

RULES

FOR THE CLASSIFICATION AND CONSTRUCTION OF HIGH-SPEED CRAFT

PART IX MACHINERY

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**St. Petersburg
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RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF HIGH-SPEED CRAFT

Rules for the Classification and Construction of High-Speed Craft 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 March 2023.

The present edition of the Rules is based on the 2018 edition taking into account the amendments developed immediately before publication.

The procedural requirements, unified requirements, unified interpretations and recommendations of the International Association of Classification Societies (IACS) and the relevant resolutions of the International Maritime Organization (IMO) have been taken into consideration.

The Rules are published in the following parts:

- Part I "Classification";
- Part II "Hull Structure and Strength";
- Part III "Equipment, Arrangements and Outfit";
- Part IV "Stability";
- Part V "Reserve of Buoyancy and 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 "Live-saving appliances";
- Part XVII "Radio Equipment";
- Part XVIII "Navigational Equipment";
- Part XIX "Signal Means";
- Part XX "Equipment for Pollution Prevention";
- Part XXI "Craft for Personnel Transportation".

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 General requirements.

1.1.1 The requirements of Section 1, Part IX "Machinery" of the Rules for the Classification and Construction of Sea-Going Ships¹ shall apply to machinery of high-speed craft² of this Part of the Rules for the Classification and Construction of High-Speed Craft³.

1.1.2 The machinery, associated piping systems and fittings relating to main machinery and auxiliary power units shall be of a design and construction adequate for the service for which they are intended and shall be so installed and protected as to reduce to a minimum any danger to persons on board, due regard being paid to moving parts, hot surfaces and other hazards. The design shall have regard to materials used in construction, the purpose for which the equipment is intended, and the working conditions to which it will be subjected and environmental conditions on board. Machinery shall be designed and constructed so as to provide access for inspection, cleaning and maintenance.

1.1.3 The reliability of machinery installed in the craft shall be adequate for its intended purpose.

Special consideration shall be given to the reliability of a generating set, which serves as a main source of electrical power; pumps of the fuel oil supply systems for engines; the sources of lubricating oil pressure; the sources of water pressure; an air compressor and receiver for starting or control purposes; the hydraulic, pneumatic or electrical means for control in main propulsion machinery, including propellers.

Technical documentation submitted to the Register for consideration and approval shall include a failure mode and effect analysis for main machinery and essential auxiliary power units and their associated controls.

The manufacturers shall make available the information necessary for correct installation of the machinery on board regarding operating conditions and limitations.

1.1.4 Machinery may be accepted, which does not show detailed compliance with the requirements of these Rules where it has been used satisfactorily in a similar application and evidence is submitted to the Register that construction, manufacture, testing and maintenance prescribed allow to use it in marine environment (having regard to the requirement of 1.8, Part VII "Machinery Installations"), the equivalent level of safety being ensured.

¹ Hereinafter referred to as "the Rules for the Classification".

² Hereinafter referred to as "HSC".

³ Hereinafter referred to as "these Rules".

2 ENGINES

2.1 General requirements.

2.1.1 Engines shall withstand excessive thermal and dynamic loads during operation time of protective devices in respect of rotation speed, temperature and power for which these devices are set.

2.1.2 Main engines (driving engines of propulsion devices) shall be protected against overload during speeding-up period to take off the craft from the displacement mode or under other service conditions. Safety devices shall not cause complete engine shutdown without prior warning, except in cases where it interferes with safety of navigation and safety of life at sea.

2.1.3 Provision shall be made to drain all excess oil fuel and oil to a specially equipped place.

2.1.4 Failures of machinery driven by the engine shall not unduly affect the integrity of the engine itself.

2.1.5 The design of the engine shall be such as to minimize the risk of fire or explosion and to enable compliance with the requirements set out in Part VI "Fire Protection" of these Rules.

2.1.6 At least two independent means of stopping the engines quickly from the operating compartment under any operating conditions shall be available. Duplication of the actuator fitted to the engine is not required.

2.2 Internal combustion engines¹.

2.2.1 The requirements of Section 2, Part IX "Machinery" of the Rules for the Classification apply to engines, having regard to their construction and purpose.

2.3 Gas turbines.

2.3.1 The requirements of 8.1 (except 8.1.8), 8.2 to 8.9, Part IX "Machinery" of the Rules for the Classification apply to gas turbines.

2.3.2 Where two or more gas turbines are installed on board, provision shall be made for starting a gas turbine from another running engine.

2.3.3 Gas turbine exhausts shall be located so as to prevent exhaust gas from penetrating into air intakes of other engines as well as harmful effect on people.

2.3.4 Gas turbines shall be so designed and installed that any reasonably probable shedding of compressor or turbine blades will not endanger the craft, other machinery, occupants of the craft or any other person. Where necessary, guards may be fitted to achieve compliance with these requirements.

2.3.5 The requirements of [2.1.3](#) shall apply to gas turbines in respect of fuel which might reach the interior of the jet pipe or exhaust system after a false start or after stopping.

¹ Hereinafter referred to as "ICE".

3 SHAFTING, GEARS, DISENGAGING AND ELASTIC COUPLINGS

3.1 The applicable requirements of Section 5 "Shafting", Section 8 "Torsional Vibration", Part VII "Machinery Installations" and Section 4 "Gears, Disengaging and Elastic Couplings", Part IX "Machinery" of the Rules for the Classification shall be applied to HSC shafting, transmissions and couplings. Calculations of torsional vibration in transmissions to air propellers and lift fans shall be also submitted to the Register for agreement.

3.2 All propulsion components which transmit the torque from the engine to the propeller shall be of adequate strength and stiffness to enable them to withstand the most adverse combination of the loads expected in service without exceeding acceptable stress levels for the material concerned. Minimum diameters of shafts with no account for an allowance for future turning-down in the process of operation shall be submitted to the Register for approval having regard to the operational experience of the prototype craft (where necessary).

3.3 The design of transmissions to air propellers and lift fans shall be submitted to the Register for approval.

3.4 The design of shafting, bearings and mounts shall be such that hazardous whirling and excessive vibration could not occur at any speed up to 105 per cent of the shaft speed attained at the designed overspeed trip setting of the prime mover.

3.5 In craft whose hull is made of light alloys, shafting shall be electrically isolated from the hull.

3.6 Normal or inadvertent engagement of the clutch shall not cause excessive stresses in the transmission or driven items.

3.7 A failure in any part of the transmission shall not cause damage which might endanger the craft or its occupants.

4 PROPULSION AND LIFT DEVICES

4.1 For the purpose of this Part, the following definitions have been adopted.

Propulsion devices are a combination of machinery, arrangements and structures, the primary function of which shall contribute to the propulsive thrust. They include machinery items, propellers and any associated ducts, vanes, scoops and nozzles.

Propulsion devices may be air, or water propellers or water jets.

Lift devices are those items of machinery which directly raise the pressure of the air and move it to provide lifting force for an air-cushion vehicle.

Propulsion arrangements and lift arrangements may be provided by separate devices, or be integrated into a single propulsion and lift device.

4.2 The design of propulsion and lift devices shall ensure adequate strength and stiffness of the items for those conditions that may occur in service, which shall be proved by calculations and tests. Drives and reduction gear shall comply with the requirements of Section 4, Part IX "Machinery", and the propellers to those of Section 6, Part VII "Machinery Installations" of the Rules for the Classification.

4.3 The design of air propellers, subcavitating and partially submerged propellers as well as waterjet propellers shall be submitted to the Register for review.

4.4 The design of propulsion and lift device shall pay due regard to the effects of corrosion (including electrochemical corrosion), erosion and cavitation, as well as the effects of spray, salt, sand, icing, debris floating in the water.

4.5 The design of propulsion and lift device shall pay due regard to any pressure which could be developed as a result of a duct blockage, to steady and cyclic loadings, to loadings that arise in manoeuvring and reversing. Inertial loadings in transmissions under any operating conditions shall not result in emergency situations.

4.6 Impellers of axial lift fans shall be balanced statically, and those of radial lift fans dynamically.

4.7 All parts and items shall have faceplates at the inlet edges or special coatings to protect them against erosion.

4.8 Appropriate arrangements shall be met to ensure that the probability of ingestion of debris or foreign matter is minimized, possibility of injury to personnel from rotating parts is minimized; and inspection and removal of debris can be carried out safely in service.

5 MECHANICAL AND HYDRAULIC DRIVES

5.1 Hydraulic drives.

Hydraulic drives shall meet the requirements of Section 7, Part IX "Machinery" of the Rules for the Classification.

5.2 Anchor machinery.

5.2.1 Anchor machinery shall meet the requirements of 6.3.1.3, 6.3.2.1, 6.3.5, Part IX "Machinery" of the Rules for the Classification.

5.2.2 The drive engine power of anchor machinery shall provide heaving-in of any anchor chain cable at a speed 10 m/min with a pull on the drum not less than that determined by the formula

$$F = 49Q, \text{ N}, \quad (5.2.2)$$

where Q =anchor mass, in kg.

The starting torque of the anchor machinery drive shall build up a pull not less than $2F_1$ (98Q) on the drum.

5.2.3 The drive shall provide heaving-in of an anchor cable at the speed and with the pull specified in [5.2.2](#) above without any interruption during the time which shall be agreed with the Register.

5.2.4 Anchor machinery shall have automatic stopper devices to avoid spontaneous running-out of an anchor cable in case of disconnection, stoppage or failure of the drive engine or taking-off the load from the manual drive handle.

5.2.5 The cable drum shall have a brake with a braking torque sufficient to stop and hold the dropping anchor at any depth within the length of the anchor cable. The force applied to the brake drive handle shall not exceed 120 N. The automatic brake shall ensure a braking torque corresponding to a force in the chain cable not less than $1,3F_1$.

5.2.6 The cable drum of the anchor engine drive shall have a stopper or a brake for the craft anchorage capable to provide a brake torque corresponding to a pull on the drum not less than $1,5F_1$ obtained in accordance with [5.2.2](#). The force applied to the brake drive handle shall not exceed 120 N.

5.2.7 The cable drum shall have an arrangement for reliable securing of the bitter end of the cable which does not interfere with proper stowage of the cable on the drum. The securing arrangement shall provide quick, efficient and safe release of the cable from the drum, including when it is tightened.

5.2.8 The cable drum shall allow stowage of the cable not more than in six rows.

5.2.9 The cable drum shall have an automatic cable layer which provide proper laying of the cable even if it is not under load.

5.2.10 Anchor machinery having both automatic and hand drives shall be fitted with an interlocking device to prevent them from simultaneous operation.

5.3 Mooring machinery.

5.3.1 Mooring machinery installed on board shall meet the requirements of 6.4.1 — 6.4.5, Part IX "Machinery" of the Rules for the Classification.

5.3.2 The strength shall be verified in accordance with 6.4.4, Part IX "Machinery" of the Rules for the Classification and Construction of Sea-Going Ships.

5.4 Towing winches.

5.4.1 Towing winches installed on board shall meet the requirements of 6.5, Part IX "Machinery" of the Rules for the Classification.

5.5 Craft auxiliary machinery.

5.5.1 Craft auxiliary machinery shall meet the requirements of Section 5, Part IX "Machinery" of the Rules for the Classification.

5.6 Steering gear.

5.6.1 Steering gear shall meet the requirements of 6.2.1.1, 6.2.1.3, 6.2.1.7, 6.2.3.1, 6.2.4.2, 6.2.5 — 6.2.9, Part IX "Machinery" of the Rules for the Classification.

5.6.2 The main steering gear shall be capable of putting the rudder over from one side to another side in accordance with 2.11, Part III "Equipment, Arrangements and Outfit" of these Rules.

5.6.3 Provision shall be made for inspection and repair of the rudder control system.

5.6.4 The auxiliary steering gear shall be capable of putting the rudder over from one side to another side in accordance with 2.12, Part III "Equipment, Arrangements and Outfit" of these Rules.

5.6.5 The design and characteristics of tilt mechanism of air rudders, tilt pylons, tilt flaps and foils and other stabilization and steering controls shall be submitted to the Register for agreement

Russian Maritime Register of Shipping

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Part IX

Machinery

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