

Expressions Used for Standards Referred to in IACS Unified Requirements (Machinery)

Amended Rules and Guidance

Rules for the Survey and Construction of Steel Ships Part D

Guidance for the Survey and Construction of Steel Ships Parts B, D, GF, and N

Guidance for High Speed Craft

Guidance for the Survey and Construction of Inland Waterway Ships

Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use

Reason for Amendment

IACS adopted Unified Requirement (UR) M77(Rev.2) in December 2020 as well as URs M66(Rev.4), M68(Rev.3) and M78(Rev.1) in February 2021 to unify the description used for standards and conventions referenced within the URs.

Accordingly, relevant requirements are amended based on IACS URs M66(Rev.4), M68(Rev.3), M77(Rev.2) and M78(Rev.1).

Outline of Amendment

The main contents of this amendment are as follows:

- (1) Adds the year of publication for standards referenced in the IACS URs.
- (2) In accordance with IACS UR M66(Rev.4), standards for the testing of crankcase explosion relief valves are given in 10.3.2-6(2)(a), Part 6 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use.

“Rules for the survey and construction of steel ships” has been partly amended as follows:

Part D MACHINERY INSTALLATIONS

Chapter 21 SELECTIVE CATALYTIC REDUCTION SYSTEMS AND ASSOCIATED EQUIPMENT

21.1 General

21.1.1 Application

Sub-paragraph -2 has been amended as follows.

2 Urea based ammonia (e.g., AUS 40 - 40%/60% urea/water aqueous urea solution specified in *ISO 18611-1:2014*) is to be used as reductant agent in SCR systems. In cases where another reductant agent is used, however, special consideration is to be given to such systems in accordance with their respective designs as well as the following (1) and (2):
(1) and (2) are omitted.)

21.4 Requirements for Construction and Arrangements, etc.

21.4.1 Construction and Arrangement

Sub-paragraph -2 has been amended as follows.

2 Reductant agent storage tanks are to be protected from excessively high or low temperatures applicable to the particular concentration of the solution. Depending on the operational area of the ship, this may necessitate the fitting of heating and/or cooling systems. The physical conditions recommended by applicable recognized standards (such as *ISO 18611-3:2014*) are to be taken into account to ensure that the contents of the reductant agent tank are maintained to avoid any impairment of the reductant agent during storage.

“Guidance for the survey and construction of steel ships” has been partly amended as follows:

Part B CLASS SURVEYS

B2 CLASSIFICATION SURVEYS

B2.3 Sea Trials and Stability Experiments

B2.3.1 Sea Trials

Sub-paragraph -2 has been amended as follows.

2 The Astern test required by **2.3.1-1(2), Part B of the Rules** is to be carried out in accordance with the following (1) to (4).

- (1) (Omitted)
- (2) It is to be confirmed that the machinery is functioning normally while the ship is running astern. The main engine is to be kept at a rate of more than 70% of the maximum continuous revolutions. The ship is to be kept running astern for the periods specified in (a) and (b) below corresponding to the type of engine and the performance is to be confirmed in accordance with **1.3.2, Part D of the Rules**.
 - (a) For ships with main engines other than steam turbines
Until the astern speed (rotational speed in rpm) stabilizes.
 - (b) For ships with steam turbines
A period of at least 15 *minutes*; the astern trial, however, is to be limited to 30 *minutes* or in accordance with manufacturer’s recommendation to avoid overheating of the turbine due to the effects of “windage” and friction.
- (3) For low pressure (i.e. pressure less than 1 *MPa*) gas-fuelled dual fuel engines, the confirmation specified in (2)(a) is to be carried out for all operating modes (i.e. the applicable gas mode, diesel mode, etc. ~~specified in 1.4.3 of Annex 4, Part GF or 1.4.3 of Annex 4, Part N~~). This test is to be carried out at the maximum power available in gas mode (See 2.5.1-1(1) in Annex 4, Part GF or 2.5.1-1.(1) in Annex 4, Part N).
- (4) (Omitted)

Sub-paragraph -2 has been amended as follows.

5 The performance tests of machinery installations required by **2.3.1-1(5), Part B of the Rules** are to include the following (1) to (10) in order to verify that the machinery installations have sufficient normal functions and reliability and are free from detrimental vibration within the numbers of revolutions used. However, these tests may be dispensed with where such tests have been conducted while the ship was anchored or at dockside. The details of these tests may be found in *JIS F 0801 “Test Code of Propelling Machinery at Sea Trials”* or other documents considered equivalent thereto. The preparations specified in **B1.4.2-16** are to be made before tests are carried out.

- (1) For reciprocating internal combustion engines, the output test shown in **Table B2.3.1-5**, is to be used as the standard. For reciprocating internal combustion engines driving generators or auxiliary machinery (excluding auxiliary machinery for specific uses), operating tests may be carried out at the appropriate time after installation on board.
- (2) For steam turbines and gas turbines used as main propulsion machinery, the output test is to be carried out at 3 or 4 levels of power output selected from normal continuous cruise power run

and 4/4, 3/4, 2/4 and 1/4 of the maximum continuous output of the engine.

- (3) Operating tests for starting devices
It is to be confirmed that the engines start continuously for the number required by **2.5.3-2** or **4.4.3-2, Part D of the Rules**.
- (4) Function tests of the alarms and safety devices
Function tests of the alarms and safety devices required by **2.4, 3.3** and **4.3, Part D of the Rules** are to be carried out.
- (5) Fuel suitability
The suitability of residual and other special fuels for use in the engine is to be confirmed. However, this test may be dispensed with where the suitability has already been demonstrated at the shop trial.
- (6) Governor tests
For reciprocating internal combustion engines driving main sources of electrical power (including reciprocating internal combustion engines driving generators for both propulsion and main power supply), the characteristics for governors specified in **2.4.1-5(1), Part D of the Rules** are to be confirmed.
- (7) (Omitted)
- (8) (Omitted)
- (9) Low pressure (i.e. pressure less than 1 *MPa*) gas-fuelled engines are to comply with the requirements specified in (1) and (6). For low pressure gas-fuelled dual-fuel engines, the output tests and governor tests are to be carried out for all operating modes (i.e. the gas mode, diesel mode, etc. ~~specified in 1.4.3 of Annex 4, Part GF or 1.4.3 of Annex 4, Part N~~). This test is to be carried out at the maximum power available in gas mode (See 2.5.1-1(1) in Annex 4, Part GF or 2.5.1-1.(1) in Annex 4, Part N). The 110% load test is not required for the gas mode.
- (10) (Omitted)

Part D MACHINERY INSTALLATIONS

Annex D6.2.2 GUIDANCE FOR USE OF HIGH-STRENGTH MATERIALS FOR INTERMEDIATE SHAFTS

1.2 Torsional Fatigue Tests

Paragraph 1.2.2 has been amended as follows.

1.2.2 Test Conditions

Test conditions are to be in accordance with **Table 1.1**. Mean surface roughness is to be less than $0.2 \mu\text{m}$ for R_a and the absence of localised machining marks is to be verified by visual examination at low magnification (x20) as required by *Section 8.4 of ISO 1352:2011*. Test procedures are to be in accordance with *Section 10 of ISO 1352:2011*.

Section 1.3 has been amended as follows.

1.3 Cleanliness Requirements

Low alloy steel forgings are to have a degree of cleanliness shown in **Table 1.2** when tested according to *ISO 4967:2013 method A*. Representative samples are to be obtained from each heat of forged or rolled products. In addition, the forgings are also to comply with the minimum requirements of **Table K6.2, Part K of the Rules**, with particular attention given to minimising the concentrations of sulphur, phosphorus and oxygen in order to achieve the cleanliness requirements. The specific steel composition is required to be approved by the Society.

Part GF SHIPS USING LOW-FLASHPOINT FUELS

Annex 4 GUIDANCE FOR LOW PRESSURE GAS-FUELLED ENGINES

Chapter 2 CONSTRUCTION AND EQUIPMENT OF LOW PRESSURE GAS-FUELLED ENGINES

2.4 Accessory Equipment

2.4.4 Gas Fuel Pipes

Sub-paragraph -5 has been amended as follows.

5 For piping attached to low pressure gas-fuelled engines, the following (1) to (5) also apply.

(1) (Omitted)

(2) (Omitted)

(3) (Omitted)

(4) (Omitted)

(5) Gas admission valves

Gas admission valves are to be certified safe as follows:

((a) to (c) are omitted.)

(d) However, if they are not rated for the zone they are intended for, it shall be documented that they are suitable for that zone. Documentation and analysis is to be based on *IEC 60079-10-1:2015* or *IEC 60092-502:1999*.

Part N SHIPS CARRYING LIQUEFIED GASES IN BULK

Annex 4 GUIDANCE FOR LOW PRESSURE DUAL FUEL ENGINES

Chapter 2 CONSTRUCTION AND EQUIPMENT OF LOW PRESSURE DF ENGINES

2.4 Accessory Equipment

2.4.4 Gas Fuel Injection Pipes

Sub-paragraph -4 has been amended as follows.

4 For piping attached to low pressure DF engines, the following (1) to (5) also apply.
((1) to (4) are omitted.)

(5) Gas admission valves

Gas admission valves are to be certified safe as follows:

(a) (Omitted)

(b) (Omitted)

(c) (Omitted)

(d) However, if they are not rated for the zone they are intended for, it shall be documented that they are suitable for that zone. Documentation and analysis is to be based on *IEC 60079-10-1:2015* or *IEC 60092-502:1999*.

“Guidance for high speed craft” has been partly amended as follows:

Part 2 CLASS SURVEYS

Chapter 2 CLASSIFICATION SURVEYS

2.3 Sea Trials and Stability Experiments

Paragraph 2.3.1 has been amended as follows.

2.3.1 Sea Trials

Details of each test to be carried out during sea trials are to be in accordance with the following requirements.

- (1) (Omitted)
- (2) Astern test

The astern test is to be carried out in accordance with the following (a) to (d):

- (a) While the main propulsion machinery is running ahead at its maximum continuous output, an order for full astern is issued and the reversing operation from ahead run to full astern run is carried out as quickly as possible, and the astern performance and stopping performance of craft are to be verified. In applying this provision, the tests are to be carried out from all control positions where there are multiple control positions for the reversing operation to astern run.
- (b) It is to be confirmed that the machinery is functioning normally while the ship is running astern. The main engine is to be kept at a rate of more than 70% of the maximum continuous revolutions until the astern speed (rotational speed in rpm) stabilizes.
- (c) For low pressure gas-fuelled dual fuel engines, the confirmation specified in (b) is to be carried out for all operating modes (gas mode, diesel mode, etc.). This test is to be carried out at the maximum power available in gas mode.
- (d) To high pressure gas-fuelled dual fuel engines, the requirements for low pressure gas-fuelled dual fuel engines specified in (c) apply mutatis mutandis.

((3) to (11) are omitted.)

“Guidance for the survey and construction of inland waterway ships” has been partly amended as follows:

Part 2 CLASS SURVEYS

Chapter 2 CLASSIFICATION SURVEYS

2.3 River Trials and Stability Experiments

2.3.1 River Trials

Sub-paragraph -1(3) has been amended as follows.

1 The Astern test required by **2.3.1-1(1), Part 2 of the Rules** is to be carried out in accordance with the following (1) to (4) below.

- (1) (Omitted)
- (2) It is to be confirmed that the machinery is functioning normally while the ship is running astern. The main engine is to be kept at a rate of more than 70% of the maximum continuous revolutions. The ship is to be kept running astern until the astern speed (rotational speed in rpm) stabilizes and the performance is to be confirmed in accordance with **1.3.2, Part 7 of the Rules**.
- (3) For low pressure gas-fuelled dual fuel engines, the confirmation specified in (2) is to be carried out for all operating modes (gas mode, diesel mode, etc.). This test is to be carried out at the maximum power available in gas mode (See 2.5.1-1(1) in Annex 4, Part GF or 2.5.1-1(1) in Annex 4, Part N of the Guidance for the Survey and Construction of Steel Ships).
- (4) (Omitted)

Sub-paragraph -3(8) has been amended as follows.

3 The performance tests of machinery installations required by **2.3.1-1(3), Part 2 of the Rules** are to include the following (1) to (9) in order to verify that the machinery installations have sufficient normal functions and reliability and are free from detrimental vibration within the numbers of revolutions used. However, these tests may be dispensed with where such tests have been conducted while the ship was anchored or at dockside. The details of these tests may be found in *JIS F 0801* “Test Code of Propelling Machinery at Sea Trials” or other documents considered equivalent thereto. The preparations specified in **1.4.2-8** are to be made before tests are carried out.

- (1) For reciprocating internal combustion engines, the output test shown in **Table 2.2.3.1-5**, is to be used as the standard. For reciprocating internal combustion engines driving generators or auxiliary machinery (excluding auxiliary machinery for specific uses), operating tests may be carried out at the appropriate time after installation on board.
- (2) Operating tests for starting devices
It is to be confirmed that the diesel engines start continuously for the number required by **2.5.3-2, Part 7 of the Rules**.
- (3) Function tests of the alarms and safety devices
Function tests of the alarms and safety devices required by **2.4, Part 7 of the Rules** are to be carried out.
- (4) Fuel suitability
The suitability of residual and other special fuels for use in the engine is to be confirmed.

However, this test may be dispensed with where the suitability has already been demonstrated at the shop trial.

(5) Governor tests

For reciprocating internal combustion engines driving main sources of electrical power (including reciprocating internal combustion engines driving generators for both propulsion and main power supply), the characteristics for governors specified in **2.4.1-5(1), Part 7 of the Rules** are to be confirmed.

(6) (Omitted)

(7) (Omitted)

(8) Low pressure (i.e. pressure less than 1 MPa) gas-fuelled engines are to comply with the requirements specified in (1) and (5). For low pressure gas-fuelled dual-fuel engines, the output tests and governor tests are to be carried out for all operating modes (i.e. the gas mode, diesel mode, etc. ~~specified in 1.4.3 of Annex 4, Part GF or 1.4.3 of Annex 4, Part N of the Guidance for the Survey and Construction of the Steel Ships~~). This test is to be carried out at the maximum power available in gas mode (See 2.5.1-1(1) in Annex 4, Part GF or 2.5.1-1(1) in Annex 4, Part N of the Guidance for the Survey and Construction of the Steel Ships). The 110% load test is not required for the gas mode.

(9) (Omitted)

“Guidance for the approval and type approval of materials and equipment for marine use” has been partly amended as follows:

Part 6 MACHINERY

Chapter 10 APPROVAL OF USE OF CRANKCASE EXPLOSION RELIEF VALVES FOR RECIPROCATING INTERNAL COMBUSTION ENGINES

10.3 Approval Tests

10.3.1 General

Sub-paragraph -2(1) has been amended as follows.

2 Test facilities for carrying out of testing of the valves are to comply with the followings:

- (1) The test facilities where testing is carried out are to be accredited to a national or international standard (e.g. *ISO ISO/IEC 17025:2017*) for the testing of explosion protection devices and be acceptable to the Society.

10.3.2 Details of Tests

Sub-paragraph -6(2) has been amended as follows.

6 Successive explosion testing to establish a valve's functionality is to be carried out during stable weather conditions by the following procedures.

- (1) Stage 1:

Two explosion tests are to be carried out in the test vessel with the circular plate described in **10.3.1-2(7)** and the opening in the plate covered by a 0.05 *mm* thick polythene film to establish a reference pressure level for the determination of the capability of a relief valve in terms of pressure rise in the test vessel.

- (2) Stage 2:

Two explosion tests are to be carried out on three different valves of the same size by the following procedures. Each valve is to be mounted in the orientation that it requires approval for installation with the circular plate described in **10.3.1-2(7)** located between the valve and pressure vessel mounting flange.

- (a) To verify whether there is flame transmission through the flame arrester, the first of the two tests on each valve is to be carried out with a 0.05 *mm* thick polythene bag, having a minimum diameter of three times the diameter of the circular plate and volume not less than 30 % of the test vessel, enclosing the valve and circular plate. Before carrying out the explosion test the polythene bag is to be empty of air. (For the means necessary for the tests, see *ISO 16852:2016, ISO/IEC 17025:2017, ISO 12100:2010, VDI 3673-1:2002 and IMO MSC/Circ.677 as amended by MSC/Circ.1009 and MSC.1/Circ.1324.*) Provided that the first explosion test demonstrated that there was indication of combustion outside the flame arrester and there are sign of damage that may affect the operation of the valve to the flame arrester, the test is unsatisfactory and the following test is not carried out.

- (b) A second explosion test is to be carried out without the polythene bag arrangement. During the second explosion test, it is to be verified that there was no indication of combustion outside the flame arrester and there are no sign of damage that may affect the operation of

the valve to the flame arrester.

(3) Stage 3:

Carry out two further explosion tests as described in Stage 1.