Guideline No. T-16 (202502)

T-16

Emergency Shutdown 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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Emergency Shutdown System

1 Scope of Application

1.1 The Guideline is applicable to the control part of the emergency shutdown system installed on LNG carriers and capable of quickly and safely stopping LNG transshipment operations and isolating ships in case of emergencies during internal transportation or lighterage of LNG.

1.2 The emergency shutdown system for alternative fuel (natural gas, methanol, ammonia, etc.) filling of ships shall refer to the applicable requirements of the Guidelines.

2 Normative References

(1) IGC CODE: International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk;

(2) CCS Rules for Construction and Equipment of Ships Carrying Liquefied Gases in Bulk;

(3) CCS Rules for Classification of Sea-Going Steel Ships;

(4) ISO 28460: Petroleum and natural gas industries — Installation and equipment for liquefied natural gas — Ship-to-shore interface and port operations;

(5) Guidelines for Type Approval Test of Electric and Electronic Products (currently effective);

(6) CCS Guidelines for Ships Using Methanol/Ethanol Fuel;

(7) CCS Guidelines for Methanol Bunkering Vessels;

(8) CCS Guidelines for Ships Using Ammonia Fuel;

(9) CCS Rules for Natural Gas Fuel Used in Ships.

3 Terms and Definitions

The terms and definitions defined in the above normative reference documents 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 Emergency shutdown: A method to safely and effectively cut off the LNG carrier-shore/ship transfer operation.

3.2 Ship-shore/ship connection system: As a part of the emergency shutdown system (ESD), it is used to cut off the transmission of signal, data and voice communication between ship-shore/ship.

3.3 Communication: Including all transmission modes such as written or voice information and data exchange.

3.4 Vessel goods control room: The vessel goods control room is located on the ship and used to control transmission operations.

4 Drawings and Data

4.1 The following drawings and data 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 arrangement plans 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) Relevant drawings and data shall be submitted according to Class II computer system in accordance with the requirements of Table 2.6.1.3, Section 6, Chapter 2, Part 7 of Rules for Classification of Sea-Going Steel Ships;

(10) Delivery test program.

5 Technical Requirements

5.1 General requirement

5.1.1 The applicable environment and working conditions of the emergency shutdown system shall conform to the requirements of Chapter 2 of Part 7 of Rules for Classification of Sea-Going Steel Ships.

5.1.2 The emergency shutdown system shall be designed and produced in accordance with the applicable parts of ISO 28460:2010.

5.1.3 The emergency shutdown system shall be designed to ensure that the ESD system can quickly and safely stop LNG transfer during LNG lightering operation.

5.1.4 The emergency shutdown system shall be powered by two independent power supplies, and an alarm shall be given when either of them loses power. When the main power supply of the ship fails, it shall be able to switch to the standby power supply for automatic power supply.

5.1.5 The emergency shutdown system shall have the protection grade and explosion-proof grade suitable for its environment.

5.2 Technical requirements

5.2.1 ESD system shall provide manual and automatic operation modes.

5.2.2 The manual operation position of ESD system shall include at least 2 positions, and the arrangement shall be able to prevent it from being triggered by mistake. The manual operation of ESD shall not rely on other shutdown systems to complete its function.

5.2.3 The ESD system shall be capable of being initiated by:

(1) ESD system of LNG carrier:

① Fire or gas detection;

② Power supply fault;

③ High liquid level of liquid cargo hold or abnormal pressure;

④ Vessel drifting;

⑤ Excessive pressure or falling off of filling arm or hose;

⑥ Emergency button;

⑦ Any other conditions and alarms that may jeopardize the safety of filling operations.

(2) ESD system for alternative fuel (methanol, ammonia, etc.) filling:

① Fire or leakage (liquid or gas leakage) is detected;

② The fuel tank of the refueled ship sends out a high liquid level alarm;

③ Vessel drifting;

④ Excessive pressure or falling off of filling arm or hose;

⑤ Emergency button;

⑥ Any other conditions and alarms that may jeopardize the safety of filling operations.

5.2.4 The ESD system shall be automatically activated on detection of fire in the cargo area weather deck and/or cargo machinery spaces.

5.2.5 The ESD system of LNG carrier shall be able to arrange the ESD functions according to Table 18.1 in 18.10, Chapter 18, Part 3 of CCS Rules for Construction and Equipment of Ships Carrying Liquefied Gases in Bulk. The ESD system action shall also include the shutdown and stop of other necessary equipment, if required.

5.2.6 The ESD control system of LNG carrier shall be capable of carrying out liquid cargo hold overflow control high level test in a safe and controlled manner. For the test, the cargo pump may be operated when the overflow control system is overridden.

5.2.7 When the ESD system is activated, an audible and visual alarm shall be given at the filling operation position and in the goods control room.

5.2.8 The manufacturer of the ESD system shall provide a comprehensive fault inquiry guidelines so that it can be searched when the system fails.

5.3 ESD communication

5.3.1 The connection of ESD communication system can be realized by electrical, optical fiber or pneumatic and their combinations. Wireless communication mode shall not be used. The ESD communication system shall have suitable back-up systems.

5.3.2 In general, pneumatic signals can only be used as an alternate transmission modes for ESD.

5.3.3 The emergency shutdown setting shall be fail-safe type.

5.3.4 ESD signals shall be transmitted via ship-shore/ship connection control system cables or fiber optic cables.

5.3.5 There shall be an independent backup system for transmitting ESD signals. The system may transmit signals by electrical, optical or pneumatic means in order to reduce common fault modes as far as reasonably practicable.

5.3.6 Data transmission and communication interface configuration shall meet the requirements of Appendix D of ISO 28460:2010.

6 Raw Materials, Parts and Components

Raw materials and parts and components of products shall be controlled in accordance with the relevant requirements of our current specifications.

7 Type Test

N/A

8 Unit/Batch Inspection

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

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

8.2.1 Appearance inspection and software version number confirmation: Check the appearance structure, selected materials, internal wiring, manufacturing process

and signs of the equipment to prove that it conforms to the relevant provisions of the CCS's specifications, technical conditions formulated by the manufacturer, approved drawings and data, etc. Check to confirm the software version number of the system.

8.2.2 Withstand voltage test: The test shall be carried out according to the test voltage in Table 8.2.2, and the test voltage frequency is 50Hz or 60Hz. This test shall last for 1min without breakdown or flashover. Printed circuit boards with electronic components that may cause damage during the test can be removed before the test.

Test Voltage Value Table 8.2.2

Rated voltage V	Test voltage V
$Un \leq 65$	$2\times Un+500$
$65 < Un \leq 250$	1500
$250 < Un \leq 500$	2000
$500 < Un \leq 690$	2500

8.2.3 Insulation resistance measurement: After the withstand voltage test, the insulation resistance shall be measured between live parts and between live parts and ground (enclosure) according to the test voltage in Table 8.2.3 (1). The insulation resistance value shall not be lower than the requirements of Table 8.2.3 (2). Printed circuit boards with electronic components that may cause damage due to the test voltage during the test can be removed before the test.

Voltage Value of Insulation Resistance Test Table 8.2.3 (1)

Rated voltage V	DC test voltage V
$Un \leq 65$	$2\times Un,$ min. 24 V
$Un > 65$	500

Insulation Resistance Value Table 8.2.3 (2)

Rated voltage V	Minimum insulation resistance value (MΩ)	
	Before the test	After the test
$Un \leq 65$	10	1
$Un > 65$	100	10

8.2.4 Function test: Verify whether the functions of the equipment meet the

requirements of approved drawings and data and technical conditions of the products, including but not limited to at least the following contents:

(1) Display function test;

(2) Manual/automatic function conversion test;

(3) Information transmission test (optical fiber link/cable link);

(4) Emergency stop function test;

(5) Alarm function test and fault history record.

8.2.5 If the surveyor deems it necessary, additional test items can be added.