Guideline No.: F-10(202511)

F-10

MARINE INERT GAS SYSTEM

Issued date: November 1,2025

Foreword:

China Classification Society (hereinafter referred to as CCS) Product Inspection and Testing Guideline (hereinafter referred to as this Guideline) contains the technical requirements, inspection and testing criteria related to classification and statutory survey of marine products to be applied for CCS approval/inspection.

This Guideline frees the users to adopt other test methods and requirements which are equivalent to or are stricter than this Guideline.

This Guideline is published and updated by CCS, and is released at http://www.ccs.org.cn. Your comments or suggestions are welcomed and may be sent to our email addressed service@ccs.org.cn.

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Historical versions and release date : F-10(201510) October 20,2015

Main changes:

1. Modify the application of the guideline

2. Editorial revision

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1 Application

1.1 This guideline is applicable to the inert gas systems on liquid cargo carriers as required by chapter II-2 of the SOLAS;

1.2 Inert gas systems may be classified into flue gas type, fuel oil type/fuel gas and nitrogen generator type depending on different sources of inert gas.

2 Normative references

Regulation 4,Chapter II-2 of International Convention for the Safety of Life at Sea, 1974(SOLAS), and its Amendments;

Chapter 15 of FSS Code and its Amendments,

Chapter 4, Part Six of China Classification Society Rules for Sea-Going Steel Ships and its Amendments

IACS UR F20 Inert Gas System

3 Terms and definitions

3.1 For the definitions of terms related to product inspection, approval, type test, test specimen, unit/batch inspection, etc., refer to 3.1.2, Chapter 3, PART ONE of CCS Rules for Classification of Sea-going Steel Ships and its Amendments.

3.2 Inert gas: gas or gas mixture which does not have sufficient oxygen content to support the combustion of hydrocarbon gases, e.g. nitrogen or mixed flue gas.

3.3 Flue gas type inert gas system: an inert gas system which uses the flue gas of the main and auxiliary boilers on board, after the flue gas has been cooled, desulfurized and dedusted in the scrubber. The inert gas qualified through inspection is delivered by the gas blower to the inert gas main through deck water seal and then distributed to the cargo oil tanks.

3.4 Fuel oil / fuel gas type inert gas system: the inert gas is generated and supplied by an independent inert gas generator by means of burning ordinary light diesel oil or heavy oil /gas in the combustion chamber of the system. The flue gas generated is transferred to the oil tanks after being cooled and purified in the scrubber. As this inert gas generator is provided with a set of special burner and control systems to allow for adequate oil/gas combustion, the inert gas generated has higher quality and the oxygen content is to be less than 5%.

3.5 Nitrogen generator type inert gas system: this system obtains the inert gas by means of separating air and its component gases when compressed air is flowing through the hollow fiber semi-permeable membrane or adsorbent material.

3.6 Composite type inert gas system: this system may be used as flue gas type inert gas plant, i.e. the boiler flue gas is cooled and purified to provide qualified inert gas, and may be used as fuel oil / fuel gas type inert gas plant, i.e. the fuel oil or flue gas is combusted with the aid of air and generates high quality inert gas. This system may also generate qualified inert gas by re-combusting the exhaust gas discharged from diesel engines or gas turbines.

4 Drawings and documentation to be submitted

When the approval is being applied for, the following drawings and documentation are to be submitted to CCS for review:

(1) Main product performance parameters, including the starting time, rated inert gas flow rate, inert gas composition, inert gas concentration, outlet pressure/temperature of inert gas generator, etc.;

(2) Details and arrangement plan of inert gas plant including all control and monitoring devices;

(3) Inert gas system arrangement plan;

(4) System diagrams, electrical diagrams and work flow chart;

(5) General assembly drawing;

(6) Component drawings;

(7) Type test plan;

(8) Instructions for use (both in Chinese and English);

The content is to include the system operation method, safety and maintenance requirements, occupational health hazards related to the inert gas system and its application in liquid cargo tank system, as well as guidelines on the procedure to be followed in the event of fault or failure of the inert gas system.

(9) Product nameplate, template of manufacturer's certificate of conformity, etc.;

5 Requirements for system configuration and Materials and components

5.1 System configuration:

(1) Inert gas generating plant generally includes flue gas type generator, fuel oil/ fuel gas type generator and nitrogen generator.

Flue gas type generator is generally to be composed of gas blower, scrubber for cooling and purification of gas, filter (demister) and monitoring devices. The boiler combustion is to be automatically controlled.

Fuel oil/ fuel gas type generator is generally to be composed of combustion chamber, fuel oil pump, main and auxiliary burners, gas blower, scrubber for cooling and purification of gas, filter (demister) and monitoring devices.

Nitrogen generator is generally to be composited of air compressor unit, membrane group, pressure vessel (absorber, heater, air tank, nitrogen tank, buffer tank, etc.), incoming air processing equipment (e.g. refrigerated drier or drier, oil/gas separator, filter, etc.), electrical control box, nitrogen (oxygen) concentration detection device, valves, etc.

(2) Inert gas distribution system: liquid-filled pressure/vacuum relief devices, mast riser, inert gas piping and valves.

(3) Non-return arrangements preventing the gas in cargo oil tank from flowing back into machinery spaces: water seal type and mechanical type.

(4) Measuring instruments (fixed, portable): instruments used to measure the oxygen content and pressure of inert gas main, the oxygen content and pressure of gas in cargo oil tank, and instruments used to indicate the inert gas temperature and pressure at the outlet of gas blower.

(5) Monitoring records and alarm devices

5.2 Materials and components

5.2.1 Materials and components are to comply with relevant requirements of CCS Rules.

5.2.2 Other critical parts and materials, such as non-return arrangements, pressure/vacuum relief devices, adsorbent material, membrane component, refrigerated drier, drier, filters, valves, etc., are to be furnished with the manufacturer's quality certificates.

6 Design requirements

6.1 General requirements

(1) The oxygen content (calculated by volume) of any portion of the atmosphere in any liquid cargo tank is to be kept at or below 8% and a positive pressure is to be maintained within each liquid cargo tank at all times during anchorage at port and navigation, except when the liquid cargo tank needs to be purged;

(2) Expulsion hydrocarbon or other combustible gas of empty cargo tank , the subsequent degassing operations would not generate inflammable air in the cabin.

(3) Inert gas system should be able to at least ship maximum unloading rate 125% (by volume) to provide inert gas to liquid cargo ship; For oil tanker, chemical tanker and chemicals/products acceptable by the competent authority of transmission capacity lower inert gas system, but are protected by the system of liquid cargo ships maximum unloading rate should be limited to no more than 80% of the inert gas throughput.

(4) The oxygen content of the inert gas in the gas supply main is not to exceed 5% under any operating conditions (by volume);

6.2 Requirements for system components:

6.2.1 Cooling and washing device (applicable to flue gas type and fuel oil/ fuel gas type inert gas systems)

(1) The inert gas system is to be provided with a cooling and washing device for effective cooling of the inert gas generated by boilers or burners and effective removal of solid particles and sulfur combustion products contained in the inert gas. In addition, a backup cooling water supply device is to be available;

(2) The inert gas systems are to be provided with filters or equivalent means to minimize the moisture entrained in the inert gas flow;

(3) The scrubbers are to be located afterward of all liquid cargo tanks, liquid cargo pump rooms and cofferdams separating these spaces from machinery spaces of category A.

6.2.2 Gas blower (applicable to flue gas type and fuel oil/ fuel gas type inert gas systems)

(1) Each inert gas system is to be provided with at least two inert gas blowers, should be able to transport rules require the inert gas volume at least to liquid tank. If the system with gas generator can be to output the amount of inert gas by rule specified to the cargo tank protected,the authorities may allow only one blower. Providing enough blower and its prime mover for maintenance.When providing two gas blowers ,the gas

flow rate required by the inert gas system is preferably to be evenly shared by two gas blowers, however, in no case is the gas flow rate of one blower to be less than 1/3 of the required total gas flow rate;

(2) The inert gas system is to be so designed that the maximum pressure exerted by the system on any liquid cargo tank will not exceed the test pressure of this liquid cargo tank. A device capable of allowing the functions of inert gas equipment to stabilize prior to the commencement of cargo offloading is to be fitted. Where the gas blowers in flue gas type inert gas systems will be used for air purging, the air inlets are to be fitted with blanking arrangements;

(3) When the inert gas generator with a positive displacement blower shall be equipped with pressure relief devices to prevent overpressure in fan outlet end.

6.2.3 Air compressor and nitrogen generator (applicable to nitrogen generator type inert gas system)

(1) Each nitrogen generator type inert gas system is to be provided with two air compressors to transfer the total capacity gas by system required. It is recommended that the total gas flow rate required by the system be evenly shared by the two air compressors; however, in no case is the gas flow rate of one air compressor to be less than 1/3 of the total gas flow rate. Provision of only one air compressor may be accepted provided that sufficient spare parts and prime movers of air compressors are available on board to allow the crew to reduce the possibility of air compressor failure;

(2) Air compressors and nitrogen generators may be installed in an engine room below the bulkhead deck or a separate space. With respect to fire protection, this separate space may be treated as one of “other machinery spaces”. This separate space is to be provided with an independent mechanical exhaust system capable of providing six air changes per hour, and in addition, a set of low oxygen alarm devices. This separate space is not to have any direct access to accommodation spaces, service spaces and control stations.

(3) Should be equipped with gas processing system to remove the moisture,particles and oil droplets from compressed air, then ensure to achieve the required temperature..

6.2.4 Nitrogen storage tank or buffer tank (applicable to nitrogen generator type inert gas system)

(1) Where appropriate, the nitrogen storage tank or buffer tank may be installed in the dedicated space or separate space in which the air compressors and nitrogen generators are located, or in the crude oil area. Where the nitrogen storage tank or buffer tank is installed in an enclosed space, the access of the enclosed space can only lead to an open deck and the door of such access can only open outwards. In addition, such enclosed space is to be provided with an independent mechanical exhaust system capable of providing six air changes per hour, as well as a set of low oxygen alarm devices;

(2) The high-concentration oxygen generated by the nitrogen generator and the high-concentration nitrogen products discharged via the protective device of nitrogen storage tank are to be discharged to a safe location on the open deck;

(3) Means separating the generator from the storage tank is to be provided to facilitate maintenance and service.

6.2.5 Water seal type non-return arrangements (applicable to flue gas type and fuel oil type inert gas systems)

(1) Water is to be supplied by two independent pumps and each pump is to be capable of continuously supplying adequate water;

(2) Water seal(or equivalent device) and its accessory devices are to be so arranged as to be capable of preventing back flow of gas and liquid, and ensure the normal operation of water under operating

conditions;

(3) Means to prevent the water seal from being frozen is to be provided;

(4) Any water seal or equivalent device as well as the circulation pipe device can prevent gas and liquid to backflow to the inert gas plant,when the pressure is equal to test pressure in the liquid tank ;

(5) Visual and audible alarms of low sealing water level are to be activated with no time

6.2.6 The fuel pump (applicable to flue gas and fuel type inert gas system).

Inert gas generator should be equipped with 2 sets fuel pump. Should have enough fuel for the use of inert gas generator.

6.3 System safety measures

6.3.1 Flue gas isolating valve (applicable to flue gas type inert gas system)

(1) The inert gas supply main between the boiler flue and gas scrubber is to be fitted with flue gas isolating valves. Indicators showing the open/closed state of these valves are to be provided, and in addition, means are to be provided to ensure gas tightness of the valves and protect the valve seats from being contaminated by flue dust.Arrangements are to be provided to ensure that the boiler soot blower cannot be operated when the flue gas isolating valves are open.

(2) Leakage of flue gas is to be prevented;

(3) The design and arrangement of the gas scrubber and blowers together with associated piping systems and attachments are to be specially considered to prevent leakage of flue gas into the enclosed spaces;

(4) For the purpose of safe maintenance and repair, one additional water seal arrangement or other effective device preventing flue gas leakage is to be fitted between the flue gas isolating valve and gas scrubber, or at the flue gas inlet of the scrubber.

6.3.2 Gas regulating valve (applicable to flue gas type, fuel oil/ flue gas type and nitrogen generator type inert gas systems)

(1) The inert gas supply main is to be fitted with gas regulating valves which can be automatically closed as required by 6.3.5. These valves are also to be capable of automatically regulating the flow rate and pressure of the inert gas leading to cargo oil tanks, unless be equipped with the automatic control device for inert gas flow rate;

(2) The gas regulating valves are to be fitted on the forward bulkhead of the most forward gas safe space through which the inert gas main passes.

6.3.3 Inert gas non-return arrangement (applicable to flue gas type and flue oil type inert gas systems)

(1) Should be installed at least two check device, in order to prevent the reverse flow of gas and liquid to the inert gas plant, or return to any safe place.;

(2) The first check device should be wet, half wet or dry water seal or double deck cut-off and relief valve. Can accept the middle is equipped with a lock valve two couplet cut-off valve, but:;

A. The lock valve operation should be automated should directly obtain open/close signal in the process of operation, such as the inert gas flow or pressure differential; and,

B. Should set the valve operation fault alarm, such as the operating conditions for "fan stalling" and "air supply valve open" alarm.

(3) The second arrangement (generally mechanical type) is to be a non-return valve or an equivalent device capable of preventing gas or liquid backflow, Installed on the deck water seal device (or equivalent) with inert gas manifold to between the first joint of cargo tank. It should be equipped with reliable closing device. As a substitute for reliable closing device, can be in check valve between the first joint to cargo tank of installing an additional role with the closing of valve, so that the water sealed deck or equivalent device and the inert gas main pipe to each cargo tank.

(4) The device described should be located in the deck in cargo tank area.

6.3.4 Double non-return arrangements(applicable to nitrogen generator type inert gas system)

The inert gas supply main is to be provided with at least two non-return arrangements:

(1) A double block and bleed arrangement, i.e. two serially connected block valves are fitted on the piping and one bleed valve is fitted on the vent pipe between the two block valves. Valve operation requirements: valves are to be automatically operated and valve opening and closing signals are to be given directly by system parameters such as flow rate and pressure differential; valve failure alarms are to be provided;

(2) Self-closing non-return arrangement.

6.3.5 Automatic closing appliance (applicable to flue gas type and fuel oil type inert gas systems)

(1) The automatic closing appliances of inert gas blower and gas regulating valve are to be automatically closed when the water pressure, flow rate and water level of flue gas scrubber and the gas temperature at the outlet of blower have reached the preset limits;

(2) The automatic closing appliance of gas regulating valve is to be automatically closed in the event of failure of the gas blower.

6.3.6 The design of the system should ensure oxygen content more than 5% (by volume), to output inert gas into the air automatically. (applicable to flue gas type, fuel type and the nitrogen generator type inert gas system).

6.3.7 Eeach generator equipment export should be equipped with appropriate closing device.

6.3.8 If installed a double lock valve, the system should ensure that the loss of electricity, the isolation valve closed, relief valve open automatically.

6.3.9 For flue gas and fuel type inert gas system, the inert gas generator shall be located outside the cargo tank area, filled with inert gas generator space should not directly to the accommodation space, service space, or control station location, but it can be located in the machinery space. Such as inert gas generator is not located in the machinery space, then their cabin should by air-tight steel bulkheads and/or deck is separated from the premises. The room should have enough positive pressure mechanical ventilation.

6.3.10 Should be equipped with inert gas system the location (s) of the appropriate position of the two oxygen sensors installation. If oxygen levels drop to below 19%, these sensors should be in place, both inside and outside

trigger acousto-optic alarm, alarm device shall be installed in the position is responsible for the crew immediately received.

6.3.11 Components subject to possible gas or liquid corrosion, such as the scrubber, blower, non-return arrangements, scrubber blowdown pipe and other drain pipes, are to be fabricated of corrosion resistant materials, or the surfaces of these components are to be protected with rubber, glassfiber, epoxy resin coating or other equivalent coating;

(1) With respect to fire protection, the space where the fuel oil/fuel gas type inert gas generator is located is to be treated as a machinery space of category A;

(2) Arrangements capable of releasing the inert gas from the inert gas generator into the atmosphere are to be provided when the parameters of the generated inert gas deviate from the specified values, for example, when the equipment is being started or has any failure;

(3) The arrangement is to be such that the fuel oil supply to the inert gas generator can be automatically shut off when the water pressure or water flow velocity of the cooling and scrubbing plant is excessively low, or when the preset limits have been reached due to excessively high gas temperature;

(4) The automatic closing appliance of gas regulating valve is to be capable of operating in the event of power source failure of the fuel oil type inert gas generator.

6.4 Requirements for inert gas piping system

(1) The inert gas main may be divided into two or more braches downstream of the non-return devices;

(2) The inert gas supply main is to be provided with branches leading to each liquid cargo tank. The inert gas branches are to be fitted with shutoff valves or equivalent means of control to isolate a liquid cargo tank from another. Shutoff valves, if fitted, are to be provided with locking devices that are under the control of senior officers. Control system should be at least to provide the inert gas control panel with clear information of this valve operating conditions;

(3) Without the inerting each liquid cargo ships should be able to partitioned off the inert gas header pipe through the following way ;

A. Discharge pipe, valve or other section, and close the section and; or

B. To set two series of double ring flange, and set a device between the two double flange to detect leaking; or

C. Provide equal protection and at least to the satisfaction of the competent authority equivalent decorate.

(4) Means (pressure/vacuum relief devices) are to be provided to protect the cargo oil tanks from overpressure or vacuum generated due to temperature changes and/or cargo operation when the cargo oil tanks are isolated from the inert gas main;

(5) Piping systems are to be so designed as to prevent accumulation of cargo oil or water in the pipe under all normal working conditions;

(6) Arrangement enabling the connection of the inert gas main with the external source of inert gas supply is to be provided. This arrangement is to include a bolted flange of 250mm nominal pipe size, which is isolated from the inert gas main by a valve and located downstream of the non-return valve. The design of the flange

is to be in line with the appropriate rating specified in the standard adopted for designing other external joints of the liquid cargo piping systems on ships;

(7) Where a connecting pipe is installed between the inert gas supply main and the liquid cargo piping system, an effective isolating arrangement is to be provided, in view of the possible great pressure difference between the two piping systems. This arrangement is to consist of two shutoff valves, and in addition, a device allowing for safe venting of the space, or a device composed of spool with blind plates, is to be fitted between these two valves;

(8) The valve isolating the inert gas main from the liquid cargo main is to be located on the side of the liquid cargo main and is to be a non-return valve with reliable means of closing.

(9) Inert gas piping should not through the accommodation space, service space and control station.

(10) For combination carriers, the arrangement separating the oil or residual oil containing slop tanks from other tanks is to be composed of blind flanges, and when cargos other than oil are being carried, such flanges are to remain in their original positions, unless otherwise specified in the relevant part of the Guidelines for Inert Gas Systems.

6.5 Requirements for monitoring records and alarm devices

(1) Monitoring devices: The operational status of inert gas system should be displayed in the control panel;

A:For flue gas type and fuel oil type inert gas systems, means are to be arranged continuously display the temperature of inert gas system discharge end at any time during the system works.

B:For Nitrogen generator type inert gas systems, instruments are to be arranged continuously display the air temperature and pressure of the periodically nitrogen generator suction end.

(2) Monitoring recording devices: instruments for continuously displaying and constantly recording the pressure of the inert gas supply main upstream of the non-return arrangement and the oxygen content of inert gas are to be provided. Such instruments are to be installed in the liquid cargo control room (if provided). Where the liquid cargo control room is not provided, these instruments are to be installed at locations easily accessible to the senior officers in charge of liquid cargo operations;

(3) Instruments are to be arranged in the navigation bridge to continuously display the pressure of the inert gas supply main downstream of the non-return devices and the pressure of slop tanks installed on combination carriers (when these slop tanks are isolated from the inert gas supply main);

(4) Instruments are to be arranged in the engine control room to display the oxygen content of inert gas;

(5) Requirements for visual and audible alarms of the system:

Requirements of system audible and visual alarm **Table6.5(5)**

	Fuel oil type	Flue gas type	Nitrogen generator type	Requirements for alarm actions
(1) Cooling and washing device low water pressure/flow rate	√	√		When the preset values have been reached, the inert gas blower is to be automatically shut down and the inert gas regulating valve automatically closed.
(2) Cooling and washing device high water level	√	√		When the preset values have been reached, the inert gas blower is to be automatically shut down and the inert gas regulating valve automatically closed.
(3) Power failure (display unit of inert gas manifold pressure and oxygen content)	√	√	√	
(4) Power failure(automatic control system)	√	√	√	
(5) high temperature of gas	√	√		When the preset high temperature has been reached, the inert gas blower is to be automatically shut down and the inert gas regulating valve automatically closed.
(6) Gas blower failure	√	√		--
(7) High oxygen content of inert gas (5%)	√	√	√	The inert gas quality is to be immediately improved, otherwise, the crude oil tank operation is to be suspended and the isolating valve closed.
(8) Deck water seal low water level	√	√		Alarm devices are to be in operating condition when inert gas is not being supplied.
(9) Gas pressure is lower than the water level gauge on the 100 mm	√	√	√	Liquid cargo pump is to be closed.
(10) High pressure of gas	√	√	√	--
(11) Insufficient fuel oil supply	√			--
(12) Power failure of generators	√	√		
(13) Low supply pressure and flow of gas source			√	System is to be automatically shut down.
(14) High air temperature at the outlet of air compressor			√	System is to be automatically shut down.
(15) High condensate water level in the automatic drain pipe of water/gas separator			√	System is to be automatically shut down.
(16) Electric heater failure (if applicable)			√	System is to be automatically shut down.

(8) The alarm devices required in (4),(7) and (9) of the table above are to be installed in the machinery space or liquid cargo control room (if provided), however, in either case, the required alarm devices are to be located at positions allowing for immediate receipt of alarm signals by the officer in charge;

(9) An audible alarm system independent of the alarm device required in (9), or a device for automatically closing the liquid cargo pump, which operates when the pressure of the inert gas supply main has reached the preset low pressure limit, is to be provided.

7 Type test

7.1 Test items

(1) The type test items are generally to include:

① Hydraulic test of pipe (not applicable to connecting pipe assembled on board);

② Pipe tightness test (not applicable to connecting pipe assembled on board);

③ Starting test;

④ Safety protection and alarm function test;

⑤ Performance test.

⑥ Marine environmental conditions test of electric control box.

(2) For initial approval, all the applicable test items listed in (1) are to be carried out.

7.2 Test requirements

(1) Test location

The manufacturer must have the equipment and capacity to conduct type test/manufacturer test. Approval tests are to be carried out at the premise of the manufacturer.

(2) Measuring instruments

The measuring instruments to be used for the test are to be furnished with valid metrological verification certificates and have a measuring precision not less than the values specified in Table 8.2:

Precision of Testing Instruments **Table 8.2**

Instrument	Precision of measuring instrument
Pressure gauge	± 1.5
Flowmeter	± 1.5
Thermometer	±0.5 °C, value of scale division ≤0.5 °C
Barometer	±66.6Pa
Oxygen analyzer	Minimum scale division: 0.1% O2

*Note: the instruments mounted on equipment, if they comply with above requirements and have been satisfactorily verified, may be used for the test.

7.3 Test method

(1) Hydraulic test of pipe

The connecting pipe of inert gas system, if provided by the manufacturer of the system, is to be hydraulically tested to 1.5 times design pressure upon completion of manufacturing.

(2) Connecting pipe tightness test

The connecting pipe of inert gas system, if provided by the manufacturer of the system, is to be tightness tested to 1.25 times working pressure after system connection has been completed.

(3) Starting test

The inert gas system is to be adjusted to be under the automatic mode and the equipment is to be started. During this period, the gas generated by the system is to be automatically discharged into the atmosphere. The system is to be switched over to normal gas supply mode when the quality of generated gas meets the requirements (oxygen content≤5%, this criterion may be raised as required by the user).

The time consumed from the moment when the start button is pressed to the moment when gas supply is started is to be recorded and is not to exceed the starting time listed in the properties and parameters table provided by the manufacturer.

(4) Safety protection and alarm function test

Measurement of insulation resistance and voltage withstanding test of the electric control parts are to be conducted in accordance with the requirements of CCS Guidelines for Type Approval Test of Electric and Electronic Products. Alarm function test is to be carried out according to the items listed in the table of 6.5(5).

(5) Performance test

① The equipment is to be in automatic operating condition during performance test. The test is to be conducted continuously and occurrence of shutdown due to failure is not allowed during the test;

② The duration of type test is to be 24 hours;

③ The composition of the gas at the outlet of inert gas system must remain compliant with the requirements (oxygen content≤5%, this criterion may be raised as required by the user.) at all times during the entire test;

④ The flow rate and oxygen content are to be measured once a hour during the test;

⑤ All the testing, indicating and recording instruments are to be in normal operating conditions at all times during the test;

⑥ If the instrument recording the oxygen content at the nitrogen outlet is not provided by the manufacturer of the nitrogen generator, the electric signals output from the signal output interface reserved for the recording instrument are also to be measured at each time when the oxygen content is measured during the test. The calculation relations between the measurement results and the measured oxygen content are to comply with the requirements of the vendor’s design documents.

(6) Marine environmental conditions test of electric control box

Product inspection by CCS may be requested only for the deliverable products which have been qualified through manufacturer inspection/test.

7.4 Selection of typical test specimens

The selected prototype for approval test is to be the representative product which can represent or cover the products or product series for which the approval is being applied in terms of property, feature and manufacturing quality. In general, the product type/specification with lower theoretical capacity (i.e. the type of product supplying inert gas of higher oxygen content) in each series is to be selected as the prototype for approval test.

8 Unit/batch inspection

Product inspection by CCS may be requested only for products which have been qualified through manufacturer inspection/test and ready for delivery.

8.1 Product unit/batch inspection for manufacturers which have obtained B type approval by CCS;

The inspection items are as follows:

(1) Approval of product plans/drawings in cooperation with ship plan approval department;

(2) Inspection items are to be executed in accordance with the inspection plan already approved during the approval and to include at least visual inspection and the test items specified in 7.1;

(3) The duration of performance test among the unit/batch inspections after approval is to be two hours;

(4) All the above tests may be completed by the manufacturer independently and complete test reports are to be developed and submitted to the surveyor for review;

(5) The attending surveyor may randomly select a portion of the products from each batch at a proportion of at least 10% of each type/specification, at least one piece, as the specimens for re-test of three items, namely, the “starting test”, “safety protection and alarm function test” and “performance test”;

(6) At each time when unit/batch inspection is being applied for, the quality certificates and product certificates (if required) of the main parts are to be submitted to the CCS surveyor review.

8.2 Product unit/batch inspection for manufacturers which have not obtained type approval by CCS;

(1) The content of inspection is to include plan approval and type test;

(2) Approval of product plans/drawings in cooperation with ship plan approval department;

Plans/technical documents are to be prepared and submitted by the manufacturer to CCS for approval/review as required by 4 of this guideline.

(3) Type test

For inert gas systems for which product inspection is being applied, one product with relatively low theoretical capacity is to be selected for all the type test items required by 8 of this guideline;

(4) For the inert gas systems which have not been selected, as a minimum, the inspections and tests are to be

performed as required by 9.1 of this guideline.