Guideline No. T-11(202502)

T-11

Gas supply control system

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Foreword

The product inspection guideline of China Classification Society (hereinafter referred to as "CCS") specifies the applicable technical requirements and inspection and test requirements for classification products and authorized statutory products of ships to be approved/inspected by CCS.

The Guidelines allow users to adopt alternative test methods and requirements, provided they meet or exceed the standards set by the Guidelines.

The Guidelines are prepared and updated by CCS and published on http://www.ccs.org.cn. In case of any comments and suggestions, please contact CCS via service@ccs.org.cn.

Historical release version and release time: newly edited

Main modifications in this version: None

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1 Scope of Application

1.1 The Guidelines are applicable to the gas supply control system installed on LNG-fueled ships.

1.2 The Guidelines are applicable to the fuel supply control system installed on ammonia or methanol or ethanol-fueled ships, where the concepts of "fuel" and "gas" are equivalent in this guideline.

1.3 The gas supply control system described in the Guidelines includes the gas control system and the gas safety system.

2 Normative References

2.1 IMO International Code of Safety for Ships Using Gases or Other Low-Flashpoint Fuels;

2.2 IMO International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk;

2.3 Interim Rules for Statutory Surveys of Natural Gas Fuel-powered Ships issued by the Maritime Safety Administration of the People's Republic of China;

2.4 CCS Rules for Natural Gas Fueled Ships;

2.5 CCS Rules for Classification of Sea-going Steel Ships;

2.6 CCS Guidelines for *Type Approval Test of Electric and Electronic Products* (currently effective);

2.7 IACS Unified Requirement E10 Type Approval Test Procedures;

2.8 CCS GD16-2022 *Guidelines for Ships Using Methanol/Ethanol Fuel*;

2.9 CCS GD15-2022 *Guidelines for Ships Using Ammonia Fuel*.

3 Terms and Definitions

The terms and definitions defined in the above survey basis are applicable to the Guidelines. For the convenience of preparation and use, the following definitions are directly quoted or supplemented in the Guidelines.

3.1 Control: the control of equipment operated remotely by an operator through mechanical, electrical, electronic, pneumatic, hydraulic, electromagnetic (radio) and optical means or a combination thereof.

3.2 Monitoring: the generation of audible and visual signals when the monitored electromechanical equipment or system exceeds predetermined parameter ranges, with the ability to identify specific fault conditions and locations within the machinery space.

3.3 Safety: the automatic initiation of protective actions by the faulty equipment in the event of a serious failure that endangers the gas supply equipment.

3.4 Override: a special control measure that forces the electromechanical equipment to operate continuously in a short time by overriding a certain procedure or a safety protection function during the control process to ensure the safety of ships.

4 Drawings and Data

4.1 The following drawings shall be submitted for review:

(1) Technical specifications of product;

(2) System block diagram, which shall indicate the system power supply, internal connection of main units/modules and interfaces with other systems;

(3) Outline dimensional drawings and assembly drawings of main components;

(4) Panel arrangement plan;

(5) Electrical schematic diagram;

(6) External wiring diagram;

(7) Product instructions;

(8) List of components and parts;

(9) According to the requirements of Table 2.6.4.1(1) in Section 6, Chapter 2, Part 7 of Rules for Classification of Sea-going Steel Ships, relevant drawings and data shall be submitted according to Class III computer system;

(10) List of monitoring items for gas control system and gas safety system;

Note: The products described in the Guidelines may include bunker monitoring and control systems. If so, the drawings submitted shall specify the information related to the fuel tank monitoring and control functions, and the surveyor shall check its compliance with the Survey Guidelines for Fuel Tank Monitoring and Control System Products.

4.2 Drawings/data submitted for approval:

(1) Factory overview: factory name, address, production history, production capacity, technical and inspection personnel, main products, affiliation, product trademarks, etc.;

(2) Details of the product to be approved;

(3) List of main production equipment;

(4) List of main testing equipment;

(5) Brief production process of the product to be approved;

(6) Quality management documents or quality system certificates;

(7) Enterprise registration certificate;

(8) Qualification certificate and/or production license, if applicable;

(9) Product quality certificate or sample of certificate;

(10) Quality control plan, if applicable;

(11) List of qualified suppliers, if applicable;

5 Technical Requirements

5.1 General requirement

The gas supply control system shall be ready for safe and reliable operation and use. Its design, manufacture and survey, including software design, shall meet the relevant requirements of Part 7 of CCS *Rules for Classification of Sea-going Steel Ships* and CCS *Guidelines for Type Approval Test of Electric and Electronic Products*.

5.2 Power supply

The gas control system and the gas safety system of the gas supply control system shall be powered by two power supplies. One is the main power supply and the other is the battery power supply or uninterrupted power supply (UPS). When the main power supply fails, it shall be automatically switched to battery or UPS power supply in an uninterrupted manner, and alarm shall be displayed locally and in the bridge. The power supply time of the battery shall not be less than 30 min.

5.3 Independence

5.3.1 The electrical safety system and the electrical control system in the gas supply control system shall be independent of each other.

5.3.2 Each gas supply control system can only serve one gas supply system.

5.4 Functional requirements (applicable to the electrical control system for natural gas fuel supply)

5.4.1 The gas control system of the gas supply control system shall be able to remotely control the main valve of the fuel tank on the gas fuel outlet pipeline of each fuel tank as well as the main gas fuel valve, interlocking gas valve and pipeline breather valve on each gas supply pipeline.

5.4.2 The gas control system of the gas supply control system shall be able to realize the monitoring, alarm and protection functions in Table 12.4.2 of the Rules for Natural Gas Fuel Used in Ships. In addition, the gas control system shall also reasonably monitor all components (such as fuel pump, heater and compressor) of the whole gas supply system according to the needs of the gas supply system itself, so as to ensure safe and stable gas supply and avoid impact pressure and inappropriate temperature in the gas pipe.

5.4.3 The gas safety system in the gas supply control system shall be able to realize the monitoring, alarm and protection functions in Table 12.4.3 of the Rules for Natural Gas Fuel Used in Ships. Any additional function may be incorporated into the gas safety system only if it can be shown that its incorporation complies with the design principles, integrity and reliability of the gas safety system.

5.4.4 The equipment shall be able to ensure that the alarms of the gas control system and the gas safety system are displayed in the bridge or the central control room with continuous personnel on duty or the ship safety center, and that an audible and visual alarm is given.

5.4.5 The gas supply control system shall have self-inspection function and can give an alarm on the main functional failures of its own sensors and control equipment.

5.4.6 If the main power supply to the gas supply control system fails, an audible and visual alarm shall be given.

5.4.7 The output of the gas safety system in the gas supply control system shall be an electric signal, and it cannot rely on the gas control system to perform relevant alarms and protection work.

5.4.8 The gas supply control system shall be subject to manual remote emergency cut-off. Emergency cut-off shall be provided with measures to prevent false triggering.

5.4.9 In case of application on ships with a single gas fuel system, when the ventilation in the machinery space fails, in addition to the actions required by Table 12.4.3 of Rules for Natural Gas Fuel Used in Ships , the gas supply control system shall also be able to realize the following: When it is applied to a ship with a single engine room, in case of ventilation failure or inert gas pressure loss of the double-walled pipe of the gas fuel pipeline, if another gas supply pipeline is ready, the

main gas fuel valve and the double cut-off breather valve on this gas supply pipeline shall be automatically closed.

5.4.10 When the system starts overriding, there shall be a clear indication on the system display equipment that the current system is in an override state. Measures shall be taken to prevent the override function from being triggered by mistake.

5.4.11 The gas safety system of the gas supply control system shall automatically shut down the gas fuel supply system in case of any system failure described in Table 12.1.2.1(2) of the Rules for Natural Gas Fuel Used in Ships and other faults that develop too fast to allow manual intervention.

5.4.12 For ESD-protected machine spaces, the gas safety system of the gas supply control system shall be capable of shutting off the gas fuel supply in case of a gas leak and disconnecting all non-qualified explosion-proof electrical equipment within the machinery space.

5.4.13 The gas safety system of the gas supply control system shall be capable of avoiding erroneous disconnection, e.g. due to wire breakage of a sensor.

5.4.14 The gas safety system of the gas supply control system shall equate the detection of its own fault by a gas detector with a self-test function to the detection of a high gas concentration.

5.4.15 An alarm related to gas detection may be triggered by the gas safety system of the gas supply control system, or by an independent gas detection system, and it shall trigger the gas safety system of the gas supply control system.

5.4.16 If the gas safety system and the gas control system of the gas supply control system need to monitor the same point, this shall be realized by using a sensor independent of each other.

5.5 Functional requirements (applicable to the electrical control system for ammonia fuel gas supply)

5.5.1 The gas safety system of the gas supply control system shall automatically shut down the fuel supply system in case of any system failure described in Table 11.4.1 (1) and Table 11.4.1(2) of the *Guidelines for Ships Using Ammonia Fuel* and

other faults that develop too fast to allow manual intervention.

5.5.2 The gas safety system of the gas supply control system shall be capable of avoiding erroneous disconnection, e.g. due to fuel vapor detector failure or sensor cable breakage.

5.5.3 The gas supply control system shall be able to take corresponding safety measures as required when the faults mentioned in Table 11.4.1(1) and Table 11.4.1(2) of *Guidelines for Ships Using Ammonia Fuel* occur. It shall also display alarm information and send out audible and visual alarms in the bridge, refueling control position, central control room with continuous personnel on duty or ship safety center.

5.5.4 The gas supply control system shall be subject to manual remote emergency cut-off. Emergency cut-off shall be provided with measures to prevent false triggering.

5.5.5 The gas supply control system shall be able to realize the following: In case of ventilation failure or inert gas pressure loss of the double-walled pipe of the gas fuel pipeline, if another fuel pipeline is ready, the main gas fuel valve and the double cut-off breather valve on this faulty gas supply pipeline shall be automatically closed. (Applicable to ships with a single fuel system and a single engine room)

5.6 Functional requirements (applicable to the electrical control system for methanol/ethanol fuel supply)

5.6.1 The electrical control system for fuel supply shall be able to realize the alarm and safety functions required in Table 11.4.1 of *Guidelines for Ships Using Methanol/Ethanol Fuel*. It shall also realize remote display of alarm information and send out audible and visual alarms.

5.6.2 The fuel safety system of the electrical control system for fuel supply shall automatically shut down the fuel supply system in case of any system failure described in Table 11.4.1 of the *Guidelines for Ships Using Methanol/Ethanol Fuel* and other faults that develop too fast to allow manual intervention.

5.6.3 The fuel safety system of the electrical control system for fuel supply shall be capable of avoiding erroneous disconnection, e.g. due to sensor cable breakage.

5.6.4 The electrical control system for fuel supply shall be subject to manual

remote emergency cut-off. Emergency cut-off shall be provided with measures to prevent false triggering.

5.7 Alarm record function

The system shall be able to record all alarm information generated and can save it for at least 60 days. Loss of power to the system shall not result in loss of alarm records. The system shall be able to prevent manual modification of alarm records.

6 Raw Materials, Parts and Components

Where a system contains the following device, the device certificate shall meet the following requirements:

Computers, displays, UPS and programmable controllers shall have CCS-approved certificates. If outsourced computers, displays and UPS cannot meet the certificate requirements, a complete set of type tests shall be carried out with the overall product.

7 Type Test

7.1 Type approval

7.1.1 Selection of typical samples

(1) The model and specification of the test sample shall be technically representative and cover the scope of products applying for type approval.

(2) For products with the same structure and electrical design, a model that can represent all functions of software and hardware of the product to be approved may be selected for type approval test. One test sample can be taken. The test samples shall be taken by the CCS surveyor at the site of the product manufacturer.

(3) If the main components of a system come from different manufacturers, the CCS may consider taking samples separately for approval tests in accordance with the above principles.

7.1.2 Type approval test items and requirements

(1) Ship environmental adaptability test

Including environmental test and electromagnetic compatibility test, which shall be carried out in accordance with the provisions of IACS Unified Requirement E10 Type Approval Test Procedures and CCS Guidelines for Type Approval Test of Electric and Electronic Products.

(2) Function test

It shall be carried out in accordance with the test program approved by the CCS. The program shall specify the test methods adopted to verify each function and the judgment criteria of test results according to the provisions in Section 5 of the Guidelines and in combination with the characteristics of specific products. The test method shall simulate the actual situation as much as possible.

(3) Independence check

System composition inspection and necessary functional tests shall be carried out to confirm that the surveyed products meet the independence requirements in 5.3.

7.1.3 Computer system verification

The verification shall be carried out according to the requirements of "System Supplier" and "Class III Computer System" in accordance with the Section 6, Chapter 2, Part 7 of Rules for Classification of Sea-Going Steel Ships.

8 Unit/Batch Inspection

7.2.1 The factory shall conduct unit/batch survey on each system and submit the factory self-inspection report. The surveyors of the CCS shall carry out sampling survey according to the actual situation.

7.2.2 Unit/batch survey items shall at least include the following:

(1) Visual inspection and software version number inspection shall be carried out to confirm that the product is consistent with the approved drawings, without unapproved modifications.

(2) The withstand voltage test shall be carried out in accordance with the CCS Guidelines for Type Approval Test of Electric and Electronic Products.

(3) The insulation resistance measurement shall be carried out in accordance with the CCS *Guidelines for Type Approval Test of Electric and Electronic Products*.

(4) Functional tests to verify the functions of the system as applicable in accordance with Section 5 of the Guidelines.