



RUSSIAN MARITIME REGISTER OF SHIPPING

HEAD OFFICE

CIRCULAR LETTER

No. 313-09-875c

dated 21.03.2016

Re:

Amendments to Part IX "Machinery" of the Rules for the Classification and Construction of Sea-Going Ships, 2016, ND No. 2-020101-087.

Item of technical supervision:

09010000 Internal combustion engines of power output 55 kW and over; 09020000 Internal combustion engines of power output below 55 kW; 09080200 Turbochargers

Implementation 01.07.2016

Valid: till -

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Cancels / Amends/ Supplements Circular Letter No. - dated -

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Appendices: Amendments and supplements to Part IX "Machinery" of the Rules for the Classification and Construction of Sea-Going Ships, 2016, ND No. 2-020101-087

Technical Director - Head of Classification Directorate Vladimir I. Evenko

Amends Rules for the Classification and Construction of Sea-Going Ships, 2016, ND No. 2-020101-087.

We hereby inform that in connection with coming into force on 01.07.2016 of Unified Requirements (UR) IACS M44 (Rev.8 Mar 2015) and M73 (Feb 2015) and considering the amendments to the Rules for Technical Supervision of Ships and Manufacture of Materials and Products for Ships, 2015, ND No. 2-020101-040, Chapters 1.2, 2.3, 2.5, 2.12, Part IX "Machinery" of the Rules for the Classification and Construction of Sea-Going Ship, 2016, ND No. 2-020101-087 shall be amended as stated in the Appendix to this Circular Letter.

IACS UR M44 (Rev.8 Mar 2015) and M73 (Feb 2015) in English are posted on the RS internal website in the Section "External Normative Documents", 02 Documents of IACS, 0209 M.

It is necessary to do the following:

1. Familiarize the surveyors of the RS Branch Offices and interested organizations within the area of the RS Branch Offices' activity with the content of the Circular Letter.
2. Apply the provisions introduced by the Circular Letter.
3. Introduce amendments to the RS documents issued prior to the date of the Circular Letter entering into force in case of replacement thereof.
4. Clarify the contents of this Circular Letter to all interested parties in the area of the RS Branch Offices' activity.

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**RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF SEA-GOING SHIPS,
2016, ND No. 2-020101-087-E**

Part IX "MACHINERY"

Chapter 1.2 SCOPE OF SURVEY

Para. **1.2.3** shall be amended to read:

1.2.3 Prior to manufacturing of the machinery, following documents shall be submitted to the Register for approval:

.1 on internal combustion engines for information - as defined in Table 1.2.3.1-1, for approval - in Table 1.2.3.1-2.

Procedure for submission and review of the documents on internal combustion engines (refer to Appendix 2 "Procedure for document submission and document flow" to Section 5" of Part IV "Technical Supervision during Manufacture of Products", the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships in compliance with Appendix 2 to IACS UR M44 (Rev.8 Mar 2015).

.2 on all other machinery regulated by the present part of the Rules except for internal combustion engines:

(and the rest remaining as it stands in accordance with the existing paras **1.2.3.2.1 – 1.2.3.2.19**).

After para **1.2.3.2.19** a new Note shall be introduced as follows:

"Note. Additional requirements to the scope of documentation on the turbochargers of internal combustion engines (ICE) (refer to **2.5.7.6**)".

After para **1.2.3** new tables 1.2.3-1 and 1.2.3-2 shall be introduced as follows:

"Table 1.2.3-1

Documentation on internal combustion engines (ICE) to be submitted for information, as applicable	
1	Engine particulars (e.g. Data sheet with general engine information (refer to Appendix 3 "Data Sheet and Engine Particulars") Project Guide, Marine Installation Manual) (Form of data submittal) to Section 5, Part IV "Technical Supervision during Manufacture of Products" in accordance with Appendix 3 to IACS UR M44 (Rev.8 Mar 2015)) or Specifications
2	Engine cross section
3	Engine longitudinal section
4	Bedplate and crankcase of cast design
5	Thrust bearing assembly ¹
6	Frame/framebox/gearbox of cast design ²
7	Tie rod

8	Connecting rod
9	Connecting rod, assembly ³
10	Crosshead, assembly ³
11	Piston rod, assembly ³
12	Piston, assembly ³
13	Cylinder jacket/ block of cast design ³
14	Cylinder cover, assembly ³
15	Cylinder liner
16	Counterweights (if not integral with crankshaft), including fastening
17	Camshaft drive, assembly ³
18	Flywheel
19	Fuel oil injection pump
20	Shielding and insulation of exhaust pipes and other parts of high temperature which may be impinged as a result of a fuel system failure, assembly
	For electronically controlled ICE, construction and arrangement drawings of:
21	Control valves
22	High-pressure pumps
23	Drive for high pressure pumps
24	Operation and service manuals ⁴
25	FMEA (for engine control system) ⁵
26	Production specifications for castings and welding (sequence)
27	Evidence of quality control system for engine design and in service maintenance
28	Quality requirements for engine production
29	Type approval certification for environmental tests, control components ⁶

Footnotes:

1. If integral with engine and not integrated in the bedplate.
2. Only for one cylinder or one cylinder configuration.
3. Including identification (e.g. drawing number) of components.
4. Operation and service manuals shall contain maintenance requirements (servicing and repair) including details of any special tools and gauges that are to be used with their fitting/settings together with any test (verification) requirements on completion of maintenance.
5. Where engines rely on hydraulic, pneumatic or electronic control of fuel injection and/or valves, a failure mode and effects analysis (FMEA) is to be submitted to demonstrate that failure of the control system will not result in the operation of the engine being degraded beyond acceptable performance criteria for the engine.
6. Tests shall demonstrate the ability of the control, protection and safety equipment to function as intended under the specified testing conditions as specified in Section 12, Part IV "Technical Supervision during Manufacture of Products", the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships.

Table 1.2.3-2

Documentation on internal combustion engines (ICE) to be submitted for approval, as applicable
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1	Bedplate and crankcase of welded design, with welding assemblies and welding instructions ^{1,2}
2	Thrust bearing bedplate of welded design, with welding details and welding instructions ¹
3	Bedplate/oil sump welding drawings ¹
4	Frame/framebox/gearbox of welded design, with welding details and instructions ^{1,2}
5	Engine frames, welding drawings ^{1,2}
6	Crankshaft, details, each cylinder No.
7	Crankshaft, assembly, each cylinder No.
8	Crankshaft calculations (for each cylinder configuration and arrangement) according to the attached data sheet and requirements of 2.4
9	Thrust shaft or intermediate shaft (if integral with engine)
10	Shaft coupling bolts
11	Material specifications of main parts with information on non-destructive material tests and pressure tests ³
	Schematic layout or other equivalent documents on the engine of:
12	Starting air system
13	Fuel oil system
14	Lubricating oil system
15	Cooling water system
16	Hydraulic system
17	Hydraulic system (for valve lift)
18	Engine control, regulation, alarm and safety system
19	Shielding of high pressure fuel pipes, assembly ⁴
20	Construction of accumulators (common rail) (for electronically controlled engine)
21	Construction of common accumulators (common rail) (for electronically controlled engine)
22	Arrangement and details of the crankcase explosion relief valve (refer to 2.3.5 ⁵)
23	Calculation results for crankcase explosion relief valves (refer to 2.3.5)
24	Details of the type test program and the type test report ⁷
25	High pressure parts for fuel oil injection system ⁶
26	Oil mist detection and/or alternative alarm arrangements in the crankcase (refer to 2.3.4.8 - .22)
27	Details of mechanical joints of piping systems on the engine (refer to 2.4.5, of Part VIII "Systems and Piping"
28	Documentation verifying compliance with inclination limits under stated ambient conditions (refer to 2.3, Part VII "Machinery Installations")
29	Documents on the programmable electronic systems as required in 7.10 of Part XI "Electrical Equipment"(if applicable)

Footnotes:

1. For approval of materials and weld procedure specifications. The weld procedure specification shall include details of pre and post weld heat treatment, weld consumables and fit-up conditions.
2. For each cylinder for which dimensions and details differ.

3. For comparison with the RS requirements for material, NDT and pressure testing as applicable.
4. All engines.
5. Only for engines of a cylinder diameter of 200 mm or more or a crankcase volume of 0,6 m³ or more.
6. The documentation shall contain specifications for pressures, pipe dimensions and materials.
7. The type test report may be submitted shortly after the conclusion of the type test (refer to 5.14 of Section 5, Part IV "Technical Supervision during Manufacture of Products", the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships).

Chapter 2.3 ENGINE FRAME

Para **2.3.4.8.2**. Reference can be made to Appendix 3 to Section 5, "of Part IV "Technical Supervision during Manufacture of Products", the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships, shall be replaced with reference to Appendix 11 to Section 5, of Part IV "Technical Supervision during Manufacture of Products", the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships.

Para **2.3.5.8**. Reference to Appendix 2 to Section 5 of Part IV "Technical Supervision during Manufacture of Products", the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships shall be replaced with reference to Appendix 10 to Section 5 of Part IV "Technical Supervision during Manufacture of Products", the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships .

Chapter 2.5 SCAVENGING AND SUPERCHARGING

After para 2.5 **Chapter 2.5.6** shall be supplemented by a new para **2.5.7** as follows:

«**2.5.7** The requirements of this para are applicable for turbochargers of ICE with regard to the design approval, type testing and survey of turbochargers (refer to Appendix 9. "Procedure for survey,, testing, approval of turbochargers and their matching on ICE" to Section 5 of Part IV "Technical Supervision during Manufacture of Products", the Rules for Technical Supervision During Construction of Ships and Manufacture of Materials and Products for Ships.

2.5.7.1 Turbochargers shall be type approved, either separately or as a part of an engine. The requirements of 2.5.6 are written for exhaust gas driven turbochargers, but apply in principle also for engine driven chargers.

2.5.7.2 The turbochargers shall be designed to operate under conditions given in 2.3, Part VII "Machinery Installations" and 2.2.7 of the present Part . The component lifetime and the alarm level for speed shall be based on 45°C air inlet temperature.

2.5.7.3 The air inlet of turbochargers shall be fitted with a filter.

2.5.7.4 The requirements escalate with the size of the turbochargers. The parameter for size is the engine power (at MCR) supplied by a group of cylinders served by the actual turbocharger, (e.g. for a V-engine with one turbocharger for each bank the size is half of the total ICE power).

2.5.7.5 Turbochargers are categorised in three groups depending on served power by cylinder groups with:

Category A: ≤ 1000 kW

Category B: > 1000 kW and ≤ 2500 kW

Category C: > 2500 kW

2.5.7.6 Documentation to be submitted

.1 Category A

On the RS request

containment test report;

cross sectional drawing with principal dimensions and names of components;

test program.

.2 Category B and C:

cross sectional drawing with principal dimensions and materials of housing components for containment evaluation in the event of disc fracture;

documentation of containment in the event of disc fracture (refer to 3.2);

operational data and limitations as:

maximum permissible operating speed (rpm);

alarm level for over-speed;

maximum permissible exhaust gas temperature before turbine;

alarm level for exhaust gas temperature before turbine;

minimum lubrication oil inlet pressure;

lubrication oil inlet pressure low alarm set point;

maximum lubrication oil outlet temperature;

lubrication oil outlet temperature high alarm set point;

maximum permissible vibration levels, i.e. self- and externally generated vibration;

(alarm levels may be equal to permissible limits but shall not be reached when operating the engine at 110 % power or at any approved intermittent overload beyond the 110 %.);

diagram and arrangement of lubrication system, all variants within a range;

type test reports;

test program;.

.3 Category C:

drawings of the housing and rotating parts including details of blade fixing;

material specifications (chemical composition and mechanical properties) of all parts mentioned above;

welding details and welding procedure of above mentioned parts, if applicable;

documentation of safe torque transmission when the disc is connected to the shaft by an interference fit (refer to 3.3)¹;

information on expected lifespan, considering creep, low cycle fatigue and high cycle fatigue;

operation and maintenance manuals¹.

¹ Applicable to two sizes in a generic range of turbochargers.

2.5.7.7 Applicable to Category C in cases where the disc is connected to the shaft with interference fit, calculations shall substantiate safe torque transmission during all relevant operating conditions such as maximum speed, maximum torque and maximum temperature gradient combined with minimum shrinkage amount.

2.5.7.8 Turbochargers shall fulfil containment:

.1 turbochargers shall fulfil containment in the event of a rotor burst. This means that at a rotor burst no part may penetrate the inner part of casing of the turbocharger or escape through the compressor unit. For documentation purposes (test/calculation), it shall be assumed that the discs disintegrate in the worst possible way;

.2 for Category B and C, containment shall be documented by testing. Fulfilment of this requirement can be awarded to a generic range of turbochargers based on testing of one specific unit. Testing of a large unit is preferred as this is considered conservative for all smaller units in the generic range. In any case, it must be documented (e.g. by calculation) that the selected test unit really is representative for the whole generic range.

2.5.7.9 In addition to the requirements of 2.12.1, the control, alarm and safety systems of turbochargers under Categories B and C shall comply with the requirements specified in Table 2.5.7.9. Indications may be provided at either local or remote locations.

Table 2.5.7.9

No.	Monitored Parameters	Category of Turbochargers				Notes
		B		C		
		Alarm	Indication	Alarm	Indication	
1	Speed	High ¹	X ¹	High ⁽¹⁾	X ¹	

2	Exhaust gas at each turbocharger inlet, temperature	High ²	X ²	High	X	High temp. alarms for each cylinder at engine is acceptable ³
3	Lub. oil at turbocharger outlet, temperature			High	X	If not forced system, oil temperature near bearings
4	Lub. oil at turbocharger inlet, pressure	low	X	low	X	Only for forced lubrication systems ⁴

Footnotes:

¹ On turbocharging systems where turbochargers are activated sequentially, speed monitoring is not required for the turbocharger(s) being activated last in the sequence, provided all turbochargers share the same intake air filter and they are not fitted with waste gates

² For Category B turbochargers, the exhaust gas temperature may be alternatively monitored at the turbocharger outlet, provided that the alarm level is set to a safe level for the turbine and that correlation between inlet and outlet temperatures is substantiated.

³ Alarm and indication of the exhaust gas temperature at turbocharger inlet may be waived if alarm and indication for individual exhaust gas temperature is provided for each cylinder and the alarm level is set to a value safe for the turbocharger.

⁴ Separate sensors are to be provided if the lubrication oil system of the turbocharger is not integrated with the lubrication oil system of the diesel engine or if it is separated by a throttle or pressure reduction valve from the diesel engine lubrication oil system”.

Chapter 2.12 INSTRUMENTS AND ALARM DEVICES

Note at the end of para **5.1.12** shall be amended to read:

“N o t e. Proceeding from the structural features of the engines, changes may be introduced to the list of measuring instruments on agreement with the Register. Additional requirements applicable to the engine turbochargers are given in 2.5.6.9”.