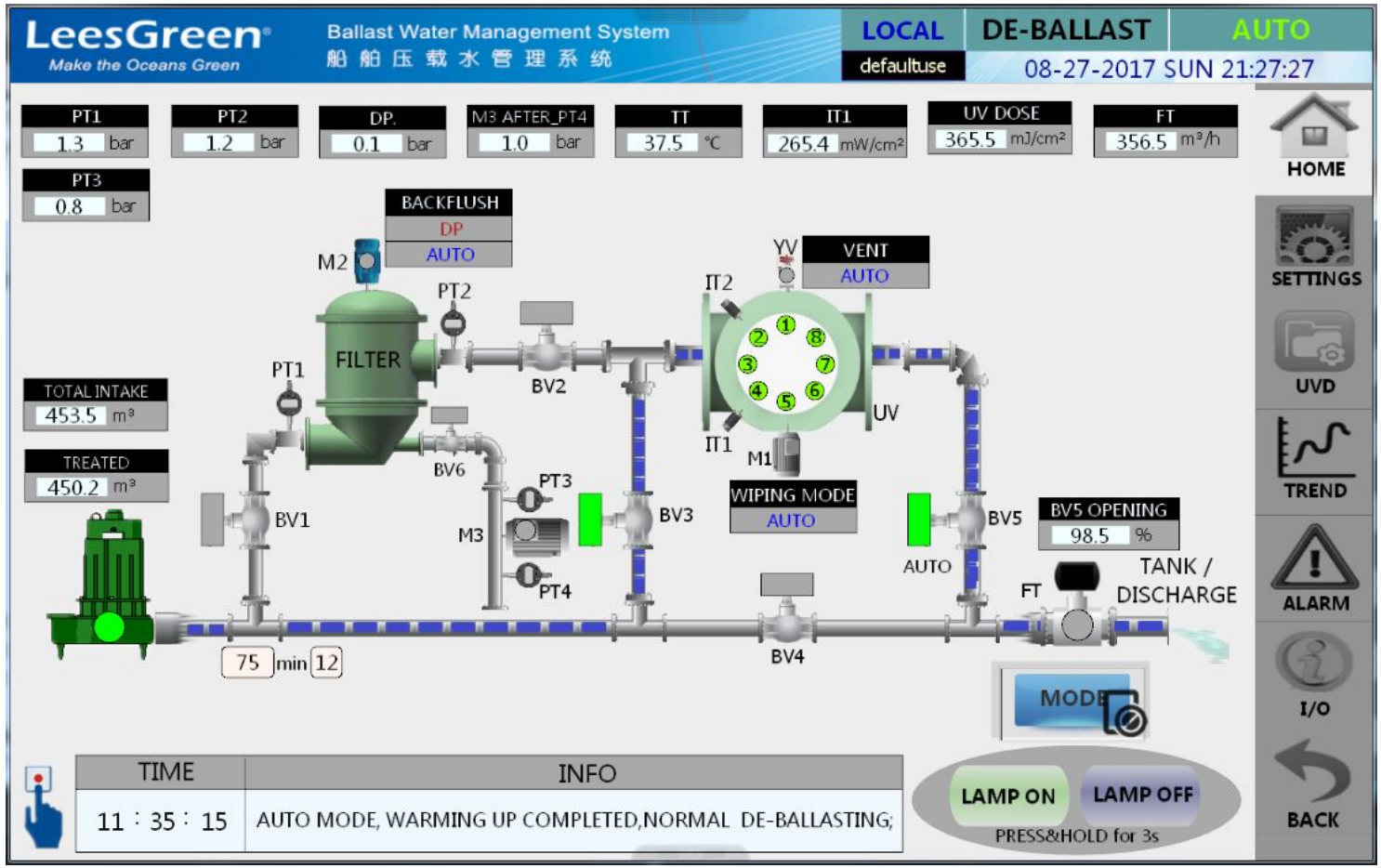
When ’WIPING MODE’ is AUTO and Ballasting process finishes, if the ballast pump shows no operation during the standby countdown, the system will automatically start the wiper motor (M1) after the countdown to clean quartz sleeves for about 20 minutes.

When “WIPING MODE” is MANUAL, a banner notice will flash at Main Screen to remind user to manually start wiping.

If the sleeve wiper is not at origin after power-on, a noticing message will be flashing in *MAIN SCREEN* and the wiper will be **AUTOMATICALLY** reset.

If the wiper is not at origin due to abnormal operation, following message will be flashing in *MAIN SCREEN* , and please be sure to reset by **MANUAL OPEARTION** prior to further operation.

4.2 卸载模式 DE-BALLASTING MODE



Ballast water in tank → UV irradiation to disinfect resistant microbe → Discharge

图 6 卸载模式

Fig.6 DE-BALLASTING MODE

卸载流程运行时，压载舱中的压载水经由压载泵进入处理系统，压载水直接再次经过紫外处理单元，杀灭可能在舱内复生的微生物后外排至舷外。

In de-ballasting mode, ballast water is disinfected by UV reactor again before discharged to overboard.

4.2.1 自动卸载模式启动操作 STARTING PROCEDURES IN AUTOMATIC DE-BALLASTING MODE

STEP		画面 FIGURE	说明 DESCRIPTION	
1		MODE	关闭作业泵后，点击“系统工作模式”弹出框，点选“卸载”。	Press on “*MODE*” to initiate the working mode selection box and then press ”DE-BALLASTING ”in the condition of pumps standing by.
		BALLASTING DE-BALLAST STRIPPING BYPASS		
			系统运行模式选择完毕后，BV3 阀门自动打开，直至“绿色”全开状态，BV5 根据流量进行调节阀门开度，应显示为“蓝色或绿色”开启状态，且 BV1，BV2 和 BV4 阀门自动关闭，应显示为“灰色”关闭状态。	After operating mode selection, BV3 valves will automatically open; BV5 will adjust valve opening according to target flowrate, and BV1,BV2 and BV4 valves will automatically close.
2		LAMP ON LAMP OFF	长按“点灯运行”（约 3 秒）使紫外开始待机。 ☞ 当作业泵开启且流量达到“点灯流量”时紫外灯才逐次点亮。 ☞ 长按“关灯运行”（约 3 秒）使紫外开始关灯；	Press and hold for 3 seconds to initiate standby of UV lamps. ☞ Ignition of UV lamps will be only started when ballast pump’s on and “ignition flowrate” reached. ☞ Press and hold LAMP OFF button for 3 seconds to turn off lamps.

STEP		画面 FIGURE	说明 DESCRIPTION	
			作业泵启动后，作业泵指示灯显示为“绿色”起动运行状态 紫外反应器在流量上升后开始点灯运行；	After the ballast pump starts up, the indicator light for No. 19 ballast pump shows as green in the on-state. The UV lamp starts igniting.
			紫外灯状态将在 1 分钟内逐个变为“绿色”,如遇故障则显示为“黄色”。 当全部显示为“绿色”时，紫外反应器自动点灯完成，进入预热阶段。 注意：预热阶段系统的处理水尚不能达到处理标准，请参照附图开闭相关阀门使用当地海水进行系统预热；	UV lamps will show as green one by one after successful ignition, and it will turn yellow if faults occur. When all the lamps turn green, it means that the UV startup completes and the de-ballasting starts.
3		WARMING UP COUNTDOWN: 1 s RESET INFO IGNITION COMPLETED, SYSTEM WARMING UP;		
			点灯完毕，预热开始，进行倒计时； 注意：预热阶段系统处理能力尚未达到最佳状态，此时处理水可能不能达到处理标准。	After all lamps ignited, warming up process starts with countdown indicating. Please be noted the treated water during warming up period may not meet the standard and should not be allowed to introduce.
4		INFO AUTO MODE, WARMING UP COMPLETED,NORMAL DE-BALLASTING;		
			当预热过程结束，操作提示框内会出现相应信息，提示卸载模式开始正常运行。 注意：此时系统处理能力达到要求，可切换阀门进行排载作业。	After warming up, a prompt message will be appeared in INFO box to indicate the de-ballasting normally starts. Please manually switch the valves to introduce the treated water to overboard.

4.2.2 自动卸载模式停止操作 STOPPING PROCEDURES IN AUTOMATICDE-BALLASTING MODE

STEP		画面 FIGURE	说明 DESCRIPTION	
1			手动关闭作业泵； 作业泵图示转为“灰色”。	Power off ballast pump manually; The icon shall turn gray.
			紫外灯状态逐一显示为“灰色”； 当全部数字编号全部显示为“灰色”时，紫外灯管自动熄灭完成，正常结束卸载处理。	UV lamps will show as grey one by one; When all the lamps show as grey, it means that UV lamps complete turned off and the de-Ballasting mode stops normally.

⚠长按“点灯停止”按钮 3 秒后可手动关闭紫外灯，此时水为未完全处理状态，请慎用！

⚠Press and hold “Lamp Off” button for 3 seconds to manually switch off the UV lamp; Please NOTE that is at this time the water is not fully treated so proceed with discretion.

⚠若“设置”画面中“刮板运行模式”为“自动”档时，系统进入待机倒计时。如果压载泵在待机倒计时期间无任何操作动作，倒计时结束后将自动启动刮板电机(M1)进行紫外套管清洗，清洗时间约为 20 分钟。

⚠When ’WIPING MODE’ is AUTO and Ballasting process finishes, if the ballast pump shows no operation during the standby countdown, the system will automatically start the wiper motor (M1) after the countdown to clean quartz sleeves for about 20 minutes.

⚠若“设置”画面中“刮板运行自动/手动选择开关”为“手动”档时，系统运行主画面中会有“刮板启动” 闪烁提示可见，请手动起动套管清洗（即刮板电机 M1）。

⚠When “WIPING MODE” is MANUAL, a banner notice will flash at Main Screen to remind user to manually start wiping.

系统上电后，若刮板不在原点位置，系统将在主画面将闪烁如下信息，并自动复位刮板至原点。

若刮板因手动操作或其他原因未停在原点位置，主画面将闪烁如下信息，请手动操作将刮板复位至原点。

If the sleeve wiper is not at origin after power-on, a noticing message will be flashing in *MAIN SCREEN* and the wiper will be **AUTOMATICALLY** reset.

If the wiper is not at origin due to abnormal operation, following message will be flashing in *MAIN SCREEN* , and please be sure to reset by **MANUAL OPEARTION** prior to further operation.

4.3 旁通模式 BYPASS PROCEDURE

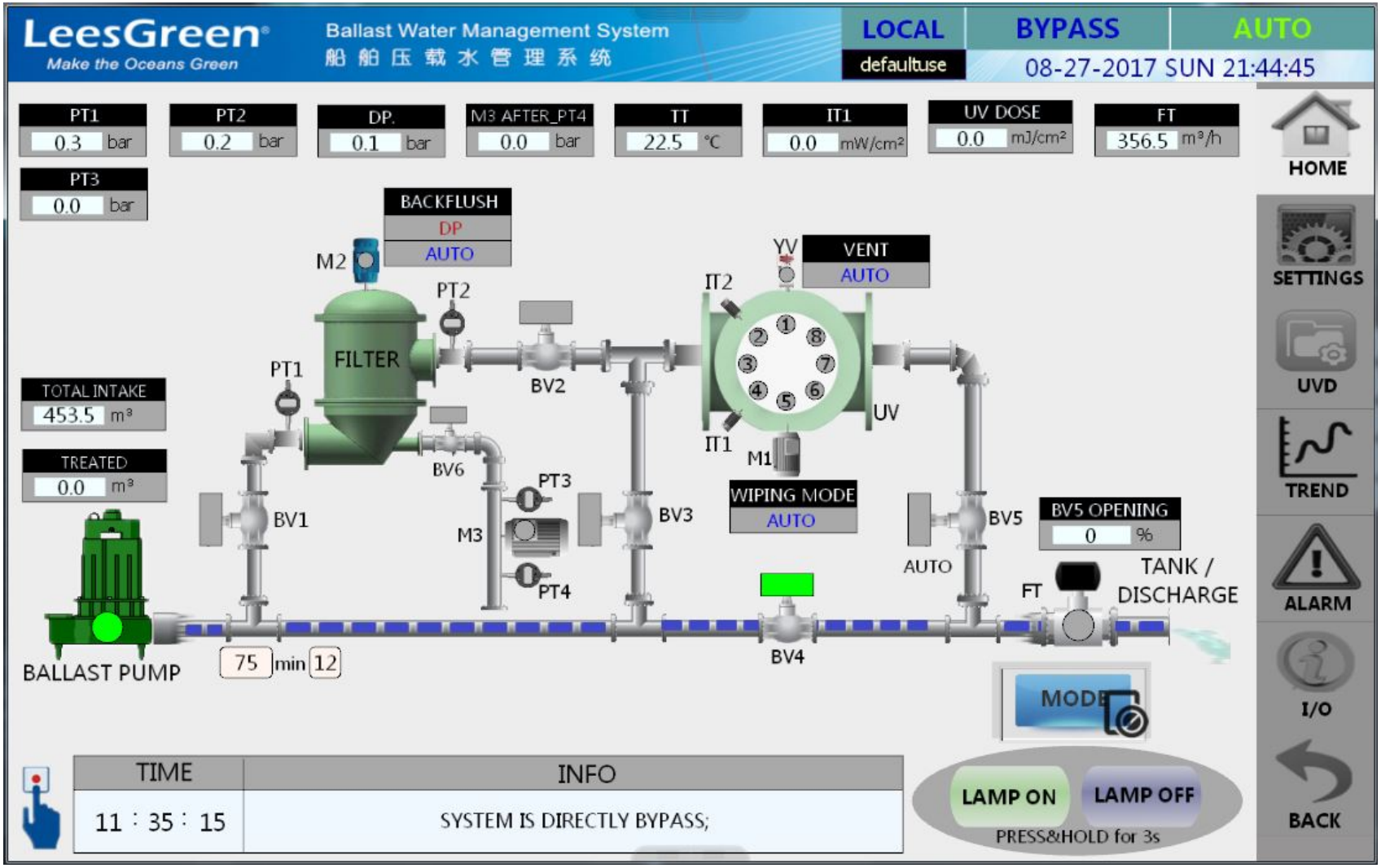


图 7 旁通模式

Fig.7 BY-PASS Procedure

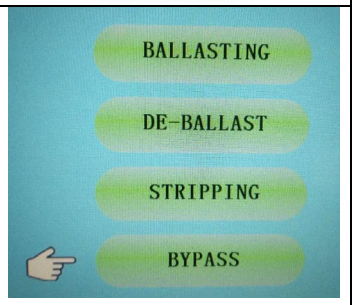
4.3.1 旁通模式启动操作 STARTING PROCEDURES IN BYPASS MODE

当系统发生故障时，可选择“旁通”模式将系统隔离，此时船舶压载水系统仍能通过旁通管系进行压载和排放。

⚠旁通模式仅限紧急情况下使用, 操作过程将被记录备查，请在主管人员许可后操作。

The system can be isolated in “BY-PASS” mode when it fails. Meanwhile emergency ballasting or de-ballasting can still be satisfied.

⚠Bypass is ONLY allowed in case of emergency, and all operations will be recorded. Please proceeds under permission by authorities.

STEP		画面 FIGURE	说明 DESCRIPTION	
1			点击 “系统工作模式”弹出框，点选“旁通”。	Press on “*MODE*” to initiate the working mode selection box and then press “*BYPASS*”.
				
			系统运行模式选择完毕后，BV4 阀门自动打开显示为“绿色”全开状态，且 BV1，BV2，BV3 和 BV5 阀门自动关闭，应显示为“灰色”关闭状态。	After operating mode selection, BV4 valves will automatically open, and BV1, BV2, BV3 and BV5 valves will automatically close.

☞在紧急停止的情况下，系统将自动切入旁通模式。

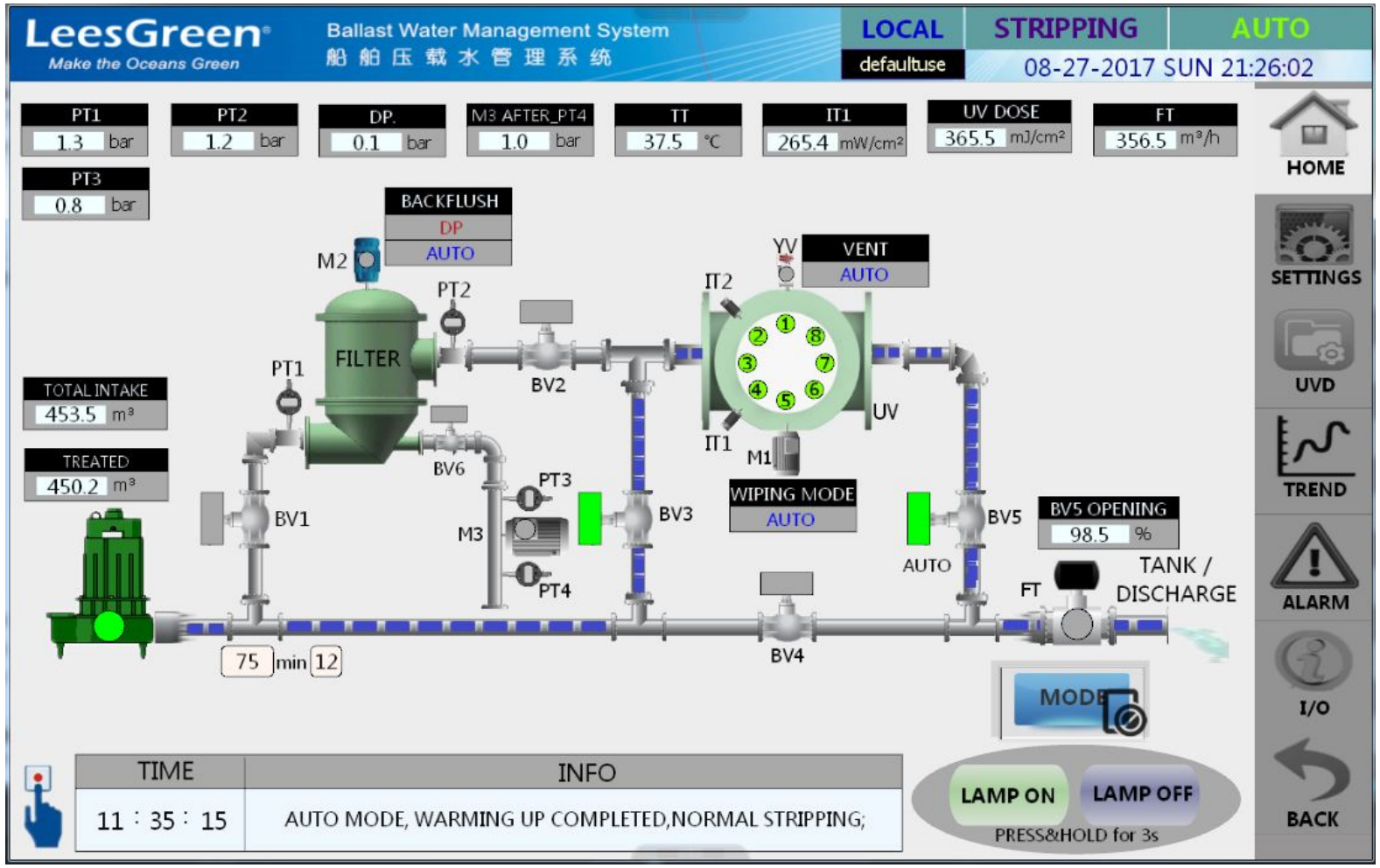
☞BYPASS Mode will be automatically triggered in case of “Emergency Stop” button pressed down.

4.3.2 原船旁通监控 MONITORED BYPASS VALVES IN VESSEL'S BALLAST SYSTEM

压载水控制箱将对退审的压载水管系原理图中所示的旁通阀进行监控，并根据相关判断逻辑进行声光报警和记录。旁通报警等历史信息将存储于控制系统中备查，时间不小于 24 个月。

The BWMS control unit will monitor the bypass valve as shown in the approved ballast water system diagram, and will provide visual and audible alarms and logs based on the relevant judgment logic. Bypass alarms history information will be stored in the control system for a period of not less than 24 months.

4.4 ★扫舱模式（选配）STRIPPING MODE（OPTIONAL）



Ballast water in tank → UV irradiation to disinfect resistant microbe → Discharge

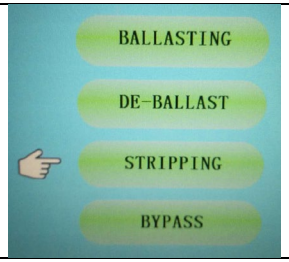
图 8 扫舱模式

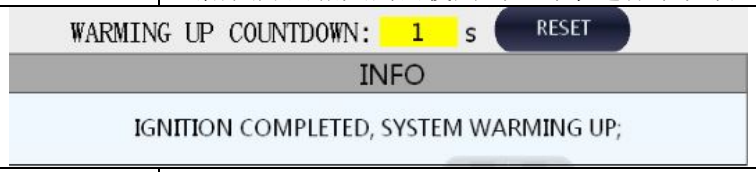
Fig.8 STRIPPING MODE

扫舱流程运行时，压载舱中的压载水经由扫舱泵进入处理系统，扫舱水直接再次经过紫外处理单元，杀灭可能在舱内复生的微生物后外排至舷外。

In stripping mode, Sweep water is disinfected by UV reactor again before discharged to overboard.

4.4.1 自动扫舱模式启动操作 STARTING PROCEDURES IN AUTOMATIC STRIPPING MODE

STEP		画面 FIGURE	说明 DESCRIPTION	
1			关闭作业泵后，点击“系统工作模式”弹出框，点选“扫舱”。	Press on “*MODE*” to initiate the working mode selection box and then press ”STRIPPING” in the condition of pumps standing by.
				
			系统运行模式选择完毕后，BV3 阀门自动打开，直至“绿色”全开状态，BV5 根据流量进行调节阀门开度，应显示为“蓝色或绿色”开启状态，且 BV1，BV2 和 BV4 阀门自动关闭，应显示为“灰色”关闭状态。	After operating mode selection, BV3 valves will automatically open; BV5 will adjust valve opening according to target flowrate, and BV1,BV2 and BV4 valves will automatically close.
2			长按“点灯运行”（约 3 秒）使紫外开始待机。 ☞ 当作业泵开启且流量达到“点灯流量”时紫外灯才逐次点亮。 ☞ 长按“关灯运行”（约 3 秒）使紫外开始关灯；	Press and hold for 3 seconds to initiate standby of UV lamps. ☞ Ignition of UV lamps will be only started when ballast pump’s on and “ignition flowrate” reached. ☞ Press and hold LAMP OFF button for 3 seconds to turn off lamps.

STEP		画面 FIGURE	说明 DESCRIPTION	
			扫舱泵启动后，扫舱泵指示灯显示为“绿色”起动运行状态 紫外反应器在流量上升后开始点灯运行；	After the Sweeper pump starts up, the indicator light for No. 19 Sweeper pump shows as green in the on-state. The UV lamp starts igniting.
			紫外灯状态将在 1 分钟内逐个变为“绿色”,如遇故障则显示为“黄色”。 当全部显示为“绿色”时，紫外反应器自动点灯完成，进入预热阶段。 注意：预热阶段系统的处理水尚不能达到处理标准，请参照附图开闭相关阀门使用当地海水进行系统预热；	UV lamps will show as green one by one after successful ignition, and it will turn yellow if faults occur. When all the lamps turn green, it means that the UV startup completes and the “STRIPPING “starts.
3				
			点灯完毕，预热开始，进行倒计时； 注意：预热阶段系统处理能力尚未达到最佳状态，此时处理水可能不能达到处理标准。	After all lamps ignited, warming up process starts with countdown indicating. Please be noted the treated water during warming up period may not meet the standard and should not be allowed to introduce.
4				
			当预热过程结束，操作提示框内会出现相应信息，提示扫舱模式开始正常运行。 注意：此时系统处理能力达到要求，可切换阀门进行排载作业。	After warming up, a prompt message will be appeared in INFO box to indicate the stripping normally starts. Please manually switch the valves to introduce the treated water to overboard.

4.4.2 自动扫舱模式停止操作 STOPPING PROCEDURES IN AUTOMATIC STRIPPING MODE

STEP		画面 FIGURE	说明 DESCRIPTION	
1			手动关闭扫舱泵； 作业泵图示转为“灰色”。	Power off Sweeper pump manually; The icon shall turn gray.
			紫外灯状态逐一显示为“灰色”； 当全部数字编号全部显示为“灰色”时，紫外灯管自动熄灭完成，正常结束扫舱处理。	UV lamps will show as grey one by one; When all the lamps show as grey, it means that UV lamps complete turned off and the stripping mode stops normally.

⚠长按“点灯停止”按钮 3 秒后可手动关闭紫外灯，此时水为未完全处理状态，请慎用！

⚠Press and hold “Lamp Off” button for 3 seconds to manually switch off the UV lamp; Please NOTE that is at this time the water is not fully treated so proceed with discretion.

⚠若“设置”画面中“刮板运行模式”为“自动”档时，系统进入待机倒计时。如果压载泵在待机倒计时期间无任何操作动作，倒计时结束后将自动启动刮板电机(M1)进行紫外套管清洗，清洗时间约为 20 分钟。

⚠When ’WIPING MODE’ is AUTO and Ballasting process finishes, if the ballast pump shows no operation during the standby countdown, the system will automatically start the wiper motor (M1) after the countdown to clean quartz sleeves for about 20 minutes.

⚠若“设置”画面中“刮板运行自动/手动选择开关”为“手动”档时，系统运行主画面中会有“刮板启动” 闪烁提示可见，请手动起动套管清洗（即刮板电机 M1）。

⚠When “WIPING MODE” is MANUAL, a banner notice will flash at Main Screen to remind user to manually start wiping.

系统上电后，若刮板不在原点位置，系统将在主画面将闪烁如下信息，并自动复位刮板至原点。

若刮板因手动操作或其他原因未停在原点位置，主画面将闪烁如下信息，请手动操作将刮板复位至原点。

If the sleeve wiper is not at origin after power-on, a noticing message will be flashing in *MAIN SCREEN* and the wiper will be **AUTOMATICALLY** reset.

If the wiper is not at origin due to abnormal operation, following message will be flashing in *MAIN SCREEN* , and please be sure to reset by **MANUAL OPEARTION** prior to further operation.

5 监控界面说明 DESCRIPTION OF CONTROL & MONITOR INTERFACE

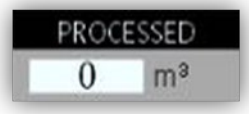
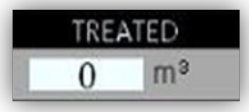
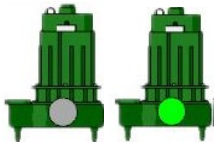
5.1 开机画面 STARTUP SCREEN

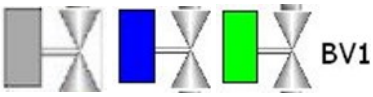
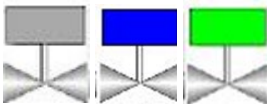
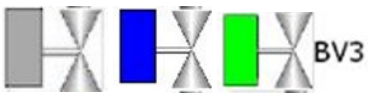
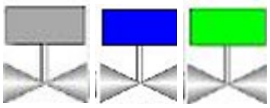
截屏 SCREENSHOT	说明 DESCRIPTION	
	👁	控制箱上电起动 5～10 秒后屏幕上自动显示。 5～10 seconds after initiation of the *Control Unit*, the This" *STARTUP SCREEN*" will automatically displays on the screen.
	👆	点击国旗图标选择触摸屏运行的系统语言；点选后系统将自动进入"系统运行主画面"； Press flag to select system language and then automatically enter the " *MAIN SCREEN OF SYSTEM RUNNING*" in corresponding language.
	👆	点击后弹出"关于本系统"信息框。 Press this area to initiate "*ABOUT BWMS*" message box.
	👁	"关于本系统"信息框。 "*ABOUT BWMS*" message box.
	👆	点击屏幕右上角可激活屏幕亮度调节框； 点击"亮"或"暗"以调节屏幕亮度；点击"×"关闭。 Press upper right corner of screen to initiate screen-brightness adjusting box; Press "UP" or "DOWN" to adjust screen brightness; Press "×" to close.

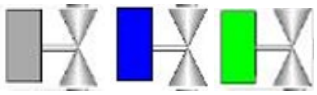
5.2 主操作界面 MAIN SCREEN

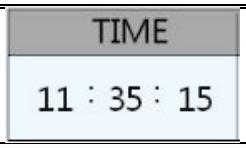
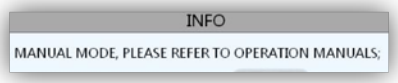
截屏 SCREENSHOT	说明 DESCRIPTION
defaultuse	显示当前登录用户名； 点击可弹出用户管理窗口。 Indicates currently logged on user; Press to initiate “User Management Box”.
BALLASTING MANUAL	显示当前工作流程（压载、卸载、扫舱和旁通）和操作模式（自动,手动）。 Indicates current working mode (*BALLASTING*, *DE-BALLASTING*， *STRIPPING* or *BYPASS*) and operation mode (*AUTO* or *MANUAL*).
LOCAL	显示当前就地/远程控制方式。（就地或是远程） Indicates current control mode (local or remote)
08-13-2016 SAT 00:25:11	显示当前系统时间； 点击后弹出系统时间设定窗口。 Indicates current system time and date; Press to initiate system time adjusting box.
PT1 0 bar	显示当前滤前压力； 点击可进入查看该参数趋势图。 Indicates current pre-filtration pressure; Press to initiate its *TREND* screen.
PT2 0 bar	显示当前滤后压力； 点击可进入查看该参数趋势图。 Indicates current post-filtration pressure; Press to initiate its *TREND* screen.
DP.(PT1-PT2) 0 bar	显示当前过滤压差； 点击可进入查看该参数趋势图。 Indicates current differential pressure between pre and post filtration; Press to initiate its *TREND* screen.
PT3 0.0 bar	显示当前反洗泵前压力； 点击可进入查看该参数趋势图。 Press to initiate its *TREND* screen.
M3 AFTER_PT4 0.0 bar	显示当前反洗泵后压力； 点击可进入查看该参数趋势图。 Press to initiate its *TREND* screen.
TT 0 °C	显示当前紫外反应器内温度； 点击可进入查看该参数趋势图。 Indicates current temperature inside *UV Reactor*; Press to initiate its *TREND* screen.

截屏 SCREENSHOT		说明 DESCRIPTION
		显示当前紫外反应器上部内壁接受的辐射强度； 点击可进入查看该参数趋势图。 Indicates current UV irradiation intensity inside upper *UV Reactor*; Press to initiate its *TREND* screen.
		显示当前紫外反应器平均辐射剂量； 点击数字框可进入查看该参数趋势图。 Indicates current UV irradiation dose calculated based on current running status; Press to initiate its *TREND* screen.
		显示当前系统出口瞬时流量； 点击可进入查看该参数趋势图。 Indicates current outlet flowrate; Press to initiate its *TREND* screen.
		显示当前过滤器反冲洗剩余时间； 仅在压载模式,反冲洗动作时出现。 Indicates remaining time of filter backflush; Only appears in *BALLASTING* mode when back-flush running.
		仅在压载模式下有效; 显示当前过滤器反洗工作模式 (压差控制, 时间控制，自动模式，手动模式); 点击可弹出设定窗口。 Only appear in *BALLASTING* mode; Indicates current filter backflush mode (*DP, TIME，AUTO，MANUAL*) ; Press to initiate its setting box. 在参数设置页面，可进行反洗手自动模式切换。 Working mode (auto or manual) can be set in *Setting Screen*.
		显示当前紫外反应器顶排气电磁阀工作模式（自动模式，手动模式）； 点击可弹出设定窗口。 注：当紫外反应器安装在竖管上时排气电磁阀停用； Indicates current vent mode of *UV Reactor*(*AUTO，MANUAL*); Press to initiate its setting box. Note：this vent valve will be unavailable when the reactor mounted in vertical pipe.

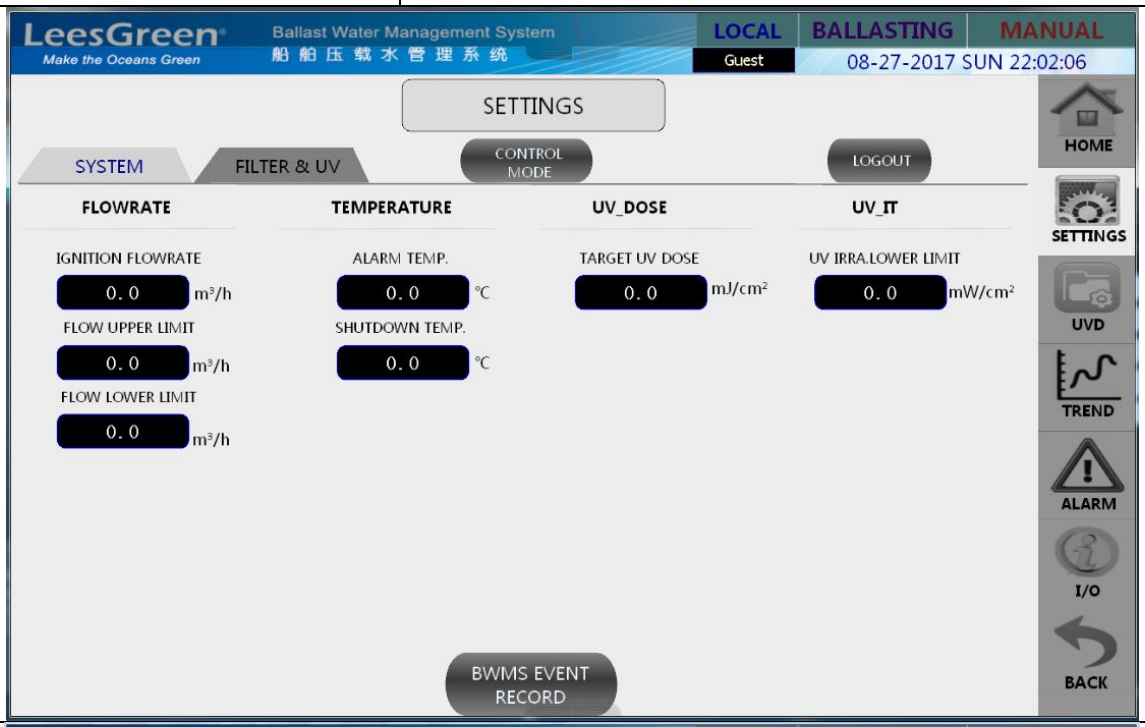
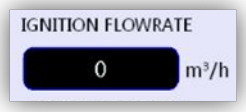
截屏 SCREENSHOT		说明 DESCRIPTION
		显示当前紫外反应器内石英套管清洗机构工作模式（自动模式，手动模式）； 在参数设置页面，可进行刮板手自动模式切换。 Indicates current working mode of quartz sleeve wiper(*AUTO*，*MANUAL)*; Working mode can be set in *Setting Screen*. ☞ 手动模式下，点击可弹出手动操作窗口。 In *Manual* mode, press to initiate following control panel.
		闪烁提示紫外反应器二次启动保护倒计时。 Flashes remaining time before re-igniting UV lamp.
		显示本次开机累积流经系统水量； 点击可弹出手动清零对话框。 Indicates cumulative processed flow since powering on the system; Press to initiate dialog of manually zeroing.
		显示本次开机累积紫外反应器处理水量； 点击可弹出手动清零对话框。 Indicates cumulative treated flow by *UV Reactor* since powered on the system; Press to initiate dialog of manually zeroing.
		显示作业泵状态（绿灯亮表示工作中；灰色表示待机中），同时文字提示相应作业泵。 Indicates status of ballast pump (Green: running; Gray: standby)and their descriptions.
		显示紫外灯工作状态（绿色代表点亮；灰色代表熄灭；黄色代表故障）； 点击可切换至“镇流器状态和设定画面”； ☞ 圆圈内数字代表紫外灯编号。 Indicates current status of UV lamps(Green:lit;Gray:standby; Yellow:fault) ; Press to switch to “*BALLAST STATUS&SETTING*” screen;

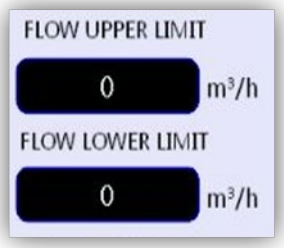
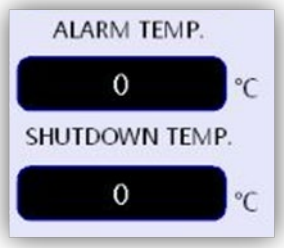
截屏 SCREENSHOT		说明 DESCRIPTION
		Figures in circles indicate the numbering of UV lamp.
		显示滤前阀（BV1）状态（绿色代表全开; 灰色代表全关；蓝色代表开启或关闭中）。 Indicates current status of pre-filter valve (BV1)(Green:fully open, Gray:fully close, Blue:opening or closing).
		显示滤后阀（BV2）状态（绿色代表全开; 灰色代表全关；蓝色代表开启或关闭中）。 Indicates current status of post-filter valve (BV2)(Green:fully open, Gray: fully close, Blue: opening or closing).
		显示卸载阀（BV3）状态（绿色代表全开; 灰色代表全关；蓝色代表开启或关闭中）。 Indicates current status of de-ballasting valve (BV3) (Green:fully open, Gray: fully close, Blue: opening or closing).
		显示旁通阀（BV4）状态（绿色代表全开; 灰色代表全关；蓝色代表开启或关闭中）。 Indicates current status of bypass valve (BV4) (Green :fully open, Gray: fully close, Blue: opening or closing).
		显示流量调节阀（BV5）状态（绿色代表全开; 灰色代表全关；蓝色代表阀门部分开启）。 Indicates current status of flow control valve (BV5) (Green:fully open, Gray: fully close, Blue: partially opened).
		显示流量调节阀（BV5）开度； 点击可弹出设定窗口及其 BV5 手自动切换按钮，并可以通过滑块手动调整阀门开度。

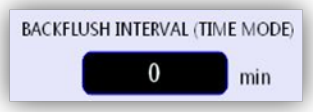
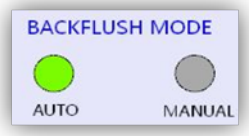
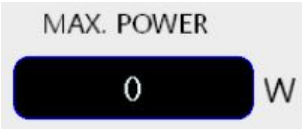
截屏 SCREENSHOT	说明 DESCRIPTION	
		Indicates current opening degree of flow control valve (BV5); Press to initiate its setting box.
 BV6		显示排污阀（BV6）状态（绿色代表全开; 灰色代表全关；蓝色代表开启或关闭中）。 Indicates current status of backflush valve (BV6) (Green:fully open, Gray: fully close, Blue: opening or closing).
		点击可弹出工作模式选择窗口； ☞点击模式按钮后阀门将自动工作，在阀门开闭到位前不能进行点灯操作； ☞压载泵启动后将不能进行工作模式的切换。如无扫舱，系统将不显示扫舱模式； Press to initiate working mode selection box: ☞Please note electric valves (BV1～5) will automatically act and no further ignition can be proceeded before valves ready; ☞Mode switch will not be allowed when ballast pump ON;
		系统自动模式下，长按 3 秒可使紫外系统进入待命状态； ☞紫外点灯仅当进行了上述操作后，压载泵开启而且瞬时流量达到点灯流量时才开始； ☞点灯按编号顺序依次进行。 In *Auto* mode, press and hold for 3 seconds to initiate standby of UV lamps; Please note the ignition of UV lamps only initiated when ballast pump's on and "ignition flowrate"reached after proceeding above operation; Igniting of UV lamps are carried out in numerical order.
		长按 3 秒可立即熄灭所有紫外灯。 Press and hold for 3 seconds to turn off all UV lamps immediately.
		警铃提示按钮，点击可弹出警铃提示；

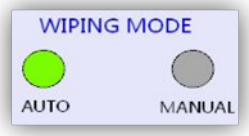
截屏 SCREENSHOT	说明 DESCRIPTION	
	👁	显示右栏信息的发生时间。 Indicates triggering time of the message in right column.
	👁	显示当前工作状态和提示信息。 Indicates current working status and messages.
	👆	点击可进入“系统主画面”。 Press to enter “*MAIN SCREEN*”.
	👆	点击可进入“参数设置”画面； 需使用管理员帐号登录。如当前登录用户权限不够时将弹出登录窗口； ☞ 只需输入密码，系统将自动识别用户。 Press to enter “*SETTINGS*” screen; Please note only Administrator can proceed and login box will be initiated when current user’s authority is too low; After inputting password, username will be automatically recognized and proceeds to next screen.
	👆	点击可进入“镇流器状态信息”画面。 Press to enter “*BALLAST STATUS&SETTING SCREEN*”
	👆	点击可进入“趋势图”画面。 Press to enter ”*TREND*” screen.
	👆	点击可进入“报警信息”画面。 Press to enter ” *ALARM*” screen.
	👆	点击可进入“输入输出”画面。 Press to enter ”*I/O*” *diagnosis* screen.
	👆	点击可返回上一画面。 Press to return to the previous screen.

5.3 参数设置界面 SETTINGS SCREEN

截屏 SCREENSHOT	说明 DESCRIPTION
	
	显示当前点灯所需最低流量； 点击数字框可更改设定值； Indicates the lowest flowrate needed for UV lamp ignition; Press the number to change the setting; Please refer to appendix for default value.

截屏 SCREENSHOT	说明 DESCRIPTION	
		显示当前瞬时流量报警上下限； 点击数字框可更改设定值； Indicates the alarming value of upper and lower flowrate; Press the number to change the setting;
		显示当前报警温度和停机温度值； 点击数字框可更改设定值； Indicates current the alarming temperature and shut-down temperature for *UV Reactor*; Press the number to change the setting;
		显示当前目标剂量报警下限； 点击数字框可更改设定值； Indicates the target UV irradiation dose; Press the number to change the setting;
		显示紫外辐射强度报警下限； 点击数字框可更改设定值； Indicates the alarming value of UV irradiation intensity; Press the number to change the setting;
		显示当前过滤器进口压力（PT1）报警上限； 点击数字框可更改设定值； Indicates current alarming upper limit of pre-filter pressure (PT1); Press the number to change the setting;
		显示过滤器出口(PT2)压力报警上限； 点击数字框可更改设定值； Indicates current alarming upper limit of post-filter pressure (PT2); Press the number to change the setting;
		显示反洗泵后出口(PT4)压力报警上限； 点击数字框可更改设定值； Indicates current alarming upper limit of pressure of flushing pump output (PT4); Press the number to change the setting;

截屏 SCREENSHOT	说明 DESCRIPTION
	显示过滤器反洗持续时间； 点击数字框可更改设定值； Indicates current duration of backflush; Press the number to change the setting;
	显示过滤器反洗压差控制模式下压差与进口压力比值； 点击数字框可更改设定值； Indicates the triggering ratio of backflush in DP control mode (PT1-PT2)/PT1×100%; Press the number to change the setting;
	显示过滤器反洗时间控制模式下时间间隔的设定值； 点击数字框可更改设定值； Indicates triggering time interval of backflush in Time control mode; Press the number to change the setting;
	绿灯显示当前反洗工作模式（自动/手动）； 点击按钮可更改反洗工作模式； Green light indicates current backflush control mode (*MANUAL* or *AUTO*); Press the circle button to change the mode; Default setting is *AUTO*.
	显示当前紫外灯输出额定最大功率； 点击数字框可更改设定值； Indicates rated maximum power of UV lamp output; Press the number to change the setting;
	显示当前紫外灯使用寿命报警值； Indicates the alarm-triggering time of cumulative UV running time;
	显示当前紫外灯二次启动前所需最小冷却保护时间； 点击数字框可更改设定值； Indicates minimum time needed for lamp cooling before re-ignition; Press the number to change the setting;
	显示系统关停后石英套管清洗延迟时间； 点击数字框可更改设定值； ☞仅在自动运行模式下有效。

截屏 SCREENSHOT	说明 DESCRIPTION	
		Indicates current delay time of wiping after ballast pump shut down; Press the number to change the setting; ☞ Only effective in *AUTO* mode.
		绿灯显示当前石英套管清洗工作模式（自动/手动）； 点击按钮可更改清洗工作模式； Green light indicates current quartz sleeve wiping control mode (*MANUAL* or *AUTO*); Press the circle button to change the mode; Default setting is *AUTO*.
		点击可进行用户注销 Press to log out
		点击可进入系统手自动切换&系统就地/远程控制弹出画面 Press to initiate the mode selection menu as follows:
		点击可进入系统“操作事件记录”画面 Press to initiate the *Log Screen*

☞设定值超出设定范围时将自动更正为出厂默认设定值。

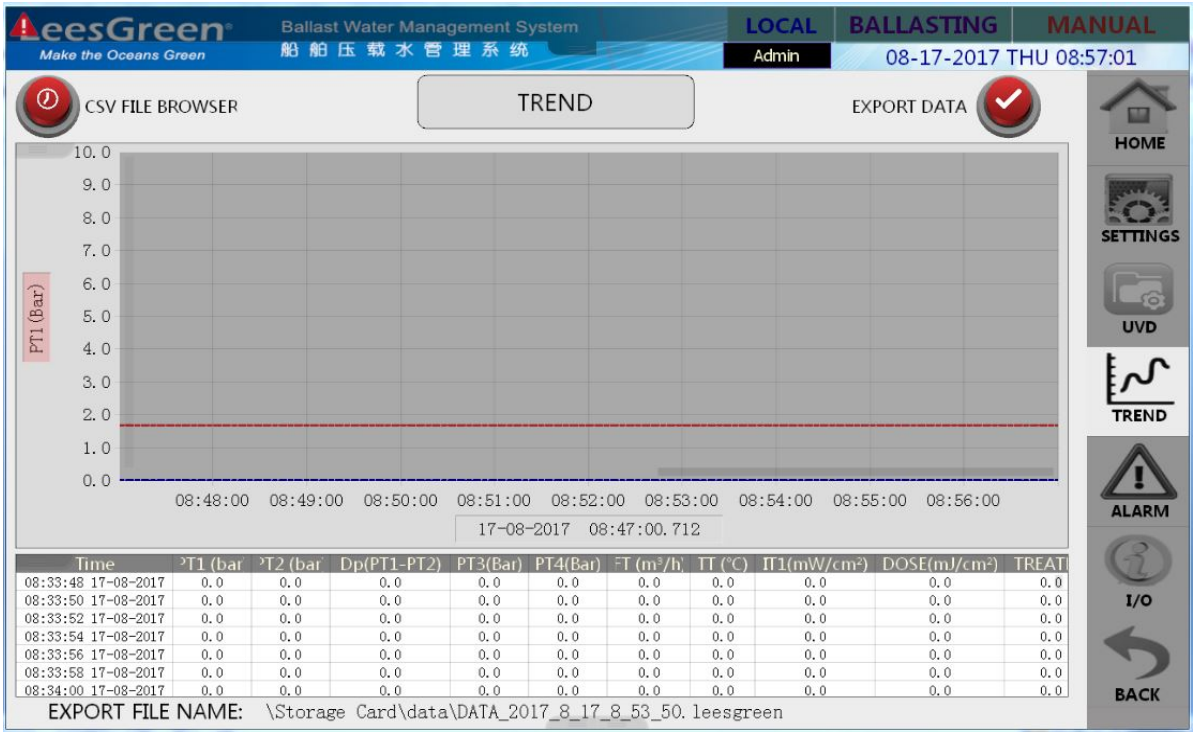
☞It will be corrected to default value when input value exceed recommended scope.

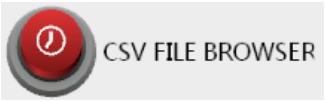
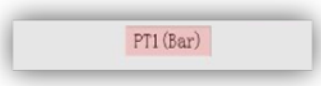
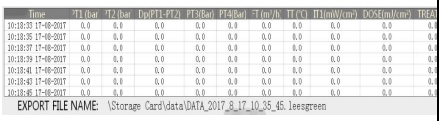
⚠更改参数前请于供应商技术支持联系，请勿随意更改默认参数。

⚠Please contact the technical supporter of the supplier before making changes to the parameters and please do not change the default parameters at will.

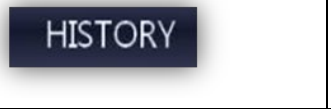
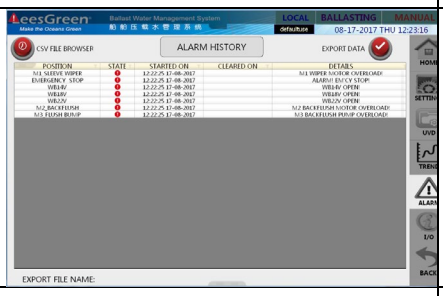
5.4 趋势图画面 TREND SCREEN

截屏 SCREENSHOT	说明 DESCRIPTION



		点击可进入 CSV 文件浏览页面，用户可通过该文档浏览器打开 SD 卡内导出的文件，进行预览； Press to enter CSV file browser and exported data file can be opened in it.
		点击 可导出历史数据至 SD 卡 Press to export data directly to external SD card.
		双击纵坐标标题可更换显示参数。 Double press Y-axis title (e.g. “PT1”) to switch relevant curves.
		在线查看当前数据记录，显示当前导出数据文件名称； Indicate the real-time running date and the current record file name.
		数据记录可保存至少 24 个月，且不可更改。 The data record can be kept for at least 24 months for reference and cannot be changed.

5.5 报警查询画面 ALARM SCREEN

画面 FIGURE	说明 DESCRIPTION
	点击可进入“历史报警”画面。 Press to enter “*ALARM HISTORY*” screen.
	“历史报警”画面。 “*ALARM HISTORY*” screen.
	显示报警位置。 Indicates current alarm position.
	显示报警状态； 代表警报未解除；代表警报已解除。 Indicates current alarm position; indicates alarm activated. Indicates alarm cleared.

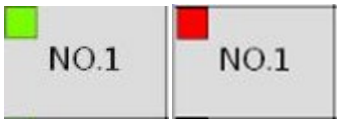
画面 FIGURE	说明 DESCRIPTION	
		显示报警激活时间。 Indicates triggering time of alarm.
		显示报警解除时间。 Indicates releasing time of alarm.
		显示报警详细内容。 Indicates detailed information of alarm.
		点击并下拉列表左上角可弹出报警查询窗口。 Press and dragupper left corner of the table to activate alarm query window.

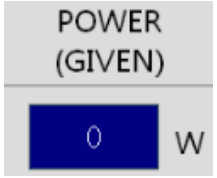
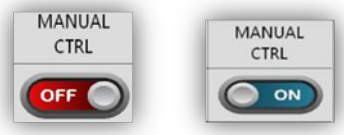
☞请对照报警说明参考附录进行原因分析。

☞Please refer to APPENDIX for detailed diagnosis and actions towards alarms.

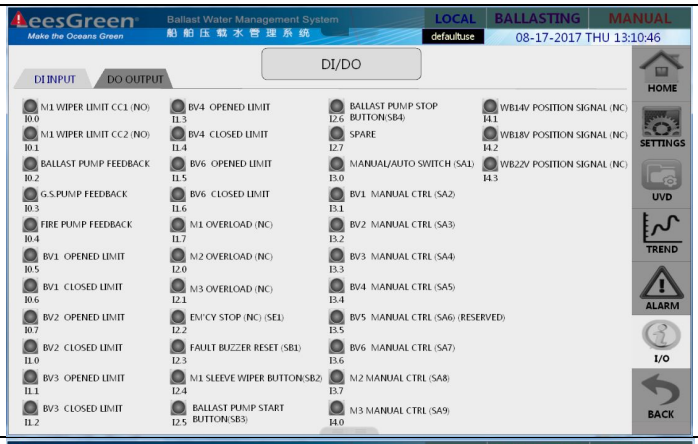
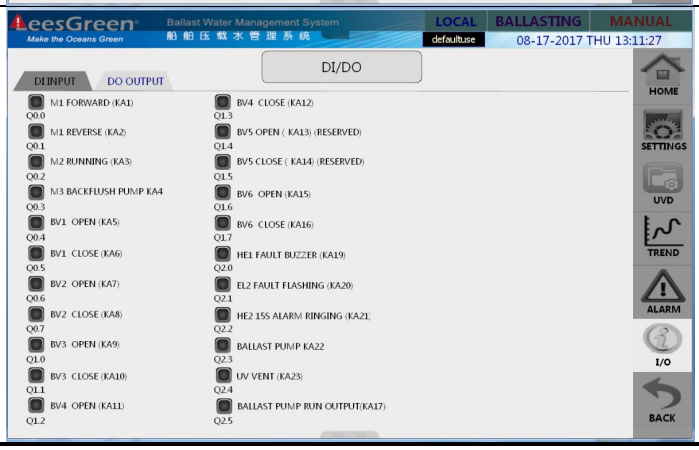
5.6 镇流器状态和设置画面 BALLAST STATUS&SETTING SCREEN

截屏 SCREENSHOT	说明 DESCRIPTION

	👁	显示镇流器编号（同时也是紫外灯编号），左上角的色块表示镇流器冷却保护状态；绿色代表镇流器冷却正常，红色代表镇流器保护锁定中。 Indicates number of ballast, which also corresponds to number of UV lamp; The green square in upper left corner indicates the ballast is normal and red indicates ballast is locked for lamp safety concern.
	👁	点击“ ”，可弹出镇流器内部相关信息，及其紫外灯管累计运行时间，可在权限情况允许的情况下删除累计运行时间值；
	👁	显示当前镇流器输出功率。 Indicates current real-time output.

截屏 SCREENSHOT	说明 DESCRIPTION	
		显示镇流器工作状态；绿色代表灯已点亮，灰色代表灯尚未点亮,灰色+“OK”代表镇流器已准备好，无故障； ☞ “OK”是镇流器点灯前必要的信息反馈，无 OK 代表镇流器存在故障，请将镇流器断电后冷却，重新上电。 Indicates current working status, green light means lamp’s lit and gray means shut, and gray light with OK means ready. The mark “I4.0”indicates its specific position in I/O.
		显示手动模式时，给定镇流器的输出功率; 点击数字框可更改设定值（范围 3000W~12000W）； 出厂默认值参见附录。 Indicates given output of ballast in *MANUAL* working mode; Press the number to change the setting (3000~12000W); Please refer to APPENDIX for default value.
		手动模式下点击可控制镇流器点灯。 Press to start ballast in *MANUAL* working mode.

5.7 输入输出画面 I/O SCREEN

截屏 SCREENSHOT	说明 DESCRIPTION	
		“输入信号”画面。 “*DI*” screen.
		“输出信号”画面。 “*DO*“ screen.

☞ 此页面内容可辅助诊断系统故障。

☞ Please note the indications in these two screens only for diagnosis of system fault.

6 其他功能和设定 OTHER FUNCTIONS & SETTINGS

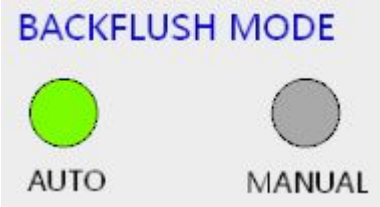
6.1 用户管理 USER MANAGEMENT

步骤 STEP	截屏 SCREENSHOT	说明 DESCRIPTION	
1			在主画面上点击登录用户名即可弹出密码修改窗口。 Press logged username at *MAIN SCREEN* to activate the user management dialog. ☞ 出厂默认密码为 8888 Default password is 8888
2			可键入新密码，按 OK 保存，按 CANCEL 关闭； User can change own password in the dialog box and click OK to save or CANCEL to close.

6.2 系统时间设定 SYSTEM TIME SETTING

步骤 STEP	截屏 SCREENSHOT	说明 DESCRIPTION	
1			在主画面上点击当前时间即可弹出系统时间设定窗口。 Press above time banner to initiate system time adjusting box.
2			对日期、时间和时区完成更改后点击“OK”保存。点击“CANCEL”取消设定并关闭此对话框。 After setting of data, time and time zone, press “OK” to save or “CANCEL” to close.

6.3 过滤器反洗模式设定 SETTING OF BACKFLUSH MODE

步骤 STEP	截屏 SCREENSHOT	说明 DESCRIPTION	
1			在参数设置页面，可进行反洗手自动模式切换。 Working mode (auto or manual) can be set in *Setting Screen.*
2			在主画面点击即可弹出反洗模式设定窗口。 Press this figure at *MAIN SCREEN* to initiate following setting box.
3			可在压差和时间模式之间切换。 Toggle between DP and time mode. 手动开关仅在手动模式下有效。 Manual backflush switch is available only at manual working mode.

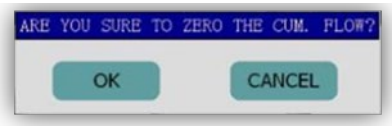
6.4 紫外罐排气阀工作模式设定

步骤 STEP	截屏 SCREENSHOT	说明 DESCRIPTION	
1			在主画面点击即可弹出设定窗口。 Press this figure to initiate following setting box
2			可在手动和自动模式之间切换。 Toggle between AUTO and MANUAL mode.
3			设定排气时长。 Set vent duration.
4			手动开关仅在手动模式下有效。 Manual switch is available only at manual working mode.

6.5 紫外刮板工作模式设定

步骤 STEP	截屏 SCREENSHOT	说明 DESCRIPTION	
1			在参数设置页面，可进行刮板手自动模式切换。 Working mode can be set in *Setting Screen*
2			在手动模式下，在主画面中点击此图标可激活以下手动控制面板。 In manual working mode, press this figure to initiate following control panel.
3			长按 3 秒即可手动启动刮板，启动后单击可关停。 Press and hold the button for 3s to activate wiper, and click again to stop.

6.6 累积流量清零 ZEROING OF ACCUMULATED FLOW

步骤 STEP	截屏 SCREENSHOT	说明 DESCRIPTION	
1			在主画面上点击此图标可弹出手动清零对话框。 Press to initiate following dialog of manually zeroing.
2			点击 OK 即将对应累积流量清零，点击 CANCEL 取消。 Click “ok” to zero the accumulated flow and “cancel” to close.

6.7 流量调节阀设定 SETTING OF FLOW CONTROL VALVE

步骤 STEP	截屏 SCREENSHOT	说明 DESCRIPTION	
1			点击可弹出设定窗口。 Press this figure in MAIN SCREEN to initiate its setting box.
2			点击按钮选择手动或自动调节。 Toggle between Manual or Auto adjusting.
3			手动调节模式下，可通过滑块手动调整阀门开度。 In Manual mode, slide to adjust opening of valve manually. In Auto mode, *SET FLOW* value can be adjusted.

6.8 数据导出 DATA EXPORT

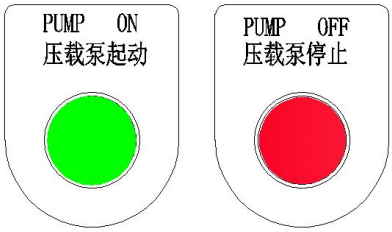
步骤 STEP	截屏 SCREENSHOT	说明 DESCRIPTION	
1			在趋势画面中点击数值表的左上角可出现下拉选单； Press left corner of data table in *TREND SCREEN* to activate function menu;
2			Press to export data to external storage (selectable).
			Press to export data to SD card.

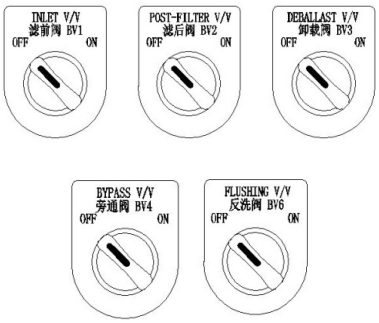
7 关于手动运行操作 ABOUT MANUAL OPERATION

7.1 安全须知 SAFETY INSTRUCTIONS

⚠	手动运行模式下可能由于操作不当造成系统损坏或无效运行，仅限系统管理员和高级用户使用，并由操作人承担手动运行可能带来的结果。	Please NOTE system failure and invalid treatment may occur under manual operation mode. Only system administrator and advanced user are recommended to proceed. Any consequences resulted shall be bear by the operator.
⚠	请在进行手动运行前悉知安全须知和操作面板说明.	Please read carefully and thorough safety instructions and description of control panel prior to proceed to manual operation.
⚠	请勿触碰就地控制箱内除面板旋钮外其他器件，有触电危险。	Please operate carefully and keep away of other electrical components, which may cause electric shock.
☞	系统手动面板位于就地控制箱内	The manual operating panel locates inside *Local Control Unit.*

7.2 手动操作面板说明 DISCRIPTION OF MANUAL OPERATION PANEL

截图 SCREENSHOT	说明 DESCRIPTION	
		压载泵未开启之前，可使用此旋钮在手自动操作模式间切换。 ☞压载泵启动后，此旋钮失效。 When ballast pump's off, this switch can toggle between *AUTOMATIC WORKING MODE* and *MANUAL WORKING MODE*. ☞This switch becomes invalid when ballast pump turned on.
		系统在手动模式下，长按 3 秒此按钮可启动套管清洗机构，刮板将往复运行一周后停在端点。 ☞运行期间可点击此按钮，将刮板电机停止。 In *MANUAL WORKING MODE*, press and hold this button for 3 seconds to activate sleeve wiping, which will wipe back and force for one round and stop at limit end. ☞Press this button during wiping, the motor stops.
截图 SCREENSHOT	说明 DESCRIPTION	
		系统在手动模式且 BV6 阀门处于全开状态下，将旋钮旋至“ON”位置，可将清洗电机 M2 开启；反之旋至“OFF”，清洗电机 M2 关闭。 In *MANUAL WORKING MODE*，turning this switch to the "ON" position can activate flushing motor M2 when flushing valve BV6's fully open; on the contrary turned to the "OFF", flushing motor M2 stops.
		压载泵控制按钮 Buttons for pump controlling.

		系统在手动模式且 BV6 阀门处于全开状态下，将旋钮旋至“ON”位置，可将反洗泵 M3 开启；反之旋至“OFF”，反洗泵 M3 关闭。 In *MANUAL WORKING MODE*，turning this switch to the "ON" position can activate flushing pump M3 when flushing valve BV6's fully open; on the contrary turned to the "OFF", flushing pump M3 stops. This switch is invalid in this case.
		BV1/BV2/BV3/BV4/BV6 的阀门开关。 Switches to control electric valves BV1～6. ☞ 当对应阀门面板开关位置处于“ OFF”状态时，也可在触摸屏上点击相应阀门进行阀门开关。 ☞ When the switch positioned at “OFF’, the regarding valve can be operated at a pop-up panel by touching the valve symbol at touchscreen.

附录 1 Appendix 1

压载系统图 BALLAST SYSTEM

附录 2 报警信息显示与处理方式 APPENDIX 2 - ALARMS & TROUBLESHOOTING

NO.	报警内容 ALARM DETAILS	可能原因 DIAGNOSIS	处理方式 ACTIONS
1	紫外灯镇流器故障/BALLAST FAULT	灯管点灯失败，镇流器内部故障，灯管电压异常 Ignition failed, internal error of ballast or abnormal lamp voltage.	关闭镇流器，待冷却大于 5 分钟后，上电重启； Shut down the ballast and wait for at least five minutes before reboot.
2	BV1 电动蝶阀故障/BV1 FAULT	1、供电故障或状态信号故障； Power supply failure; 2、驱动器过载。 Actuator overload.	1、停机检查电源； Shutting down to check the power; 2、检查环境温度；检查阀瓣是否卡死； Check ambient temperature and check whether the valve disc is jammed; 3、检查限位开关。 Check limit switch.
3	BV2 电动蝶阀故障/BV2 FAULT		
4	BV3 电动蝶阀故障/BV3 FAULT		
5	BV4 电动蝶阀故障/BV4 FAULT		
6	BV5 电动蝶阀故障/BV5 FAULT		
7	BV6 电动蝶阀故障/BV6 FAULT		
8	紫外照度 IT1 过低 UV INTENSITY IS TOO LOW (IT1)	1、紫外灯寿命终止； UV lamp life end; 2、套管沉积物过多； Too many sediments in sleeve; 3、照度计探头沉积物过多； Too many sediments on sensor probe; 4、水质下降； Water quality deterioration; 5、清洗器运行故障； Wiping fault; 6、紫外强度计故障。	1、检查紫外线灯使用时间；联系供应商更换； Check lamp running time; Contacting the supplier for replacement.; 2、清洗套管； Wiping sleeves; 3、拆卸探头用酒精清洗； Disassemble the sensor and clean probe mirror with alcohol; 4、检查水源； Checking the water source; 5、拆解检查清洗机构；

NO.	报警内容 ALARM DETAILS	可能原因 DIAGNOSIS	处理方式 ACTIONS
		UV intensity meter fault.	Disassemble and check the wiper; 6、检查探头线缆和接线端子；联系供应商更换。 Check sensor cable and terminal; Contact supplier for replacement.
10	紫外反应器温度过高 HIGH TEMPERATURE	1、未排空罐内空气； Air is not well vented; 2、流量过低； Flowrate is too low; 3、温度变送器故障。 Temperature transmitter fault.	1、开启排气阀排气； Open vent valve for 5s manually; 2、检查压载泵； Check ballast pump and target flow setting; 3、检查探头线缆和接线端子，或更换铂电阻； Check sensor cable and terminal, or replacing the platinum resistor.
11	紫外反应器温度过高！系统关停！ HIGH TEMPERATURE！ SYSTEM SHUTDOWN！	高温报警未及时解除。 High temperature alarm was not timely cleared.	待紫外灯冷却后检查。 Check after the UV lamp cooling down.
12	紫外灯已达使用寿命！ 请及时更换灯管! LAMP LIFETIME APPROACHING! PLEASEREPLACELAMPINTIME!	/	联系供应商更换。 Contact supplier for replacement.
13	PT1 滤前压力过高 PT1 TOO HIGH	滤芯已堵塞。 The filter element was blocked up	更换或清洗滤芯。 Replace or clean the filter element.
		管路阀门未调节到位。 The valve not adjusted properly.	检查系统出口外阀门。 Check external valves beyond system outlet.
14	PT2 滤后压力过高 PT2 TOO HIGH	管路阀门未调节到位。 The valve not adjusted properly.	检查系统出口外阀门。 Check external valves beyond system outlet.

NO.	报警内容 ALARM DETAILS	可能原因 DIAGNOSIS	处理方式 ACTIONS
		出水管路堵塞。 Outlet pipeline blocked up.	检查系统出口段管路。 Check outlet pipeline.
15	流量过高 FLOWRATE IS TOO HIGH	/	检查调节阀目标流量设定和开度； Check target flow set and opening degree; 手动调节阀门开度降低流量。 Manually adjust opening of BV5.
16	流量过低 FLOWRATE IS TOO LOW	流量过低。 FLOWRATE IS TOO LOW.	检查调节阀目标流量设定和开度； Check target flow set and opening degree; 手动调节阀门开度提高流量。 Manually adjust opening of BV5.
		压载泵故障。 Ballast pump fault.	检查压载泵。 Check ballast pump.
		旁通阀未关。 BV4 not fully closed.	关闭旁通阀。 Fully close BV4.
17	M1 刮板电机过载 M1 WIPERMOTOROVERLOAD	供电故障。 Power fault.	检查电源，并复位热继电器。 Check power supply and reset thermal relay.
		套管污浊，过载保护。 Quartz sleeve deteriorated so overload.	检查水源；检查环境温度；开罐清洗。 Check water quality; Check ambient temperature; Disassemble UV Reactor to clean sleeves.
18	M2 反冲洗电机过载 M2 BACKFLUSHMOTOROVERLOAD	供电故障。 Power fault.	检查电源，并复位热继电器。 Check power supply and reset thermal relay.
		过载保护。 Overload.	检查环境温度； Check ambient temperature; 开罐检查反洗悬臂。

NO.	报警内容 ALARM DETAILS	可能原因 DIAGNOSIS	处理方式 ACTIONS
			Open filter lid to check flushing arm.
19	辐射剂量过低 UV DOSE IS TOO LOW	原水污浊。 Raw water muddiness.	检查水源。 Check the water.
		流量过高。 Flowrate was too high.	降低流量。 Decrease the flowrate.
		紫外灯管功率过低。 UV lamp power was too low.	提高输出功率； Increase the output power; 检查辐射强度计。 Check the radiation intensity meter.
20	BV/BV2/BV5 未全打开 BV1/BV2/BV5 NOT FULLY OPEN	供电故障。 Power fault. 阀门限位开关故障 Valve limit switch fault	停机检查电源及其限位开关。 Halt and check power supply and limit switch.
21	BV3/BV5 未全打开 BV3/BV5 NOT FULLY OPEN		
22	BV4 未全打开/BV4 NOTFULLYOPEN		
23	紧急停止 EMERGENCY STOP	急停按钮被按下。 Emergency stop button is pressed down.	拔出急停按钮。 Turn clockwise to release.
24	BV6 未打开 BV6 NOTOPEN	供电故障。 Power fault.	停机检查电源。 Halt and check power supply.
25	反洗过频 BACKFLUSH HIGH FREQUENCY	滤芯堵塞。 Filter elements block.	更换或离线清洗滤芯。 Open filter lid to check filter elements; Replace or clean the elements.

附录 3 Appendix 3 运行参数默认值 Default setting Values

NO.	参数	PARAMETERS	DEFAULT VALUE
1	启灯流量	IGNITION FLOWRATE	12% of TRC
2	BV5 阀门开度流量设定	BV5 VALVE OPENING FLOWRATE	100% of TRC
3	流量上限	FLOW UPPERLIMIT	100% of TRC
4	流量下限	FLOW LOWER LIMIT	20% of TRC
5	报警温度	ALARM TEMPERATURE	55℃
6	停机温度	SHUTDOWN TEMPERATURE	60℃
7	滤器进口压力（PT1）下限	INLET PRESS LOWER LIMIT (PT1)	1.5bar
8	滤器进口压力（PT1）上限	INLET PRESS UPPER LIMIT (PT1)	5.0bar
9	滤器出口压力（PT2）上限	OUTLET PRESS LIMIT (PT2)	5.0bar
10	反洗时间间隔（时间控制）	BACKFLUSH INTERVAL (TIME MODE)	15min
11	反洗压差比率（压差控制）	BACKFLUSH DP LEVEL (DP MODE)	70%
12	反洗时间	BACKFLUSH DURATION	60s
13	辐照强度（IT1、IT2）下限	UV IRRADIATION LOWER LIMIT (IT1,IT2)	75mW/cm^2
14	目标辐射剂量（DOSE）	UV DOSE LOWER LIMIT	210mJ/cm^2
15	镇流器额定功率设定	BALLAST GIVEN POWER	Varies by model
16	紫外罐体排气阀工作时间	UV REACTOR VENTING DURATION	10s
17	紫外灯使用寿命	UV LAMP LIFE	1500h
18	紫外灯冷却时间	UV LAMP COOLING INTERVAL	10 min
19	刮板启动延时	WIPER START DELAY	5min

TRC: 额定处理量 TMENTMENT RATED CAPACITY （m^3/h）

附录 4 Appendix 4 系统设计限制 System Design Limitations（SDL）

类别 Category	参数 Parameter	范围 Value
过滤 Filter	进口压力 Inlet pressure	≥ 0.15 MPa
紫外 UV Reactor	透光率 UV Transmittance（UVT）	≥50%（100%TRC）
	辐射强度 UV Intensity（UVI）	≥ 250 W/m^2（100%TRC）
水质 Water Quality	水温 Water temperature	不适用 N/A
	盐度 Salinity	不适用 N/A
操作 Operation	存储时间（Holding Time）	≥ 24hr

附录 5 防爆型系统组件操作和维护说明

Appendix 5 Operation and Maintenance Manual of Ex-proof Components

Part I EX-PROOF PRESSURIZED UV REACTOR
第一部分 正压型防爆紫外反应器

1 安全须知 SAFETY INSTRUCTIONS

1.1 概述 Overview

- LSV-□Ex正压型防爆紫外反应器是为了满足爆炸性气体环境和可燃性粉尘环境需要而设计的。采用“泄露+补偿”形式，达到内部正压相对稳定目的，将电气元器件与爆炸性气体环境或可燃性粉尘环境隔离。

  LSV-□Ex pressurized explosion-proof ultraviolet reactor is designed to meet the requirements of explosive gas environment and flammable dust environment. Using "leak + compensation” method to achieve the relatively stable internal pressurization to isolate electrical equipment from explosive gas atmosphere or flammable dust environment.

- 本说明书适用于LSV-1500Ex及LSV-150Ex、LSV-250Ex、LSV-350Ex、LSV-500Ex、LSV-700Ex、LSV-850Ex、LSV-1150Ex正压型防爆紫外反应器。

  This manual is applicable to LSV-1500Ex and LSV-150Ex, LSV-250Ex, LSV-350Ex, LSV-500Ex, LSV-700Ex, LSV-850Ex, LSV-1150Ex pressurized explosion-proof UV reactors.

- LSK-220Ex正压型防爆紫外反应器控制箱（以下简称“正压控制箱”）为LSV-□Ex正压型防爆紫外反应器（以下简称“正压紫外反应器”）的关联设备。

  LSK-220Ex control unit for pressurized explosion-proof UV reactor (hereinafter referred to as "pressurization control unit") is the associated equipment of LSV-□Ex pressurized explosion-proof UV reactor (hereinafter referred to as "pressurized UV reactor").

- 正压控制箱不能单独使用，仅限与本公司LSV-□Ex正压型防爆紫外反应器配套使用。

  The Pressurization Control Unit cannot be used alone, but only in conjunction with the associated LSV-□Ex pressurized UV reactor.

- 用户在操作和维护系统前应仔细阅读本使用说明书。

  Users should read this instruction manual carefully before operating and maintaining.

1.2 安全须知 Safety precautions

- 产品配置的各防爆部件的使用、维护应遵守其产品使用说明书有关规定。

  The use and maintenance of each explosion-proof component of the product configuration should comply with the relevant provisions of its product instruction manual.

- 请注意严禁带电开盖标识，“警告：严禁带电打开正压腔门盖”。

  Please note that it is strictly forbidden to open the enclosure when energized. "Warning: DO NOT OPEN THE DOOR OF PRESSURIZED ROOM WHEN ENERGIZED."

- 请严格按照本说明书操作，严禁违反本说明书进行安装、调试、操作！用户不得自行更换该产品的零部件，应会同产品制造商共同解决运行中出现的故障，以杜绝损坏现象的发生。

  Please operate in strict accordance with this manual. It is strictly forbidden to install, commission and operate in violation of this manual! Users shall not replace the parts of the product on their own, and shall work together with the product manufacturer to solve the malfunctions that occur during operation in order to eliminate the occurrence of damage.

- 现场使用时，必须保证产品处通风良好！

  When used on site, the installation site must be well ventilated!

- 产品使用时外壳应可靠接地

  The enclosure should be reliably grounded.

- 在可燃性粉尘环境时，设备启动前请用湿棉布或适用环境的防爆电器将箱体内粉尘清理干净，以免粉尘累积。在爆炸性气体环境时，请严格按照操作流程进行换气操作。

  In a flammable dust environment, clean the dust inside the box with a damp cotton cloth or an explosion-proof electrical appliance that is suitable for the environment before starting the system to prevent dust accumulation. In an explosive gas atmophere, please strictly follow the operation process for ventilation and purging.

- 严禁使用能够产生静电放电的物体或不适用环境的电器清理粉尘。

  It is strictly forbidden to use objects that can generate electrostatic discharge or unsuitable electrical appliances to clean up the dust.

- 产品的安装、使用和维护应同时遵守产品说明书、GB3836.13-2013“爆炸性环境第13部分：设备的修理、检修、修复和改造”、GB/T3836.15-2017“爆炸性环境第15部分：电气装置的设计、选型和安装”、GB/T3836.16-2017“爆炸性环境 第16部分：电气装置的检查和维护”及GB50257-2014“电气设备安装工程爆炸和火灾危险环境电气装置施工及验收规范”的有关规定。

  The installation, use and maintenance of products should comply with both the product

manual, GB3836.13-2013 "Explosive Atmospheres Part 13: Equipment repair, overhaul and reclamation ", GB/T3836.15-2017 "Explosive Atmospheres Part 15: Electrical installations Design, Selection and erection", GB/T3836.16-2017 " Electrical apparatus for explosive gas atmospheres Part 16: Inspection and Maintenance of Electrical Installations" and GB50257-2014 " Code for construction and acceptance of electric equipment on fire and explosion hazard electrical equipment installation engineering".

2 结构及零部件布置 STRUCTURE AND COMPONENT

2.1 结构 structure

- 主要由正压紫外反应器和正压控制箱组成。
  The equipment is composed of Pressurized UV Reactor and Pressurization Control Unit.
- 正压紫外反应器结构主要包括：外罩、接线罩A、接线罩B及紫外反应器罐体。安装有隔爆型压力变送器、隔爆型电子流量开关、隔爆型一体化温度变送器、防爆电磁阀、本质安全型紫外线传感器、隔离式安全栅。正压紫外反应器腔室外设置了隔爆型压力变送器、隔爆电子流量开关、阻火透气帽、以及旁通、换气气管接头。

  The structure of Pressurized UV reactor mainly includes: outer cover, wiring cover A, wiring cover B and UV reactor body. Flameproof pressure transmitter, flameproof electronic flow switch, flameproof temperature transmitter, explosion-proof solenoid valve, intrinsically safe UV sensor and isolated safety barrier are installed. Flameproof pressure transmitter, flameproof electronic flow switch, flameproof venting cap, and bypass and purging fittings are installed outside the pressurized UV reactor chamber.
- 正压控制箱主要部件包括：防爆声光报警器、防爆控制箱、防爆防腐操作柱、防爆线圈、流量减压阀、节流阀，球阀，气管快速接头组成。防爆控制箱内包括：防爆防腐指示灯（电源）、防爆防腐指示灯（正压）、防爆防腐控制旋钮（调试/工作）、防爆防腐控制旋钮（电源）、防爆防腐控制按钮（换气）。防爆防腐操作柱内包括：开关电源、程序控制器（PLC）、继电器、接线端子等。

  The main components of the Pressurization Control Unit include: explosion-proof sound and light alarm, explosion-proof control box, explosion-proof anti-corrosion operation panel, explosion-proof coil, flow reduction valve, throttle valve, ball valve, gas pipe quick coupling composition. Inside the Pressurization Control Unit it includes: explosion-proof anti-corrosion indicator (power supply), explosion-proof anti-corrosion indicator (positive pressure), explosion-proof anti-corrosion control knob (debugging/working), explosion-proof anti-corrosion control knob (power supply), explosion-proof anti-corrosion control button

(purging). The explosion-proof anti-corrosion operation panel includes: switching power supply, program controller (PLC), relay, terminal block, etc.

- 用户现场气管直接将正压控制箱与正压紫外反应器腔室进行连接。流量减压阀对气源进行减压、净化。气源应为洁净、安全、干燥空气或惰性气体，通过防爆线圈（DCF1换气）进行换气，通过防爆线圈（DCF2补气）进行补气。

  The air pipe connects the Pressurization Control Unit directly to the Pressurized UV Reactor chamber. The flow reduction valve depressurizes and purifies the gas source. The gas source should be clean, safe, dry air or inert gas, with air exchange through the explosion-proof coil (DCF1 purging) and air replenishment through the explosion-proof coil (DCF2 air replenishment).

2.2 防爆标志 Explosion-proof Mark

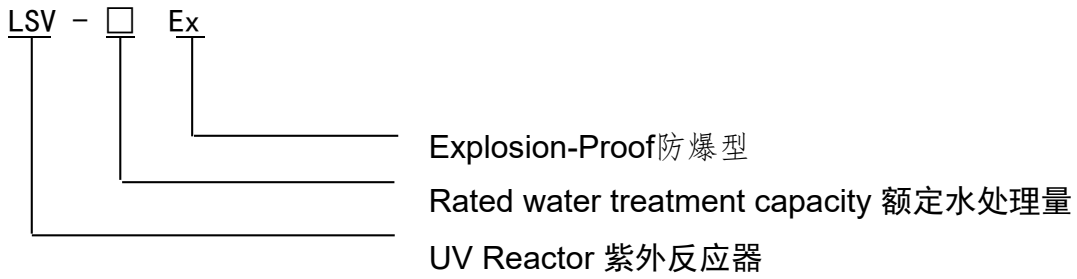
- 正压紫外反应器防爆标志 Ex-proof Mark of Pressurized UV Reactor

  Ex d e ib mb px IIC T4 Gb。

- 正压控制箱防爆标志：Ex-proof Mark of Pressurization Control Unit
  Ex d e mb IIC T4 Gb。

2.3 型号和含义 Models and designation

- 正压紫外反应器型号和含义 Designation of Pressurized UV Reactor model



- 正压控制箱型号和含义 Designation of Pressurization Control Unit

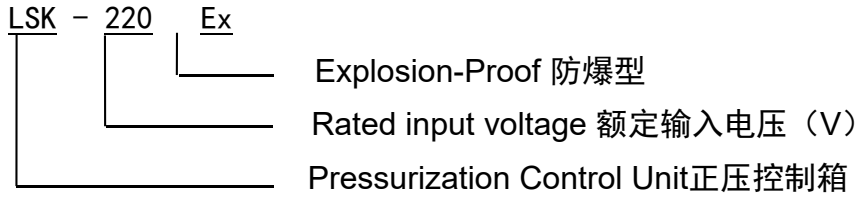


表 1 额定水处理量定义表

Table 1 Definition of rated water treatment capacity

正压紫外反应器型号 Model of Pressurized UV Reactor	正压控制箱型号（关联设备） Model of Pressurization Control Unit	额定水处理量m^3/h Rated treatment Capacity	适用水处理量范围m^3/h Applicable treatment range	适用压载水管理系统型号 Applicable BWMS model
LSV-150Ex	LSK-220Ex	150	50—150	LS-150
LSV-250Ex	LSK-220Ex	250	150—250	LS-250
LSV-350Ex	LSK-220Ex	350	250—350	LS-350
LSV-500Ex	LSK-220Ex	500	350—500	LS-500
LSV-700Ex	LSK-220Ex	700	500—700	LS-700
LSV-850Ex	LSK-220Ex	850	700—850	LS-850
LSV-1150Ex	LSK-220Ex	1150	850—1150	LS-1150
LSV-1500Ex	LSK-220Ex	1500	1150—1500	LS-1500

2.4 环境条件 Environmental conditions

- 海拔高度不超过2000m；
  The altitude does not exceed 2000m;
- 环境温度：-10℃～+40℃；
  Ambient temperature: -10 ℃ ~ + 40 ℃;
- 空气的相对湿度：≤95%（＋25℃时）；
  Relative humidity of the air: ≤95% (+ 25 °C);
- 存在有可燃气体或蒸气同空气形成的爆炸性气体混合物的场所；
  Locations where explosive gas mixtures of flammable gases or vapors and air are present;
- 无剧烈振动和冲击的场所。
  A place free from severe vibration and shock.

3 性能及参数 PERFORMANCE AND PARAMETERS

3.1 基本参数 Basic parameters

- 额定处理量：150~1500 m^3/h；
  Rated processing capacity: 150 ~ 1500 m^3/h;
- 处理介质：海水/苦咸水/淡水；
  Treatment medium: seawater / brine / fresh water;
- 正常运行正压值：200Pa～800Pa；
  Normal operating pressurization range: 200Pa ~ 800Pa;
- 供电电源：AC220V；

Power Supply: AC220v;

- 正压气源：洁净、安全、干燥空气或惰性气体；温度不大于40摄氏度

  Positive pressure air source: Clean, safe, dry air or inert gas at a temperature of not more than 40°C

- 紫外反应器罐体外壳材质：316L不锈钢；

  Shell material: carbon steel internal and external epoxy coating anti-corrosion treatment;

- 低压断电报警：≤100Pa；

  Low pressure power Off alarm: ≤100Pa;

- 高压断电报警：≥1000Pa；

  High pressure power Off alarm: ≥1000Pa;

- 保护性气体最小换气流量：50L/Min；

  Minimum purging flowrate of protective gas: 50L/Min;

- 正压腔最大允许泄露流量：$2m^3/h$。

  Maximum allowable leakage flow of positive pressure chamber: $2m^3/h$.

- 最短换气持续时间：10Min

  Minimum purging duration: 10Min

3.2 安全气源 Safe gas source

- 气源气体必须是安全洁净的气体，如洁净的压缩空气，气源为窒息性气体时，请设置安全标识。

  The gas source gas must be safe and clean gas, such as clean compressed air.

- 气源为洁净压缩空气时，气源压力应为 0.4～0.8MPa。

  When the gas source is asphyxiating gas, please set a safety label. When the gas source is clean compressed air, the gas source pressure should be 0.4 ~ 0.8MPa.

- 产品采用泄露补偿形式，允许有不足以影响正压腔室内最低正压值的气体泄露情况。

  The product adopts the leakage compensation form, which allows gas leakage that is not enough to affect the lowest positive pressure value in the positive pressure chamber.

- 严禁气源为爆炸性混合气体！

  It is strictly forbidden that the gas source is an explosive mixed gas!

3.3 安全压力和流量 Safety pressure and flowrate

- 严禁在未达到换气完成的“设置压力”及“设置流量”时，向正压紫外反应器腔室内电气内电气设备通电！

  It is strictly forbidden to energize the electrical equipment in the positive pressure chamber when the "set pressure" and “set flowrate” of ventilation completion is not

reached!

3.4 安全接地 Ground

- 请将所有设备接地符号“⏚”处，可靠安全接地连接！
  Please all ground symbols " ⏚ "Reliable and safe ground connection at the corresponding location!

4 安装要求 INSTALLATION REQUIREMENTS

4.1 正压紫外反应器 Pressurized UV Reactor

- ⚠紫外反应器须可靠安全接地连接。
  The UV Reactor must be connected reliably and safely to ground.
- 请勿在反应器外壳和连接法兰上施加外力或进行焊接作业。
  The UV reactor is an internal pressure design. Do not apply external force or welding on the reactor shell and connection flange.
- 紫外反应器可布置在垂直管路上也可布置在水平管路上，但须满足紫外反应器罐体内灯管为水平位置，严禁灯管垂直或斜向安装。

  The UV reactor can be arranged on a vertical pipe or a horizontal pipe, but the lamp must be horizontal. It is strictly prohibited to install the lamp vertically or obliquely.
- 紫外反应器端盖附近预留足够的维护空间。
  Please refer to the UV reactor diagram to keep sufficient maintenance space near the end cover.

4.2 正压控制箱 Pressurization Control Unit

- 用户需按照控制系统电气原理图、接线图等技术文件进行正压控制部分的接线，同时本产品在安装时必须可靠接地。

  The user needs to perform the wiring of the pressurization control part according to the technical schematics of the control system, the wiring diagram and other technical documents. At the same time, the product must be reliably grounded during installation.
- 正压控制箱进出线电缆必须用电缆格兰头锁紧。必要时可用防爆胶泥密封。
  The product's incoming and outgoing cables must be locked with cable glands. If necessary, the incoming and outgoing parts should be sealed with explosion- proof cement.

- 正压控制箱气管连接处，应使用密封垫处理，以保证可靠气密性。
  The air pipe connection of the pressurization control unit should be coupled with gasket to ensure reliable air tightness.

5 产品连接示意图 SYSTEM CONNECTION DIAGRAM

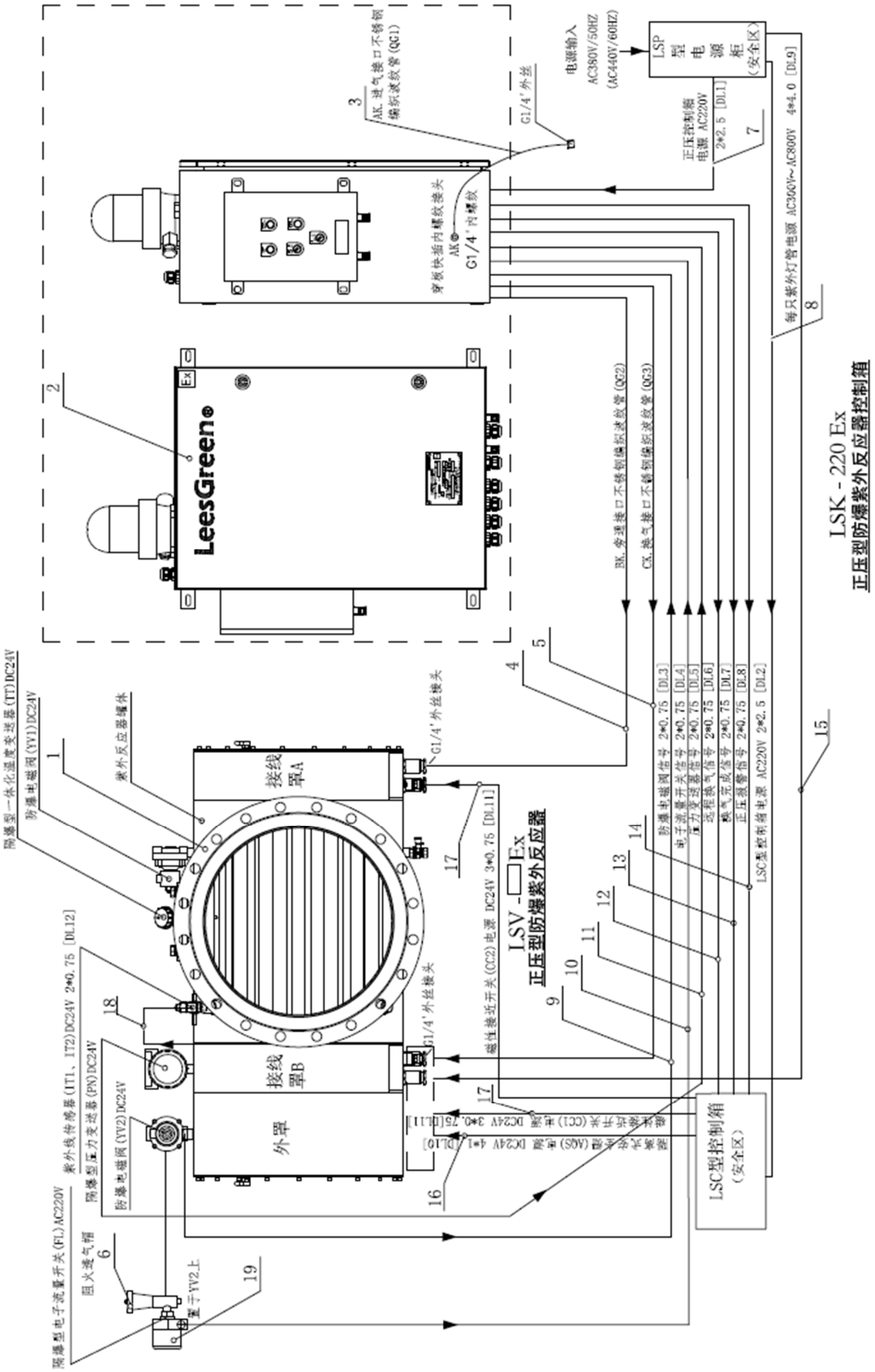


图1　正压系统连接示意图

Figure 1 Connection diagram of pressurization system

6 正压控制箱接线说明 WIRING DESCRIPTION OF PRESSURIZED CONTROL UNIT

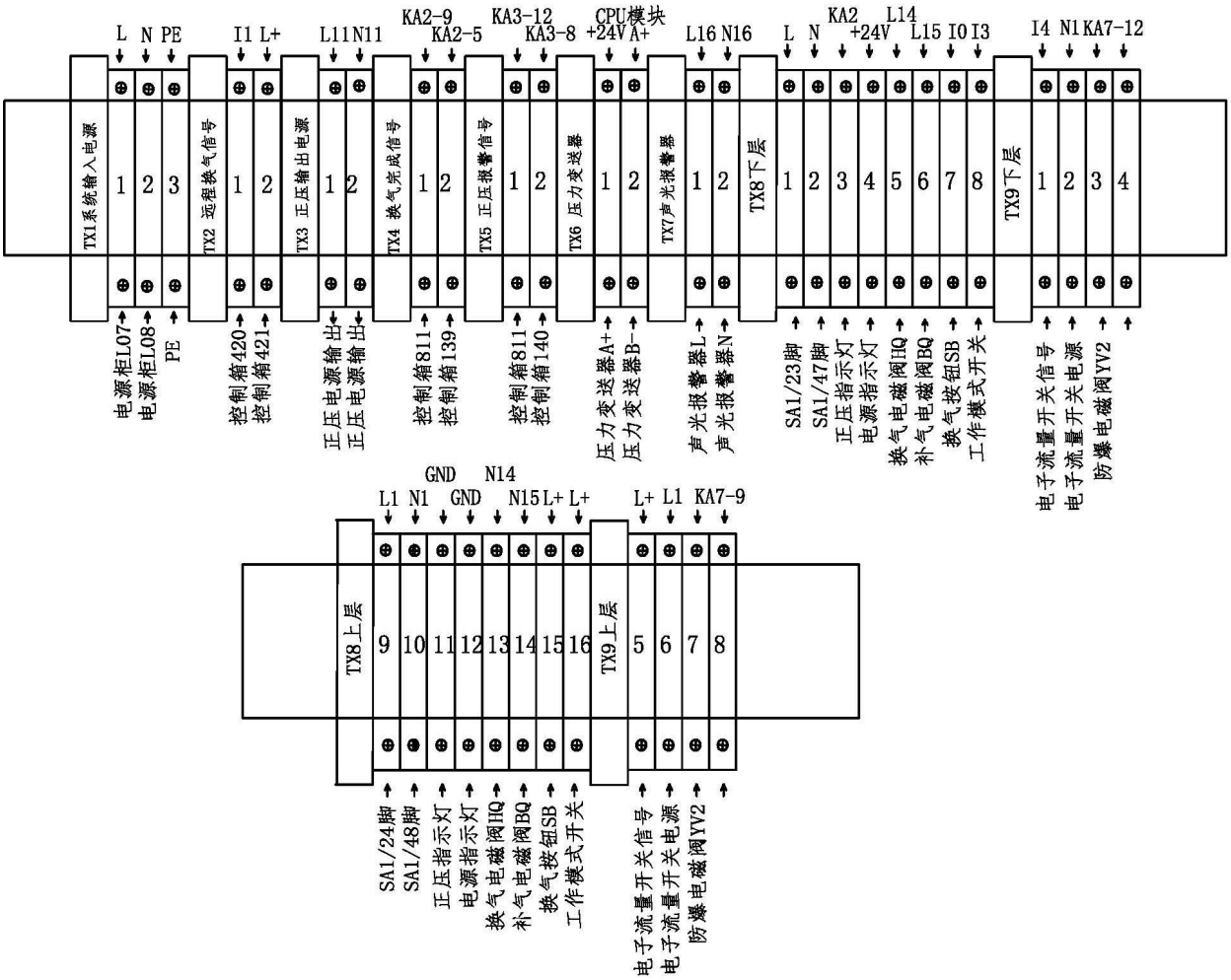


图2 防爆防腐操作柱端子接线图

Figure 2 Terminal wiring diagram of explosion-proof and anticorrosive operation panel

6.1 TX1：系统输入电源 Power supply

出厂时已与正压控制箱的“*开/关*”旋钮连接，用户将220V输入电源接在正压控制箱内“电源柜L07”和“电源柜L08”端子上。当“*开/关*”旋钮调至“合/ON”位置，正压控制箱上的“电源指示”灯点亮。

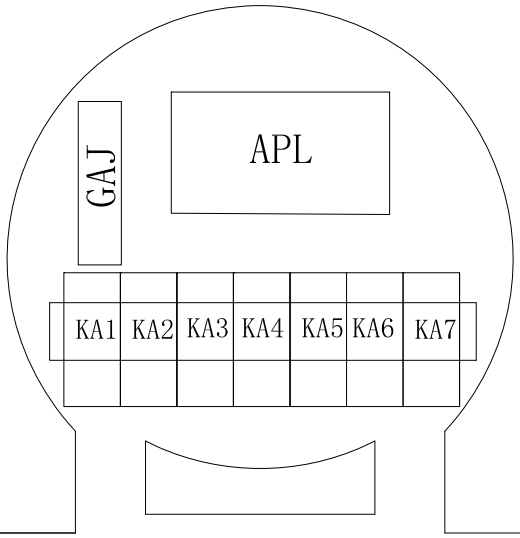
It has been connected with the "on/off" knob of the Pressurization Control Unit, so shall connect the 220V input power to the "power cabinet L07" and "power cabinet L08" terminals in the Pressurization Control Unit. When the "On/Off" knob is set to the "Close/ON" position, the "power indicator" light on the Pressurization Control Unit will be lit.

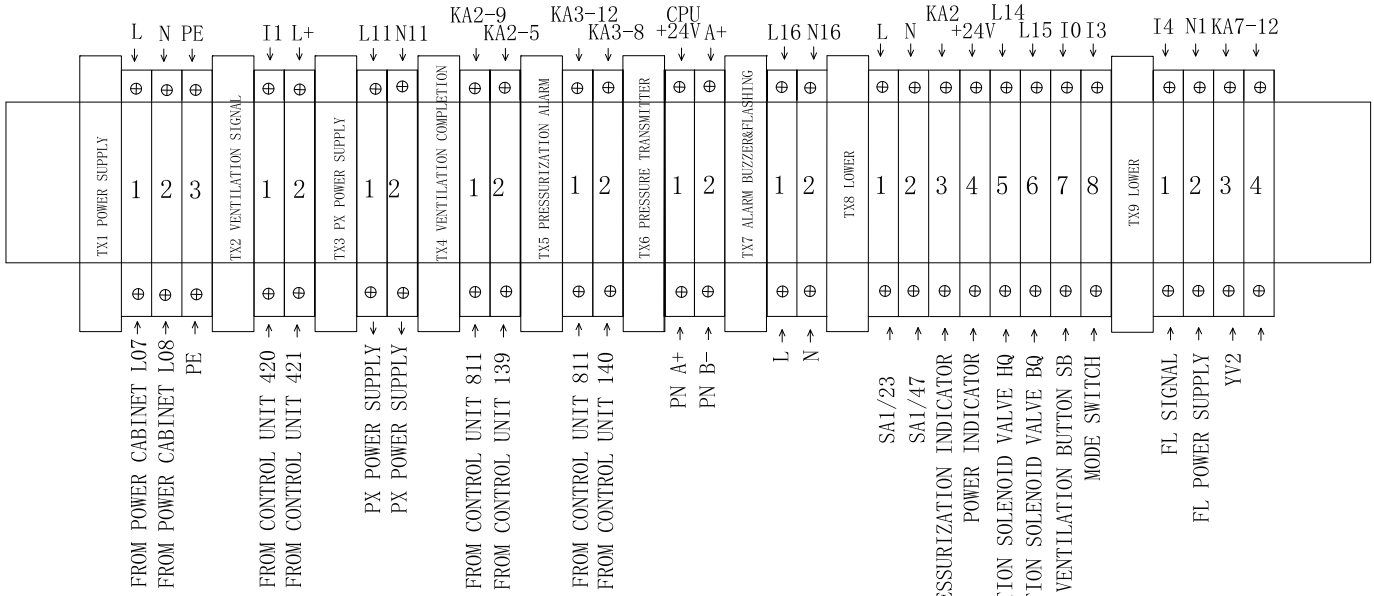
6.2 TX2：远程换气信号 remote purging signal

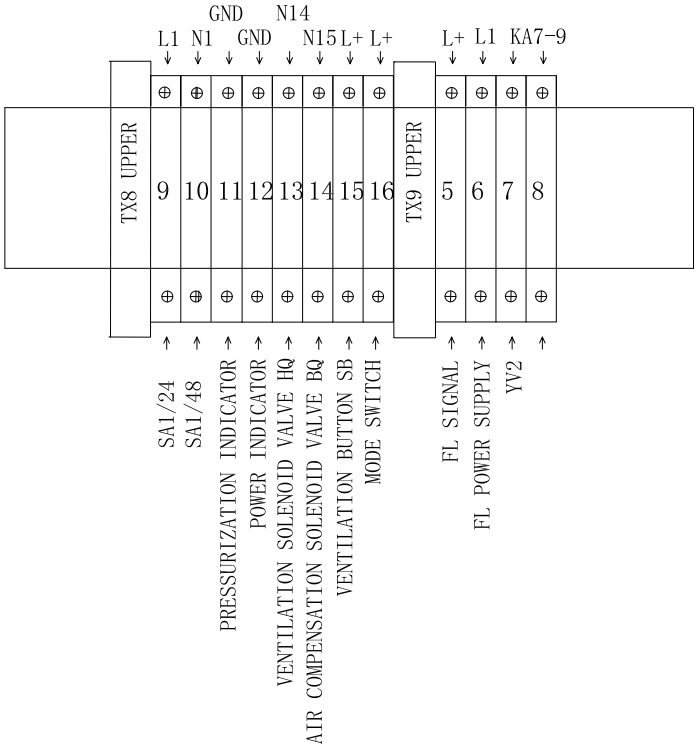
TX2信号作为远程换气按钮使用，和正压控制箱上的“*换气按钮*”功能相同。

The TX2 signal is used as a remote purging button, which has the same function as the "Air purging button" on the Pressurization Control Unit.

KX1


GAJ
APL
KA1
KA2
KA3
KA4
KA5
KA6
KA7


TX1 POWER SUPPLY
L N PE
1 2 3
FROM POWER CABINET L07
FROM POWER CABINET L08
PE
TX2 VENTILATION SIGNAL
I1 L+
1 2
FROM CONTROL UNIT 420
FROM CONTROL UNIT 421
TX3 PX POWER SUPPLY
L11 N11
1 2
PX POWER SUPPLY
PX POWER SUPPLY
TX4 VENTILATION COMPLETION
KA2-9 KA2-5
1 2
FROM CONTROL UNIT 811
FROM CONTROL UNIT 139
TX5 PRESSURIZATION ALARM
KA3-12 KA3-8
1 2
FROM CONTROL UNIT 811
FROM CONTROL UNIT 140
TX6 PRESSURE TRANSMITTER
CPU +24V A+
1 2
PN A+
PN B-
TX7 ALARM BUZZER&FLASHING
L16 N16
1 2
L
N
TX8 LOWER
L N KA2 +24V L14 L15 I0 I3
1 2 3 4 5 6 7 8
SA1/23
SA1/47
PRESSURIZATION INDICATOR
POWER INDICATOR
VENTILATION SOLENOID VALVE HQ
AIR COMPENSATION SOLENOID VALVE BQ
VENTILATION BUTTON SB
MODE SWITCH
TX9 LOWER
I4 N1 KA7-12
1 2 3 4
FL SIGNAL
FL POWER SUPPLY
YV2


TX8 UPPER
L1 N1 GND GND N14 N15 L+ L+
9 10 11 12 13 14 15 16
SA1/24
SA1/48
PRESSURIZATION INDICATOR
POWER INDICATOR
VENTILATION SOLENOID VALVE HQ
AIR COMPENSATION SOLENOID VALVE BQ
VENTILATION BUTTON SB
MODE SWITCH
TX9 UPPER
L+ L1 KA7-9
5 6 7 8
FL SIGNAL
FL POWER SUPPLY
YV2

6.3 TX3：正压输出电源 Power output

当正压控制箱工作时，输出电源：AC220V。

Power output: AC220v when operating.

6.4 TX4：换气完成信号 Purging completion signal

TX4信号为“1”时，正压控制箱上的“正压指示”灯点亮，正压紫外反应器腔室体内的电气元器件允许通电；TX4信号为“0”时，正压控制箱上的“正压指示”灯灭，正压紫外反应器腔室体内的电气元器件禁止通电运行。

When the TX4 signal is "1", the "pressurization indication" lamp on the Pressurization Control Unit lights up, and the electrical components in the Pressurized UV reactor chamber are allowed to be energized; when the TX4 signal is "0", the " pressurization indication" lamp on the Pressurization Control Unit goes out, and the electrical components in the Pressurized UV reactor chamber are prohibited to be energized.

6.5 TX5：正压报警信号 Alarm signal

报警信号输出。

Alarm signal output

6.6 TX6：压力变送器 Air pressure transmitter

测量正压紫外反应器腔室体内压力，隔爆型压力变送器量程：0～3000Pa，输出信号：4～20mA，DC24V供电电源。

Measure the pressure in the Pressurized UV reactor chamber, range:0 ~ 3000Pa, output signal: 4 ~ 20mA, DC24V power supply

6.7 TX7：声光报警器 Visual and sound alarm

AC220V电源，报警时，防爆声光报警器响起。

AC220v, alarm and flash when working

6.8 TX9-5、TX9-1：隔爆电子流量开关信号 Ex-proof electric flow switch signal

测量换气瞬时流量，量程：0.03～10m³/h，输出信号：无源开关信号，常开。

Measure instantaneous flow of ventilation, range: 0.03 ～ 10m^3/h, output signal: passive switch signal, normally open

6.9 TX9-6、TX9-2：隔爆电子流量开关电源 Power supply of Electric flow switch

电源：AC220V。

Power supply of electric flow switch: AC220v

6.10 TX9-7、TX9-3：防爆电磁阀 Ex-proof solenoid valve

换气时，防爆电磁阀（YV2）打开，DC24V供电。

During purging, the solenoid valve is opened. Power supply: DC24v

7 操作步骤 OPERATIONAL PROCEDURES

a) 运行前，请检查各线路以及管线已按使用说明书进行可靠连接，气源供给是否正常。

Before operation, please check that the wiring and pipelines are reliably connected according to the instruction manual and that the protective gas supply is okay.

b) 将正压控制箱上的“*调试/工作*”旋钮调至“*工作*”位置，且“*开/关*”旋钮调至“*合/ON*”位置，正压控制箱通电，“电源指示”灯点亮；

Set the "debugging/Working" knob on the Pressurization Control Unit to the "Working " position and the "on/off" knob to the "close/ON" position, energize the Pressurization Control Unit, and the "power indicator" light will be lit.

c) 逐渐打开正压控制器内球阀（进气），同时调节节流阀(流量)，使正压紫外反应器腔室上的隔爆型压力变送器压力稳定在 200～800Pa 之间；

Gradually open the ball valve (air inlet) in the Pressurization Control Unit, while adjusting the throttle valve (flow), so that the pressure of the explosion-proof pressure transmitter on the Pressurized UV reactor is stabilized between 200 and 800 Pa.

d) 按下正压控制箱上的*“换气按钮”*，进入换气过程；

Press the "Purging button" on the Pressurization Control Unit to start the purging process.

e) 防爆电磁阀自动打开，隔爆型电子流量开关“On Line”指示灯应常亮。换气过程开始计时，“*工作*”模式下 10 分钟完成换气，“*调试*”模式下 90 秒完成换气；

The explosion-proof solenoid valve will open automatically, and the "On Line" indicator of the explosion-proof electronic flow switch should be on. The air purging process starts timing, 10 minutes to complete in "working" mode, 90 seconds to complete in "debugging" mode.

f) 完成换气后，当正压紫外反应器腔室内压力大于等于 200Pa 且小于等于 800Pa 时，正压控制箱上的“正压指示”灯点亮，正压紫外反应器腔室内电气元器件通电工作；

When the pressure inside the Pressurized UV reactor is greater than or equal to 200Pa and less than or equal to 800Pa, the "pressurization indicator" light on the Pressurization Control Unit will be on and the electrical components inside the pressurized UV reactor will be energized.

g) 当正压紫外反应器腔室内最低压力小于等于100Pa时，防爆声光报警器发出声光报警，正压紫外反应器腔室内电气元器件自动断电；

When the lowest pressure inside the Pressurized UV reactor is less than or equal to 100Pa, the visual / sound alarm will work, and the electrical components inside the Pressurized UV reactor will be powered off automatically.

h) 当正压紫外反应器腔室内最高压力大于1000Pa时，防爆声光报警器发出声光报警，正压紫外反应器腔室内电气元器件自动断电；

When the maximum pressure inside the Pressurized UV reactor is greater than 1000Pa, the visual / sound alarm will work, and the electrical components inside the Pressurized UV reactor will be powered off automatically.

i) 当正压紫外反应器腔室内压力大于100Pa且小于等于200Pa时，防爆声光报警器发出声光报警，正压紫外反应器进入自动补气过程；

When the pressure inside the chamber of Pressurized UV reactor is greater than 100Pa and less than or equal to 200Pa, the visual/sound alarm will work and the Pressurized UV reactor will enter the automatic gas replenishment process.

j) 当正压紫外反应器腔室内压力大于800Pa且小于等于1000Pa时，防爆声光报警器发出声光报警，正压紫外反应器进入自动泄放过程。

When the pressure inside the Pressurized UV reactor is greater than 800Pa and less than or equal to 1000Pa, the visual/sound alarm will work, and the Pressurized UV reactor will enter the automatic discharge process.

k) 长按正压控制箱上的***“换气按钮”***3 秒，可解除防爆声光报警器报警！

Press and hold the "purging button" on the Pressurization Control Unit for 3 seconds to reset the explosion-proof sound and light alarm!

注意：Notes

1) 产品出厂时已设置断电压力值、补气压力值、泄放压力值，换气时间及换气流量等参数，无权限用户不可修改参数设定。

The parameters of disconnection pressure value, replenishing pressure value, discharge pressure value, purging duration and purging flow rate have been set at the factory, and the parameter setting will not be modified by users without authority.

2) 在爆炸性环境中，换气过程是一个重要过程。每次启动时，都要严格进行换气操作步骤，确保正压紫外反应器腔室内爆炸性气体被完全置换。

In explosive atmosphere, the process of air purging is an important process. Every time you start up, you should strictly carry out the operation steps to ensure that the explosive gases in the Pressurized UV reactor are completely replaced.

3) 严禁换气未完成时，正压紫外反应器腔室内电气元器件通电。

It is strictly forbidden to energize the electrical components in the Pressurized UV reactor before the air purging is completed.

8 维护保养和故障处理 MAINTENANCE AND TROUBLESHOOTING

8.1 检查和例行保养 Inspection and routine maintenance

- 运行时，正压紫外反应器罐体内紫外灯管带高压电，请勿在使用中检查和维护紫外反应器，有触电危险。打开端盖前请先断开电源柜总电源，并确认正压紫外反应器罐体完全冷却后再进行后续操作。

  When operating, the UV lamp inside the Pressurized UV reactor is charged with high voltage, please do not check and maintain the UV reactor in use, there is a risk of electric shock. Before opening the end cover, please disconnect the main power supply of the power cabinet and make sure the UV reactor tank is completely cooled down before following operation.

- 正压紫外反应器罐体表面可能带有高温，请勿触碰罐体。打开手孔盖板前请先关闭正压紫外反应器进出口阀门，并打开防爆电磁阀（YV1）。

  The surface of the Pressurized UV reactor may be high temperature, please do not touch the tank. Before opening the hand hole cover, please close the import and export valves of the Pressurized UV reactor and open the solenoid valve (YV1).

- 使用的过程中，避免频繁地点亮紫外灯管，且二次点灯须保证足够的冷却时间（至少5分钟），这样可有效延长紫外灯管的使用寿命。请先关闭紫外反应器进出口阀门，并打开防爆电磁阀（YV1）排气后再进行泄空和置换操作。

  During use, avoid frequent lighting of the UV lamp and ensure sufficient cooling time (at least 5 minutes) for the second ignition, which can effectively extend the service life of the UV lamp. Please close the inlet and outlet valves of the UV reactor and open the solenoid valve (YV1) to vent the air before emptying and replacing.

- 定期检查（建议为每周一次）连接器是否有松动，确保卡扣正确合上。

Regularly check (recommended once a week) for loose connectors and make sure the clips are properly closed.

- 定期检查（建议为每月一次）灯头螺母是否有松动，否则拧紧。

  Regularly check (recommended once a month) if the lamp head nut is loose, otherwise tighten it.

- 定期（建议为每月一次）清洗本质安全型紫外线传感器光感应面。

  Periodically (recommended once a month) clean the light-sensing surface of the intrinsically safe UV sensor.

- 定期检查石英套管0型圈处是否有漏液现象，如发现可拧紧灯头螺母，或泄空正压紫外反应器罐体后更换0型圈。

  Periodically check the quartz casing O-ring for leakage, if found, tighten the lamp head nut or replace the O-ring after evacuating the Pressurized UV reactor.

- 定期（建议为每周一次）手动运行刮板对石英套管清洗，同时观察磁性接近开关工作是否正常。

  Periodically (recommended once a week) manually run the scraper to clean the quartz casing and observe whether the magnetic proximity switch works normally.

- 定期（建议为每月一次）打开手孔盖板后检查磁钢座是否松动，否则拧紧。

  Periodically (recommended once a month) check whether the magnetic steel seat is loose after opening the hand hole cover, otherwise tighten it.

- 长期不使用前应打开正压紫外反应器底部球阀（泄放），放掉残水后注入洁净淡水保存。

  Before not using for a long time, open the ball valve at the bottom of Pressurized UV reactor (drain), drain the residual water and then inject clean fresh water for preservation.

详情请参阅《LeesGreen设备及维护手册》。

Details can be referred in <LeesGreen Equipment and Maintenance Manual>

8.2 换气故障诊断 Troubleshooting on ventilation fault

换气过程启动后，“工作”模式下10分钟换气时间已到，但仍未能结束换气，说明正压紫外反应器腔室内压力未能达到设定值200～800Pa或者隔爆型电子流量开关“On Line”指示灯未点亮。请依次进行如下操作：

If the purging process started for 10 minutes in the "working" mode, but the purging is still

not finished, indicating that the pressure inside the Pressurized UV reactor has not reached the set value of 200-800Pa or the electronic flow switch "On Line " indicator is not lit. Please follow instruction below.

a) 确认气源是否满足要求。如果气源满足要求，请检查正压紫外反应器腔室内密封部位是否完全密封。注意防爆格兰头是否拧紧，如果压不紧，请使用随机配备的防爆胶泥密封。

   Confirm that the gas source meets the requirements. If the gas source meets the requirements, please check whether the sealing part of the Pressurized UV reactor is completely sealed. If it is not tight, please use the supplied explosion-proof cement to seal it.

b) 如果正压紫外反应器腔室密封部位已经密封，请调节流量减压阀，增大气源的进气量。

   If the sealing of the Pressurized UV reactor is good, please adjust the flow reducing valve to increase the air inlet volume of the gas source.

c) 请检查气源管路是否阻塞及防爆线圈（DCF1 换气）、防爆线圈（DCF2 补气）是否正常。

   Please check whether the air source pipeline is blocked and whether the explosion-proof coil (DCF1 air purging) and explosion-proof coil (DCF2 air replenishment) are normal.

d) 隔爆型压力变送器压力显示数值大于 800Pa，说明正压紫外反应器腔室内压力过高，请调节减压阀，减小进入正压紫外反应器腔室内的保护气体流量，使压力值稳定在正常区间，并且保证换气计时仍然运行；

   If pressure transmitter display value is greater than 800Pa, indicating that the pressure inside the Pressurized UV reactor is too high, please adjust the pressure reducing valve, reduce the flow of protective gas into the Pressurized UV reactor, so that the pressure value is stable in the normal range, and ensure that the purging timing is still running.

e) 如果调节流量减压阀仍然不能解决问题，请检查防爆电磁阀（YV2）是否存在问题；

   If adjusting the flow reducing valve still cannot solve the problem, please check whether there is any problem with the solenoid valve (YV2).

f) 如果以上都无问题，请联系我公司售后人员。

   If there is no problem with all of the above mentioned, please contact us directly.

Part II EX-PROOF FILTER
第二部分 防爆型过滤器

1 安全须知 SAFETY PRECAUTIONS

1) 系统内过滤器为机械设备，应确保底座用螺栓紧固，否则有翻倒和振动危险；
The filters in the system are mechanical equipment, and the base should be secured with bolts, otherwise there will be danger of overturning and vibration;

2) 请悉知过滤器在运行过程中的反冲洗过程为全自动进行，反洗电机和排污阀等动作前不会有预示；
Please know that the backflushing process of the filter during the operation is fully automatic, and there will be no warning before the action of the backflushing motor and the sewage valve;

3) 应在指定接地点有效接地，否则有触电危险；
Should be effectively grounded at the designated ground point, otherwise there is a danger of electric shock;

4) 请使用设备自带吊环进行吊装作业，请勿在起吊设备和零部件下工作；
Please use the equipment's own lifting ring for lifting operations, do not work under the lifting equipment and components;

5) 反洗电机带电，请关断电源柜内380V（或440V）三相断路器后进行接线和维护，否则有触电危险；
The backflush motor is live, please turn off the 380v (or 440v) three-phase circuit breaker in the power cabinet for wiring and maintenance, otherwise there is a danger of electric shock;

6) 维护前须释放罐内压力或排空罐体，以免液体喷溅；
Before maintenance, the pressure in the tank must be released or the tank must be evacuated to avoid liquid splashing;

7) 产品运行前须在过滤器内部注满水。
The product must be filled with water before the product is operated.

8) 爆炸危险场所严禁干擦清洗产品外壳。
Dry cleaning of the product casing is strictly forbidden in explosion-hazardous places.

9) 现场使用和维护防爆电气设备（压力变送器、隔爆型三相异步电动机）时，必须遵守“严禁带电开盖”的原则。防爆电气设备的使用和维护应遵守其产品使用说明书有关规定。

When using and maintaining explosion-proof electrical equipment (pressure transmitter, explosion-proof three-phase asynchronous motor) on site, the principle of "DO NOT OPEN WHEN ENERGIZED" must be observed. The use and maintenance of explosion-proof electrical equipment should comply with the relevant provisions of the product manual.

10) 不得自行更换零部件，应会同产品制造商共同解决运行中出现的故障，以杜绝损坏现象的发生。

Users shall not replace the parts of the product on their own, and shall work together with the product manufacturer to solve the malfunctions that occur during operation in order to eliminate the occurrence of damage.

11) 产品的安装、使用和维护应同时遵守产品说明书、GB3836.13-2013“爆炸性环境 第13部分：设备的修理、检修、修复和改造”、GB/T3836.15-2017“爆炸性环境 第15部分：电气装置的设计、选型和安装”、GB/T3836.16-2017“爆炸性环境 第16部分：电气装置的检查和维护”及GB50257-2014“电气设备安装工程爆炸和火灾危险环境电气装置施工及验收规范”的有关规定。

The installation, use and maintenance of products should comply with both the product manual, GB3836.13-2013 "Explosive Atmospheres Part 13: Equipment repair, overhaul and reclamation ", GB/T3836.15-2017 "Explosive Atmospheres Part 15: Electrical installations Design, Selection and erection", GB/T3836.16-2017 " Electrical apparatus for explosive gas atmospheres Part 16: Inspection and Maintenance of Electrical Installations" and GB50257-2014 " Code for construction and acceptance of electric equipment on fire and explosion hazard electrical equipment installation engineering".

2 过滤器结构及零部件布置 STRUCTURE AND COMPONENT

2.1 过滤器结构 Filter structure

产品由顶盖、中筒、底座、过滤组件、牺牲阳极组件（法兰不锈钢、内置锌块）、隔爆型电机和隔爆型压力传感器构成。产品外形图见图1，产品外形尺寸见表1。

The Ex-proof filter consists of a top cover, a middle body, a base, a filter assembly, a sacrificial anode assembly (flange stainless steel, built-in zinc block), an explosion- proof motor and two explosion-proof pressure sensors.

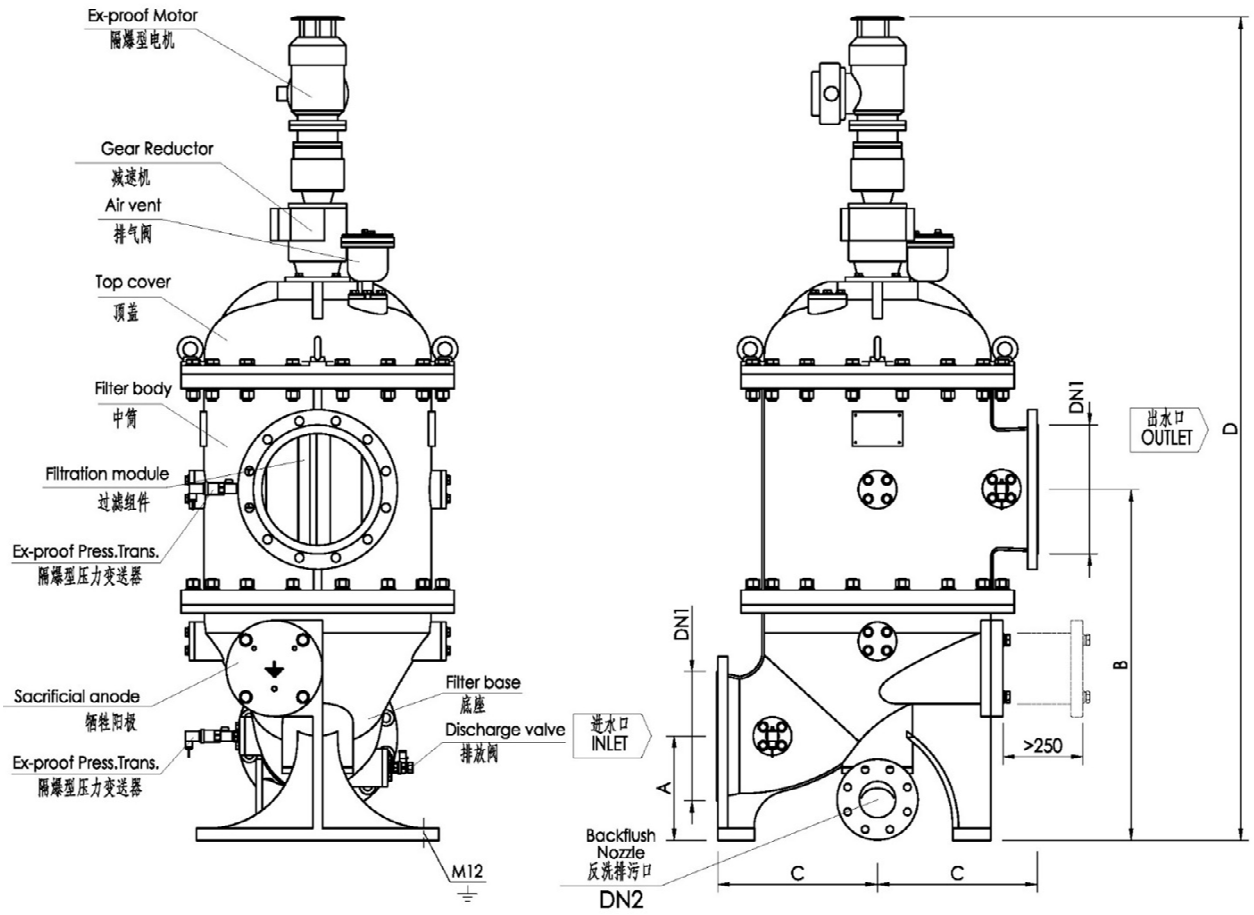


图1 防爆过滤器外形图

Figure 1 Outline drawing of explosion-proof filter

表1 防爆过滤器外形尺寸

Table 1 External dimensions of explosion-proof filter (mm)

Model	DN1	DN2	A	B	C	D
LSF-150Ex	DN150	DN50	230	700	310	1860
LSF-250Ex	DN250	DN65	263	862	380	2020
LSF-350Ex	DN250	DN65	263	862	380	2020
LSF-500Ex	DN250	DN65	263	862	380	2020
LSF-700Ex	DN400	DN100	358	1216	531	2570
LSF-850Ex	DN400	DN100	358	1216	531	2570
LSF-1150Ex	DN400	DN100	358	1216	531	2570
LSF-1500Ex	DN500	DN125	420	1360	635	2720

2.2 防爆标志 Explosion-proof Mark

Ex d IIC T4 Gb.

2.3 型号和含义 Model and Designation

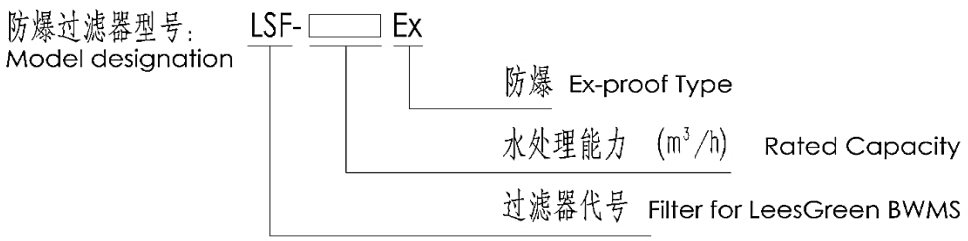


Table 2 水处理能力定义表 Treatment capacity

Filter Model 过滤器型号	Water treatment capacity 水处理能力 m^3/ h	Water treatment capacity range 水处理量范围 m^3/ h	Applicable system model 适用系统型号
LSF-150Ex	150	0～150	LS-150
LSF-250Ex	250	150～250	LS-250
LSF-350Ex	350	250～350	LS-350
LSF-500Ex	500	350～500	LS-500
LSF-700Ex	700	500～700	LS-700
LSF-850Ex	850	700～850	LS-850/LS-1700DS
LSF-1150Ex	1150	850～1150	LS-1150/LS-2300DS
LSF-1500Ex	1500	1150～1500	LS-1500/LS-3000DS

2.4 环境条件 Environmental conditions

- 海拔高度不超过2000m

  The altitude does not exceed 2000m;
- 环境温度：0℃～40℃；

  Ambient temperature: 0 ℃ ~ 40 ℃;
- 空气的相对湿度：≤95%（＋25℃时）；

  Relative humidity of the air: ≤95% (+ 25 °C);
- 无强腐蚀的地方；

  No strong corrosion place;
- 有爆炸性气体环境中；

  In an explosive atmosphere.
- 无雨雪侵袭的场所；

  No rain or snow;

3 过滤器性能及工作原理 FILTER PERFORMANCE AND PRINCIPLE

该自动反冲洗过滤器为机电一体化设计，程序自动控制，无需人工值守，实现了在线式的过滤与反洗过程。

The automatic backflush filter is designed for mechatronics, and the program is automatically controlled without manual watchkeeping. It realizes the online filtration and backflush process.

- 额定处理能力：150~1500 m3/h
  Rated processing capacity: 150 ~ 1500 m^3 / h;
- 处理介质：海水/苦咸水/淡水；
  Treatment medium: seawater / brine / fresh water;
- 最高工作压力：0.8 MPa；
  Max. working pressure: 0.8 MPa;
- 过滤精度：≤50μm；
  Filtration accuracy: 50μm;
- 电机工作制：S3 10%；
  Motor working system: s3 10%;
- 滤芯材质：SS316；
  Filter material: ss316;
- 滤器材质：碳钢内外环氧涂层防腐处理；
  Filter material: carbon steel internal and external epoxy coating anti-corrosion treatment;
- 最大压损： 0.05 MPa；
  Maximum pressure loss: 0.05 MPa;
- 最大反洗流量：～80 m^3/h（压差为1.5bar时）；
  Maximum backflush flow: ~ 80 m3 / h (when pressure difference is 1.5 bar);
- 反洗控制模式：自动（压差，时间），手动
  Backflush control mode: automatic (pressure difference, time), manual.

4 过滤器安装要求 FILTER INSTALLATION REQUIREMENTS

- 过滤器应垂直安装在平整表面，并使用地脚螺栓固定；
  The filter should be installed vertically on a flat surface and fixed with anchor bolts;
- 排污管的管径不能小于排污阀的的公称直径；
  The diameter of the sewage pipe must not be less than the nominal diameter of the sewage valve;
- 排污管路的输出管路长度应尽可能短，且尽量减少弯头布置数量；

The length of the output pipe of the sewage pipe should be as short as possible, and the number of elbow arrangements should be minimized;

- 应按照图纸要求预留顶部维护空间及牺牲阳极维护空间；
  Reserve the top maintenance space and sacrificial anode maintenance space according to the requirements of the drawings;
- 应按照电机接线要求进行三相进线的接线作业；
  The wiring of the three-phase incoming line should be performed according to the motor wiring requirements;
- 应按照图纸要求将过滤器地脚接地螺栓可靠接地。
  The ground bolt of the filter foot should be reliably grounded according to the requirements of the drawing.

5 过滤器的运行 Filter operation

过滤器用于筛除液体介质中的颗粒物，从而保护下游设备；该过滤器为全自动运行，使用自动反洗机制使滤芯再生恢复滤过能力和精度。

The filter is used to remove particles in the liquid medium to protect downstream equipment. The filter is fully automatic and uses an automatic backflush mechanism to regenerate the filter element to restore the filtering ability and accuracy.

过滤器的运行由控制箱进行控制。控制箱上的液晶屏显示过滤器运行界面。

The operation of the filter is controlled by Control Unit. The LCD touchscreen on the control unit displays the filter operation status.

过滤器的反洗默认为压差控制机制，PLC实时监测滤器进出口压力传感器反馈的压力值，随着滤芯内部积聚的杂质的增多和增厚，当压差值达到设定的阈值，则给出反洗指令，进行相关电机和阀门的动作进行反洗作业，如下图所示。

The backflush of the filter defaults to the differential pressure control mechanism. Plc monitors the pressure value fed back by the pressure sensor at the inlet and outlet of the filter in real time. As the impurities accumulated inside the filter element increase and thicken, when the pressure difference reaches the set threshold, the Issue the backflush instruction, perform the relevant motor and valve actions for backflush operation, as shown in the figure below.

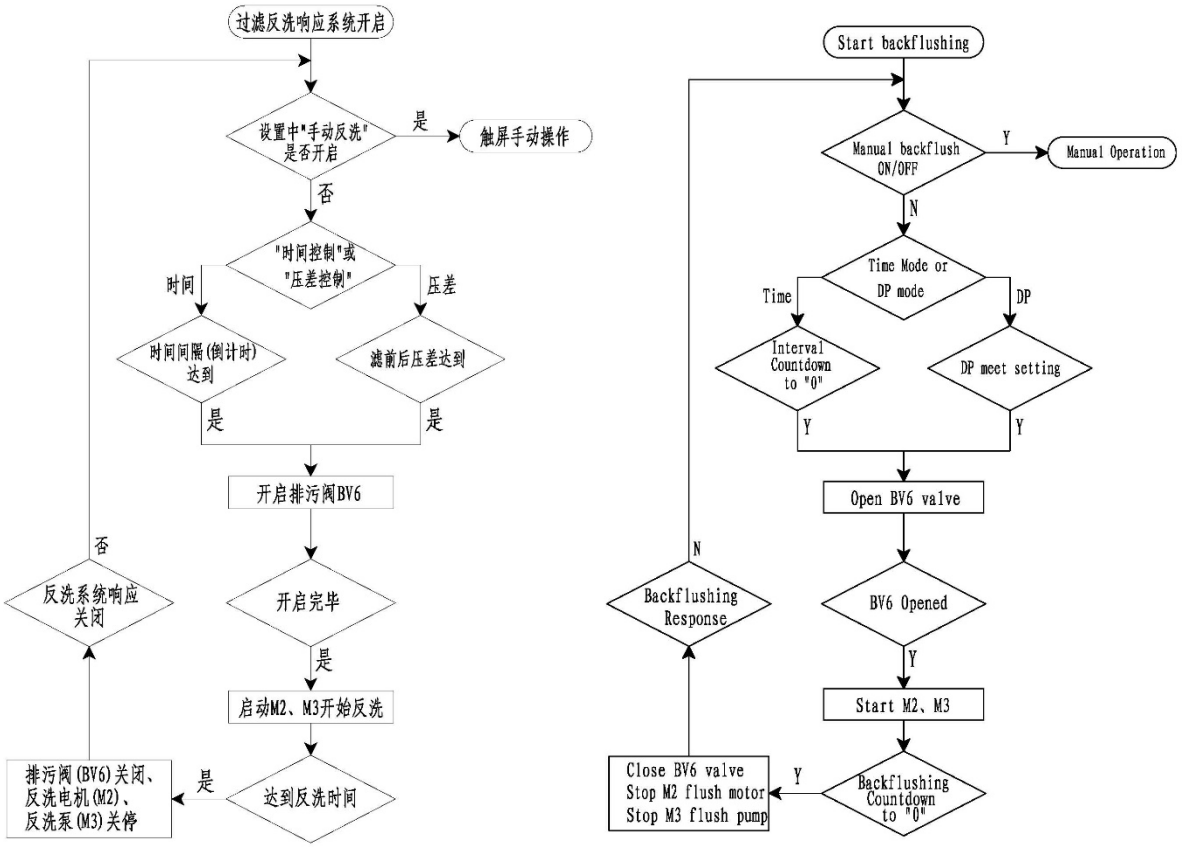


图3 过滤器反洗响应机制流程图

Figure 3 Flowchart of the filter backflush response mechanism.

6 维护和保养 MAINTENANCE

6.1 检查和例行保养 Inspection and routine maintenance

检查和维护反洗电机前，必须关断电源柜内380V（或440V）三相断路器。

Before inspecting and maintaining the backflush motor, you must turn off the 380v (or 440v) three-phase circuit breaker in the power cabinet.

1) 定期检查（建议为每周一次）反洗电机是否正常运转：启动手动操作模式后开启M2反洗电机。

   Check regularly (recommended once a week) whether the backflush motor is running normally: Turn on the m2 backflush motor after starting the manual operation mode.

2) 定期检查（建议为每月一次）手动排污阀（常开）是否开闭正常：手动旋动手轮至全闭状态后再旋开至全开状态。

   Check regularly (recommended once a month) whether the manual blowdown valve (normally open) opens and closes normally: manually turn the hand wheel to the fully closed state and then turn it to the fully open state.

长期不使用滤器是应关闭手动排污阀(MV1)。

If the filter is not used for a long time, the manual drain valve(MV1) should be closed.

3) 定期检查（建议为每次开机前）滤器地脚螺栓是否松动，反洗电机电缆接头是否松动，否则拧紧；

Regularly check (recommended before each startup) whether the filter anchor bolts are loose and the backflush motor cable connectors are loose, otherwise tightening;

4) 请在每次压载泵启动后注意是否自动排气阀有排气声，若无排气声或排气声不连续，请运行完毕后拆下自动排气阀用清水冲洗排气口和浮球。

Please pay attention to whether there is an exhaust sound from the automatic exhaust valve after the ballast pump is started. ball.

5) 请在每次运行时注意反冲洗启动的时间间隔（压差控制模式下），一般来说如果间隔时间越来越短，则说明滤芯已形成不可再生的堵塞，需要手动拆换或离线清洗。

Please pay attention to the time interval of back flushing in each operation (in differential pressure control mode).

Short, it means that the filter element has formed a non-renewable blockage, which needs to be manually replaced or cleaned offline.

如果反冲洗时间间隔突然增长，这可能表示滤芯已损坏，请立刻更换滤芯。

If the backflush interval suddenly increases, this may indicate that the filter element is damaged, please replace the filter element immediately.

6) 定期检查（建议为每 6 个月一次）牺牲阳极，若发现锌块破蚀至骨架可见则说明须更换。

Check the sacrificial anode regularly (recommended once every 6 months). If it is found that the zinc block is damaged until the framework is visible, it means that it must be replaced.

6.2 装卸反洗电机和减速机 Loading and unloading backflush motor and reducer

1) 反洗电机/减速机装卸示意图见下图。

The schematic diagram of the backflush motor / reducer assembly and disassembly is shown in following figure.

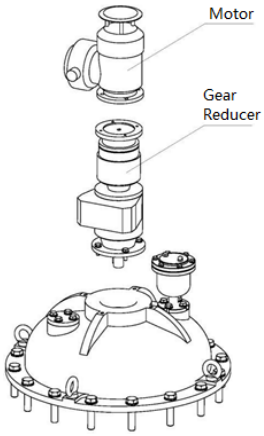


图4 反洗电机/减速机装卸示意图

Figure 4 Schematic diagram of backflushing motor / reducer assembly and disassembly

2) 装卸反洗电机注意事项：

Attentions when installing and removing the backflush motor:

装卸反洗电机前，必须关断电源柜内380V（或440V）三相断路器。

Before installing and removing the backflush motor, the 380v (or 440v) three-phase circuit breaker in the power cabinet must be turned off.

3) 装卸反洗电机具体操作步骤如下.

The specific operation steps for installing and removing the backflush motor are as follows:

操作步骤 Steps	操作内容 Instruction
step 1	拔下电缆连接器；Unplug the cable connector;
Step 2	打开接线盒解除刮板连接电缆； Open the terminal box to release the scraper connection cable;
Step 3	旋下电机固定螺栓； Unscrew the motor fixing bolts;
Step 4	向上提出电机。 Lift the motor up.
Step 5	旋下减速机固定螺栓； Unscrew the reducer fixing bolts;
Step 6	向上提出减速电机。 Lift up the geared motor.

Part III EMERGENCY PROCEDURE

第三部分 系统应急处置步骤

当遇到压缩空气失压，危险气体或化学物质泄漏等紧急情况时，请参照下述步骤处置：

In the case of compressed air pressure loss, spillage or leakage of dangerous gas, chemicals etc., the system emergency procedures are as follows:

⚠请确保使用环境通风性良好。

BE SURE THAT THE ENVIRONMENT IS WELL VENTILATED.

1. 当系统正常使用时，紫外反应器正压腔压力大于100Pa小于200Pa时，系统进入泄露补偿过程，自动补气，触发声光报警，此时系统仍处于正常工作状态。当紫外反应器正压腔小于等于100Pa时【100Pa为正压腔内电气元件断电临界压力】，系统自动停机保护，并触发声光报警，无需人为手动操作。

   When the pressure in the Pressurized UV Reactor is greater than 100Pa and less than 200Pa, the system enters the leakage compensation process, automatically replenishes gas, and triggers an audible and visual alarm. At this time, the system is still in normal working condition. When the pressure in Pressurized UV reactor is less than or equal to 100Pa [100Pa is the critical pressure of the electrical components when the power is off], the system automatically shuts down and triggers an audible and visual alarm without manual operation.

2. 当紫外反应器正压腔无法完成“换气”流程时【失压状态】，请检查现场的供气气源，以及紫外反应器本体上密封性。【紫外反应器本体上防爆格兰头是否松动、外罩与接线罩之间的密封胶条是否老化裂开、端盖与接线罩之间的密封胶条是否老化裂开、正压腔换气出口是否正常、正压腔与正压控制箱之间的连接气管是否老化、开裂、松动等】。

   When the "purging" process [loss of pressure] cannot complete, please check the gas supply on site and the tightness of the UV reactor cover. [Whether the cable gland is loose, whether the sealing strip is aging and cracking, and the purging outlet is normal, whether the connecting air pipe between the Pressurized UV reactor and the pressurization control unit is aging, cracking, loosening, etc.].

3. 打开紫外反应器正压腔部分检查维护时，严禁向正压腔内电气元器件通电，请切断

系统电源！

When opening the Pressurized UV Reactor for inspection and maintenance, it is strictly forbidden to energize the electrical equipment in the Pressurized UV Reactor, please cut off the system power!

4. 检修好后，将正压控制箱上的【电源开关】旋转到【ON】，系统通电，同时将进气手动球阀旋转到合适的位置，直至气压表稳定在200~800Pa之间,一般在500Pa左右。按下正压控制箱上的“换气”按钮，系统正式进入换气过程，在危险性气体环境中，换气过程是一个重要过程，系统每次重启时，都要严格进行换气过程，保证柜内危险性气体被置换出，确保柜内为安全环境。

   After the inspection, turn the [power switch] on the Pressurization Control Unit to [ON], the system will be energized, and at the same time, turn the air inlet ball valve to a suitable position until the air pressure gauge is stabilized between 200~800Pa, generally around 500Pa. Press the "air purging" button on the Pressurization Control Unit, the system officially enters the purging process, in the explosive gas atmosphere, the gas purging process is an important process, every time the system restarts, the purging process should be strictly carried out to ensure that the explosive gas in the UV reactor is replaced to ensure that the chamber is a safe environment.

5. 系统换气完成后，正压指示灯亮，紫外反应器正压腔内的电气元件可上电，系统即可正常运行。

   After the system is ventilated, the pressurization indicator lights up, the electrical components in the Pressurized UV Reactor can be powered on, and the system can operate normally.

附录 6 设备年度校准计划及说明

Calibration Schedule & Instruction for LeesGreen BWMS

序号 No.	ITEM 组件	TAG 位号	SCHEDULE 计划
1	电磁流量计 Flowmeter	FT	每 2 年一次 Every two years
2	压力变送器 Pressure transmitter	PT1,PT2,PT3,PT4 PN	每年一次 Once a year
3	温度变送器 Temp transmitter	TT	每年一次 Once a year
4	紫外辐射强度变送器 UV intensity sensor	IT1, IT2	每年一次 Once a year
5	磁感应开关 Magnetic Induction Switch	CC1, CC2	每年一次 Once a year
6	触摸屏触摸校准 Touch Calibration of touchscreen	HMI	每月一次 Once a month

Follow above calibration schedule to ensure the reliable performance of the BWMS' components. Either Onboard service or offline service can be provided by BWMS manufacturer.

请按照上述校准计划进行相关组件的校准，以确保系统的稳定运行。
设备制造商可提供上船服务或离线服务（相关组件寄送）。

附：各组件校准说明
Appendix：Calibration instruction

一、 电磁流量计 Flowmeter

【对应线号 cable No. 801/309】

FT 为测量系统内的瞬时流量，位于系统管路出口处，电磁流量计的测量量程范围根据型号来定【LS-150, 0~300m³；LS-250, 0~600m³；LS-500, 0~1000m³，LS-850, 0~1500m³，LS-1150, 0~2000m³，LS-1500, 0~2500m³】对应输出 4~20mA 电流信号。[测量误差±5%]视为正常。

FT for measuring the instantaneous flow in the system, located at the outlet of the system pipeline, electromagnetic flowmeter measurement range according to the model to determine [LS-150, 0~300m^3; LS-250, 0~600m^3; LS-500, 0~1000m^3, LS-850, 0~1500m^3, LS-1150, 0~2000m^3, LS- 1500, 0~2500m^3] Corresponding output 4~20mA current signal. The [measurement error ±5%] is considered normal.

校准方法：How to calibrate

将 LSC-1L 控制箱内对应信号线拆掉一根, 用万用表“mA 电流档”串入其中,当实时流量为 375 m³ /h 时,对应测得电流值约 10.0mA，[测量误差±5%]视为正常。

Remove a signal line in LSC-1L control unit correspondingly, use a multimeter "mA current file" series into which, when the real-time flow of 375 m^3 / h, the corresponding measured current value of about 10.0mA, [measurement error ± 5%] as normal.

① 实际测量值计算公式如下（以 LS-500 型号为例）

The actual measured value is calculated by the following formula (taking LS-500 model as an example)

输出电流 X 对应的实际压力值 Y，按 Y=(H-L)×(X-4)÷16+L 计算；

其中：H 为 20mA 对应的压力量程值，L 为 4mA 对应的压力量程值

H 为 1000mW/cm², L 为 0mW/cm²，那么 10mA 对应的 实际压力值 Y 值就是：

Y=(1000-0) ×（10-4）÷16+0=375 m³ /h。

The actual pressure value Y corresponding to the output current X, calculated as Y = (H - L) × (X - 4) ÷ 16 + L.

Where: H is the pressure range value corresponding to 20mA, L is the pressure range value corresponding to 4mA

H is 1000mW/cm^2, L is 0mW/cm^2, then the actual pressure value Y value corresponding to 10mA is Y=(1000-0) × (10-4)÷16+0=375 m^3/h.

② 零位校准：Zero calibration

零点修正时应确保传感器管内充满流体，且流体处于静止状态。流量零点是用流速表示的，单位为mm / s 。

The zero-point correction should ensure that the sensor tube is filled with fluid and that the fluid is at rest. The flow zero point is expressed in terms of flow rate in mm/s.

转换器流量零点修正显示如下：The converter shows the following

FS = ○ ○ ○ ○ ○
± ○ ○ ○ ○ ○

上行小字显示：FS 代表仪表零点测量值；

下行大字显示：流速零点修正值；

当 FS 显示不为“0”时，应调修正值使 FS = 0。注意：若改变下行修正值，FS 值增加，需要改变下行数值的正、负号，使 FS 能够修正为零。

The upper line in small print: FS for the zero measurement value of the instrument. The lower line shows in large letters: the zero correction value of the flow rate.

When FS is not "0", the correction value should be adjusted to make FS = 0. Note: If the FS value increases by changing the correction value in the lower line, you need to change the positive and negative sign of the lower line value so that FS can be corrected to zero.

流量零点的修正值是传感器的配套常数值，应记入传感器的记录单和传感器标牌。记入时传感器零点值是以mm / s 为单位的流速值，其符号与修正值的符号相反。

The correction value of the flow rate zero point is the matching constant value of the sensor, which should be recorded in the record sheet of the sensor and the sensor label. Recorded when the sensor zero value is the flow rate value in mm / s, the symbol and the correction value of the opposite symbol.

二、 压力变送器 Pressure Transmitter

1. PT1、PT2、PT4 正压型压力变送器 positive pressure Transmitter

【对应线号 Cable No. 801/301; 801/303; 801/307】

PT1 为过滤器进口压力，PT2 为过滤器出口压力，PT4 为排污泵出口压力，均为 0~10Bar 量程范围，对应输出 4~20mA 电流信号。

PT1 is the filter inlet pressure, PT2 is the filter outlet pressure and PT4 is the backflush pump outlet pressure, all in the range of 0~10Bar, corresponding to the output of 4~20mA current signal.

校准方法：How to calibrate

① 零位校准：将 LSC-1L 控制箱内对应信号线拆掉一根, 用万用表 “mA 电流档”串入其中,当压力为 0Bar 时,对应测得电流值约为 4mA[测量误差±5%]视为正常。

Zero calibration: remove the corresponding signal line in the LSC-1L control unit, and use the multimeter "mA current file" to string into it, when the pressure is 0Bar, the corresponding measured current value is about 4mA [measurement error ±5%] is considered normal.

② 实际测量值计算公式如下，

The actual measured value is calculated as follows:

输出电流 X 对应的实际压力值 Y，按 Y=(H-L)×(X-4)÷16+L 计算；

其中：H 为 20mA 对应的压力量程值，L 为 4mA 对应的压力量程值

H 为 10Bar, L 为 0Bar，那么 10mA 对应的 实际压力值 Y 值就是：

Y=(10-0) ×（10-4）÷16+0=3.75Bar。

The actual pressure value Y corresponding to the output current X, calculated as Y = (H - L) × (X - 4) ÷ 16 + L. Where: H is the pressure range value corresponding to 20mA, L is the pressure range value corresponding to 4mA.

H is 10Bar, L is 0Bar, then the actual pressure value Y corresponding to 10mA is Y=(10-0) × (10-4)÷16+0=3.75Bar.

2. PT3 负压型压力变送器 negative pressure Transmitter

【对应线号 Cable No. 801/305】

PT3 为排污泵进口压力，均为-1~5Bar 量程范围，对应输出 4~20mA 电流信号。

PT3 is the inlet pressure of the backflush pump, which is in the range of -1~5Bar, corresponding to the output of 4~20mA current signal.

校准方法：How to calibrate

③ 零位校准：将 LSC-1L 控制箱内对应信号线拆掉一根，用万用表“mA 电流档”串入其中,当压力为 0Bar 时,对应测得电流值约 6.67mA[测量误差±5%]视为正常。

Zero calibration: remove the corresponding signal line in the LSC-1L control box, and use a multimeter "mA current file" to string into it, when the pressure is 0Bar, the corresponding measured current value is about 6.67mA [measurement error ±5%] as normal.

④ 实际测量值计算公式如下

The actual measured value is calculated as follows:

输出电流 X 对应的实际压力值 Y，按 Y=(H-L)×(X-4)÷16+L 计算；

其中：H 为 20mA 对应的压力量程值，L 为 4mA 对应的压力量程值

H 为 5Bar, L 为-1Bar，那么 10mA 对应的 实际压力值 Y 值就是：

Y=(5-（-1）) ×（10-4）÷16+（-1）=1.25Bar。

The actual pressure value Y corresponding to the output current X, calculated as Y = (H - L) × (X - 4) ÷ 16 + L. Where: H is the pressure range value corresponding to 20mA, L is the pressure range value corresponding to 4mA

H is 5Bar, L is -1Bar, then the actual pressure value Y corresponding to 10mA is

Y=(5-(-1)) × (10-4)÷16+(-1)=1.25Bar.

三、 温度变送器 Temp Transmitter

【对应线号 cable No. 801/311】

TT 为测量紫外反应器腔体内的水温，位于紫外反应器本体上。常规温度变送器的测量量程范围 0~100℃，对应输出 4~20mA 电流信号。[测量误差±5%]视为正常。

将 LSC-1L 控制箱内对应信号线拆掉一根，用万用表“mA 电流档”串入其中,当温度为 37.5℃时,对应测得电流值约 10.0mA，[测量误差±5%]视为正常。

TT is to measure the water temperature inside the UV reactor chamber, located on the UV reactor body. The measuring range of conventional temperature transmitter is 0~100℃, corresponding to output 4~20mA current signal. The [measurement error ±5%] is considered normal.

校准方法：How to calibrate

Remove the corresponding signal line in the LSC-1L control box and use a multimeter "mA current file" to series into it, when the temperature is 37.5℃, the corresponding measured current value is about 10.0mA, [measurement error ±5%] is considered normal.

实际测量值计算公式如下，

The actual measured value is calculated as follows:

输出电流 X 对应的实际压力值 Y，按 Y=(H-L)×(X-4)÷16+L 计算；

其中：H 为 20mA 对应的压力量程值，L 为 4mA 对应的压力量程值

H 为 100℃, L 为 0℃，那么 10mA 对应的 实际压力值 Y 值就是：

Y=(100-0) ×（10-4）÷16+0=37.5℃。

The actual pressure value Y corresponding to the output current X, calculated as Y = (H - L) × (X - 4) ÷ 16 + L.

Where: H is the pressure range value corresponding to 20mA, L is the pressure range value corresponding to 4mA

H is 100℃, L is 0℃, then the actual pressure value Y value corresponding to 10mA is Y=(100-0) × (10-4)÷16+0=37.5℃.

备注：由于温度值关联到了系统温度超高停机保护，如有校准发现异常，请及时更换。

Note: As the temperature value is associated to the system high-high temperature shutdown protection, if any calibration found abnormal, please replace it in time.

四、 紫外照度变送器 UV Intensity Sensor

【对应线号 Cable No. 801/313】

IT 为测量紫外反应器罐体内紫外光照强度，位于紫外反应器本体上，紫外线强度变送器的测量量程范围 0~1000mW/cm²，对应输出 4~20mA 电流信号。[由于受水质环境的影响，测量误差±10%]视为正常。

IT is to measure the UV light intensity inside the UV reactor, located on the UV reactor body. The measurement range of UV intensity transmitter is 0~1000mW/cm², corresponding to the output of 4~20mA current signal. [Due to the influence of water quality environment, the measurement error ±10%] is regarded as normal.

校准方法：How to calibrate

将 LSC-1L 控制箱内对应信号线拆掉一根, 用万用表“mA 电流档”串入其中,当温度为 375 mW/cm² 时,对应测得电流值约 10.0mA，[测量误差±5%]视为正常。

Remove one LSC-1L control box corresponding signal line, with a multimeter "mA current file" series into which, when the temperature is 375 mW/cm², the corresponding measured current value of about 10.0mA, [measurement error ± 5%] as normal.

实际测量值计算公式如下，

The actual measured value is calculated as follows:

输出电流 X 对应的实际压力值 Y，按 Y=(H-L)×(X-4)÷16+L 计算；

其中：H 为 20mA 对应的压力量程值，L 为 4mA 对应的压力量程值

H 为 1000mW/cm² , L 为 0mW/cm² ,那么 10mA 对应的 实际压力值 Y 值就是：

Y=(1000-0) ×（10-4）÷16+0=375 mW/cm² 。

The actual pressure value Y corresponding to the output current X, calculated as Y = (H - L) × (X - 4) ÷ 16 + L. Where: H is the pressure range value corresponding to 20mA, L is the pressure range value corresponding to 4mA.

H is 1000mW/cm², L is 0mW/cm², then the actual pressure value Y value corresponding to 10mA is Y=(1000-0) × (10-4)÷16+0=375 mW/cm².

五、 磁感应开关 Magnetic Induction Switch

【对应线号 Cable No. 811/812/101; 811/812/102】

CC1/CC2 磁感应开关为刮板电机 M1 运行限位开关，CC1 位于紫外反应器本体 M1 刮板电机侧【长端】，CC2 位于紫外反应器本体 M1 刮板电机对侧【短端】。其供电电源为 DC24V。正常线缆棕色【DC24V+】、蓝色【DC24V-】、黑色【信号线】。

CC1/CC2 magnetic induction switch is the wiping motor M1 running limit switch,

CC1 is located on the side of the wiping motor of the UV reactor body M1 [long end of UV chamber], CC2 is located on the opposite side of the wiping motor of the UV chamber M1 [short end]. The power supply is DC24V, and the cables are brown [DC24V+], blue [DC24V-] and black [signal line].

校准方法：How to calibrate

① CC1：取磁钢接近 CC1 感应检测面，磁感应开关本体指示灯将亮起，此时用万用表“直流电压档”进行测量，黑色【信号线】与蓝色【DC24V-】之间有 DC24V 电压，且线缆复原后，对应 PLC 输入第一个点位 I0.0 亮起则正常。

Use the magnet close to CC1 induction detection surface, the magnetic induction switch body indicator will light up, at this time, use the multimeter "DC voltage file" to measure, there is DC24V voltage between the black [signal line] and blue [DC24V-], and after the cable is restored, the first point of the corresponding PLC input I0.0 lights up, then it is normal.

② CC2：取磁钢接近 CC2 感应检测面，磁感应开关本体指示灯将亮起，此时用万用表“直流电压档”进行测量，黑色【信号线】与蓝色【DC24V-】之间有 DC24V 电压，且线缆复原后，对应 PLC 输入第一个点位 I0.1 亮起则正常。

Use the magnet close to CC2 induction detection surface, the magnetic induction switch body indicator will light up, at this time, use the multimeter "DC voltage file" to measure, there is DC24V voltage between the black [signal line] and blue [DC24V-], and after the cable is restored, the first point of the corresponding PLC input I0.1 lights up, then it is normal.

六、 触摸屏校准 Calibration of touchscreen

1. 触摸校准 Touch Calibration

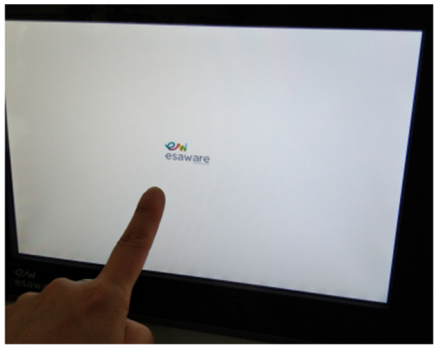
触摸屏位于控制箱的门板上，是整个 BWMS 的操作控制系统。在运行一段时间后，由于现场环境&操作习惯等问题，会造成触摸屏的触摸效果出现不准确等问题，需要进行校准：

The touch screen is located on the door panel of the control box, which is the operation control system of the whole BWMS. After a period of operation, due to the site environment & operating habits and other issues, it will cause problems such as inaccurate touch effect of the touch screen, which needs to be calibrated as follows.

校准方法如下：How to calibrate

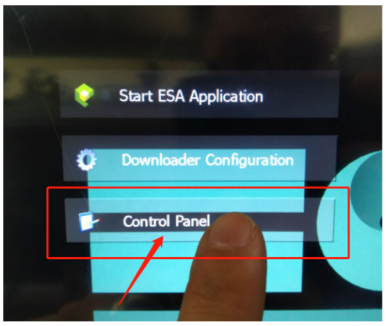
1) 屏幕上电后，手一直按着屏幕，知道出现控制面板页面后松开手指，如下图：

After the screen is electrified, keep your hand on the screen and release your finger when the control panel page appears, as shown in the figure below:



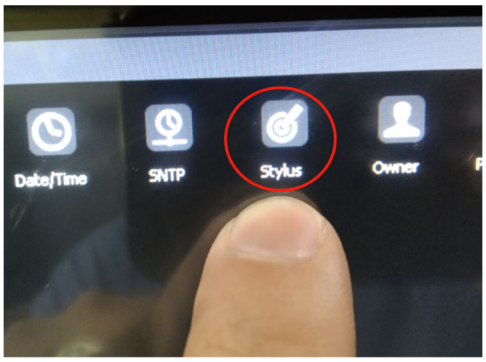
2) 手指一直按到出现控制面板页面即可，如下图：

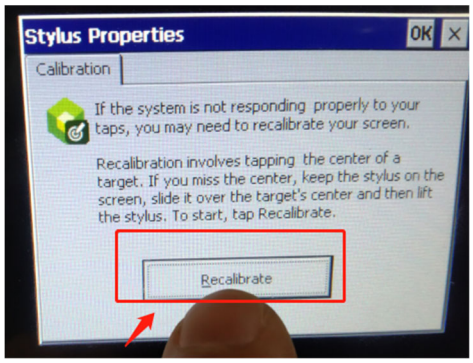
Press your finger until the control panel page appears, as shown below:



3) 点击“CONTROL PANEL” Press“CONTROL PANEL”

4) 点击“Stylus” Press "Stylus"

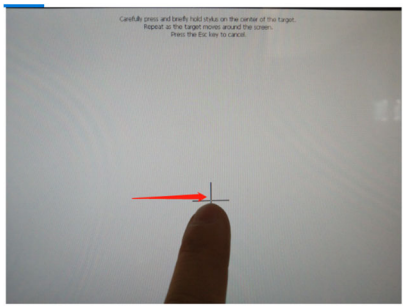


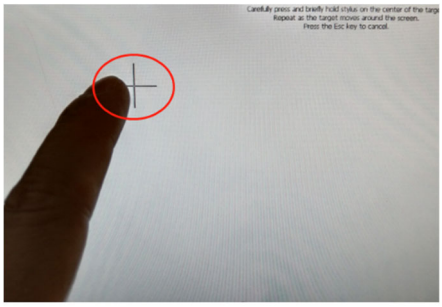


5) 点击上图中的按钮「Click the button “Recalibrate” in the picture below」

6) 依次点击下图中十字架中心点位置，如下图：

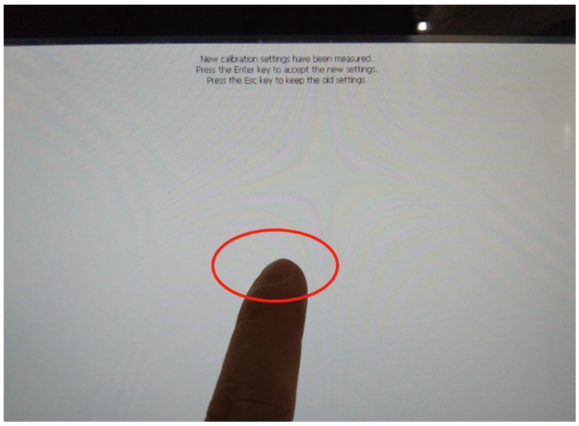
Click the center point of the cross in the picture one by one, as shown below:

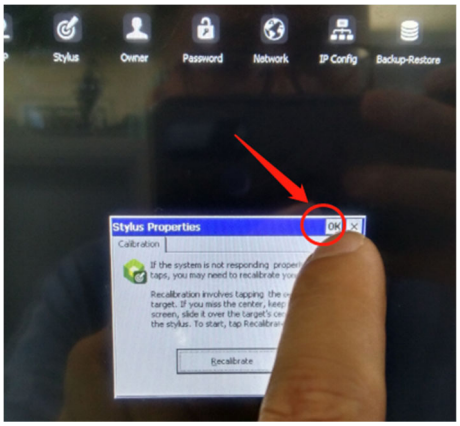




7) 最后点击屏幕，退出屏幕校准区域：

Finally, click the screen to exit the screen calibration, as shown in the figure below:





8) 点击“OK”完成，重启屏幕即可。

Click "OK" to complete and restart the screen.

2. 系统 UTC 时间校准 UTC time calibration

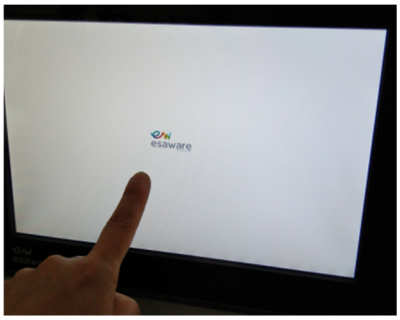
BWMS 在运行一段时间后，由于操作习惯问题忘记及时更新触摸屏时间，会造成触摸屏时间与 UTC 时间不符合问题，需要进行校准：

After a period of operation, BWMS needs to update the time due to operating habits, which will cause the touch screen time and UTC time do not match and need to be calibrated.

校准方法如下：How to calibrate

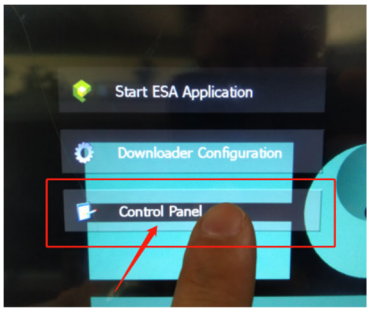
1) 屏幕上电后，手一直按着屏幕，直到出现控制面板页面后松开手指，如下图：

After powered on, keep your hand on the screen and release your finger when the control panel page appears, as shown in the figure below:



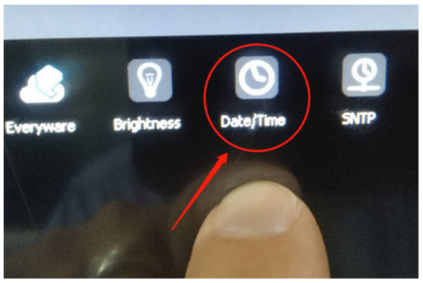
2) 手指一直按到出现控制面板页面即可，如下图：

Press your finger until the control panel page appears, as shown below:



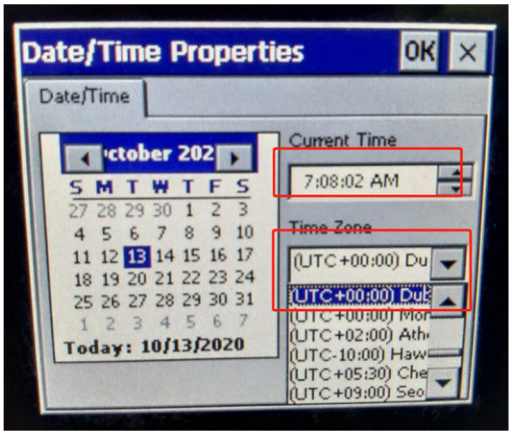
3) 点击“CONTROL PANEL” [Press “CONTROL PANEL”]

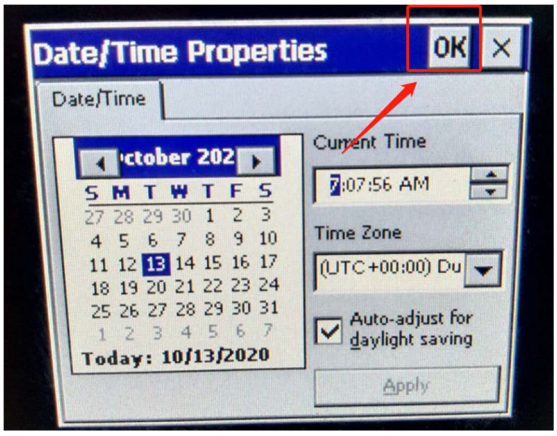
4) 点击“Date/Time”[Press " Date/Time "]



5) 点击下图中的按钮,修改时区及相应的时间

Click the button in the picture below to change the time zone and the corresponding time





6) 修改完成后，点击 OK 即可。

When the modification is completed, click OK.

- 另外一种修改时间的方法，进入“参数设置”界面后，点击时间位置。

Another way to modify the time is to enter the "parameter setting" interface and click the time position as shown in following figure.

GUIDANCE

ON

CHALLENGING WATER QUALITY (CWQ)

of

LeesGreen BWMS

SEP 2024

V1.0

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1. Introduction

1.1 Purpose

To outline procedures for operating the LeesGreen BWMS (Filter & UV-type BWMS) under challenging water quality conditions, ensuring effective ballast water treatment according to MEPC 387(81).

This manual applies to all personnel involved in the operation and maintenance of the LeesGreen BWMS, specifically under conditions of high turbidity and high TSS (total suspended solids).

1.2 Definitions

Challenging Water Quality (CWQ) describes water conditions characterized by quality parameters that restrict the effective operation of a type-approved BWMS. These limitations may arise from the system's inability to be installed, maintained, or operated as intended. For LeesGreen BWMS, high turbidity, elevated levels of total suspended solids, and other parameters that can induce filter clogging and reduce UVT are indicative of CWQ, thereby compromising the system's performance.

Operational demand is defined as the lowest BWMS flow rate stipulated in the Ballast Water Management Plan (BWMP) that permits a ship to carry out cargo operations concurrently with the operation of the BWMS. For the LeesGreen system, this operational demand is equivalent to 12% of the system's rated treatment capacity (TRC).

Operational limitations are defined as conditions that trigger the automatic deactivation of the BWMS, including critical alarms or safety-related events that

mandate the shutdown of the system to safeguard the BWMS equipment, the vessel, and its crew.

Pre-emptive bypassing is defined as the proactive act of diverting ballast water around the ballast water management system (BWMS) prior to or during ballasting operations, undertaken when it is forecasted that operational restrictions will be encountered or operational demands cannot be fulfilled.

Reactive bypass is an emergency procedure undertaken during ballasting operations where a portion or all of the ballast water is diverted around the BWMS. This action is typically initiated when the BWMS encounters operational limitations, such as exceeding flow rate limits, or when it fails to meet operational demands, such as achieving the required level of treatment. The purpose of a reactive bypass is to prevent damage to the BWMS or the vessel and to ensure the safety of the crew.

2. Challenging Water Quality Conditions

2.1 High Turbidity and high TSS

High turbidity and high TSS in ballast water can significantly impair the performance of both filters and ultraviolet (UV) reactors within a ballast water management system (BWMS).

- **Filters:**
  - **Clogging:** High turbidity increases the likelihood of filter clogging. The suspended particles in turbid water can accumulate on the filter surface, reducing the filter's efficiency and increasing pressure drop. Over time, this can lead to a complete blockage of the filter, requiring frequent cleaning or replacement.
  - **Reduced flow rate:** Clogged filters restrict the flow of water through the system, reducing the overall treatment capacity.

  - **Premature wear:** The constant abrasion of suspended particles against the filter media can accelerate wear and tear, shortening the filter's lifespan.
- **UV reactors:**
  - **Shielding:** Suspended particles in turbid water can scatter and absorb UV radiation, reducing the intensity of the UV light reaching the microorganisms. This shielding effect can compromise the effectiveness of the UV disinfection process, allowing harmful organisms to survive.
  - **Fouling:** Over time, the buildup of organic matter and biofilms on the UV lamp quartz sleeves can further reduce UV transmittance and reduce the effectiveness of the treatment process.
  - **Lamp degradation:** The reduced UV intensity can also lead to premature aging of the UV lamps, increasing maintenance costs and downtime.

High turbidity and high TSS poses a significant challenge to the effective operation of ballast water management systems. By understanding the mechanisms by which turbidity affects filters and UV reactors, ship operators can implement appropriate measures to mitigate these impacts, such as pre-treatment of ballast water, regular monitoring of turbidity levels, and frequent maintenance of the BWMS.

2.2 High Organic Load

A high organic load in ballast water can significantly reduce the effectiveness of ultraviolet (UV) reactors in ballast water management systems (BWMS). This is due to the following mechanisms:

- **UV Shielding:** Organic matter in the water can absorb and scatter UV radiation, reducing the intensity of the UV light reaching the microorganisms.

This shielding effect can compromise the effectiveness of the UV disinfection process, allowing harmful organisms to survive.

- **Biofouling:** Organic matter can promote the growth of biofilms on the quartz sleeves of the UV lamps. These biofilms can further reduce UV transmittance and decrease the effectiveness of the treatment process.
- **Trihalomethane (THM) Formation:** Under certain conditions, the combination of UV radiation and organic matter can lead to the formation of disinfection byproducts, such as trihalomethanes (THMs). While THMs are not harmful organisms, they are considered potential carcinogens and are regulated by many environmental authorities.
- **Chemical Scavenging:** Some organic compounds can act as UV scavengers, reacting with UV radiation and reducing the available UV dose for disinfection.

High organic loads can significantly reduce the effectiveness of UV disinfection in BWMS. To mitigate these effects, it is important to consider factors such as the type and concentration of organic matter, the design of the UV reactor, and the overall treatment strategy.

3. GUIDANCE FOR SHIPS OPERATING IN CWQ

3.1 System design limitations (SDL)

Reference is made from the Type Approval Certificate. The details follow:

Table 1 System Design Limitation

Category	Parameter	Value
Filter	Inlet pressure	≥ 0.15 MPa
UV Reactor	UV Transmittance（UVT）	≥50%（100%TRC）
	UV Intensity（UVI）	≥ 250 W/m^2 （100%TRC）
Water Quality	Water temperature	No limit

Category	Parameter	Value
	Salinity	No limit
	Holding Time	≥ 24hr

3.2 Critical alarms indicating challenging water quality

Table 2 Critical alarms indicating CWQ

NO.	Item	Alarm	Shutdown
1	Flowrate low	√ (< 20% of TRC)	√ (< 12% of TRC)
2	PT1 High	√ (> 5 bar)	-
3	DP High	√ (PT1-PT2/PT1>90%	√ (delay 30 sec after alarm)
4	UV Intensity Low	√ (< 75 mW/cm^2)	√ (delay 30sec after alarm)
5	UV Dose Low	√ (< 210mJ/cm^2)	√ (delay 30sec after alarm)

3.3 CWQ process

Table 3 CWQ process

NO.	Process	Description	Actions
1	Assessment	Determination that the BWMS is not performing at its expected treatment rated capacity	• indications from the self-monitoring system • mechanical observations by crew • maintenance records by CE
2	Troubleshooting and mitigation	Ensure proper operation and maintenance of BWMS and deploy measures to assist it	• verify valves • address alarms • online manual backflush • offline clean of filter candles • increase UV ballast output

NO.	Process	Description	Actions
			• reduce BV5 opening
3	CWQ triggering	Assess operational limitations and operational demands to establish CWQ	• consult BWMS self-monitoring system • monitor BWMS flow rate • critical alarms triggered
4	Alternatives to bypass	Take all additional steps possible before bypassing the BWMS	• restrict flow to operational demand • optimize BWMS for CWQ • increase UV ballast output • load less ballast water
5	Bypass	Load the minimum amount of unmanaged water and limit the tanks and piping affected	• consider partial BWMS bypass • load minimum safe amount and reposition ballast • specify a bypass BWT
6	Decontamination	Decontaminate tanks and piping to lower the risk of not meeting D-2 at next discharge	• conduct exchange in preferably mid-ocean • suitable tank flushing • manual flushing filter • offline clean filter candles • treatment when BWE • treatment when deballast
7	Record-keeping/ communication	Regularly update the Ballast Water Record Book and inform future ports of any BWMS bypass	• make BWRB entries throughout this process according to BWM.2/Circ80 • submit a pre-arrival reporting form

Figure 1 Assessment of BWMS operations

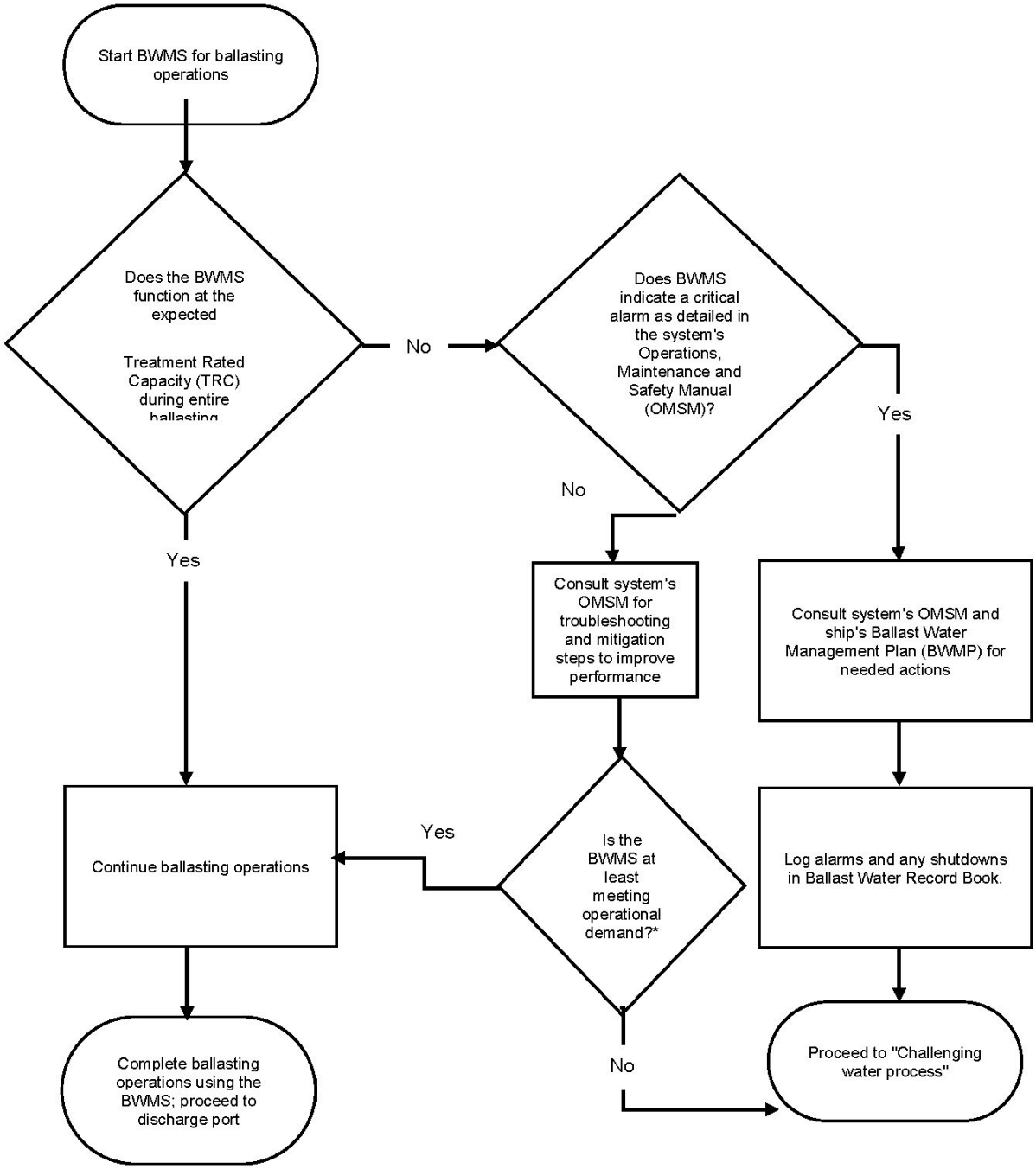


Figure 2 CWQ process

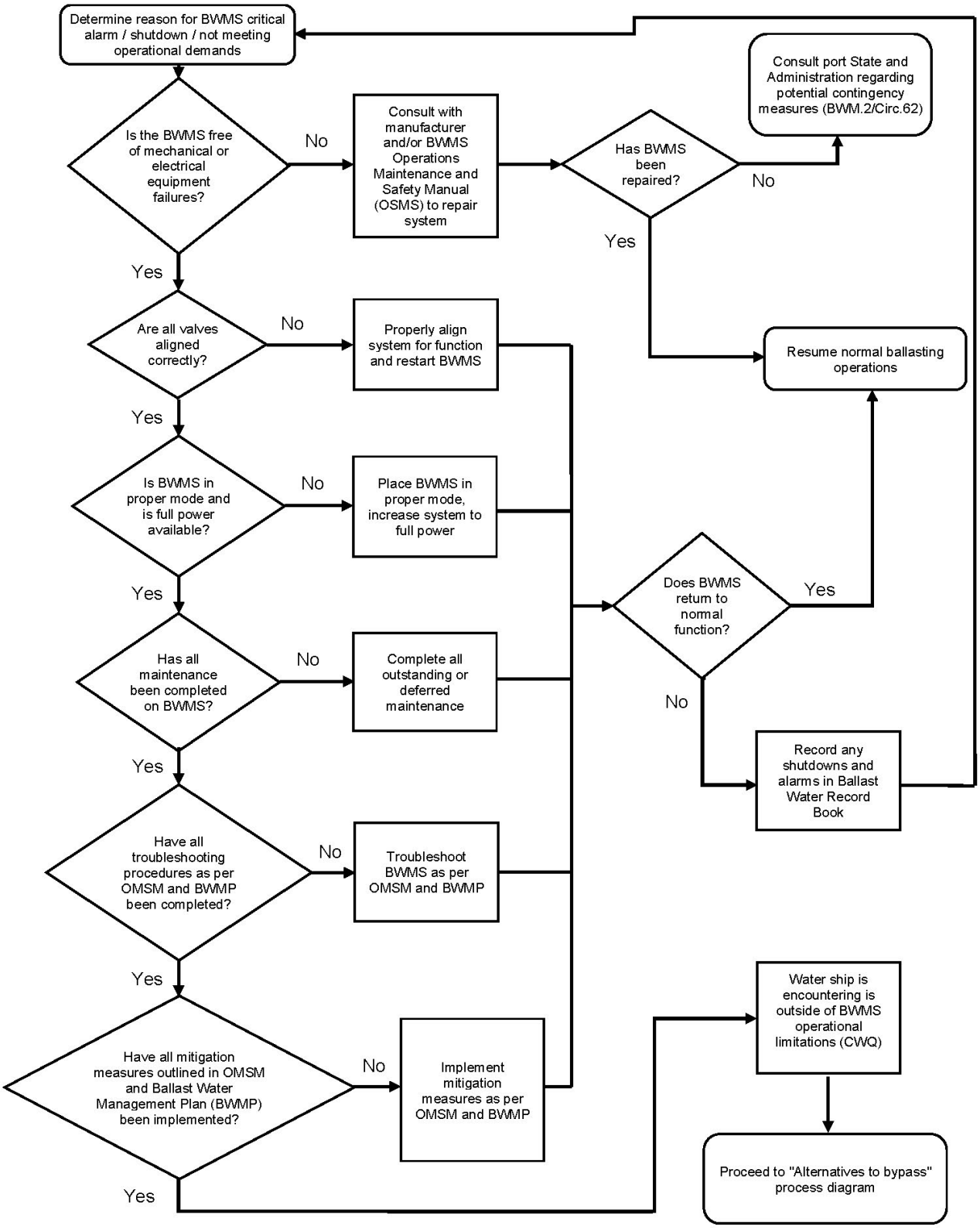


Figure 3 Alternatives to bypass

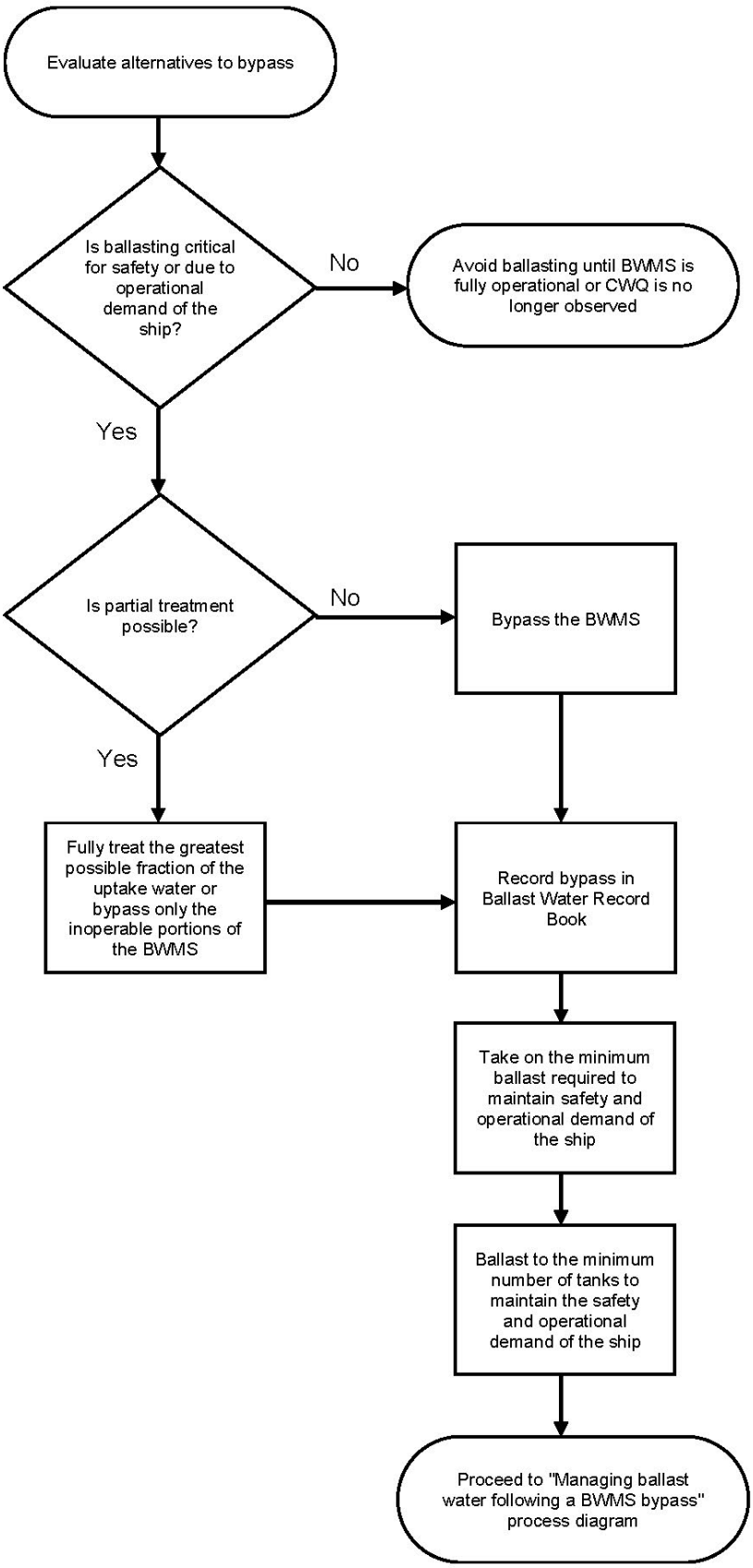
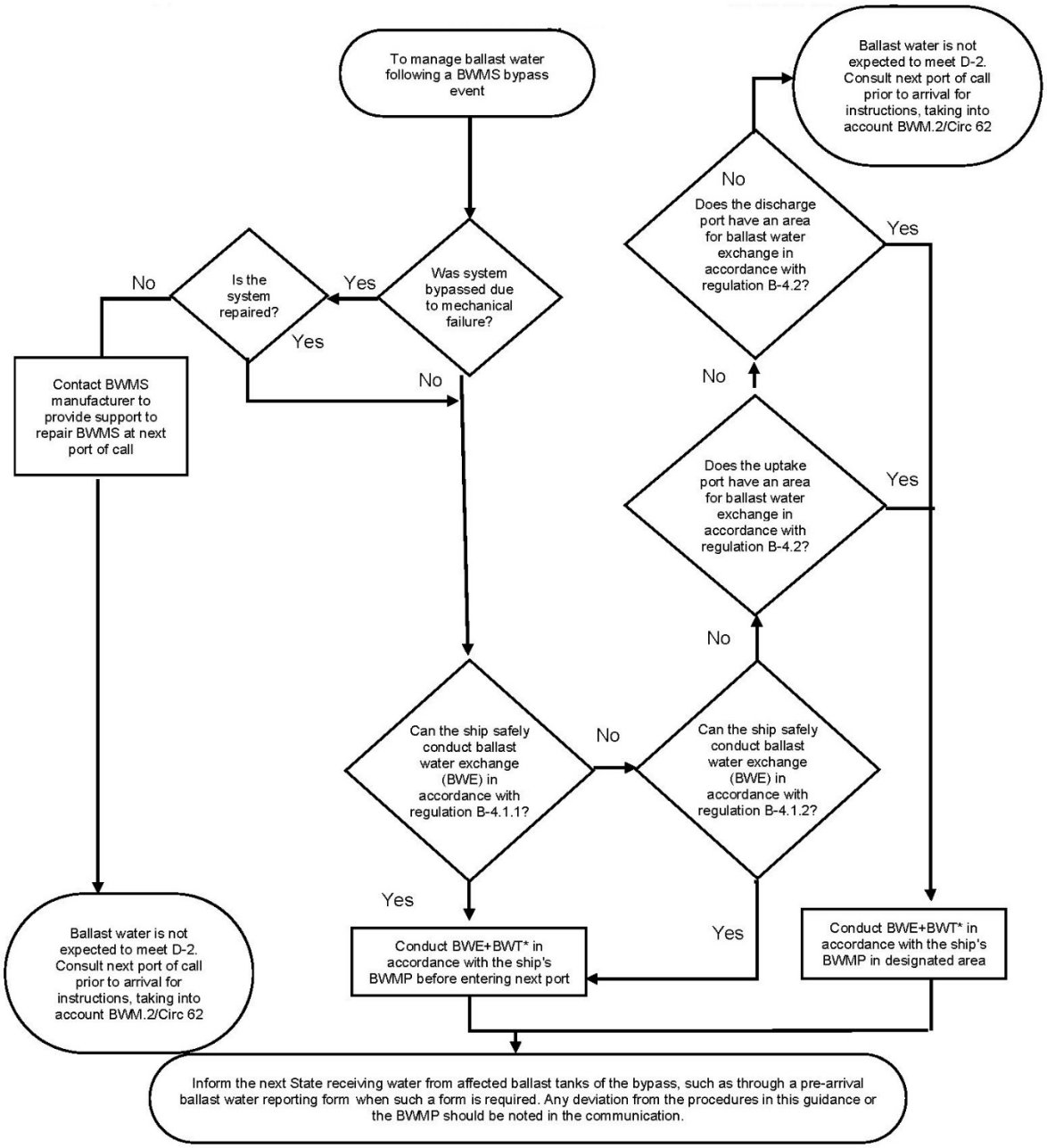


Figure 4 Decontamination



3.4 Notice on pre-emptive bypass

Pre-emptive bypass is a preventative measure used to avoid potential issues with ballast water treatment systems (BWMS) in areas with known challenging water quality (CWQ). While it's generally discouraged due to potential environmental risks, it may be agreed upon in specific cases between the ship's administration and the receiving port state. However, such agreements must ensure that the bypass does not harm the environment or the interests of other states.

1. **Bilateral Agreement:**
    - **Prior Coordination:** Before a voyage to a port with known CWQ, the ship's administration and the receiving port state should agree on a pre-emptive bypass strategy if necessary. This agreement should be documented in the ship's approved Ballast Water Management Plan (BWMP) and the Ballast Water Record Book (BWRB).
2. **Environmental Impact Assessment:**
    - **Risk Evaluation:** The administration should ensure that pre-emptive bypass will not negatively impact the environment, human health, property, or resources of any state.
3. **Specific Voyage Arrangements:**
    - **Port-to-Port Basis:** Pre-emptive bypass arrangements should be tailored to specific voyages between designated ports or locations.
4. **Self-Monitoring System Reliance:**
    - **Real-time Assessment:** Rely on the BWMS's self-monitoring system to accurately determine water quality challenges in real-time. This eliminates the need for crew judgment and ensures a more precise response.
5. **Avoid Overreliance:**
    - **Case-by-Case Evaluation:** While pre-emptive bypass can be useful in certain situations, avoid relying on it solely based on historical CWQ data. Water quality conditions can vary significantly due to various factors.

In essence, pre-emptive bypass should be considered as a last resort and only used when necessary after careful evaluation of environmental risks and in coordination with the receiving port state.

Appendix 1 Example Decontamination procedure

The following steps are intended to promote a return to compliance with regulation D-2 after a BWMS has been bypassed.

Having loaded the minimum volume of ballast water, proceed to the first suitable location for the discharge of ballast water from the following list:

.1 a location specified in regulation B-4.1; or
.2 a location specified in regulation B-4.2 by the port State in whose waters the BWMS is bypassed; or
.3 a location specified in regulation B-4.2 by the port State in whose waters the ballast water is to be discharged.

Replace the ballast water in each contaminated tank through ballast water exchange (in accordance with the operational and safety provisions of the BWMP), flushing and treatment.

.1 In the case of a ship using the sequential method, which is preferred:
.1 the ballast water should be fully discharged through the neutralization, if applicable, and/or treatment process for the deballasting operation of the BWMS, if technically feasible;
.2 the stripping pump (eductor) should be used to remove residual water from the tank;
.3 the concentration of organisms in remaining residual ballast water and sediments should be reduced by flushing the tank using the following sequential steps, if allowed and/or required by the receiving port State:6
.1 the addition of treated water to the ballast tanks (decontamination will be most effective with the addition of as much treated mid-ocean water into the tank as is safe for the ship and crew, at minimum an amount that will cover the entire bottom of the ballast tank);
.2 the mixing, through the motion of the ship, of the added water with the residual ballast water and any sediments that have settled in the tanks; and
.3 the release of the mixed waters; and
.4 the tank should be refilled with treated ballast water.

.2 The use of the flow-through or dilution method is not recommended. However, in the case of a ship which must use the flow-through or dilution method:
.1 a sufficient volume of treated uptake water should be pumped through to reduce the concentration of organisms in the tank to the standard in regulation D-2, at least 1.66 times the volume specified by regulation D-1.2, if required by the receiving port State;7 and

.2 to reduce the risk that non-neutralized Active Substances could damage the environment, human health, property or resources, a ship with a BWMS that uses Active Substances should only conduct this exchange in a location described in regulation B-4.1 and in compliance with any precautions in the approved BWMP designed to ensure the safety of the ship and crew.

.3 Record the ballast water exchange and flushing operations in the BWRB

LeesGreen®