



RUSSIAN MARITIME REGISTER OF SHIPPING

CIRCULAR LETTER

No.315-05-1492c

dated 29.12.2020

Re:

amendments to the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships to align them with the Rules for the Classification and Construction of Sea-going Ships

Item(s) of supervision:

electrical equipment (the RS Nomenclature codes 11XXXXXX)

Entry-into-force date:

01.01.2021

Valid till:

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~~Cancels / amends / adds Circular Letter No.~~

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Number of pages: 1+18

Appendices:

Appendix 1: information on amendments introduced by the Circular Letter

Appendix 2: text of amendments to Section 10, Part IV "Technical Supervision during Manufacture of Products"

Director General

Konstantin G. Palnikov

Text of CL:

We hereby inform that the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships shall be amended at re-publication in 2021 as specified in the Appendices to the Circular Letter.

It is necessary to do the following:

1. Bring the content of the Circular Letter to the notice of the RS surveyors, interested organizations and persons in the area of the RS Branch Offices' activity.
2. Apply the provisions of the Circular Letter when performing technical supervision during manufacture of equipment requested after the entry into force date.

List of the amended and/or introduced paras/chapters/sections:

Tables 10.1.2-1 and 10.1.2-2, paras 10.2.1.1, 10.2.1.5 and 10.4.3.3, Table 10.4.6.2.1, paras 10.4.6.2.3, 10.4.6.4, 10.4.6.4.1, 10.4.6.5.2, 10.4.6.8.1, Table 10.5.1.1, para 10.5.1.2, Table 10.5.5.1.3, para 10.7.1.10.5, Tables 10.7.2.1 and 10.7.6.1, paras 10.7.13 – 10.7.19.1, Tables 10.7.13.1 – 10.7.19.1, 10.8.4-1 and 10.8.4-2, para 10.8.5, para 1 of Appendix 1, items 1 and 2 of Table 1 to Appendix 2, Appendix 4, Appendices 10 – 17

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**Information on amendments introduced by the Circular Letter
(for inclusion in the Revision History to the RS Publication)**

Nos.	Amended paras/chapters/sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
1	Table 10.1.2-1	Requirements for transformers have been specified, requirements for radio-frequency interference filters have been deleted	315-05-1492c of 29.12.2020	01.01.2021
2	Table 10.1.2-2	Requirements for transformers have been specified, requirements for radio-frequency interference filters have been deleted	315-05-1492c of 29.12.2020	01.01.2021
3	Para 10.2.1.1	The reference to the non-existing para has been deleted	315-05-1492c of 29.12.2020	01.01.2021
4	Para 10.2.1.5	The wording of the para has been specified	315-05-1492c of 29.12.2020	01.01.2021
5	Para 10.4.3.3	Note 3 has been specified	315-05-1492c of 29.12.2020	01.01.2021
6	Table 10.4.6.2.1	Requirements for transformers have been specified	315-05-1492c of 29.12.2020	01.01.2021
7	Para 10.4.6.2.3	The para has been deleted	315-05-1492c of 29.12.2020	01.01.2021
8	Para 10.4.6.4	The para has been renamed	315-05-1492c of 29.12.2020	01.01.2021
9	Para 10.4.6.4.1	Requirements for the lighting accessories have been deleted	315-05-1492c of 29.12.2020	01.01.2021
10	Para 10.4.6.5.2	The para has been amended for the application of tachometers	315-05-1492c of 29.12.2020	01.01.2021
11	Para 10.4.6.8.1	The reference to the para of the Rules has been replaced	315-05-1492c of 29.12.2020	01.01.2021
12	Para 10.5.1.1	Requirements for radio-frequency interference filters have been deleted	315-05-1492c of 29.12.2020	01.01.2021

Nos.	Amended paras/chapters/sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
13	Para 10.5.1.2	The reference to the applicable standards has been supplemented	315-05-1492c of 29.12.2020	01.01.2021
14	Table 10.5.5.1.3	The reference to the applicable requirements has been replaced	315-05-1492c of 29.12.2020	01.01.2021
15	Chapter 10.7	Paras 10.7.13 – 10.7.13.4 have been deleted. Paras 10.7.14 – 10.7.19.4 and Tables 10.7.14.1, 10.7.15.1, 10.7.16.1, 10.7.17.1 and 10.7.19.1 have been renumbered accordingly	315-05-1492c of 29.12.2020	01.01.2021
16	Para 10.7.1.10.5	The measuring units of the electric machines power have been amended	315-05-1492c of 29.12.2020	01.01.2021
17	Table 10.7.2.1	Item 2 has been deleted	315-05-1492c of 29.12.2020	01.01.2021
18	Table 10.7.6.1	The requirements for electromagnetic brakes of electric motors, brake electromagnets, electro-hydraulic pushers. Footnote «12» has been deleted. Existing footnote "13" has been renumbered. New footnote "13" has been introduced	315-05-1492c of 29.12.2020	01.01.2021
19	Table 10.7.13.1 (renumbered)	The requirements for tachometers of propeller shafts have been deleted. The footnotes have been amended and renumbered	315-05-1492c of 29.12.2020	01.01.2021
20	Table 10.7.14.1 (renumbered)	The requirements for coaxial cables and mounting wires have been deleted. The footnotes have been renumbered	315-05-1492c of 29.12.2020	01.01.2021
21	Table 10.7.16.1 (renumbered)	The requirements for boilers and water heaters (including the flowing ones), as well as cooking ranges, boilers and units have been deleted. The footnotes have been amended and renumbered	315-05-1492c of 29.12.2020	01.01.2021

Nos.	Amended paras/chapters/sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
22	Table 10.8.4-1	Footnote «4» as to the electric motors measuring units has been amended	315-05-1492c of 29.12.2020	01.01.2021
23	Table 10.8.4-2	Requirement for limit switches, electromagnetic brakes of electric motors, brake electromagnets, electrohydraulic pushers and radio-frequency interference filters have been deleted. The footnotes have been amended and renumbered	315-05-1492c of 29.12.2020	01.01.2021
24	Para 10.8.5	The wording has been specified	315-05-1492c of 29.12.2020	01.01.2021
25	Para 1 of Appendix 1	The power measuring units of electric machines have been amended	315-05-1492c of 29.12.2020	01.01.2021
26	Items 1 and 2 of Table 1, Appendix 2	The power measuring units of electric machines have been amended	315-05-1492c of 29.12.2020	01.01.2021
27	Appendix 4	The Appendix has been renamed. The requirements for electromagnetic brakes have been deleted.	315-05-1492c of 29.12.2020	01.01.2021
28	Appendices 10 – 17	Appendix 10 has been deleted. Appendices 11 – 18 have been renumbered accordingly	315-05-1492c of 29.12.2020	01.01.2021

PART IV. TECHNICAL SUPERVISION DURING MANUFACTURE OF PRODUCTS

1 **Table 10.1.2-1** is replaced by the following:

General types of tests and checks of product prototypes and products at steady production of electrical equipment

Nos.	Products	Inspection and checks		Measurements of insulation resistance		Check of operability		Tests of electrical insulating strength		Tests for compliance with operational conditions (mechanical and environmental)	Tests of protective enclosures		Heat tests		Overcurrent tests		Check of radio interference level		Tests for immunity to electromagnetic emission (EMC)	
		P	S	P	S	P	S	P	S		P	S	P	S	P	S	P	S	P	S
1	Electrical machines ¹	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
2	Transformers ²	+	+	+	+	+	+	+	+	+		+	+	+		+	+			
3	Static converters	+	+	+	+	+	+	+	+	+		+	+	+		+	+	+	+	
4	Accumulators	+	+	+	+				+	+	+	+								
5	Switchgear	+	+	+	+	+	+	+	+	+		+	+	+				+	+	
6	Electrical apparatus (switching, protective, etc.)	+	+	+	+	+	+	+	+	+		+	+	+			+		+	
7	Capacitors and capacitor sets to raise a power factor	+	+	+	+				+	+	+	+								
8	Busducts	+	+	+	+				+	+	+	+	+	+		+				
9	Electrical measuring instruments	+	+	+	+	+	+	+	+	+		+	+	+			+		+	
10	Electric drives (as a set)	+	+	+	+	+	+	+	+	+		+					+		+	
11	Electrical equipment of electrically-started internal combustion engines	+	+	+	+	+	+	+	+	+		+		+			+		+	
12	Lightning fixtures, search lights and control gear of gas-discharge lamps	+	+	+	+	+	+	+	+	+		+	+	+			+		+	
13	Ship's control and monitoring, communication and alarm devices	+	+	+	+	+	+	+	+	+		+		+			+		+	
14	Cable products	+	+	+	+	—	—	+	+	+		+		+						
15	Heating and cooking appliances	+	+	+	+	+	+	+	+	+		+								

Nos.	Products	Inspection and checks		Measurements of insulation resistance		Check of operability		Tests of electrical insulating strength		Tests for compliance with operational conditions (mechanical and environmental)		Tests of protective enclosures		Heat tests		Overcurrent tests		Check of radio interference level		Tests for immunity to electromagnetic emission (EMC)	
		P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
16	Items and devices for installation, splicing and connection of cables and wires	+	+	(+)	(+)	(+)	(+)	(+)	(+)	(+)	-	-	-	(+)	-	-	-	-	-	-	-

Symbols: P = prototype; S = production sample;
" + " = test is needed;
"(+)" = test performance depends on the particular product;
" - " = test is not needed.

1

For electric motors over 2 kW.

2

For power transformers only.

3

For navigation lights commutators.

4

Excepting accumulator, portable, explosion-proof lighting fixtures.

5

Excepting the lightening fixtures with incandescent lamps and with no ignition control devices.

6

For engine telegraphs, sensors of rudder angle and blade angle indicators, tachometers, telephone switchboards and apparatus of light and sound alarm devices, switches.

Nos.	Products	Torque overload tests		Stalling tests		Tests for immunity to shortcircuit		Overspeed tests		Check of commutator machines commutation		Check of operability at load loss and increase		Check of secondary voltage variation value		Tests for limiting commutation stability		Check for operate and release values		Check of manual interlocks operation		Check of manual drive and an indicator of commutation positions		Check of electromagnetic brakes operation		Check of minimal voltage protection		Check of track and limit switches operation		Heat stability tests		Check of on-load and no-load operation		Check of capacitors discharge time		Insulation breakdown tests		Tests for tightness of tanks, cans, monoblocks and other products		Check of automatic starting after voltage recovery		Measuring of loss-angle tangent		Check of protection and alarm systems		Check of mechanical and thermoplastic properties of cables	
		P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S				
15	Heating and cooking appliances																																														
16	Radio-frequency interference filter																																														

Symbols (refer to Table 10.1.2-1).

¹ For a.c. and d.c. electric motors.

² For propulsion motors, anchor and mooring machinery motors, and motors of the direct drive of the rudder and steering gear.

³ For a.c. and d.c. generators.

⁴ For d.c. generators and motors, control generators, phase-wound motors and other commutator machines.

⁵ For power transformers and current transformers.

⁶ For power transformers only.

⁷ Tests for heat resistance of the acid battery mastic.

⁸ Checking of acid battery monoblocks tightness.

⁹ Applied to circuit breakers, switches, breakers, disconnectors, contactors, current relays and other relays connected in series in power circuits.

¹⁰ For circuit breakers, starters, controllers, electromagnetic brakes, electrohydraulic pushers.

¹¹ For circuit breakers, switches, breakers, disconnectors, starters, field rheostat controllers.

¹² For insulators, busducts and other insulators.

¹³ For steering machinery and watertight doors machinery.

¹⁴ For anchor and mooring machinery and directly-driven steering machinery.

¹⁵ For boat winches, lifts, watertight door drives.

¹⁶ For lighting fixtures with gas-discharge lamps.

¹⁷ Fuel-oil and luboil heaters if covered by 1.3.2.1, Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

¹⁸ Periodically and selectively by agreement with the Register.

3 **Para 10.2.1.1** is replaced by the following text:

"1 the Register approved technical documentation on the electrical equipment testing;"

4 **Para 10.2.1.5** is replaced by the following text:

"5 testing equipment specified in the program with pertinent documents confirming equipment parameters. Requirements for testing laboratories are specified in 5.7, Part I "General Regulations for Technical Supervision";".

5 **Para 10.4.3.3.** Note "3" is replaced by the following text:

"3. The measuring voltage for capacitors of sets for raising power factor ($\cos \varphi$) for a voltage $U_r \geq 380$ V shall be equal to 2500 V.".

6 **Table 10.4.6.2.1.** is replaced by the following:

" Table 10.4.6.2.1

Transformers	Rated voltage of windings, in V	Test voltage, in kV
Power ones:		
three-phase rated at up to 6,3 kVA	Up to 50	1,0
single-phase rated at up to 4,0 kVA	51 – 250	1,5
	251 – 400	2,0
	401 – 660	2,5
	661 – 1000	3,0
three-phase rated over 6,3 kVA	127 – 1000	3,0
single-phase rated over 4,0 kVA	127 – 1000	3,0

7 **Para 10.4.6.2.3** is deleted.

8 **Para 10.4.6.4** is replaced by the following text:

"10.4.6.4 Electrical switchgear, busducts and apparatus.".

9 **Para 10.4.6.4.1** is replaced by the following text:

"10.4.6.4.1 The insulation of electrical (switching, protective, control) apparatus, switchboards and consoles, busducts, lighting fixtures for a voltage of up to 1000 V shall withstand without breakdown and tracking the test voltage applied of which rms values are as follows:"

VOLTAGE, V	
Rated voltage of apparatus by insulation, U_r , in V	Test voltage (rms value), in V
60	1000
60 – 250	2000
251 – 660	2500
661 – 800	3000
801 – 1000	3500
1001 – 3000	$3U_r$

Notes: 1. In testing switchboards, consoles, busducts, their accessories previously tested independently for insulation strength may be disconnected. Instead of disconnecting such elements, the test voltage may be reduced by 20 % as compared with the above.

2. The test voltage for apparatus rated over 3 kV is specified in a separate table of this Section.

3. The insulation of electromagnetic releasing machinery windings is tested at rms value of 2000 V.".

10 **Para 10.4.6.5.2** is replaced by the following text:

"10.4.6.5.2 The test voltages in 10.4.6.5.1 are irrelevant to tachometers for which the voltages specified in 10.4.6.1.1 (for tachometer sensors) and 10.4.6.4.1 (for secondary devices of meters) shall be applied."

11 **Para 10.4.6.8.1** is replaced by the following text:

".1 Analog and digital devices for measuring electrical quantities, transducers, as well as components of devices for measuring nonelectric quantities, if an electric quantity is fed to the input of these components, are classed with the electrical quantity measuring devices covered by the requirements of 10.4.6.8.2."

12 **Table 10.5.1.1** is replaced by the following:

"Table 10.5.1.1

Tests of equipment for compliance with operational conditions onboard a ship

Products	Mechanical tests for				Environmental tests for								Tests of enclosure protection
	Vibration tests	Shock tests	Resistance to motions	Resistance to prolonged inclinations	Heat stability	Cold endurance	Exposure to temperature changes	Humidity resistance	Resistance to hoarfrost and dew after thawing	Resistance to salt mist	Resistance to solar radiation	Fungus resistance	
Electrical machines	+	+	(+)	+	+	+	(+)	+	(+)	(+)	(+)	(+)	+
Transformers	+	+	(+)	(+)	+	+	—	+	—	(+)	—	(+)	(+)
Static converters	+	+	(+)	—	+	+	—	+	—	(+)	—	(+)	
Switch, protective and control apparatus	+	+	+	+	+	+	(+)	+	(+)	(+)	—	(+)	(+)
Electrical measuring instruments	+	+	(+)	+	+	+	—	+	—	(+)	+	(+)	+
Electrical switch-boards and consoles	+	+	(+)	(+)	+	+	(+)	+	(+)	(+)	(+)	(+)	+
Enclosures of switchgear, switch-boards and consoles of electrical installations, monitoring and alarm	+	+	—	—	+	+	(+)	+	(+)	(+)	(+)	(+)	+
Electrical drives	+	+	(+)	+	+	+	(+)	+	(+)	(+)	(+)	(+)	+
Ship's control and monitoring devices	+	+	(+)	+	+	+	(+)	+	(+)	(+)	(+)	(+)	+
Internal communication and alarm devices and apparatus	+	+	+	(+)	+	+	(+)	+	(+)	(+)	(+)	(+)	+
Electrical heating and cooking appliances	+	+	(+)	(+)	+	+	—	+	—	(+)	—	(+)	
Accumulators and accumulator batteries	+	+	+	+	+	+	—	—	—	(+)	—	(+)	—
Capacitors and capacitor sets to raise a power factor	+	+	(+)	(+)	+	+	—	+	—	(+)	—	(+)	(+)
Lighting fixtures	+	+	—	(+)	(+)	(+)	(+)	+	(+)	(+)	—	(+)	(+)
Wiring accessories	+	+	—	—	(+)	+	—	+	(+)	(+)	(+)	(+)	(+)
Cables and wires	(+)	(+)	—	—	+	+	—	+	—	(+)	(+)	(+)	—
Busducts	+	+	(+)	(+)	+	+	—	+	—	(+)	—	(+)	(+)
Symbols : " + " = products are subject to testing; " (+) " = the test is not compulsory for some products of the given type or, in some cases, the products may be exempted from this test (refer to the provisions on this test performance and on testing the products of the given type); " — " = the test is not needed.													

13 **Para 10.5.1.2** is replaced by the following text:

"10.5.1.2 For single large-sized or heavy products which are impractical for testing on standard test benches and in standard test chambers instead of maritime full scale tests, calculation data regarding mechanical, and environmental effects according to the procedures approved by the Register, or in compliance with national or international standards may be introduced."

14 Table 10.5.5.1.3 is replaced by the following:

"Table 10.5.5.1.3

Degree of protection (first numeral after IP)	Test procedure and assessment criteria
1	A rigid sphere 50 mm in diameter is applied to any holes in the product enclosure with a force of 50 N \pm 10 %. The results are considered satisfactory if the sphere does not pass through and touch current-carrying parts inside the product.
2	A test probe (refer to Appendix 10) connected to a safety voltage (not below 40 V) source is applied in any possible position with a force of 10 N \pm 10%, as well as a rigid sphere 12,5 mm in diameter is applied to any holes with the 30 N \pm 10%. The results are considered satisfactory if the pilot lamp of the probe does not illuminate, and the probe does not get through any of the holes and touch current-carrying or moving parts inside the product enclosure.
3	A rigid steel wire of 2,5 mm in diameter is applied to any hole in the enclosure with a force of 3 N \pm 10 %. The results are considered satisfactory if the wire does not get through any of the holes in the enclosure.
4	Similar, the wire diameter is 1 mm and force applied 1N \pm 10 %.
5	<p>Enclosures are of necessity in one of two categories:</p> <p>Category 1: Enclosures where the normal working cycle of the equipment causes reductions in air pressure within the enclosure below that of the surrounding air, for example, due to thermal cycling effects.</p> <p>Category 2: Enclosures where no pressure difference relative to the surrounding air is present. The enclosure shall be deemed category 1 unless the relevant product standard for the equipment specifies that the enclosure is category 2.</p> <p>Test of Category 1 enclosures.</p> <p>The enclosure is supported inside the test chamber and the pressure inside the enclosure is maintained below the surrounding atmospheric pressure by a vacuum pump. The suction connection shall be made to a hole specially provided for this test. If not otherwise specified in the relevant product standard, this hole shall be in the vicinity of the vulnerable parts.</p> <p>If it is impracticable to make a special hole, the suction connection shall be made to the cable inlet hole. If there are other holes (for example, more cable inlet holes or drain holes) these shall be treated as intended for normal use on site.</p> <p>The product is blown over with talc screened through a mesh with a clear opening of 75 μm and wire thickness of 50 μm on the basis of 2 kg of talc per 1 m³ of the chamber volume. The talc applied during the test shall not be use more than 20 tests.</p> <p>The object of the test is to draw into the enclosure, by means of depression, a volume of air 80 times the volume of the sample enclosure tested without exceeding the extraction rate of 60 volumes per hour. In no event shall the depression exceed 2 kPa (20 mbar) on the manometer. If an extraction rate of 40 to 60 volumes per hour is obtained the duration of the test is 2 h. If, with a maximum depression of 2 kPa (20 mbar), the extraction rate is less than 40 volumes per hour, the test is continued until 80 volumes have been drawn through, or a period of 8 h has elapsed.</p> <p>Tests of Category 2 enclosures.</p> <p>The enclosure under test is supported in its normal operating position inside the test chamber, but is not connected to a vacuum pump. Any drain-hole normally open shall be left open for the duration of the test. The test shall be continued for a period of 8 h. If it is impracticable to test the complete enclosure in the test chamber, one of the following procedures shall be applied:</p> <ul style="list-style-type: none"> – testing of individually enclosed sections of the enclosure; – testing of representative parts of the enclosure, comprising components such as doors, ventilation openings, joints, shaft seals, etc., in position during test; – testing of a smaller enclosure having the same full-scale design details. <p>In the last two cases, the volume of air to be drawn through the enclosure under test shall be the same as for the whole enclosure in full scale.</p> <p>The protection is satisfactory if, on inspection, talcum powder has not accumulated in a quantity or location such that, as with any other kind of dust, it could interfere with the correct operation of the equipment or impair safety.</p> <p>No dust shall deposit where it could lead to tracking along the creepage distances.</p>

Degree of protection (first numeral after IP)	Test procedure and assessment criteria
6	The enclosure shall be deemed category 1, whether reductions in pressure below the atmospheric pressure are present or not. The test shall be carried out as for the enclosure of Category 1 (degree 5X). The protection is satisfactory if no deposit of dust is observable inside the enclosure at the end of the test (complete protection against penetration of dust).

15 **Para 10.7.1.10.5.** The second paragraph is replaced by the following text:

"The evaluation of the results of testing machines rated over 1000 kW is additionally carried out also for indications obtained from the strain measurement of stresses in the fastenings of an active steel and insulation of frontal parts, as well as from the measurements of vibrations (with vibration transducers) of the same parts, and also of the machine case and bearings."

16 **Table 10.7.2.1** is replaced by the following:

"Table 10.7.2.1

Nos.	Transformers	Inspection and check	Measurement of insulation resistance	Insulation testing	Test of electrical strength of air gaps (refer to Footnote 2)	Test for compliance with operational conditions	Check of measurement of a secondary voltage value	Heat test	Overcurrent test	Test for electrodynamic and thermal strength at short-circuit current	Test of a tank for tightness and strength at a higher internal pressure	Test of a sample of non-combustible liquid dielectric
1	Power ones:											
	three-phase rated at 6,3 kVA and over, and single-phase rated at 4,0 kVA and over	+	+	+	+	+	+	+	+	+	+	+
	three-phase rated under 6,3 kVA, and singlephase rated under ,0 kVA	+	+	+	–	+	+	+	+	+	–	–
2	Instrument ones:											
	voltage	+	+	+	+	+	–	+	–	+	–	–
	current	+	+	+	+	+	–	+	–	–	–	–
Notes: 1. Symbols, refer to Table 10.7.1.1. 2. The test of electrical strength of air gaps is carried out for transformers for voltage 1 kV and over.												

17 **Table 10.7.6.1** is replaced by the following:

"Table 10.7.6.1

Apparatus	Inspection and checks	Measurements of insulation resistance	Test of insulation strength	Tests for compliance with conditions of equipment operation onboard a ship	Heat test	Check of operate (and reset) value	Test for limiting switching capacity	Test for electrodynamic and thermal strength at short-circuit current	Check of functioning of manual and motor drives and of position indicator	Operational test of a circuit	Tests for permissible levels of industrial radio interference voltages	Tests for immunity to electromagnetic emission	Other tests (and checks)
Circuit breakers	+	+	+	+	+	+ ¹	+	+ ²	+	+	–	+	–
Breakers, switches, disconnectors	+	+	+	+	+	–	+	+ ²	+	–	–	–	–

Apparatus	Inspection and checks	Measurements of insulation resistance	Test of insulation strength	Tests for compliance with conditions of equipment operation onboard a ship	Heat test	Check of operate (and reset) value	Test for limiting switching capacity	Test for electrodynamic and thermal strength at short-circuit current	Check of functioning of manual and motor drives and of position indicator	Operational test of a circuit	Tests for permissible levels of industrial radio interference voltages	Tests for immunity to electromagnetic emission	Other tests (and checks)
Fuses	+	+	+	+	+	+ ¹	+ ³	—	—	—	—	—	+ ⁴
Contactors, relays ⁵	+	+	+	+	+	+	+	+ ⁶	—	—	—	+	+ ⁷
Starters and controllers (including master controllers), starter and starting regulating rheostats	+	+	+	+	+	+ ⁸	+	+ ⁶	+	+	+ ⁹	+	+ ⁷
Field rheostats, resistors in boxes	+	+	+	+	+	—	—	—	+ ¹⁰	—	—	—	—
Electromagnetic couplings ¹¹	+	+	+	+	+	—	—	—	—	—	—	+	+ ¹²
Push-button and limit switches	+	+	+	+	+	—	+	—	—	—	—	—	—
Magnetic amplifiers, reactors, chokes	+	+	+	+	+	—	—	(+)	—	+ ¹³	—	+	(+)
Apparatus, blocks, modules with contactless elements	+	+	+	+	+	—	—	—	—	—	(+)	+	(+)
Generator protection devices	+	+	+	+	+	+	+	(+)	—	+	(+)	+	(+)

Symbols:

" + " = test (check) is needed;

"(+)" = test (check) performance depends on the particular product (i.e. on its design, principle of operation, purpose, location onboard a ship, etc.);

" — " = test (check) is not needed.

¹ For circuit breakers the operation of releases (maximum, minimum, reverse current, independent and at a short circuit current in one pole). Time-current characteristics are checked.

² The electrodynamic and thermal strength during short-circuit currents are tested.

For circuit breakers the test of switching capacity is combined with the tests of the maximum switching/breaking capacity. Universal breakers and other switches, switches operated in control, signalling and measuring circuits, as well as forming part of the electrically-started internal combustion engines are not subject to testing.

³ For fuses, tests for switching off capability (including interlocking contacts of the auxiliary circuits).

⁴ Test for the maximum non-fusing current and the minimum fusing current applies to fuses with fuse links of general use, check of activating indicators and block effecting upon the contacts of fuse auxiliary circuit or interlocking device of other apparatus.

⁵ Except for semiconductor relays, not intended for starting electric motors.

⁶ Test for electrodynamic and thermal strength during short-circuit current for main contacts and relay coil current, that is, switched in succession.

Electrothermal relays are tested for thermal strength only.

⁷ Check of operation/activation of manual drive interlocking of reversible contactors, starters, controllers.

⁸ Relates to integrated apparatus (contactors, relays).

⁹ Relates to controllers and control gear rheostats, as well as to starters and starting rheostats where they do not meet the requirements specified in 2.2 of Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

¹⁰ Relates to rheostats.

¹¹ Tests of electromagnetic couplings are conducted similarly to the tests of electrical machines (and in the same succession).

¹² Check of balancing, relation between the maximum and the nominal moments, check of non-available axial forces, overspeed test.

¹³ Relates to magnetic amplifiers.

18 **Paras 10.7.13 — 10.7.13.4 and 10.7.18 — 10.7.18.5** are deleted. Paras 10.7.14 — 10.7.14.5, 10.7.15 — 10.7.15.14, 10.7.16, 10.7.16.1, 10.7.17 — 10.7.17.2 and 10.7.19 — 10.7.19.4 and references to them are replaced 10.7.13 — 10.7.13.5, 10.7.14 — 10.7.14.14, 10.7.15, 10.7.15.1, 10.7.16 — 10.7.16.2 and 10.7.18 — 10.7.18.5, accordingly. Tables 10.7.14.1, 10.7.15.1, 10.7.16.1, 10.7.17.1 and 10.7.19.1 and reference to them are replaced 10.7.13.1, 10.7.14.1, 10.7.15.1, 10.7.16.1 and 10.7.18.1, accordingly.

19 Renumbered **Table 10.7.13.1** is replaced by the following:

"Table 10.7.13.1

Apparatus and devices	Inspection and checks	Measurement of insulation resistance	Test of insulation strength	Tests for compliance with operational conditions onboard a ship	Heat test	Operational test	Other special checks	Check for permissible levels of industrial radio interference voltages	Tests for immunity to electromagnetic emission
Electric engine telegraphs	+	+	+	+	+	+	+	+	+
Sensors and indicators of a rudder angle and CPP blades position	+	+	+	+	+	+	+	–	+
Tachometers of propeller shafts ¹	+	+	+	+	+	+	+	+	+
General alarm system – devices and contactors of visual and audible alarms	+	+	+	+	+ ¹	+	+	+	+
Switchboards and telephone sets	+	+	+	+	–	+	+	+	+
Devices of a fire detection system and of a warning alarm of fire-extinguishing medium release	+	+	+	+	+ ²	+	–	+ ²	+
Devices of a system warning about starting a local application fire extinguishing system	+	+	+	+	+ ³	+	–	+ ³	+
Devices of a high bilge water level alarm system	+	+	+	+	+	+	+	+	+
Devices of a system for emergency call of engineers and of a personnel alarm	+	+	+	+	+	+	+	+	+
Devices of an alarm system on presence of people inside refrigerated holds	+	+	+	+	+	+	+	+	+
Devices of a system for control of side ports, fire and watertight doors position	+	+	+	+	+	+	+	+	+
Devices of an external/internal video surveillance system	+	+	+	+	+	+	+	+	+
Devices of an alarm system on rise of explosive gases concentration	+	+	+	+	+	+	+	+	+
Devices of a cargo hold water level alarm system of bulk carriers and dry cargo ships	+	+	+	+ ⁴	+	+ ⁵	+ ⁶	+	+
Devices of a high and high-high cargo level alarm system	+	+	+	+	+	+	+	+	+

Symbols, refer to Table 10.7.5.1.

¹ Contactors are not subject to testing.

² Detectots of an automatic fire detection system and manual fire alarms are not subject to testing.

³ Detectors are not subject to testing.

⁴ In respect of protective enclosure testing – refer to Appendix 16 "Requirements for testing of a cargo hold water level alarm system of bulk carriers and single-hold cargo ships other than bulk carriers".

⁵ Functionality tests shall be carried out in accordance with IMO Resolution MSC.188(79) "Performance standards for water level detectors on bulk carriers and single-hold cargo ships other than bulk carriers".

⁶ Refer to Appendix 16 "Requirements for testing of a cargo hold water level alarm system of bulk carriers and single-hold cargo ships other than bulk carriers".

22 **Table 10.8.4-1** is replaced by the following:

"Table 10.8.4-1

Products	Tests and checks in accordance with 10.8.2 and 10.8.3	Test at increased speed ¹	Measurements of collector runout (of slip rings), check of axial displacement of a rotor (armature)	Test of interturn insulation strength	Check in operation at nominal parameters and short-time current overload	Check of interlocks, protection and alarm operation	Other specific checks and tests
Electrical machines ²	+ ^{3, 4}	+ ⁵	+ ⁶	+	+ ⁷	+	+ ⁸
Electromagnetic couplings	+ ^{3, 4}	+	+ ⁶	+	+	—	—
Transformers	+	—	—	+	+ ⁷	—	+ ⁹
Static converters	+	—	—	+ ¹⁰	+	+ ¹¹	+ ¹²
¹ Performed prior to insulation testing. ² Synchronous and d.c. generators, induction and d.c. motors, converters, rotary amplifiers. ³ If necessary (as a rule, for large products), with measurements of air gaps, with a check of documents on balancing, testing a watercooling system for tightness and strength. ⁴ With mass production of machines rated up to 5 kW, insulation strength may be tested during 1 s at a voltage equal to 1,2 times the full normalized test voltage. ⁵ Excepting cage induction motors. ⁶ As a rule, applies to large products. With propulsion plant motors and couplings, the runout of a shaft end shall also be measured. ⁷ For a.c. machines and transformers, the check may be replaced by an open-circuit and short-circuit tests. ⁸ Check of commutator machines switching at the rated load and short-time current overload, the check of limits of voltage setting variation for generators with a static field system, the check of electric heating of the machine, the measurement of voltage between the insulated bearing base and foundation, as well as between shaft ends of such machines. ⁹ With nonflammable liquid-filled transformers, the tank test for tightness and the test of a dielectric sample taken from the tank. ¹⁰ Applies to converter transformers lacking such a test. ¹¹ Check of overload and short-circuit protection in operation. ¹² Check of operation at load loss and increase, the check of control apparatus and filter operation.							

23 **Table 10.8.4-2** is replaced by the following:

"Table 10.8.4-2

Products	Tests and checks in accordance with 10.8.2 and 10.8.3	Check of operation of drives and indicators of switching positions	Check of interlocks operation	Check of adjustment and operation of elements (releases, integrated relays, etc.)	Check of electrical resistance value	Operational test	Other specific checks
Circuit breakers	+	+	+	+	—	—	—
Breakers, switches, disconnectors, push-button and limit switches	+	—	—	—	—	+	—
Fuses	+	—	—	—	+ ¹	—	+ ²
Contactors, contact relays	+	—	—	—	—	—	+ ³
Starters, controllers	+	—	+	+	—	+	—
Rheostats	+	+	—	+	+	—	—
Resistors in boxes	+	—	—	—	+	—	—
Magnetic amplifiers, apparatus, blocks and modules with contactless elements	+					+	
Reactors, chokes	+	—	—	—	+ ⁴	—	—
Generator protection devices	+	—	+	+	—	+	—

Products	Tests and checks in accordance with 10.8.2 and 10.8.3	Check of operation of drives and indicators of switching positions	Check of interlocks operation	Check of adjustment and operation of elements (releases, integrated relays, etc.)	Check of electrical resistance value	Operational test	Other specific checks
Electrical measuring (switchboard) instruments	+	–	–	–	–	+ ⁵	+ ⁶
Electrical switchboards and consoles	+	+	–	–	–	+ ⁷	–
Apparatus and devices for intercommunication and alarm	+	–	–	–	–	+	–
Ship's control and monitoring devices ⁸	+	–	–	–	–	+	+ ⁹
Electrical heating and cooking appliances	+	–	–	–	–	–	+ ¹⁰
Lighting fixtures	+	–	–	–	–	–	–
Busducts	+	+	–	–	–	–	–
¹ Applies to fuse-links, performed periodically by sampling. ² Test for the maximum non-fusing current and minimum fusing current. Performed periodically by sampling. ³ Check of contact gaps, follows-up and pressure. Check of actuation parameters. ⁴ Measured inductive impedance. ⁵ Performed with instruments inclined. Periodical sampling inspection of operation at ambient air temperatures above 25 °C; at mechanical actions (in a reduced scope as compared with prototype tests); at the limiting permissible deviations of voltage and frequency from rated values. ⁶ Determination of a basic error and variation. ⁷ Applies to control, monitoring and alarm circuits. ⁸ Sensors (tachogenerators) and indicators of tachometers of propeller shafts shall be additionally tested as electrical machines and electrical measuring instruments respectively. ⁹ Check of accuracy of indicator readings. ¹⁰ Test of fuel oil and luboil heaters for tightness and strength (or check of documents if such tests are carried out in production), as well as of products operating under a steam pressure, or potentially being pressurized with steam, if these are subject to the requirements of 1.3.2.1, Part X "Boilers, Heat Exchangers and Pressure Vessels" of the Rules for the Classification and Construction of Sea-Going Ships. Check of operation of protection against abnormal operating modes (an elevated temperature, the drop of a liquid level, etc.).							

24 **Para 10.8.5** is replaced by the following text:

"10.8.5 With the satisfactory results of tests and checks, the Register Surveyor issues a certificate for a product according to Table 5.2-1, Part I "General Regulations for Technical Supervision".

APPENDIX 1

PERMISSIBLE VALUES OF ELECTRICAL EQUIPMENT INSULATION RESISTANCE

25 **Para 1.** The second paragraph is replaced by the following text:

"Minimum insulation resistance for electrical equipment above 500 V rating shall be determined in compliance with national and international standards."

PERMISSIBLE TEMPERATURES

26 **Table 1** is replaced by the following:

"Table 1

Permissible temperature excesses for electrical machines at a cooling air temperature of 45 °C

Nos. Parts of electrical machines		Class of insulating material														
		A			E		B			F			H			
		Measurement method (instrument)														
		Thermometer	Resistance method	Thermal detectors placed in a slot between coils	Thermometer	Resistance method	Thermal detectors placed in a slot between coils	Thermometer	Resistance method	Thermal detectors placed in a slot between coils	Thermometer	Resistance method	Thermal detectors placed in a slot between coils	Thermometer	Resistance method	Thermal detectors placed in a slot between coils
1	Windings of ac synchronous machines rated 5000 kVA and over or having a core length of 1 m and more	–	55	55	–	65	65	–	75	75	–	95	95	–	120	120
2	Windings of ac machines rated under 5000 kVA and having a core length under 1 m	45	55	–	60	70	–	65	75	–	80	95	–	100	120	–
3	Field windings of d.c.-excited d.c. and a.c. machines excepting those in items 5 to 8 of the Table	45	55	–	60	70	–	65	75	–	80	95	–	100	120	–
4	Armature windings connected to a commutator	–	–	–	–	–	–	–	85	–	–	105	–	–	–	–
5	Field windings of d.c.-excited nonsalient pole machines	–	–	–	–	–	–	–	85	–	–	105	–	–	–	–
6	Single-row field windings with bare surfaces	60	60	–	75	75	–	85	85	–	105	105	–	130	130	–
7	Bar windings of asynchronous machine rotors	60	60	–	75	75	–	85	85	–	105	105	–	130	130	–
8	Field windings of low resistance with several layers and compensation windings	55	55	–	70	70	–	75	75	–	95	95	–	120	120	–
9	Insulated windings continuously closed on itself	55	–		70	–	–	75	–	–	95	–	–	120	120	–
10	Noninsulated windings continuously closed on itself	The excess of a temperature of these parts shall not reach the values, which would cause a risk of damaging insulating and other adjacent materials														
11	Steel cores and other parts having no contact with windings															
12	Cores and other steel parts in contact with windings	55	–	70	–	–	–	75	–	–	95	–	–	120	120	–
13	Unprotected and protected commutators and slip rings	55	–	60	–	–	–	75	–	–	85	–	–	95	95	–

Notes: 1. For windings of a.c. machines for rated voltage over 11000 V, the limiting permissible excesses of temperature shall be reduced by 1,5 °C for each complete and incomplete 1000 V above 11000 V in measurements with a thermometer or by 1 °C when a thermal detector is used.

2. The limiting permissible excesses of a windings temperature specified in items 2 and 4 of the Table, measured by the resistance method, may be increased by 5 °C for enclosed machines for voltage not more than 1500 V.

3. The specified class of insulating material as per item 13 of the Table applies to the commutator or slip ring insulation, or else to the insulation of windings connected thereto if the insulation class of these latter is below that of the commutator or slip rings.

4. The resistance method is generally used for measuring the excess of a winding temperature. The use of a thermometer is allowed only in those cases when the above method cannot be applied due to certain reasons; the limiting permissible excesses of temperatures for these cases are specified in the Table.

Nos.	Parts of electrical machines	Class of insulating material											
		A		E		B		F		H			
		Measurement method (instrument)											
		Thermometer	Resistance method	Thermal detectors placed in a slot between coils	Thermometer	Resistance method	Thermal detectors placed in a slot between coils	Thermometer	Resistance method	Thermal detectors placed in a slot between coils	Thermometer	Resistance method	Thermal detectors placed in a slot between coils
<p>5. If a thermometer indication is desirable additionally to the data received by the resistance method, the temperature excess measured in the most heated accessible point shall not exceed 60 °C for insulation class A, 75 °C for insulation class E, 85 °C for class B, 105 °C for class F and 130 °C for class H.</p> <p>6. The permissible temperature excesses for commutators and slip rings may exceed the values specified in item 13 of Table if the following conditions are met: the temperature excess for insulating materials of commutators and slip rings and their related windings does not exceed the values specified in <u>items 4 and 7</u> of the Table for materials of the relevant classes; the temperature does not reach the values dangerous for solder joints.</p>													

APPENDIX 4

RECOMMENDATIONS ON CHECKING MECHANICAL STRENGTH OF ELECTRICAL APPARATUS AND ELECTROMAGNETIC BRAKES

27 **Appendix 4** is renamed reading as follows:

"RECOMMENDATIONS ON CHECKING MECHANICAL STRENGTH OF ELECTRICAL APPARATUS".

28 **Appendix 10** is deleted. **Appendices 11 — 18** are renumbered **10 — 17**, accordingly."