

# **RULES**

## **FOR THE CLASSIFICATION AND CONSTRUCTION OF HIGH-SPEED CRAFT**

### **PART XVIII NAVIGATIONAL EQUIPMENT**

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# **RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF HIGH-SPEED CRAFT**

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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 SCOPE OF APPLICATION

**1.1** This Part of the Rules for the Classification and Construction of High-Speed Craft<sup>1</sup> shall apply to high-speed craft<sup>2</sup> referred to in 1.1.1.1, 1.1.1.2 of Part I "Classification". The list of navigational equipment for the craft shall meet the requirements of [Table 5.1](#). Navigational equipment to be installed on board the craft shall comply with the operational requirements described in [Section 11](#) of the present Part of the Rules, and any equipment not mentioned herein shall comply with the appropriate requirements of Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships.

**1.2** This Part of the Rules shall apply to HSC referred to in 1.1.1.3 of Part I "Classification", and also to Category A high-speed passenger craft, not engaged on international voyages, carrying not more than 36 passengers, below 100 gross tonnage and proceeding for a distance of not more than 20 miles from a place of refuge. The list of navigational equipment for these craft shall be as follows:

magnetic compass (for craft of less than 150 GRT, equipment with nomenclature codes 05010000MK, 02090013MK may be fitted);

remote transmitting heading device (THD) (not required, provided the craft is fitted with a gyrocompass to transmit heading information for input to the relevant navigational equipment);

radar operating in 9 GHz band (3 cm wavelength) (for craft of less than 300 GRT (including passenger craft) not engaged on international voyages, equipment with nomenclature code 05140250 may be fitted), and on craft with a maximum speed of 30 knots and above, the scan rate of the aerial shall not be less than 40 rpm;

radionavigation system receiver;

night vision equipment (night vision equipment not intended for HSC is allowed, with the exception of passenger ships and HSC within the requirements of the International Code of Safety for High-Speed Craft, HSC, not fitted with night vision equipment, capable of operating in the night-time at a limited maximum speed not exceeding the rate calculated in meters per second (m/s), according to the formula  $3.7 \times \nabla^{0.1667}$ ; where  $\nabla$  is the displacement equal to the design waterline, m<sup>3</sup>);

sound reception system (not required where conning station is equipped with opening windows or exit to open deck);

electronic chart display and information system (ECDIS) (not required provided corrected paper nautical charts are available on board for route planning and route monitoring throughout the intended voyage);

prismatic binocular.

Besides, in view of high speed of such craft it is recommended to install a heading or track control system, ship automatic universal identification system, echo-sounder which shall comply with the relevant requirements of [Section 11](#) in the present Part of the Rules and Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships.

**1.3** This Part sets forth technical requirements to be met by the navigational equipment and specifies its composition and arrangement.

**1.4** Navigational equipment not dealt with in this Part or dealt with only partially is covered by the requirements of Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships, unless they are contradictory to the requirements of this Part.

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

<sup>2</sup> Hereinafter referred to as "HSC".

## **2 DEFINITIONS AND EXPLANATIONS**

**2.1** Definitions and explanations relating to general terminology are given in 1.1 of Part I "Classification" of these Rules and in Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships.

### **3 SCOPE OF TECHNICAL SUPERVISION**

**3.1** All types of navigational equipment required by this Part, all associated arrangements, independent sources of electrical power, switchgear and cable lines as well as spaces and areas where the equipment is arranged are subject to technical supervision by the Register during the craft construction and service.

**3.2** Design and production of all navigational equipment intended for installation on HSC are subject to technical supervision by the Register at the manufacturer.

**3.3** The procedure of the technical supervision is given in the General Regulations for the Classification and Other Activity and in Part I "General" of the Rules for the Equipment of Sea-Going Ships.

#### **4 TECHNICAL DOCUMENTATION**

**4.1** The requirements for technical documentation on navigational equipment of high-speed craft to be submitted for consideration together with plan approval documentation are set forth in 2.2.4, 2.2.5 of Part I "General" of the Rules for the Equipment of Sea-Going Ships.

**4.2** The requirements for technical documentation on navigational equipment to be submitted for consideration together with ship's technical design are set forth in 2.3.3, 2.3.4 of Part I "General" of the Rules for the Equipment of Sea-Going Ships.

## **5 LIST OF NAVIGATIONAL EQUIPMENT**

**5.1** Navigational equipment of HSC shall meet the requirements of [Table 5.1](#).

**5.2** In order to plan and plot the craft's voyage, each high-speed craft shall be provided with a set of updated paper nautical charts for at least the intended voyage. An electronic chart display and information system (ECDIS) may be accepted as meeting the chart carriage requirements. In such case, back-up arrangements shall be provided to meet the requirements of 5.15.90, Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships.

**5.3** In addition to the requirements of [5.1](#), it is recommended that high-speed craft be equipped with unified timing system and integrated navigation system.

Rules for the Classification and Construction of High-Speed Craft (Part XVIII)

Table 5.1

No	Craft's navigational equipment	Quantity			Remarks
		Passenger craft (100 passengers and less)	Passenger craft (450 passengers and less)	Cargo craft of 500 gross tonnage and more or passenger craft (more than 450 passengers)	
1.	Magnetic compass	1	1	1	
2.	Remote device to transfer information on magnetic course to other navigational equipment	1	–	–	Not required if gyrocompass is installed
3	Gyrocompass	–	1	1	
4.	Log (dynamic pressure, induction, Doppler, etc.)	1	1	1	Where interlace with auto tracking aid (ATA) or automatic radar plotting aid (ARPA) is required, the log shall be capable to measure craft's speed through the water
5.	Echo sounder	1	1	1	Only for non-amphibian craft for sounding depths in the displacement mode
6.	Radar <sup>1</sup>	1	1	2 <sup>2,3</sup>	Radar shall operate at 9 GHz (3 cm range scale)
7.	Radionavigational system receiver <sup>4</sup>	1	1	1	
8.	Rudder angle indicator and/or propeller thrust direction indicator	1	1	1	
9.	Rate-of-turn indicator	1 <sup>5</sup>	1 <sup>5</sup>	1 <sup>5</sup>	Mandatorily required for craft of more than 500 gross tonnage
10.	Night vision equipment	1 <sup>6</sup>	1 <sup>6</sup>	1 <sup>6</sup>	
11.	Craft's heading or track control system	1	1	1	
12.	Sound reception system	1	1	1	Required on craft with enclosed control station
13.	Automatic identification system (AIS)	1	1	1	
14.	Voyage data recorder <sup>7</sup>	1	1	1	

*Rules for the Classification and Construction of High-Speed Craft (Part XVIII)*

No	Craft's navigational equipment	Quantity			Remarks
		Passenger craft (100 passengers and less)	Passenger craft (450 passengers and less)	Cargo craft of 500 gross tonnage and more or passenger craft (more than 450 passengers)	
15.	Radar reflector	1 <sup>8</sup>	1 <sup>8</sup>	1 <sup>8</sup>	Radar reflectors shall operate both at 3 and 9 GHz
16.	Marine sextant	1	1	1	
17.	Prismatic binocular	2	1	1	
18.	Aneroid barometer		1	1	
19.	Anemometer	1	1	1	
20.	Inclinometer	1	1	1	
21.	Marine chronometer	1	1	1	
22.	Stopwatch	1	1	1	
23.	Electronic chart display and information system (ECDIS)	1	1	1	Provision shall be made for back-up arrangements in compliance with 5.15.90 — 5.15.107, Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships or by using a set of corrected paper nautical charts
24.	Long-range identification and tracking (LRIT) system equipment	1	1	1	Not required for craft not making international voyages

<sup>1</sup> At least one radar shall be equipped with automatic radar plotting or auto tracking aid suitable for craft's speed.  
<sup>2</sup> The second radar shall operate at 3 GHz (10 cm range scale).  
<sup>3</sup> Where two radars are required, they shall be independent of each other.  
<sup>4</sup> The radionavigational system used shall be accessible at all times during the intended voyage.  
<sup>5</sup> The rate-of-turn indicator is required for craft of less than 500 gross tonnage if the test according to Annexes 3 and 9, Chapter 19 of 2000 HSC Code, shows that the turn rate can exceed safety level 1.  
<sup>6</sup> According to the requirements of [9.1](#).  
<sup>7</sup> Voyage data recorders shall be installed on cargo craft of more than 3000 gross tonnage.  
<sup>8</sup> To be installed on any craft of 150 gross tonnage and less.

## **6 ARRANGEMENT OF NAVIGATIONAL EQUIPMENT**

**6.1** All navigational equipment required by this Part shall be arranged at the stations from where the craft is navigated.

Where some sets of navigational equipment cannot be arranged at such stations, their indicators and controls shall be positioned in all cases in accordance with this requirement.

**6.2** Indicators and controls of the navigational equipment shall be readily accessible and arranged so that the craft operating crew can steer the craft and obtain all the necessary information without leaving their seats.

**6.3** The compass card or repeater shall be capable of being easily read from the position at which the craft is normally controlled.

**6.4** The radar display unit shall be installed in a compartment from where the craft is navigated. The display unit shall be positioned so that in case of course orientation mark "course" on the display shall be oriented in relation to the fore-and-aft line of the craft.

**6.5** The radar shall be so arranged that the operator could work when seated.

**6.6** Each radar shall be mounted so as to be as free as practicable from vibration.

**6.7** Controls and monitors for information display of the night vision equipment shall be readily accessible and positioned at the navigating workstation, the distance between the observer's eyes and the information display shall not be greater than the screen diagonal more than 2,3 times.

**6.8** The sensor of the night vision equipment shall be arranged so that:

**.1** in the required horizontal field of view there are no shadow sectors forward of the bow on either side to 30°;

**.2** in the required vertical field of view, sea surface shown on the screen shall not reduce by more than two lengths of the ship following changes of the shadow zone of the ship due to vertical inclinations of the sensor.

## **7 SOURCES OF POWER**

**7.1** Navigational equipment required by this Part shall be supplied from the main and emergency sources of electrical power in compliance with the requirements of Part XI "Electrical Equipment".

**7.2** Each navigational instrument indicated in [Table 5.1](#) and requiring electrical power shall be supplied from the navigational equipment switchboard by separate feeders. Power supply to switchboard busbars shall be provided from the main switchboard and from the emergency switchboard by two separate feeders.

**7.3** Magnetic compasses shall be illuminated from the main and emergency sources of electrical power.

## **8 SPARE PARTS**

**8.1** Spare parts for all navigational instruments shall be provided in accordance with 2.5, Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships.

## **9 NIGHT VISION EQUIPMENT**

**9.1** For navigation of high-speed craft in dark time, they shall be fitted with night vision equipment.

## 10 CRAFT CONTROL STATIONS

**10.1** All control functions of the craft when under way in any mode shall be exercised from the craft control station at the navigating bridge.

**10.2** The craft control station shall be positioned in the upper part of the superstructure or be raised above the upper deck. The operating compartment shall be fitted with windows around the periphery to provide view all-round the horizon when at sea and in manoeuvring the craft to a berth. Where all-round view is not provided, two control stations shall be arranged.

At least one exit to the craft's side or stern shall be provided at the craft's operating compartment. Besides, the operating compartment shall communicate with interior spaces. Arrangements shall be made to prevent passengers from entering the operating compartment.

**10.3** Blind sectors shall be as few as possible. The total arc of blind sectors from right ahead to 22,5° abaft the beam on either side shall not exceed 20°. Each individual blind sector shall not exceed 5° and the clear sector between two blind sectors shall not be less than 10°. The view of the sea surface from the control station, when the navigators are seated, shall not be obscured by more than one craft length forward of the bow to 90° on either side, irrespective of the craft draught, trim and deck cargo.

**10.4** The control station of the craft shall be, as far as possible, such as to ensure visual observation for the navigators and utilization of leading marks astern of the craft.

**10.5** The number of workstations for personnel on watch in the craft control station shall be sufficient to normally maintain the watch and steer the craft. The required vision of the surroundings from each workstation sufficient for the operating personnel to perform their duties shall be provided.

**10.6** The number of workstations and their arrangement depend on a possibility of all-round view, procedure of maintaining the watch by a navigator, helmsman, craft engineer and radio operator as well as on the extent of craft automation.

**10.7** Where a docking station is provided for docking the craft, the field of vision from the docking workstation shall permit one navigator to safely manoeuvre the craft to a berth.

**10.8** If separate workstations for supervision of engine performance and use of the radio equipment are placed in the operating compartment, the location and use of these workstations shall not interfere with primary functions in the operating compartment.

**10.9** Each workstation shall be equipped with a seat, control panels with all necessary controls for the officer in charge to perform all the prescribed functions.

**10.10** Seats shall be comfortable and so positioned that in the operational mode each operating crew member could be seated facing right ahead. The height of the seat shall be adjustable so that, in addition to the view referred to in [10.3](#), all indicators, controls and alarms referred to [10.15](#) could be easily used.

**10.11** Seats shall be provided with safety belts and permanently attached in the most convenient position for the personnel in charge which shall not be changed during the craft operation. The operating crew members, with the seats suitably adjusted and safety belts correctly worn, shall be able to perform the operations referred to in [10.10](#). Subsequent change of seat position to operate any control shall not be acceptable. Exception may be made only in respect of controls which are required on very rare occasions and which are not associated with the need for safety restraint.

**10.12** A table suitable for chart work and record keeping in a logbook at the workstation shall be of a size sufficient for keeping nautical charts and publications thereon. The table shall be so placed that the navigator could work with charts and publications not leaving the seat. No table is necessary where an electronic chart display system is available on board.

**10.13** The dimensions of the table at the workstation shall be not less than:

- .1 760 mm in width;

.2 660 mm in depth.

**10.14** Where an automatic steering aid is provided, a chart table may be positioned beyond the workstation but close thereto. In such case the officer in charge may temporarily leave the seat.

**10.15** The following devices and instruments shall be located at each workstation in the control station:

.1 levers to control main engines direction and speed of rotation or engine telegraph hand levers;

.2 hand levers, buttons or wheels of directional control systems, i.e. steering engines, foils, flaps, steerable propellers, jets, yaw control ports, side thrusters, differential propulsive thrust, variable geometry of the craft or its lifting-system components, aerial or water rudders, lift fans, etc.;

.3 main engine rotational speed and direction indicators, course indicators, rudder angle indicators, position indicators of foils, flaps, steerable propellers, jets, yaw control ports, side thrusters, differential propulsive thrust, variable geometry of the craft or its lifting-system components, aerial or water rudders, lift fans, etc.;

.4 alarms on failures in engines, control devices and systems referred to in [10.15.1](#), [10.15.2](#) and [10.15.5](#);

.5 craft's automatic stabilization system control station and automatic safety control station;

.6 hand controls of safety device of automatic stabilization system of craft modes;

.7 illuminated indicator panels and sound alarms of the warning and alarm systems of craft automated machinery, systems and arrangements;

.8 illuminated indicator panels and sound alarms of fire detection systems;

.9 a device for remote starting of fire-extinguishing systems;

.10 navigation light boards and associated signalling systems;

.11 navigational equipment required by this Part;

.12 radio equipment required by Part XVII "Radio Equipment";

.13 light and sound signalling devices on failures in ventilation system for special-category spaces;

.14 switches for remote stopping of fans in accommodation, service, machinery spaces and in special-category spaces;

.15 instruments for measuring temperature, pressure, level of liquid, voltage, load and other essential parameters of craft propulsion machinery and arrangements;

.16 remote arrangements for stopping flammable liquid transfer pumps and fire-extinguishing systems control;

.17 alarms on high water level in drained spaces;

.18 any other instruments, arrangements, controls, including those for emergency purposes, which may be required depending on the craft structure.

**10.16** The equipment referred to in [10.15](#) shall be arranged on consoles, bulkheads, desks, etc. It shall have such design and size of light and digital indicator scales, signal lamps, controls, and be so mounted and illuminated that operating personnel can easily view the instruments and operate the controls without leaving their seats in all possible service conditions.

**10.17** All alarm, indication and monitoring instruments referred to in [10.15](#), and controls shall be logically grouped according to their function. The alarm, indication and monitoring instruments shall be clearly marked with any limitation if this information is not otherwise clearly presented to the operating crew. The instrument panels forming the emergency control for the monitoring of the fire-fighting systems and launching of liferafts, etc. shall be grouped and be separate. The instruments shall not be rationalized by sharing functions or by inter-switching.

**10.18** The alarm, indication and monitoring instruments shall be so designed as to be plainly visible at any level of lighting. Glare and reflections from the instruments shall not interfere with normal work of the operating personnel at night-time.

**10.19** The surfaces of the alarm, indication and monitoring instruments, and console tops shall have dark, matt, glare-free colours.

**10.20** Only the most essential equipment shall be arranged in front of the operating crew members facing right ahead, provided their attention and observation of the surroundings is not prevented.

Where indications of the alarm, indication and monitoring instruments and visual information on the displays of navigational equipment shall be used by more than one person, they shall be located for easy viewing by all users concurrently. If this is not possible, the instrument or display shall be duplicated.

**10.21** Where maintaining watch and radio equipment control at workstations are difficult due to arrangement of the radio equipment used, a special workstation for the radio operator, in addition to the workstations referred to in [10.5](#), shall be provided. The VHF radio installation control desk shall be positioned in all cases at the workstations referred to in [10.5](#).

**10.22** Means to communicate between the operating compartment and spaces containing essential machinery, such as propulsion machinery, emergency steering positions, etc., shall be provided.

**10.23** A portable microphone shall be provided in the operating compartment for making public address and safety announcements to all areas to which passengers and crew have access and through which escape paths are routed, and to all survival craft embarkation stations.

**10.24** The operating compartment shall be equipped with adequate temperature and ventilation control systems.

**10.25** An adequate level of lighting shall be provided in the operating compartment to enable the operating personnel to efficiently perform their tasks both at sea and in port. Red light shall be used to maintain dark adaptation whenever any items of equipment other than the chart table require local illumination in the operational mode.

**10.26** Lighting in the operating compartment and noise generated by the instruments installed in the operating compartment shall not produce any interference for navigation.

**10.27** Where provision is additionally made to control the craft from control stations other than the craft's operating compartment referred to in [10.2](#), the alarm, indication and monitoring instruments and controls shall be switched over to operation from other stations only from the craft's operating compartment.

**10.28** Sockets supplied from the emergency source of electrical power for connection of a portable lamp which shall be permanently kept in the craft control station shall be provided in the craft.

**10.29** Where the craft control station is equipped with a combined craft control panel, one shall be guided by the provisions of this Section, those of 5.12, Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships and 4.5 "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships<sup>1</sup>.

**10.30** Divisions between windows shall be kept to a minimum. No division shall be installed immediately forward of the officer in charge and helmsman workstations.

**10.31** The arrangement of the control station windows and the curvature of their surface shall be such that no glare, reflections or distortions are produced which might result in navigation errors. Neither polarized or tinted window glass shall be fitted. The windows shall be angled from the vertical plane top out to not less than 10° but not more than 25° to reduce unwanted reflections. Windows shall be made of a material which will not break into dangerous fragments if fractured.

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

**10.32** Front windows and, depending on configuration of the control station, other windows shall be provided with means for wiping, heating and air blowing of the windows. The means shall be so arranged that no reasonably probable single failure can result in a reduction of the cleared field of vision from the operating compartment.

**10.33** The design and software of the equipment arranged in the operating compartment shall be such as to prevent their use for purposes other than navigation, communication and other functions essential to the safe operation of the craft.

## 11 OPERATIONAL REQUIREMENTS FOR NAVIGATIONAL EQUIPMENT

### 11.1 General requirements.

**11.1.1** All navigational instruments and devices that are part of the craft's navigational equipment shall have technical characteristics not lower than those required by this Part, and they shall be arranged so that safety of navigation is ensured in the area and under conditions for which the craft is intended.

**11.1.2** All navigational equipment required by these Rules as well as the navigational aids to be installed on HSC in addition to those required shall comply in respect of their technical characteristics with the requirements of Section 5, Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships and with special requirements dictated by high speeds of the craft between 30 and 70 knots.

**11.1.3** For presentation of navigation-related information from different detectors, display equipment (indicators) may be used which integrate data from several sources. In this case, equipment of this kind installed in a craft control station should present navigation-related information in conformity with the requirements of Section 6, Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships.

### 11.2 Gyrocompasses.

**11.2.1** In craft whose speed is below 30 knots the gyrocompass shall comply with the requirements of 5.3, Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships; for craft having speeds between 30 and 70 knots the gyrocompass shall meet the requirements given below.

**11.2.2** The gyrocompass positioned on a horizontal and stationary base on board the craft operating in latitudes of up to 70° shall comply with the following requirements:

- .1 the gyrocompass shall be brought into alignment with meridian within 6 hours;
- .2 the steady-state error at any course shall not exceed  $\pm 0,75^\circ \times \text{secant latitude}$ , the root mean square value of the difference between individual course indications and the mean value of the course shall be not less than  $\pm 0,25^\circ \times \text{secant latitude}$ ;
- .3 the permissible error from one run-up to another shall be within  $\pm 0,25^\circ \times \text{secant latitude}$ .

**11.2.3** In latitudes between 70°N and 70°S, when the craft operates within the latitude range 10°, the gyrocompass shall comply with the following requirements:

- .1 under rolling and pitching harmonic motions with a period of 6 to 15 s, amplitude of 5° at maximum accelerations of 22 m/s<sup>2</sup> the gyrocompass shall be brought into alignment with meridian within 6 h;
- .2 the steady-state error of the master compass readings, from one run-up to another, under service conditions associated with variations of the magnetic field and environmental temperature shall be within  $\pm 1^\circ \times \text{secant latitude}$ ;
- .3 the residual error at a straight course (after correction for speed and course at a speed of 70 knots shall not exceed  $\pm 0,25^\circ \times \text{secant latitude}$ ;
- .4 the maximum error of readings due to a rapid acceleration of the craft up to a speed of 70 knots shall not exceed 2°;
- .5 the error of readings due to rapid alteration of course of 180° at a turn angular speed 20°/s and speed of 70 knots shall not exceed  $\pm 3^\circ$ ;
- .6 steady and variable errors of the indications caused by harmonic rolling up to 20°, pitching up to 10° and yawing up to 5° with a period from 6 to 15 s and the maximum horizontal acceleration not more than 1 m/s<sup>2</sup> at any course (in particular, 45°, 90° and 315°) shall not exceed  $\pm 1^\circ \times \text{secant latitude}$ ;
- .7 gyrocompasses shall operate reliably as it is required in 5.1.2, Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships; the maximum error shall not exceed  $\pm 1^\circ$ ;

.8 the maximum divergence in readings between the master compass and repeaters shall not exceed  $\pm 0,5^\circ$  under any operational conditions;

.9 the respond rate of the gyrocompass follow-up system shall be not less than 20 %.

**11.2.4** Gyrocompass shall be provided with a compass card or analogue repeater for indication of course information, visual bearing taking devices as well as a corrector used for correction of compass readings in respect of craft speed and latitude.

The device shall be calibrated in  $1^\circ$  or  $1/10^\circ$  increments. Digital markings shall be indicated in every  $10^\circ$  clockwise from 0 to  $360^\circ$ .

In addition, a digital indicator may be provided. The course shall be presented on the digital indicator in the form of three figures (the fourth figure may indicate tenths of a degree). If a gyrocompass with a digital indicator is used it shall include a turn indicator.

**11.2.5** The remote indication system of the gyrocompass shall be designed so as to ensure simultaneous operation of gyrocompass own repeaters, course recorder, as well as repeaters fitted in other navigational equipment.

**11.2.6** A course recorder shall be capable of recording craft course in respect of time with an accuracy  $\pm 1\%$ .

**11.2.7** Provision shall be made for a visual and/or audible indication of gyrocompass readiness for operation as well as audible and visual alarms on power supply failure or failures in the compass system.

**11.2.8** The compass shall be supplied with electric power from the main and emergency sources of power with automatic switching-over.

**11.2.9** Gyrocompass shall be provided with devices for correction of error due to a rapid alteration of craft's speed and influence of the magnetic field in different latitudes.

**11.2.10** Appropriate interfaces shall be provided to transfer of the course information to other navigation equipment, such as radars, ARPA, ATA, ETA, AIS, ECDIS, voyage data recorder, craft's heading control system or track control system.

**11.3 Craft heading control systems (automatic steering devices).**

**11.3.1** The heading control system for HSC shall meet the requirements of 5.16, Part V "Navigational Equipment" of the Rules for the Convention Equipment of Sea-Going Ships as well as the requirements given below and governed by specific features of HSC and the following operational conditions:

- .1 craft speed – 30 to 70 knots;
- .2 maximum rate of turn –  $20^\circ/\text{s}$ ;
- .3 navigation of the craft in latitudes up to  $70^\circ$ .

**11.3.2** The heading control system shall enable the craft to keep automatically the preset heading with minimum operation of the craft steering gear.

**11.3.3** The heading control system, having regard to the craft's manoeuvring qualities, shall enable the craft to keep automatically the preset heading with an accuracy of  $+2^\circ$ .

The heading control system shall be fitted with a regulator of permissible deviation from the preset heading (yaw), and the maximum amplitude of yaw shall not exceed the amplitude permitted under manual control. Means shall be incorporated in the heading control system to enable the rudder angle limitation and an alarm to indicate when the angle of limitation has been reached.

**11.3.4** The heading control system shall be able to perform turns within the craft turning capabilities.

**11.3.5** The heading control system shall be capable of adapting automatically or manually to different steering characteristics of the craft under various speeds, accelerations, loading conditions of the craft, sea and weather conditions. Means shall be provided to control and correct the system parameters.

**11.3.6** Change-over from manual to automatic steering and vice versa shall be possible at any position of the rudder. The heading control system shall change to a preset heading without significant overshoot. Adequate indication shall be provided to show which method of

steering is in operation. When changing from manual to automatic steering the heading control system shall take over the actual heading as the preset heading. Any possibility of inadvertent or unauthorized alteration of the preset course shall be prevented. Switching-over from automatic to manual control shall be possible under any circumstances, even in case of the automatic control system failure. In case of manual steering, a possibility shall be provided for preventing the automatic steering operation.

**11.3.7** Controls intended for changing from manual to automatic steering method and vice versa shall be located in the master station and close to each other.

**11.3.8** Controls intended for alteration of the heading shall be designed so as to ensure altering the preset heading to starboard by turning the heading setting control clockwise or tilting the control handle to the right-hand side or a command for turning starboard if a control is a digital device. Alteration of the preset heading to port side shall be ensured by turning the heading setting control counter-clockwise or tilting the control handle to the left-hand side or a command for turning to the port side if a control is a digital device.

The alteration of the preset heading shall be possible by adjustment of only one the preset heading control.

Controls at the remote control stations shall meet the requirements of this Chapter. Change of the system control to a remote control station shall be possible only from the master station.

**11.3.9** The heading control system shall be electrically connected with a gyrocompass and receive information on the heading.

**11.3.10** An alarm shall be provided in the heading control system to indicate failure of any heading monitor used for control. All warning alarms likely to appear when information transmitters are in operation shall be duplicated at the craft's course control station.

**11.3.11** The heading control system shall be provided with audible and visual alarms to indicate failure or reduction of power supply.

**11.3.12** An alarm shall be provided when the actual heading deviates from the preset heading beyond a preset limit, the heading track aid shall get information from an independent indicator.

**11.3.13** Alarms shall be positioned at the steering control station.

**11.3.14** Provision shall be made for connection of the heading control system with information sensors as required by 5.1.31, Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships.

#### **11.4 Night vision equipment.**

**11.4.1** Night vision equipment shall be designed for continuous operation during night time (from sunset to dawn). Night vision equipment shall be designed so that it detects objects above water surface at a given distance from the ship which threaten shipping, such as small unlit boats, floating logs, oil drums, containers, buoys, ice, whales, etc. and shows them on the screen.

Night vision equipment shall determine position of such objects in relation to the ship and display them in real time.

**11.4.2** After the equipment has been switched on it shall be operational in less than 15 min.

**11.4.3** Night vision equipment shall detect the standard test target at a distance of at least 600 m with a minimum probability of 90 per cent under mean starlight conditions without clouds and without moon. The standard target shall be a black metal object of such a size that when at least 50 per cent is immersed, 1,5 m long and 0,5 m high remains above water at right angles to the desired direction of detection. The standard test target shall stay at least 24 h in water before testing.

**11.4.4** Equipment shall enable detection and display of objects staying in:

horizontal field of view shall be at least 20°, 10° on either side of the bow;

vertical field of view shall be at least 12°, meanwhile observation of the horizon shall be provided.

Other sectors of view may be provided. They shall be activated by special non-locking switch which returns to the required field of view when released.

Watch navigator working place shall be equipped with the visual indication of the sector of view in use.

**11.4.5** The axis of the field of view of the equipment shall be capable of being moved at least 20° horizontally to either side. The system shall be capable of panning at a minimum angular speed of 30°/s. This shift shall be made by a single control and the equipment shall be capable to revert automatically to the initial sector of view to the ahead position at a minimum angular speed of 30°/s.

**11.4.6** The elevation axis of the field of view shall be capable of being adjusted by at least 10° to compensate for the trim of the craft.

**11.5.7** The heading marker of the craft shall be indicated on the display with an error not greater than ±1°.

A visual indication of relative bearing with an error of not greater than +1° shall be provided, it shall appear while the axis of horizontal field of view has shifted to the corner when the heading marker disappears from the display.

**11.4.8** Sensor of the night vision equipment shall be designed so that it operates at the following weather conditions:

- pitching and/or rolling up to 10°;
- relative velocity of the head wind and/or true wind up to 100 knots;
- icing;
- spattering or thumbing of the sensor lens.

It shall be possible to clean sensor lens from the ship control station.

If the sensor rotating mechanism fails, it shall be possible to fix it in the forward direction.

**11.4.9** The equipment shall be designed so that to exclude or reduce to minimum such hindrances like dazzle or reflection of light, glow or other visual interferences.

**11.4.10** Equipment shall have indication that it is up and running.

**11.4.11** Night vision equipment shall include a visual indication of any failure.

**11.4.12** Number of controls shall be minimal. Clear notes and/or conventional symbols shall indicate their purpose.

It is not recommended to use controls of dual purpose as well as to apply Menus for operation of equipment.

**11.4.13** Controls shall be clearly visible in darkness. If they are fitted with lighting it shall be adjustable.

**11.4.14** Information display of night vision equipment shall not twinkle or blind craft operating crew. Screen diagonal shall be sufficient to show image of at least 180 mm by diagonal.

**11.4.15** If any function of the night vision equipment is realized by means of software, it shall:

- display the user interface status;
- contain self-description of the functions implemented by means of software;
- be protected from casual and/or unauthorised changes;
- meet requirements of Part XV "Automation" of the Rules for the Classification.

**11.4.16** If manufacturer recommends to carry out maintenance works of the equipment regularly, it shall be fitted with the elapsed operation time counter.

Russian Maritime Register of Shipping

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Part XVIII  
Navigational Equipment**

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