

# **RULES**

## **FOR THE CLASSIFICATION AND CONSTRUCTION OF SMALL SEA FISHING VESSELS**

### **PART VII MACHINERY INSTALLATIONS**

ND No. 2-020101-181-E



**St. Petersburg  
2023**

# **RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF SMALL SEA FISHING VESSELS**

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Rules for the Classification and Construction of Small Sea Fishing Vessels of Russian Maritime Register of Shipping (RS, the Register) have been approved in accordance with the established approval procedure and come into force on 1 January 2023.

The present edition of the Rules is based on the 2022 edition taking into account the amendments and additions developed immediately before publication.

The Rules are published in the following parts:

Part I "Classification";

Part II "Hull";

Part III "Equipment, Arrangements and Outfit";

Part IV "Stability and Freeboard";

Part V "Subdivision";

Part VI "Fire Protection";

Part VII "Machinery Installations";

Part VIII "Systems and Piping";

Part IX "Machinery";

Part X "Boilers, Heat Exchangers and Pressure Vessels";

Part XI "Electrical Equipment";

Part XII "Refrigerating Plants";

Part XIII "Materials";

Part XIV "Welding";

Part XV "Automation";

Part XVI "Structure and Strength of Fiber-Reinforced Plastic Ships";

Part XVII "Radio Equipment";

Part XVIII "Navigational Equipment".

**REVISION HISTORY**

(purely editorial amendments are not included in the Revision History)

For this version, there are no amendments to be included in the Revision History

## **1 GENERAL**

### **1.1 APPLICATION**

**1.1.1** The requirements of this Part of the Rules for the Classification and Construction of Small Sea Fishing Vessels<sup>1</sup> are set forth proceeding from the condition that flash point of oil fuel used for internal combustion engines is not below 55° C.

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<sup>1</sup> Hereinafter referred to as "these Rules".

## **1.2 DEFINITIONS AND EXPLANATIONS**

**1.2.1** The definitions and explanations relating to the general terminology are given in Part I "Classification" of these Rules. Definitions and explanations applicable for the purpose of this Part are given in 1.2, Part VII "Machinery Installations" of the Rules for the Classification and Construction of Sea-Going Ships<sup>1</sup>.

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<sup>1</sup> Hereinafter referred to as "the Rules for the Classification".

### **1.3 SCOPE OF SUPERVISION**

**1.3.1** Subject to supervision by the Register is the assembling of the machinery space equipment and testing of the following components of the machinery installation:

- .1** main engines with reduction gears and couplings;
- .2** heat exchangers and pressure vessels;
- .3** auxiliary machinery;
- .4** control, monitoring and alarm systems of the machinery installation;
- .5** shafting and propellers.

**1.3.2** Machinery, heat exchangers and pressure vessels, shafting parts and assemblies, propellers and control systems of machinery and propellers, manufactured under the supervision of the Register or other classification society — IACS member in compliance with the approved documentation and having their certificates, may be installed onboard the ship.

**1.3.3** After assembling of machinery, equipment, systems and piping arrangements on board the ship, the machinery installation shall be tested in operation under load according to the program approved by the Register.

## **2 GENERAL REQUIREMENTS**

### **2.1 POWER OF MAIN MACHINERY**

**2.1.1** The power of main machinery shall provide safe ship operation in all the operation modes under worst allowable conditions without exceeding the maximum permitted loading specified in the documentation. The astern power shall be sufficient to take way off the ship making a full ahead speed on a agreeable length, which shall be confirmed during trials.

**2.1.2** Machinery installation shall provide sufficient astern power to maintain manoeuvring of the ship in all normal service conditions.

**2.1.3** Machinery installation shall be capable of maintaining in free route astern at least 70 % of rated ahead speed for a period of at least 30 min.

**2.1.4** In the case of ships with twin hulls, the failure of machinery installation of one hull shall not put the machinery installation of the other hull out of action.

## **2.2 ENVIRONMENTAL CONDITIONS**

**2.2.1** The machinery, equipment and systems installed in the ship shall remain operative under environmental conditions stated in 2.3, Part VII "Machinery Installations" of the Rules for the Classification.

## **2.3 MATERIALS AND WELDING**

**2.3.1** Materials for the manufacture of parts of shaftings and propellers shall comply with the requirements of 2.4, Part VII "Machinery Installations" of the Rules for the Classification.

**2.3.2** Welding procedure and non-destructive testing of welded joints shall be carried out in compliance with the requirements of Part XIV "Welding" of the Rules for the Classification.

## **2.4 INDICATING INSTRUMENTS**

**2.4.1** All the indicating instruments, with the exception of liquid-filled thermometers, shall be checked by competent bodies.

**2.4.2** On the scales of pressure gauges and tachometers the restricted pressure and speed ranges shall be marked with bright colour.

### **3 CONTROL DEVICES AND STATIONS. MEANS OF COMMUNICATION**

#### **3.1 CONTROL DEVICES**

**3.1.1** Machinery installation generally shall be designed and constructed for operation in non-attended service mode.

**3.1.2** All control systems essential for the propulsion, control and safety of the ship shall be independent or so designed that failure of one system does not degrade the performance of another.

**3.1.3** The starting and reversing arrangements shall be so designed and placed that each engine may be started or reversed by one operator.

**3.1.4** Proper working direction of control handles and handwheels shall be indicated by arrows and relevant inscriptions.

**3.1.5** Control arrangements shall be so designed as to eliminate the possibility of spontaneously changing the positions prescribed.

**3.1.6** The control devices of main engines shall have an interlocking system to preclude starting of the main engine, with a mechanical shaft-turning gear engaged.

**3.1.7** When in addition to electric start, manual engine start is also provided, interlocking device excluding the possibility of simultaneous operation of the two drives shall be provided.

**3.1.8** Main engines shall be remotely operated from the wheelhouse by means of a single control element per propeller. In installations with reverse reduction gear or CP-propellers, the system with two control elements may be used.

**3.1.9** The main engine remote control system (with the exception of system of remote control by means of mechanical links), with control from the bridge, shall be so designed as to provide an alarm in the event of failure. As far as practicable, the present propeller speed and thrust direction shall be remain unchanged until control is transferred to the local station. Among other factors, the loss of power supply (electric, pneumatic, hydraulic power) shall not substantially affect the power of main engines or change the direction of propeller rotation.

### **3.2 CONTROL STATIONS**

**3.2.1** For generally used machinery installations with one non-reversion starter-actuated main engine, reverse reduction gear and fixed pitch propeller, the bridge control station of main engine and propeller, with any type of remote control, shall be equipped with:

- .1 controls for operation of main engine and reverse reduction gear;
- .2 main engine speed indicator;
- .3 shaft speed and direction indicator;
- .4 main engine starting device;
- .5 main engine emergency stop device;
- .6 lubricating oil pressure indicators for main engine and reduction gear;
- .7 temperature indicator of the main engine coolant;
- .8 indicator of sufficient water amount pumped through the sterntube arrangement;
- .9 emergency alarm according to [3.2.1.6–3.2.1.8](#);
- .10 starting battery charging indicators;
- .11 means of communication in compliance with the requirements of [3.3](#).

**3.2.2** The emergency stop devices of main engine and the overrides of automatic controls shall be so constructed that inadvertent operation of such devices is not possible.

**3.2.3** With a remote control provision shall be made for local control of main engines and propellers, with the exception of remote control by means of mechanical links.

**3.2.4** Control of main machinery and propellers shall be performed only from one control station. The transfer of control between the navigating bridge and the engine room shall be possible only in the engine room. The means of transfer shall be so designed as to prevent the propelling thrust from altering significantly.

### **3.3 MEANS OF COMMUNICATION**

**3.3.1** At least two independent means shall be provided for communicating orders from the navigating bridge to the engine room or control station, from which the speed and direction of thrust of the propellers are normally controlled.

One of these shall be an engine-room telegraph, which provides visual indication of the orders and responses both in the machinery spaces and on the navigating bridge and which is fitted with a sound signal clearly audible in any part of the engine room while the machinery is at work, and distinct in tone from all other signals in the machinery space (refer also to 7.1, Part XI "Electrical Equipment" of the Rules for the Classification).

When there is no local control of main machinery in the machinery space, it is allowed to provide only one means of communication; when the distance between the wheelhouse and the machinery space is small, it is allowed not to provide special means of communications.

**3.3.2** In the case of ships with twin hulls, provision shall be made for vocal communication between local control stations of the hulls in addition to communication between local control stations and the common control station in the wheelhouse.

## **4 MACHINERY SPACES. ARRANGEMENT OF MACHINERY AND EQUIPMENT**

### **4.1 GENERAL**

**4.1.1** Ventilation of machinery spaces shall comply with the requirements of Part VIII "Systems and Piping" of the Rules for the Classification.

## **4.2 ARRANGEMENT OF MACHINERY AND EQUIPMENT**

**4.2.1** Machinery, equipment, pipes and fittings shall be so arranged as to provide easy access for servicing and emergency repair; the requirements in [4.5.1](#) shall also be met.

**4.2.2** Air compressors shall be installed in such places where the intaken air is least contaminated by vapours of combustible liquids.

**4.2.3** Oil fuel units, as well as hydraulic units containing flammable liquids with working pressure above 1,5 MPa and not being a part of main and auxiliary machinery, shall be placed in separate rooms with self-closing steel doors.

If it is impracticable to locate such units in separate rooms, special consideration shall be given with regard to shielding of the components and containment of possible leakages.

**4.2.4** Requirements for the arrangement of equipment of refrigerating plant in the main machinery space are outlined in Part XII "Refrigerating Plants" of these Rules.

### **4.3 ARRANGEMENT OF OIL FUEL TANKS**

**4.3.1** The requirements of 4.3.1 — 4.3.3, Part VII "Machinery Installations" of the Rules for the Classification shall be complied with.

**4.3.2** The arrangement of fuel and oil tanks in the area of accommodation and service spaces shall comply with the requirements of Part VI "Fire Protection" of the Rules for the Classification.

#### **4.4 INSTALLATION OF MACHINERY AND EQUIPMENT**

**4.4.1** The machinery and equipment constituting the machinery installation shall be installed and secured on strong and rigid seatings. The construction of the seatings shall comply with the requirements of Part II "Hull" of the Rules for the Classification.

**4.4.2** The main machinery, their gears, thrust bearings of shafts shall be secured to the shipboard seatings with fitted bolts throughout or in part. The bolts may be omitted, if appropriate stops are provided. Where necessary, fitted bolts shall be used to fasten auxiliary machinery to seatings.

**4.4.3** The bolts securing the main and auxiliary machinery, shaft bearings to their seatings, end nuts of shafts, as well as bolts connecting the length of shafting shall be fitted with appropriate lockers against spontaneous loosening.

**4.4.4** Where the machinery shall be mounted on shock absorbers, the design of the latter shall be approved by the Register. Shock absorbing fastening of the machinery and equipment shall:

maintain vibration-proof insulation when the absorbed machinery and equipment are operated in the environmental conditions as per the requirement of [2.3.1](#);

be resistant to the corrosive media, temperature and various kinds of radiation;

be equipped with the yielding grounding jumper of sufficient length to prevent radio reception interference and comply with the requirements of safety engineering;

eliminate the interference for operation of other equipment, devices and systems.

**4.4.5** Installation procedure for machinery on plastic pads shall be submitted to the Register for review. Polymeric materials used for the pads shall comply with the requirements of Section 6, Part XIII "Materials" of the Rules for the Classification.

**4.4.6** The machinery with horizontal arrangement of the shaft shall be installed parallel to the center line of the ship.

**4.4.7** The machinery for driving generators shall be mounted on the same seatings as the generators.

#### **4.5 MEANS OF ESCAPE FROM MACHINERY SPACES**

**4.5.1** The main and auxiliary machinery shall be so arranged in the machinery spaces as to provide passageways from the control stations and servicing flats to the means of escape from the machinery spaces. The width of passageways shall not be less than 500 mm over the whole length. The width of passageways along the switchboards shall comply with the requirements in 4.6.7, Part XI "Electrical Equipment" of the Rules for the Classification.

**4.5.2** The width of ladders of means of escape shall not be less than 500 mm, and the width of doors and hatches of means of escape shall not be less than 600 mm.

**4.5.3** Means of escape from machinery spaces shall provide safe escape to the rescue means.

**4.5.4** All the doors, covers of companionways and skylights, which may serve as means of escape from machinery spaces, shall permit opening and closing both from inside and outside. The covers of companionways and skylights shall be clearly marked with the sign prohibiting from placing any things on them.

**4.5.5** When the requirements of 4.5.11 and 4.5.13, Part VII "Machinery Installations" of the Rules for the Classification are met, one means of escape from machinery space to open deck is permitted without being fitted with an enclosure.

#### **4.6 INSULATION OF HEATED SURFACES**

**4.6.1** Surfaces of machinery, equipment and piping with temperatures above 220 °C shall be insulated. Measures shall be taken to prevent insulation destruction due to vibration and mechanical damage.

**4.6.2** The insulating materials and surface of insulation shall comply with the requirements of 2.1.1, Part VI "Fire Protection" of the Rules for the Classification.

## **5 SHAFTING**

### **5.1 GENERAL**

**5.1.1** Requirements of Section 5, Part VII "Machinery Installations" of the Rules for the Classification shall be met for the ship's design and construction to the applicable extent. In ships with no obstruction for the propeller shaft to slip out of the sterntube, means shall be provided which, in the event of the propeller breaking, will prevent its slipping out of the sterntube; alternative arrangements shall be made to preclude flooding of the engine room, should the propeller shaft be lost.

**5.1.2** Shafting parts shall be manufactured from forged or rolled steel (carbon or alloy) with tensile strength of 400 to 800 MPa in compliance with the requirements of 3.7, Part XIII "Materials" of the Rules for the Classification. Connecting bolts, couplings and half-couplings shall be made from steel with tensile strength not less than tensile strength of the shafting material. Dimensions of the joined parts shall comply with the standards in force.

**5.1.3** Propeller shafts made from carbon steel shall be reliably protected from contact with sea water. Propeller shaft cone under the propeller shall also be protected from impact of sea water.

**5.1.4** Length of the propeller shaft bearing nearest to the propeller shall be taken according to 5.6, Part VII "Machinery Installations" of the Rules for the Classification.

**5.1.5** The area between the sterntube and propeller boss shall be protected by a strong casing.

**5.1.6** The sea water cooling of sterntube bearings shall be of forced type. The water supply system shall be provided with a flow indicator, pressure gauge and alarms for the minimum flow of water.

**5.1.7** The shaftline shall comprise appropriate braking device preventing rotation of the shaft in the event the main engine or reduction gear goes out of action.

## 5.2 DESIGN AND DIAMETERS OF SHAFTS

**5.2.1** The design diameter of the propeller shaft  $D_p$ , in mm, (without taking into account allowance for subsequent boring during the operation period) shall not be less than that determined by the formula

$$D_p = 120 \sqrt[3]{P/n} \quad (5.2.1)$$

where  $P$  = rated power of the propeller shaft, in kW;  
 $n$  = rated speed of the propeller shaft, in rpm.

At that it is assumed that additional stresses due to torsional vibrations shall not exceed the permissible stresses stipulated by the requirements of Section 8, Part VII "Machinery Installations" of the Rules for the Classification.

**5.2.2** The thickness  $S$  of a bronze liner shall not be less than  $0,03d + 7,5$ , in mm, where  $d$  = diameter of the propeller shaft under the liner. The thickness of the liner between the bearings may be reduced to  $0,75S$ .

**5.2.3** Where keys are used to fit the propeller on the propeller shaft cone, the latter shall have a taper not in excess of 1:12 (for shafts with diameter less than 200 mm — not in excess of 1:10); in case of keyless fitting — not in excess of 1:15.

## **6 PROPELLERS**

### **6.1 GENERAL**

**6.1.1** The requirements of the this Section apply to metal fixed-pitch propellers, both solid and detachable-blade propellers, as well as to controllable-pitch propellers.

**6.1.2** Propellers shall be manufactured from steels, which comply with the requirements of 3.12, Part XIII "Materials" of the Rules for the Classification, or from copper alloys in compliance with the requirements of 4.2, Part XIII "Materials" of the Rules for the Classification in accordance to the approved documentation developed on the basis of the requirements of Section 6, Part VII "Machinery Installations" of the Rules for the Classification.

**6.1.3** The completely finished propellers shall be statically balanced.

Mass of test load, in kg, shall not exceed the relation of propeller mass in tons to propeller diameter, in m ( $m < M/D$ ).

**6.1.4** The sealings fitted to the cone of the propeller shaft shall be tested to a pressure of at least 0,2 MPa after the propeller fitted in place. Propeller boss design shall provide for carrying out this test.

## **7 ACTIVE MEANS OF THE SHIP'S STEERING**

### **7.1 GENERAL**

**7.1.1** Active means of the ship's steering (AMSS) are steerable propellers including retractable units of all types, active rudders, vertical-axis propellers, water-jets, athwartship thrusters and other devices of similar purpose. The requirements for AMSS construction and installation are outlined in Section 7, Part VII "Machinery Installations" of the Rules for the Classification.

## **8 TORSIONAL VIBRATION**

### **8.1 GENERAL**

**8.1.1** Requirements of the this Section apply to all propulsion plants, irrespective of their power, and auxiliary machinery driven from internal combustion engines having power of 110 kW and above.

**8.1.2** Calculations and measurement of torsional vibration shall be performed in compliance with the requirements of Section 8, Part VII "Machinery Installations" of the Rules for the Classification.

**8.1.3** Restricted speed ranges shall be marked off on the tachometers of the engine and control station

## **9 VIBRATION OF MACHINERY AND EQUIPMENT**

### **9.1 GENERAL**

**9.1.1** Vibration levels of machinery installation units shall not exceed the permissible standards specified in Part VII "Machinery Installations" of the Rules for the Classification.

**9.1.2** Vibration measurements of machinery and equipment shall be taken after construction of the ship according to the program approved by the Register in compliance with 18.6 of the Guidelines on Technical Supervision of Ships under Construction.

Russian Maritime Register of Shipping

**Rules for the Classification and Construction of Small Sea Fishing Vessels**  
**Part VII**  
**Machinery Installations**

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