

**RULES
FOR THE CLASSIFICATION OF
SHIPS**

*Part 9 – MACHINES
July 2022*

*Amendments No. 1
January 2023*

CROATIAN REGISTER OF SHIPPING

Hrvatska (Croatia) • 21000 Split • Marasovića 67 • P.O.B. 187
Tel.: (...) 385 (0)21 40 81 11
Fax.: (...) 385 (0)21 35 81 59
E-mail: tech.coord@crs.hr
web site: www.crs.hr

By the decision of the General Committee of Croatian Register of Shipping,

Amendments No. 1 to the
RULES FOR THE CLASSIFICATION OF SHIPS
Part 9 – MACHINES

have been adopted on 19th December 2022 and shall enter into force on 1st January 2023

GENERAL TERMS AND CONDITIONS

(March 2022)

Article 1 GENERAL

1.1 CROATIAN REGISTER OF SHIPPING (hereinafter: the *Register*) shall at all times remain an independent contractor and neither the *Register* nor any of its officers, surveyors, auditors, inspectors, agents, appointers, officers or managers shall act as an employee, servant or agent of any other party in the performance of the Services rendered by the *Register*.

1.2 The *Register* acts as a service provider. The Services provided by the *Register* cannot be construed as a commitment by the *Register* to achieve any result or as a warranty.

1.3 The provision of Services is subject to these General Terms and Conditions. No other terms and conditions shall apply, either expressly or by implication, unless expressly agreed in writing between the Parties.

1.4 These General Terms and Conditions shall be incorporated into, or referred to in any Contract and shall prevail over and exclude any other terms and conditions that the Client may wish to impose.

Any amendments to and/or deviations from these General Terms and Conditions, as well as any additional terms and conditions of the Client, shall be binding or valid only if set forth in writing and duly signed by the authorised representatives of both Parties.

1.5 The invalidity of one or more provisions of these General Terms and Conditions shall not affect the remaining provisions.

1.6 The Client acknowledges that the latest version of these General terms and Conditions and the latest version of applicable Rules apply to the Services provided by the *Register*.

1.7 Definitions in these General Terms and Conditions take precedence over other definitions that may appear in other documents issued by the *Register*.

1.8 The Client should at all times be aware of the provisions of these General Terms and Conditions, as they may be further amended, with their latest up to date version available on the web site of the *Register*.

Article 2 DEFINITIONS

2.1 **Certificate** means either a class certificate or statutory certificate, statement, attestation, statement of compliance, and a report following the Services provided by the *Register*.

2.2 **Certification** means the activity of certification in application of international and national standards and international industry practice provided by the *Register*.

Certification is an appraisal given by the *Register* to the Client and cannot be construed as an implied or express warranty of safety, fitness for purpose, seaworthiness of the vessel or its value for sale, insurance or chartering.

The purpose of Certification is to provide classification and statutory services and assistance to the maritime industry, Flag State Administrations, and regulatory authorities relating to maritime safety and pollution prevention.

2.3 **Classification** includes all activities and Services provided by the *Register* in accordance with the Rules. Classification may or may not be accompanied by the issuance of a Certificate of class with reference to the Rules.

Certificate of class is valid only if issued by the *Register*.

However, Certificate of class should not be construed as a guarantee of the safety, fitness for purpose or seaworthiness of the vessel. It is merely an attestation that the vessel complies with the Rules developed and published by the *Register*.

In addition, the *Register* is not a guarantee of the safety of life or property at sea or the seaworthiness of a vessel because, although the classification of a vessel is based on the assumption that the vessel will be properly loaded, operated, and maintained by competent and qualified personnel, the *Register* has no control over how a vessel is operated and maintained between the periodic surveys it conducts.

2.4 **Statutory certification** means certification made by the *Register* on behalf of the Flag State Administrations when and to the extent that the *Register* has been authorised to do so by the respective Flag State.

Statutory certification and services include the assessment of vessels registered by the Flag State and/or ship management companies to determine whether such ships/companies comply with the applicable requirements of international conventions, codes and national legislation, and the issuance of, or assistance in the issuance of, the appropriate certificates and documents.

Statutory certification includes, but is not limited to, certification, survey, and issuance of statutory certificates on behalf of the Flag State.

In cases where the *Register* acts on behalf of Flag State Administrations, the *Register* shall follow guidance issued by IMO (Resolutions, Circulars, etc.) or by IACS through Unified Interpretations (UI), unless otherwise directed by the Flag State.

2.5 **Client** means the shipowner, company, shipyard and/or party requesting Services or taking ownership of a classed vessel. In cases where shipowners have authorized another party to operate the vessel on their behalf, that party shall be considered as the company.

In addition to the above the Client means the person and/or entity that has requested Services from the *Register* and that has entered into a Contract or an agreement for Services with the *Register*.

2.6 **Parties** means the *Register* and Client together.

2.7 **Party** means the *Register* or the Client.

2.8 **Contract** means the contract in the form of a written agreement between the Client and the *Register* requesting Services, including these General Terms and Conditions and the Rules.

The provisions related to the Contract in these General Terms and Conditions shall apply even if there is no written agreement between the Client and the *Register*.

The Client may request the *Register* in writing to make a change to the contracted Services. However, the *Register* shall not be obligated to accept or execute any such change until a written agreement has been signed with the Client regarding the compensation and the possible impact of the change on the schedule as an addendum to the originally contracted Services.

2.9 **Services** shall mean the services specified in 2.2, 2.3 and 2.4, but also other services related to certification, classification and statutory certification, such as, but not limited to: ISM Code certification, ISPS Code, MLC 2006 certification, fuel oil consumption reporting, IHM certification, approval of manufacturers and service providers, certification of materials and products, training activities, conformity assessment, and any other relevant activities such as third party inspections, testing, shore and shipboard trials.

The Services provided by the *Register* are performed on a random basis and in no case include a full inspection of all items.

The *Register* shall provide the Services in accordance with related Contract(s), the provisions of these General Terms and Conditions, Rules, the international and national standards, the international conventions, the EU Regulations, the Flag State requirements and the industry practices applicable to the particular Service and always assuming that the Client is aware of these standards and the industry practices.

When providing Services, the *Register* does not guarantee the accuracy of the information or advice provided.

In providing Services, the *Register* does not assess compliance with standards other than the Rules, international and national standards, international conventions, EU regulations, Flag State requirements and industry practice, to the extent agreed in writing or specified in the Contract.

2.10 The *Register* means the Croatian Register of Shipping, an entity organized and existing under Croatian law, which, according to the Law on the Croatian Register of Shipping (Official Gazette No. 1996/81, 2013/76 and 2020/62) and the Charter of the *Register*, is an independent, not-for-profit, but public welfare oriented, public foundation that performs tasks:

- classification of sea-going ships,
- statutory certification of sea-going ships on behalf of the Flag State Administrations,
- classification of inland navigation vessels,
- statutory certification of inland navigation vessels,
- statutory certification of recreational crafts,
- certification of materials and products,
- conformity assessment of recreational crafts,
- conformity assessment of marine equipment,
- conformity assessment of pressure vessels,
- certification/registration of quality management systems.

2.11 **Vessel** means a ship, vessel, unit or offshore structure of any kind, whether or not connected to the shore or sea/river bed, located at sea or in inland waters and intended for transportation or special operations on the water, as decided by the *Register*.

2.12 **Rules** means the Rules for the classification, guidelines, instructions, or other documented evidence of the *Register* related to the Services provided.

The competent interpretation of the requirements specified in the Rules or other regulations published by the *Register* shall be the exclusive responsibility of the *Register's* Head Office, notwithstanding any possible different interpretations by other parties.

In cases where the Rules do not contain detailed requirements, the specific approval by the *Register* shall be based on the principles of the Rules and shall ensure a safety standard equivalent to that of the Rules.

Article 3 RESPONSIBILITIES

3.1 It is the Client's responsibility to ensure that all surveys required for vessel's class maintenance are conducted in a timely manner and in accordance with the Rules.

3.2 The *Register* may suspend or withdraw the vessel's existing Certificate of class in the event of serious deficiencies and replace it with a new Certificate of class with a shortened period of validity during which the deficiencies are to be rectified.

In addition, the *Register* shall suspend or withdraw a vessel's Certificate of class if the deficiencies are of such a magnitude as to endanger the class of the vessel, its safety and integrity, the safety of the crew, passengers, or the marine environment, and shall require that the vessel is to be inspected at the first port of call where the necessary repairs are to be carried out.

3.3 The Client should inform the *Register*:

- (i) in the event of a change in the intended use of a vessel, a conversion and alteration of the hull, machinery installations and other equipment affecting the Class of the vessel assigned by the *Register*. Conversions and alterations must be made under the supervision of the *Register* and must comply with the requirements of the Rules and/or additional requirements of the *Register*,
- (ii) in cases where the vessel has been damaged to such an extent that the Class of the vessel is likely to be affected and the safety and integrity of the vessel is likely to be compromised. In such cases, the vessel must be surveyed at the first port of call or as further directed by the *Register*. The survey shall be to the extent deemed necessary by the *Register*, by taking into account the extent of the damage.
- (iii) in cases where class-related deficiencies and/or defects are found as a result of a Flag State inspection or Port State Control. Should the Client fail to notify the *Register* of the detention of the vessel by Port State Authorities due to class related deficiencies, the *Register* reserves the right to suspend or withdraw the Certificate of class.

3.4 The *Register* shall have full control over Certificates issued and may suspend or withdraw a Certificate at any time in its sole discretion if the Client fails to comply with the following requirements set forth in the *Rules for the Classification of Ships, Part 1 - General Requirements, Chapter 1 - General Information*, as applicable:

- (i) para. 5.3 - *Maintenance of the validity of Certificate of Class*,
- (ii) para. 5.4 - *Period of Validity*,
- (iii) para. 5.5 - *Extension of the Period of Validity*,
- (iv) para. 5.6 - *Suspension and Reinstatement of Class in the Case of Overdue Surveys*, and
- (v) para. 5.7 - *Withdrawal of Class*.

3.5 The *Register* may suspend or withdraw a Certificate at any time in its sole discretion if the Client fails to comply with the following requirements set forth in the *Rules for the Classification of Inland Navigation Vessels, Part 1 - Classification and Surveys, Chapter 1 - Principles of Classification*, as applicable:

- (i) para. 2.8 - *Maintenance of the Validity of the Certificate of Class*,
- (ii) para. 2.9 - *Extension of validity of the Certificate of Class*, and following requirements set forth in the *Rules for the Classification of Inland Navigation Vessels, Part 1 - Classification and Surveys, Chapter II - Classification*, as applicable:
- (iii) para. 2.1 - *Suspension of Class*,
- (iv) para. 2.2 - *Withdrawal of Class*.

3.6 In addition to clauses 3.2, 3.4 and 3.5 of this Article, the *Register* reserves the right to terminate the Services and related Contract in the event of a breach of the provisions of these General Terms and Conditions.

3.7 If the Client fails to provide the *Register* with the required access or information at the agreed times or fails to prepare for the Service in a timely manner, the *Register* may suspend the provision of the Service until it receives the Client's instructions for access and/or the required information.

The *Register* shall not be liable for the consequences of such suspension, and the Client shall be responsible for the *Register's* additional fees and other unnecessary costs and expenses incurred by the *Register*.

3.8 The Client is obliged to perform timely payments of the invoices for provided Services. However, the *Register* may retain or withhold any Service or Certificate to the Client in the case of outstanding payments, whether mutually related or not, arising out of the entire business relationship with the Client.

Article 4 HEALTH, SAFETY AND ENVIRONMENT

4.1 Both the *Register* and the Client shall apply reasonable standards to promote safety, health, and environmental protection and to provide a safe working environment for their personnel.

4.2 The Client shall provide the *Register* with all access and information necessary for the safe and efficient performance of the requested Services as required by the Rules.

4.3 During the survey, personnel of the *Register* should have secure access to all work that directly or indirectly affects the Service.

4.4 The *Register* has the right to refuse to conduct an activity or visit an area or site if the *Register* in its sole discretion, believes that relevant risks are unacceptable or are not adequately addressed, contained, or otherwise mitigated.

Such a decision shall suspend the obligations of both Parties under the Contract without incurring any liability or penalty until the Parties agree on how to proceed.

Article 5 THIRD PARTIES AND SUBCONTRACTORS

5.1 Each specific Contract, including any Certificates issued, relates specifically to the Client, and no rights, obligations, interests, claims, benefits or Certificates issued shall extend to any third party without the prior written consent of the *Register*.

5.2 The Client shall not be entitled to grant any right to use the Certificates to any third party without the prior written consent of the *Register*.

5.3 The Client shall not without *Register's* consent, cede, assign, transfer, subcontract or deal in any manner with all or any of its rights or obligations under any Service and related Contract.

5.4 With regard to third party rights to access information and Certificates under confidentiality clause reference is to be made to Article 9.

Article 6 TAXES

6.1 Each Party shall be responsible for and shall bear all taxes, duties or similar governmental charges levied or imposed on any activity of that Party.

6.2 Prices, fees, rates, or remuneration are exclusive of any form of sales tax, value added tax, administrative fees and services tax and/or other similar taxes, including any surcharges. If any such indirect tax is or becomes applicable to the Services provided under the Contract, the Client shall be responsible for the payment of such indirect taxes.

Article 7 PAYMENT OF INVOICES

7.1 The provision of Services by the *Register*, whether complete or not, shall include payment of fees thirty (30) days after issuance of the invoice for the portion of the Services performed.

7.2 In the event that the Client fails to meet the requirements for payment in accordance with the instalments and terms of payment contained herein, the *Register* reserves the right to charge the Client with the interest rate in accordance with the applicable laws of the Republic of Croatia.

7.3 If the Client disputes an invoice or part of an invoice, the Client shall notify *Register* thereof in writing without undue delay. If no notification is received by the due date, Client shall be deemed to have accepted the invoice in full. If only part of an invoice is disputed, the undisputed amount must be paid by the due date.

Consequently, no disputes arising between the *Register* and the Client shall interfere with prompt payment of invoices by the Client. Any rights of lien or retention in favour of the Client or otherwise, are hereby excluded.

7.4 In the event of cancellation of all or part of the Services prior to their final completion, the Client shall pay all costs incurred by the *Register* on pro-rata basis for the portion of the Services provided to date. In such event, the *Register* will not claim the Client for loss of profit or reduced income. All reasonable costs directly attributable to the early termination and all amounts due to the *Register* at that time shall become immediately due and payable.

7.5 In the event of termination of the Service and related Contract, the *Register* shall be entitled to retain any payments, deposits or prepayments of fees made by the Client prior to the date of termination up to the amount to which the *Register* is entitled.

Article 8 TERMINATION

8.1 The Parties shall have the right to terminate the Services and the related Contract(s) by written notice to the other Party, and without prejudice to Article 7, in the following cases:

- (i) if the other Party commits a material breach of these General Terms and Conditions and/or the Contract and fails to rectify such breach in accordance with clause 8.4 of this Article,
- (ii) if the other Party becomes insolvent, is unable to pay its debts as they become due, or becomes subject to bankruptcy proceedings, administration, receivership, dissolution, liquidation, winding up or otherwise ceases to carry on its business; or
- (iii) for convenience, after giving the other Party thirty (30) days' prior written notice of termination.

8.2 The Classification issued for the relevant vessel and the Certificates previously issued shall remain valid until the effective date of termination or, in the event of such termination, immediately, subject to compliance with Article 3 and Article 7.

8.3 If, in the reasonable opinion of the *Register*, the Client breaches or is suspected of breaching Article 14 or Article 15, the *Register* shall have the right to terminate the Service and related Contract with immediate effect.

8.4 Notwithstanding the provisions of clause 8.1 of this Article, the Party intending to terminate Services for non-compliance or breach of the provisions of these General Terms and Conditions shall notify the other Party of the non-compliance or violation of the provisions of these General Terms and Conditions and set a reasonable deadline of 15 (fifteen) days for the other Party to remedy the breaches of the provisions of these General Terms and Conditions.

If the Party fails to remedy the breaches of the provisions of these General Terms and Conditions within the aforementioned period, the other Party shall have the right to terminate Services without further notice.

8.5 Termination of the Service and related Contract pursuant to the provisions of these General Terms and Conditions shall not give either Party the right to claim any additional compensation, indemnity or reimbursement from the other Party as a result of such termination, but such termination shall not affect any rights or remedies available to a Party at the time the termination becomes effective or any obligations or liabilities incurred by a Party.

Article 9 CONFIDENTIALITY

9.1 The Parties agree to keep confidential all facts, data, information, etc. related to the other Party's business that they have learned in the course of providing Services. Such information and data shall not be disclosed by the Parties to any third party and shall not be used or misused to the detriment of the other Party.

9.2 The *Register* will keep confidential any data, plans or other technical information received from the Client and will not disclose it to any third party outside the *Register*, unless authorised by the Client. This obligation shall continue to apply after termination of the Services. This obligation shall not apply to any data, plans or other technical information that was in the possession of the *Register* prior to being disclosed to the *Register* by or on behalf of the Client, or that becomes publicly available through no fault of the *Register*, or is otherwise provided to the *Register* by an independent source that is under no obligation of confidentiality to the *Register*.

9.3 Certificates issued by the *Register* to the Client as a result of the Services provided shall not be covered by the confidentiality Article.

Notwithstanding the foregoing, the Client shall be entitled to disclose any data to its affiliates involved in the transactions related to the Services or the Client's core activities.

9.4 Notwithstanding clause 9.1 and clause 9.2 of this Article, the *Register* shall have the right to disclose the Confidential Information to the following parties if required by regulations of:

- (i) authorised representatives of the Flag State Administration,
- (ii) authorised audit teams (i.e., accreditation body or EC auditors),
- (iii) the International Association of Classification Societies (IACS),
- (iv) a court of competent jurisdiction, government agency, or other relevant public authority, in accordance with applicable law, court order, or other public regulation.

9.5 The Client acknowledges that the *Register* is required to provide access to information to the EU Commission or any person acting on its behalf in accordance with applicable EU requirements and that the Client shall give the EU Commission with unrestricted access to the vessels for the purpose of inspection.

9.6 The obligations in this Article shall survive the conclusion of the Service or the termination of related Contract and shall continue for as long as the relevant information remains confidential.

Article 10 INTELLECTUAL PROPERTY

10.1 Each Party shall be the sole owner of all rights to its Intellectual Property created before or after the effective date of these General Terms and Conditions, whether or not associated with any Contract between the Parties.

10.2 The Intellectual Property developed by the *Register* for the provision of the Services, including but not limited to drawings, calculations and reports, shall remain the exclusive property of the *Register*.

Article 11 PROFESSIONAL ETHICS

11.1 Each of the Parties warrants that, with respect to the matters contemplated herein, neither it nor its affiliates has made or will make, directly or indirectly, any offer, payment, gift or authorization of money to any government official or employee, political party, public official or candidate for the benefit or advantage thereof.

11.2 In providing the Services, the *Register* shall strictly adhere to the requirements of its Code of Ethics relating to business activities.

Article 12 FORCE MAJEURE

12.1 For the purposes of these General Terms and Conditions, the term "Force Majeure" includes any event that directly or indirectly prevents the Parties from fulfilling their obligations due to events beyond their control, such as: strikes, wars, riots, piracy, civil commotion, malicious damage, pandemic, compliance with laws or government orders, rules, regulations or directives, sanctions and embargoes, accidents, defects of plants or machinery, seizures, fires, floods, storms and the like.

12.2 If either Party is prevented or delayed from performing its obligations by Force Majeure, such Party shall promptly notify the other Party in writing of the circumstances of the Force Majeure and its influence and, after such notification, shall not be liable for performance of any obligations prevented by the influence of the Force Majeure during its duration. Upon termination of the influence of the Force Majeure, the same Party should proceed with the planned activities in order to fulfil its obligations.

12.3 If one of the Parties is prevented by Force Majeure in its activities and fulfilment of its obligations and this event lasts continuously for three (3) months, the other Party shall be entitled to terminate the Service and related Contract without liability.

12.4 Neither of the Parties shall be liable for non-compliance with these General Terms and Conditions due to Force Majeure. If one of the Parties is prevented from fulfilling its obligations under these General Terms and Conditions due to Force Majeure, it shall immediately notify the other Party in writing within a reasonable period of time, stating the reasons for the Force Majeure and providing relevant evidence, if any.

Article 13 INDEMNIFICATIONS

13.1 Each Party shall indemnify the other Party against all claims arising out of the performance of the Services in respect of bodily injury, illness or death of any of its employees or other representatives and in respect of loss of or damage to the Party's property.

This provision shall apply whether or not the damage is caused or contributed to by the negligence of the other Party. Both Parties are obliged to take out separate insurances for these liabilities.

13.2 The Client shall indemnify the *Register* from and against all claims arising from the Client's violation of the provisions of these General Terms and Conditions and from the misuse of the Certificates issued by the *Register*.

13.3 The Client shall indemnify the *Register* against any financial responsibility or amounts arising from non-payment, late payment or payment of withholding taxes to the non-relevant tax authority or any other relevant governmental body.

13.4 Each Party shall notify the other Party without undue delay as soon as it becomes aware of any incident that could give rise to a claim against the other Party in respect of the Service provided and related Contract.

Article 14 ANTI-CORRUPTION

14.1 Each Party agrees that in performing its obligations under any Service, it will ensure that its affiliates, employees and/or agents, subsidiaries, subcontractors, consultants, and any other persons providing Services will:

- (i) comply with all applicable anti-bribery and anti-corruption laws (collectively, Anti-Bribery Laws) and, in particular, do not, directly or indirectly, offer, promise, grant, authorise the payment of, or confer any financial or other benefit on any public or government official:
 - to a public or governmental official to obtain or retain business with the intent to influence such official in his or her capacity as an official, if such official is not permitted or required by written law to be influenced by the offer, promise or gift; or
 - to another person with the intent to induce or reward the improper performance of a function or activity or for any other illegal purpose,
- (ii) maintain adequate systems and procedures designed to prevent activities, practises, or conduct in connection with services that would constitute an offence under an anticorruption law; and
- (iii) take reasonable steps to prevent similar acts by customers, contractors, subcontractors, agents and other third parties, persons under its control or influence.

14.2 Any failure by a Party to comply with or ensure compliance with its obligations under this Article shall, notwithstanding anything to the contrary in these General Terms and Conditions, be deemed a breach of these General Terms and Conditions which shall entitle the other Party to suspend and/or terminate the Services by notice in writing with immediate effect without further liability to the other Party except for any liability which may have arisen prior to the date of termination or suspension (as the case may be).

14.3 If a Party elects to suspend the provision of Services under these General Terms and Conditions pursuant to this Article, it shall have the sole and absolute discretion to determine:

- (i) when it will resume performance (if at all); and
- (ii) extend the period for performance of its obligations under the Services in its sole discretion.

Article 15 SANCTIONS

15.1 Each Party shall conduct all activities in compliance with all laws, statutes, rules, economic and trade sanctions (including, but not limited to, U.S. sanctions and EU sanctions) and regulations applicable to such Party, including, but not limited to: child labour, forced labour, collective bargaining, discrimination, abuse, working hours and minimum wages, anti-bribery, anti-corruption, copyright and trademark protection, personal data protection.

15.2 Each Party hereby represents and warrants that it is not or will not be subject to any economic or trade sanctions ("Sanctions") imposed by the United States of America, the European Union, the United Kingdom, any EU Member State, or the United Nations with respect to any country and/or by any sanction giver with respect to any company/individual.

15.3 Each Party represents and warrants that it will strictly comply with all Sanctions.

15.4 Nothing in these General Terms and Conditions shall be construed as causing or obligating either Party to act or refrain from acting in a manner inconsistent with, punishable by, or prohibited by any Sanctions.

15.5 Neither Party shall be obligated to perform any obligation arising under these Terms and Conditions (including, without limitation, the obligation to):

- (i) perform, deliver, accept, sell, purchase, pay or receive any funds to, from or through any person or entity; or
- (ii) engage in any other action whatsoever, if doing so violates or is inconsistent with sanctions and/or recommendations of international (intergovernmental) organisations to combat the financing of terrorism and other criminal activities and/or money laundering or exposes such Party to investigation or penalties.

15.6 In the event that a Party breaches any Sanctions or the Party's Business and/or Transactions arising out of or in connection with these General Terms and Conditions breach any Sanctions or otherwise violate the recommendations of one or more international (intergovernmental) organisations for combating the financing of terrorism and other criminal activities and/or money laundering, the other Party shall be entitled to terminate these General Terms and Conditions by written notice with immediate effect without incurring any liability to the other Party, except for liabilities (if any) incurred prior to the date of termination.

Article 16 LIABILITY

16.1 The *Register* is not, and cannot be considered as, an underwriter, consulting engineer, naval architect, shipbuilder, shipowner, or ship management company, nor can it assume the obligations and responsibilities associated with such functions, although the *Register's* experience may enable it to respond to inquiries about matters not covered by its Rules, policies, instructions, or other documented evidence.

16.2 The practices and procedures of the *Register* shall be selected by the *Register* in its sole and absolute discretion based on its experience and knowledge and in accordance with generally accepted professional standards in the relevant field of classification societies.

16.3 Nothing herein contained shall release any designer, naval architect or engineer, shipbuilder or manufacturer, shipyard, vendor, supplier, contractor or subcontractor, repairer or owner, from any information, report, certificate or similar document issued in connection with the provision of Services by the *Register*, operator, manager or other person or entity from any express or implied warranty or other contractual obligation or responsibility, or from any negligent act, error or omission of any kind whatsoever, nor shall they create any right, claim or benefit for any third party.

16.4 The *Register* shall exercise due care in the selection or appointment of its surveyors and all other employees whose presence and work is necessary for the provision of the Services.

16.5 If any person or entity using the Services of the *Register* suffers any loss, damage or expense that is or is shown to have been caused by a negligent act, omission or error of the *Register's* officers, surveyors, auditors, inspectors, agents, appointees, officers or managers, or those purporting to act in the name of and on behalf of the *Register*, or a negligent inaccuracy, advice, report or evidence given by or in the name of or/and on behalf of the *Register*, then the liability of the *Register* is limited in respect of any direct or indirect claim shall be limited to an amount not exceeding five times the fee charged or to be charged by the *Register* for the relevant Service.

16.6 Any liability for consequential damages is expressly excluded.

For purposes of this clause, consequential damages include, without limitation:

- (i) indirect or consequential damages,

- (ii) loss and/or delay of production, loss of products, loss of use, loss of bargain, loss of revenue, loss of profit or anticipated profit, loss of business and business interruption, in each case directly or indirectly.

16.7 The Parties are not entitled to assign the performance of obligations under these General Terms and Conditions or parts thereof to third parties without the prior written consent of the other Party.

16.8 If during the term of the Contract, there is a transfer of function due to change of status (merger, acquisition, division, etc.), all obligations and rights under these General Terms and Conditions and associated Contract will be transferred to the legal successor of the Party concerned.

Article 17 GOVERNING LAW AND RESOLVING OF DISPUTES

17.1 These General Terms and Conditions and any dispute or claim between the Parties arising from or in connection with it, or the Services provided hereunder, will be governed and interpreted in accordance with the English law.

17.2 The Parties shall use their reasonable efforts to resolve any claim or dispute arising in relation to rendered Service by negotiations within a reasonable time.

17.3 Should the Parties fail to resolve any claim or dispute by negotiations, the dispute shall be exclusively subject to the jurisdiction of the Permanent Arbitration Court with the Croatian Chamber of Economy in Zagreb, Republic of Croatia.

17.4 The Parties agree to keep the any arbitration proceedings confidential.

17.5 Notwithstanding the above, any claim not presented within three (3) months of the completion of the particular Services, or within three (3) months of from the date when the events which are relied on were first discovered by the Client, shall be deemed waived and absolutely time barred.

17.6 Any objections against the line adopted by any of the *Register's* servants in fulfilling their duties or against the conclusions reached are to be raised to the *Register* by the Party as soon as possible.

If the Party is not satisfied with the final conclusions and interpretations by the *Register* the arbitration lays upon the Commission for appeal for Classification and Statutory certification of ships, which is to be formed according to the Regulation 39 of the Charter of the *Register*.

INTRODUCTORY NOTES

These amendments shall be read together with the requirements in the Rules for the Classification of Ships, Part 9 – Machines, edition July 2022.

Table 1 contains review of amendments, where items changed or added in relating to previous edition are given, with short description of each modification or addition. All major changes throughout the text are shaded.

This Part of the Rules includes the requirements of the following international Organisations:

International Maritime Organization (IMO)

Conventions: International Convention for the Safety of Life at Sea 1974 (SOLAS 1974) and all subsequent amendments up to and including the 2014 amendments (MSC.365/93). Protocol of 1988 relating to the International Convention for the Safety of Life at Sea 1974, as amended (SOLAS PROT 1988).

Circulars: MSC.1/Circ.1425

International Association of Classification Societies (IACS)

Unified Requirements (UR): A3 (Rev.1 2019), F29 (Rev. 6, 2005), M2 (1971), M3 (Rev. 6, 2018), M9 (Corr. 2, 2007), M10 (Rev. 4, 2013), M11 (1972), M12 (1972), M16 (Rev. 1, 2005), M26 (Corr. 1, 2005), M28 (1978), M42 (Corr. 1, Oct 2021), M44 (Corr. 1, Feb 2022), M51 (Corr. 1, Oct 2018), M53 (Rev. 4, Aug 2019), M56 (Corr.1, Oct 2021), M60 (Rev.1, Nov 2021), M61 (Rev.1, Feb 2022), M63 (2005), M66 (Corr. 1, Oct 2021), M67 (Rev. 2, 2015), M71 (Corr.1, 2016), M72 (Rev.2, 2019), M73 (Rev.1, Mar 2022), M74 (Rev. 2, June 2021), Z26 (2015), M77 (Rev. 3, Sep 2021), M79 (Rev. 1, Feb 2020), M80 (2019), M81 (Jan 2021)

Unified Interpretations: SC76 (1985), SC94 (Rev. 2, 2016), SC133 (1998), SC189 (2004), SC228 (2008), SC242 (Rev.2, 2020), SC246 (Rev.1, 2015)

International Organisation for Standardisation:

ISO 1122-1:1998 Corr. 1:1999 Corr. 2:2009, ISO 1328-2:2020, ISO 6336-1:2019, ISO 6336-2:2019, ISO 6336-3:2019, ISO 6336-5:2016, ISO 19019:2005

TABLE 1 – REVIEW OF AMENDMENTS

This review comprises amendments in relation to the Rules for the Classification of Ships, Part 9 – Machines, edition July 2022.

| <i>ITEM</i> | <i>DESCRIPTION OF THE AMENDMENTS</i> |
|--|---|
| SECTION 2 – INTERNAL COMBUSTION ENGINES | |
| Head 2.20 | Existing item 2.20.1 has been amended to include requirements contained in IACS UR M73, Rev.1, Mar 2022 |
| SECTION 8 – GAS TURBINES | |
| Head 8.7 | Existing Head 8.7 has been amended to include requirements contained in IACS UR M60, Rev.1 Nov 2021 |
| Head 8.9 | Existing Head 8.9 has been amended to include requirements contained in IACS UR M60, Rev.1 Nov 2021 |

2 INTERNAL COMBUSTION ENGINES

■ **Head 2.20 TURBOCHARGERS**, item 2.20.1 has been amended and should be read as follow:

2.20.1 General

2.20.1.1 These requirements are applicable for turbo-chargers with regard to design approval, type testing and certification and their matching on engines.

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

NOTES:

The requirements of this head, except for item 2.20.4, are to be implemented to turbochargers with the date of application for certification of the new turbocharger type on or after 1 July 2016.

The requirements of item 2.20.4 are to be implemented with the date of application for certification of an individual turbocharger on or after 1 July 2016.

The "date of application for certification" is the date of whatever document the Register requires/accepts as an application or request for certification of a new turbocharger type or of a turbocharger type that has undergone substantive modifications in respect of the one previously type approved, or for renewal of an expired type approval certificate.

The requirements of this head, except for item 2.20.4, are to be uniformly implemented to turbochargers with the date of application for certification on or after 1 January 2023. Turbochargers with an existing type approval on 1 January 2023 are not required to be re-type approved in accordance with this head until the current Type Approval reaches its expiry date.

The requirements of item 2.20.4 are to be implemented to turbochargers with the date of application for certification of an individual turbocharger on or after 1 January 2023.

2.20.1.2 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 engine power).

2.20.1.3 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.

2.20.2 Documentation to be submitted

2.20.2.1 For turbochargers of category A:

- Containment test report;
- Cross sectional drawing with principal dimensions and names of components;
- Test program.

2.20.2.2 For turbochargers of category B and C:

- Cross sectional drawing with principal dimensions and materials of housing components for containment evaluation;
- Documentation of containment in the event of disc fracture, see 2.20.3.2.
- Operational data and limitations as:
 - Maximum permissible operating speed (rpm);
 - Alarm level for overspeed;
 - 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;
 - Arrangement of lubrication system, all variants within a range;
 - Type test reports;
 - Test program.

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%.

2.20.2.3 For turbochargers of 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, see 2.20.3.3 (*NOTE: Applicable to two sizes in a generic range of turbochargers*);
- Information on expected lifespan, considering creep, low cycle fatigue and high cycle fatigue;
- Operation and maintenance manuals (*NOTE: Applicable to two sizes in a generic range of turbochargers*).

2.20.3 Design requirements and corresponding type testing

2.20.3.1 General

2.20.3.1.1 The turbochargers shall be designed to operate under conditions stated in the *Rules for the classification of ships, Part 7 - Machinery Installations*, 1.6. The component lifetime and the alarm level for speed shall be based on 45°C air inlet temperature.

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

2.20.3.2 Containment

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

2.20.3.2.2 For turbochargers of 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.

NOTE: A generic range means a series of turbocharger which are of the same design, but scaled to each other.

2.20.3.2.3 The minimum test speeds, relative to the maximum permissible operating speed, are:

- For the compressor: 120%;
- For the turbine: 140% or the natural burst speed, whichever is lower.

2.20.3.2.4 Containment tests shall be performed at working temperature.

2.20.3.2.5 A numerical analysis (simulation) of sufficient containment integrity of the casing based on calculations by means of a simulation model may be accepted in lieu of the practical containment test, provided that:

- The numerical simulation model has been tested and its suitability/accuracy has been proven by direct comparison between calculation results and the practical containment test for a reference application (reference containment test). This test shall be performed at least once by the manufacturer for acceptance of the numerical simulation method in lieu of tests;
- The corresponding numerical simulation for the containment is performed for the same speeds as specified for the containment test;
- Material properties for highspeed deformations are to be applied in the numeric simulation. The correlation between normal properties and the properties at the pertinent deformation speed are to be substantiated;
- The design of the turbocharger regarding geometry and kinematics is similar to the turbocharger that was used for the reference containment test. In general, totally new designs will call for a new reference containment test.

2.20.3.3 Disc-shaft shrinkage fit

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 (*NOTE: Applicable to Category C*).

2.20.3.4 Type testing

2.20.3.4.1 Turbocharger type testing is applicable to Categories B and C.

2.20.3.4.2 The type test for a generic range of turbochargers may be carried out either on an engine (for which the turbocharger is foreseen) or in a test rig.

2.20.3.4.3 Turbochargers are to be subjected to at least 500 load cycles at the limits of operation. This test may be waived if the turbocharger together with the engine is subjected to this kind of low cycle testing, see 2.14.

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2.20.3.4.4 The suitability of the turbocharger for such kind of operation is to be preliminarily stated by the manufacturer.

2.20.3.4.5 The rotor vibration characteristics shall be measured and recorded in order to identify possible sub-synchronous vibrations and resonances.

2.20.3.4.6 The type test shall be completed by a hot running test at maximum permissible speed combined with maximum permissible temperature for at least one hour. After this test, the turbocharger shall be opened for examination, with focus on possible rubbing and the bearing conditions.

2.20.3.4.7 The extent of the surveyor’s presence during the various parts of the type tests is left to the discretion of the *Register*.

2.20.4 Certification

2.20.4.1 The manufacturer shall adhere to a quality system designed to ensure that the designer’s specifications are met, and that manufacturing is in accordance with the approved drawings.

2.20.4.2 For category C, this shall be verified by means of periodic product audits of an Alternative Certification Scheme (ACS) by the *Register*.

2.20.4.3 These audits shall focus on:

- Chemical composition of material for the rotating parts;
- Mechanical properties of the material of a representative specimen for the rotating parts and the casing;
- UT and crack detection of rotating parts;
- Dimensional inspection of rotating parts;
- Rotor balancing;
- Hydraulic testing of cooling spaces to 4 bars or 1.5 times maximum working pressure, whichever is higher;
- Overspeed test of all compressor wheels for a duration of 3 minutes at either 20% above alarm level speed at room temperature or 10% above alarm level speed at 45°C inlet temperature when tested in the actual housing with the corresponding pressure ratio. The overspeed test may be waived for forged wheels that are individually controlled by an approved non-destructive method.

2.20.4.4 Turbochargers shall be delivered with:

- For category C, a Register certificate, which at a minimum cites the applicable type approval and the Alternative Certification Scheme (ACS), when ACS applies;
- For category B, a work’s certificate, which at a minimum cites the applicable type approval, which includes production assessment.

2.20.4.5 The same applies to replacement of rotating parts and casing.

2.20.4.6 Alternatively to the above periodic product audits, individual certification of a turbocharger and its parts may be made at the discretion of the *Register*. However, such individual certification of category C turbocharger and its parts shall also be based on test requirements specified in the above mentioned bullet points.

2.20.5 Alarms and Monitoring

2.20.5.1 For all turbochargers of Categories B and C, indications and alarms as listed in the table are required.

2.20.5.2 Indications may be provided at either local or remote locations.

| Pos. | Monitored Parameters | Category of Turbochargers | | | | Notes |
|------|---|---------------------------|------------------|---------------------|------------------|--|
| | | B | | C | | |
| | | Alarm | Indication | Alarm | Indication | |
| 1 | Speed | high ⁽⁴⁾ | X ⁽⁴⁾ | high ⁽⁴⁾ | X ⁽⁴⁾ | |
| 2 | Exhaust gas at each turbocharger inlet, temperature | high ⁽¹⁾ | X ⁽¹⁾ | high | X | High temp. alarms for each cylinder at engine is acceptable ⁽²⁾ |
| 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 ⁽³⁾ |

⁽¹⁾ 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.

⁽²⁾ 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.

- (3) *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.*
- (4) *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.*

8 GAS TURBINES

■ **Section 8 GAS TURBINES** has been amended and should be read as follow:

8.1 GENERAL REQUIREMENTS

8.1.1 The requirements of the present Section are applicable to the main and auxiliary marine gas turbines with combustion chambers.

8.1.2 The design output refers to the design conditions, i.e. the specified values of temperatures of ambient air and water, of air humidity, of atmospheric pressure and of resistance of exhaust and suction adopted when designing gas turbines.

8.1.3 When one gas turbine is employed in ships of unrestricted service, the necessity of application of the emergency device ensuring the ship movement shall be agreed upon with the *Register* in each case.

8.1.4 The gas turbine with air intercooling shall develop an output not less than 20% of the design one, when water supply to the air cooler is completely shut off.

8.1.5 The gas turbine installation with a reversing device shall provide reversing from full ahead to full astern and vice versa.

The gas turbine installation without a reversing device may be installed provided the ship is equipped with other means and devices ensuring the reverse.

When the astern turbine is employed, the requirements of 3.1.2 and 3.6.2 shall be complied with; when the reverse-reduction gearing is used the requirements of 4.1.1 of this Part of the Rules and in case of controllable pitch propeller the requirements of 3.5.4 of the *Rules for the classification of ships, Part 7 - Machinery Installation* shall be met.

When using the compressed air for the reverse system, its store shall provide at least 25 re-settings of the reverse. Refuelling of compressed air store shall be automatic from at least two sources of compressed air.

Connection of other consumers to the high pressure compressed air systems providing the operation of the reverse system, protection of gas turbines, bridge control shall not be permitted.

8.1.6 The steady operation of the gas turbines without stalling and surging under all possible operating conditions, manoeuvring included, as well as at the permissible deposits on gas turbines and under ambient conditions stated in 1.6 of the *Rules for the classification of ships, Part 7 - Machinery Installation* shall be proved by calculations and experiments.

Increases and drops of load shall be performed at the speed specified for the gas turbine bridge control system throughout the operating range.

The program of the operation stability control for the gas turbine shall be agreed with the *Register* the control shall be performed at the test bench and on board.

8.1.7 Throughout the operating and starting ranges shall be no zones restricting the operation of the gas turbine due to vibration.

The vibration shall be determined by a vibration of the gas turbine casing in way of bearings and shall not exceed the values stated in the standards.

8.1.8 For the gas turbines for ships with ice strengthening of category 1 AS, 1 A and 1 B the requirements of 1.4.2 of the *Rules for the classification of ships, Part 7 - Machinery Installation* shall be complied with; if these requirements cannot be fulfilled, the loads on units transmitting the power from the gas turbine to propeller shall be agreed upon with the *Register*.

8.1.9 The starting device of each gas turbine shall be operated from at least two sources of power.

A change over from one source of power to the other for starting up the gas turbine shall be performed in not more than 60 sec. Provision shall be made for starting up the gas turbine to the full stop of the rotor.

Hydrofoil ships and air-cushion vehicles need not to be provided with two sources of power.

The provision shall be made for ensuring at least four successive starts of the gas turbine.

8.1.10 Provision shall be made for cleaning the blading of gas turbine under the ship's service conditions without stopping the gas turbine.

For hydrofoil ships and air-cushion vehicles, the cleaning of gas turbines may be carried out by means of shore appliances.

8.1.11 The air suction inlets of the gas turbines shall be fitted with filters to preclude entering of particles including sea salt into compressor, dangerous for the normal operation of the gas turbine. The provisions shall be made for closing air suction inlets when gas turbines are out of operation.

The air suction inlets shall be fitted with quick-closing devices. The location of the air suction inlets shall prevent the entry of water, vapours or blow-out from a fan into compressor.

Provisions shall be made for preventing the suction duct from icing if the risk of icing exists in the ship's operating conditions. The reserve intake of 60% of air volume shall be provided in case of icing of the main suction inlet.

In agreement with *Register* measures against icing and the reserve intake need not to be provided for the hydrofoil ships and air-cushion vessels.

Drainage shall be provided through hydraulic valves.

8.1.12 Gas exhaust systems shall be provided with arrangements distance controlled to prevent air circulation through the gas turbine in case of fire and when in port.

If one air duct or exhaust manifold are intended for two or more engines, it is necessary to exclude the recirculation of air and gas through a non-operating engine.

8.1.13 Air suction and gas exhaust trunks, fuel, refrigeration and other piping shall be so connected to the engine that no expansion stresses are transmitted to the place of connection.

8.1.14 In air ducts and trunks of air supply to compressors all inner components shall be manufactured from materials resistant to corrosion in sea conditions. Dimensions of components and fastenings shall exclude the possibility of their penetration through the protective gratings before compressor. All inner mountings shall be fixed. Trunks and ducts shall provide the possibility of periodical checking the condition of inner surfaces.

8.1.15 All turbocompressors, gas turbines shall be fitted with a shaft turning gear. Provision shall be made for interlocking a shaft turning gear with a gas turbine starting device or for an automatic disconnection of the shaft-turning gear.

Quick-disconnecting couplings shall be provided with a device for interlocking the starting up of gas turbine with a reduction gear being disconnected.

8.1.16 Gas turbines for driving the emergency generator and fire pump shall be fitted with independent fuel, lubricating oil and cooling systems. In addition to automatic starting, manual starting shall be provided.

8.1.17 Automatic or interlocked means shall be provided for clearing all parts of the main gas turbine of the accumulation of liquid fuel or for purging gaseous fuel, before ignition commences on starting or recommences after failure to start.

Each main gas turbine shall be provided with a fire extinguishing system independent of the fire extinguishing systems of a machinery space.

When there are several gas turbines in a ship, provision shall be made for supply of fire extinguishing agent from a fire extinguishing system of one gas turbine to another.

8.1.18 Starting devices shall be so arranged that firing operation is discontinued and main fuel valve is closed within pre-determined time, when ignition is failed.

8.2 ROTORS

8.2.1 The strength calculation of the rotating parts of the gas turbines shall be performed for the condition of the rated output and for conditions when the stresses can reach their maximum values. The check calculation is carried out for the number of revolutions exceeding the design number by 20%.

8.2.2 The calculation for the enlarged torque corresponding to the operation of gas turbines at the outside air temperature reduced by 20°C as compared to the design temperature shall be performed for the rotating parts of the gas turbine.

8.2.3 The strength calculation of the rotating parts of the astern gas turbines shall be performed to the maximum torque corresponding to the crush stop from full ahead to full astern at the maximum output of astern turbine.

8.2.4 The strength calculation of the units transmitting the gas turbine power for driving the electric generators shall be performed according to the torque for the condition of the short circuit if the system engine-generator does not use the special sliding couplings.

8.2.5 The rotating blades which dimensions do not permit the safety of casings or special sheaths shall have the increased factors of the static and dynamic strength.

8.2.6 The critical speed of the rotor shall be determined with regard for brackets and meet the requirements of 3.2.2. For overhanging rotors the precession calculation and calculation of the additional loads from the gyroscopic moment shall be carried out.

8.2.7 The requirements of 3.2.3 to 3.2.5 of the this Part of the Rules shall be complied with as well.

8.2.8 The dynamic stresses in the compressors blades shall be experimentally determined throughout all operating range, the starting ranges included, and blading shall be set so that the dangerous vibrations do not occur. Factor of fatigue strength of the blades shall be not less than 3 for the operational ranges and 2,5 for the transient ranges. If the corroding medium effect is taken into account, this factor may be reduced to 1,2.

8.3 CASING

8.3.1 Special sight holes for the inspection of the blading shall be provided in the casing of gas turbines and compressors, and gas turbines proper shall be equipped with special instruments for the inspection.

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8.3.2 The casing of the gas turbine shall be in conformity with the requirements of 3.3.4 and 3.3.7 of the present Part; in this case, requirements of 3.3.7 are applicable only to the constructions of gas turbines with sleeve bearings.

8.3.3 When the internal lagging of the gas turbine casing is applied, its safe fastening and covering with a sheath shall be provided excluding its local stripping and entering of the lagging into the blading.

8.3.4 The oil sealing shall prevent lubricating oil and its vapours from entering into the blading of the turbines and compressors and blow out of oil and vapours outside.

8.3.5 Each turbine and compressor shall have drain holes in the lower points of the casing.

Provision shall be made for blowing down the turbine casing for removing the unburned fuel from the combustion chambers and gas piping.

8.4 BEARINGS

8.4.1 The sleeve bearings of the gas turbines shall comply with the requirement of 3.4.

8.4.2 The use of the ball and roller bearings is allowed for all types of ship gas turbines.

8.5 COMBUSTION CHAMBERS

8.5.1 The arrangement of the combustion chambers of the gas turbines shall provide the convenience of servicing and the possibility of replacement of burners and flame tubes by ship's means.

8.5.2 The possibility of inspection of the flame tubes of the combustion chambers without disassembling shall be provided.

8.5.3 The entering of the fuel into the combustion chambers of the gas turbine, while the engine is out of function, shall be excluded.

8.5.4 To remove unburned fuel, provision shall be made for blowing out combustion chamber and gas pipelines.

8.6 HEAT EXCHANGERS

8.6.1 The possibility of detection of the leakage and the location of the damaged member by means of a pressure test shall be provided in the heat exchangers of the gas turbines (regenerators and air coolers).

The regenerators shall be tested for tightness on the gas side, as well as on the air side. The procedure and the method of detecting the leakage and the location of the damaged components, as well as disconnection thereof shall be set forth in special instructions.

8.6.2 The dangerous resonance vibrations and self-excited vibrations of the components of the heat exchangers shall be excluded.

8.6.3 The regenerator shall be provided with a fire extinguishing system in conformity with the *Rules for the classification of ships, Part 17 - Fire Protection*.

8.6.4 The air coolers shall comply with the requirements of 1.5.6.

8.6.5 The air coolers shall provide for the possibility of the inspection and cleaning of the tube plates and for muffling of any tubes without removing the covers.

8.6.6 The air coolers shall be provided with arrangements for continuous removal of moisture falling out of the air during the operation of the gas turbines.

8.6.7 The heat exchangers shall also be in compliance with the requirements of the *Rules for the classification of ships, Part 10 - Boilers, Heat Exchangers and Pressure Vessels*, 1.2 and 6 with the exception of 6.3.1 to 6.3.4, 6.3.6 and 6.4.2.

8.7 CONTROL, PROTECTION AND REGULATION

8.7.1 The main gas turbine shall be provided with the automatic regulation and remote control systems ensuring the following:

- .1 setting of the necessary rates and steady maintaining thereof throughout the whole range of operating speeds;
- .2 starting and stopping under any operating conditions;
- .3 maintaining of steady operation of the compressors and combustion chambers in the manoeuvring mode of operation;
- .4 prevention of the sudden increase of gas temperatures;
- .5 unified control of the gas turbine and propeller by the single lever or hand wheel; however, provision shall be made for separate control;
- .6 restriction of torque at the power take off shaft, if necessary;

The following turbine services shall be fitted with automatic temperature controls so as to maintain steady state conditions throughout the normal operating range of the main gas turbine:

- .7 lubricating oil supply;
- .8 oil fuel supply (or automatic control of oil fuel viscosity as alternative);
- .9 exhaust gas.

8.7.2 Each propulsion turbine shall be provided with an overspeed device directly connected to the turbine shaft. The oil switch receiving the impulse from the impeller directly driven by the turbine shaft can be used as an overspeed device.

Main gas turbines are to be provided with over speed protective devices to prevent the turbine speed from exceeding more than 15% of the maximum continuous speed.

The overspeed device shall operate so that racing the turbine above 15 percent of rated speed is not allowed. Control system which stops the turbine from the overspeed device shall be executed with the minimum number of power sources so that in the case of deenergizing in the control system, the number of revolutions of the gas turbine will not be increased.

Where a main gas turbine incorporates a reverse gear, electric transmission, controllable pitch propeller or other free-coupling arrangement, a speed governor independent of the over speed protective device is to be fitted and is to be capable of controlling the speed of the unloaded gas turbine without bringing the over speed protective device into action.

8.7.3 In cases specified in 3.6, the gas turbines shall be fitted, in addition to the overspeed device, with a speed governor and the speed governor itself shall comply with the requirements contained in that chapter.

When reducing the fuel supply by the governor, stopping of the gas turbines is not allowed.

8.7.4 The main gas turbine shall, after at least 60 min stand by "Propeller-stop" condition, provide the ship's movement immediately after receiving the command. In the "Propeller-stop" condition, the propeller shaft speed is permitted of not more than 3 rpm.

After unlimited out of action the gas turbine shall be prepared for the immediate loading within 20 min what ensure the heating of the gas turbine, its starting and the bearing of ship's movement.

8.7.5 The requirements stated in the *Rules for the classification of ships, Part 13 - Automation, Section 2* shall be met.

8.7.6 Main and auxiliary gas turbines shall be fitted with an arrangement for emergency stopping of the gas turbine under any operation conditions by at least two independent means.

When operating from the bridge control of the wheel house provision shall be made for emergency stopping of the gas turbine from the control station of engine room.

8.7.7 The manoeuvring arrangement of the gas turbine installation with an astern turbine shall comply with the requirements of 3.6.1 and 3.6.2.

The manoeuvring ahead and astern valves shall be interlocked. Adequate stall safety factor of gas turbine compressors shall be provided in any position of the manoeuvring valves.

8.7.8 Miscellaneous automatic safety devices

8.7.8.1 Details of the manufacturer's proposed automatic safety devices to safeguard against hazardous conditions arising in the event of malfunctions in the gas turbine installation are to be submitted to the *Register* together with the failure mode and effect analysis (FMEA). Unless the FMEA proves otherwise, the shutdown functions for gas turbines are to be provided in accordance with Table 8.9.1 in addition to the general monitoring and safety system functions.

8.7.8.2 Main gas turbines are to be equipped with a quick closing device (shut-down device) which automatically shuts off the fuel supply to the turbines at least in case of:

- a) Over speed
- b) Unacceptable lubricating oil pressure drop
- c) Loss of flame during operation
- d) Excessive vibration
- e) Excessive axial displacement of each rotor (Except for gas turbines with rolling bearings)
- f) Excessive high temperature of exhaust gas
- g) Unacceptable lubricating oil pressure drop of reduction gear
- h) Excessive high vacuum pressure at the compressor inlet

8.7.8.3 The following turbine services are to be fitted with automatic temperature controls so as to maintain steady state conditions throughout the normal operating range of the main gas turbine:

- a) Lubricating oil supply
- b) Oil fuel supply (or automatic control of oil fuel viscosity as alternative)
- c) Exhaust gas

8.7.8.4 Automatic or interlocked means are to be provided for clearing all parts of the main gas turbine of the accumulation of liquid fuel or for purging gaseous fuel, before ignition commences on starting or recommences after failure to start.

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8.7.8.5 Hand trip gear for shutting off the fuel in an emergency is to be provided at the manoeuvring station.

8.7.8.6 Starting devices are to be so arranged that firing operation is discontinued and main fuel valve is closed within pre-determined time, when ignition is failed.

8.7.9 The main gas turbine shall be provided with alarm system in accordance with the *Rules for the classification of ships, Part 13 – Automation*.

8.7.10 The control system of gas turbines shall comply with the requirements of the *Rules for the classification of ships, Part 7 - Machinery Installation*, 1.7, 1.8, 1.9 and 1.10.

8.7.11 The working medium for the control system shall not become viscous at low temperatures and shall not be readily flammable.

The system of filters and heat exchangers shall provide the necessary temperature and purity of the working medium.

8.7.12 Provision shall be made for checking the tachometer readings for main gas turbines.

8.7.13 The control systems of the auxiliary gas turbines intended for driving generators shall comply with the requirements of 2.11.3 and 2.11.4.

8.8 INSTRUMENTS

8.8.1 The control station of the main gas turbine shall be provided with instruments for measuring the parameters in accordance with 8.7.9 and devices specified in 3.7.2.2 to 3.7.2.4, as well as instruments necessary to carry out thermal check of the gas turbine operation.

8.8.2 The control station for the auxiliary gas turbines shall be provided with instruments for measuring:

1. rotor revolutions,
2. lubricating oil pressure before the gas turbine,
3. fuel pressure before the gas turbine,
4. lubricating oil temperature before the turbine,
5. gas temperature before or after the turbine.

8.9 ALARMING DEVICES

8.9.1 Although in principle alarming devices listed in Table 8.9-1 are to be provided, they can be added or omitted, taking into account the result of FMEA specified in item 2.1.

8.9.2 Alarms marked with “*” in Table 8.9-1 shall be activated at the suitable setting points prior to arriving the critical condition for the activation of shutdown devices.

8.9.3 Suitable alarms shall be operated by the activation of shutdown devices.

Table 8.9-1
List of alarms and shutdowns

| Monitoring parameter | Alarm | Shutdown |
|---|--------|----------|
| Turbine speed | high | x |
| Lubricating oil pressure | Low * | x |
| Lubricating oil pressure of reduction gear | Low * | x |
| Differential pressure across lubricating oil filter | high | |
| Lubricating oil temperature | high | |
| Oil fuel supply pressure | low | |
| Oil fuel temperature | high | |
| Cooling medium temperature | high | |
| Bearing temperature | high | |
| Flame and ignition Failure | x | x |
| Automatic starting Failure | x | |
| Vibration | high* | x |
| Axial displacement of rotor | high | x |
| Exhaust gas temperature | High * | x |
| Vacuum pressure at the compressor inlet | High * | x |
| Loss of control system | x | |