

Rules for Classification and Construction

I Ship Technology

4 Rigging Technology



4 Guidelines for Maintenance and Inspection of Tall Ship Rigs

The following Guidelines come into force on 1 December 2013.

Germanischer Lloyd SE

Head Office

Brooktorkai 18, 20457 Hamburg, Germany

Phone: +49 40 36149-0

Fax: +49 40 36149-200

headoffice@gl-group.com

www.gl-group.com

"General Terms and Conditions" of the respective latest edition will be applicable
(see Rules for Classification and Construction, I - Ship Technology, Part 0 - Classification and Surveys).

Reproduction by printing or photostatic means is only permissible with the consent of
Germanischer Lloyd SE.

Published by: Germanischer Lloyd SE, Hamburg

Table of Contents

Section 1 General

A	Scope	1- 1
B	Purpose	1- 1
C	Reference Rules	1- 1
D	Definitions	1- 2

Section 2 Inspections

A	Scope Assessment	2- 1
B	Levels of Inspection	2- 1
C	Pre-inspection Information	2- 4
D	Generic Inspection Program	2- 4
E	Deficiency Criteria	2- 6

Section 3 Maintenance

A	Scope	3- 1
B	Maintenance Schedule	3- 1

Section 4 Certification

A	General	4- 1
B	Certificate	4- 1

Annex A Generic Inspection Program

Annex B Assessment / Evaluation Criteria

Annex C Sample Certificate

Section 1 General

A	Scope	1-1
B	Purpose	1-1
C	Reference Rules	1-1
D	Definitions	1-2

A Scope

These Guidelines generally apply to sailing rigs of traditional type sailing vessels, often indicated as “tall ships”.

These Guidelines are suited for rigs with spars made of steel, aluminium and wood.

The directions and principles given in the following are to be used as a general guidance and possibly need to be adjusted for individual rigs.

B Purpose

The design, materials, construction and design of masts, yards, booms, bowsprits, standing rigging and associated structural elements on a sailing vessel must be suitable for the intended service under the condition that the vessel is handled correctly in terms of good seamanship.

Frequent maintenance of sailing ship rigs and associated equipment and structures contribute to safer operation in service.

These Guidelines intend to give directions on appropriate inspections and maintenance with the purpose and intention to maintain structural integrity for the purpose of a safe operation of a tall ship.

This document offers an approach based on best practice. It will assist in ensuring that owners and operators are aware of the condition of their spars and rigging and are able to undertake remedial maintenance when this is required.

These Guidelines may be used to support surveys for safety, certification, purchase and insurance or admission to Class.

C Reference Rules

Various GL Rules and international standards will be referred to in these Guidelines.

C.1 International regulations

The following international regulations may apply:

- ISM Code: Element 10 (for passenger vessel sailing ships)
- Others

C.2 National regulations

National regulations are to be observed as far as applicable.

D **Definitions**

Within these Guidelines, the following wording applies:

D.1 **Traditional sailing vessels “Tall Ships”**

Vessels carrying rigs as per definition of GL Rules for [Tall Ship Rigs \(I-4-1\)](#) and/or upon individual considerations.

D.2 **Educated expert**

An educated expert is a person from within the operating staff of the vessel, who is educated and experienced in rigging technology and operation and focused on the vessel's safety.

D.3 **Inspector**

An inspector is holding a high level of expertise and a wide range of experience in the field of rigging of tall ships.

The inspector is authorized by GL for carrying out inspection work based on the *GL Code of Practice “Authorisation as a Tall Ship Rig Inspector”*.

The inspector shall be physically and mentally capable and well instructed to climb a rig to gain appropriate access to all relevant locations of a Tall Ship Rig critical to inspection.

D.4 **GL Surveyor (HO)**

Expert at GL Head Office (HO) holding a high level of expertise in the field of rigging of tall ships. The GL Surveyor will be asked to approve the work carried out by the inspector.

D.5 **Rig-Log**

The rig-log is an evolutionary on-board document, kept by rig operators. It is a technological record of all issues related to the rigs history. Continuous recordings shall be made about maintenance measures, inspections carried out and their results. The rig-log shall include deficiencies found and repairs carried out, replacements or modifications carried out. The technological depth of these records shall be in a way that post-reconstructive calculations and evaluations can be made, including the appropriate technical specifications. Keeping a rig-log provides a baseline for appropriate maintenance and necessary inspections.

Section 2 Inspections

A	Scope Assessment	2-1
B	Levels of Inspection	2-1
C	Pre-inspection Information	2-4
D	Generic Inspection Program	2-4
E	Deficiency Criteria	2-6

A Scope Assessment

When considering how to effectively inspect a rig, it can be useful to apply risk assessment methods. This will help the user identify the key structural elements and ensure that other parts of the structure which may be subject to high or repetitive loading are not missed. As a guide, the risk assessment process for inspection may follow the format below:

- Identify critical regions within the structure.
- Assess the structural importance, susceptibility to damage and consequences of failure.
- Select inspection techniques to manage and control identified risks.
- Implement and maintain control measures.

In large structures such as tall ship rigs, a 100 % inspection is a significant exercise. In any event priority for evaluation should be given to regions within the structure that have the highest risk, such as

- Areas with high susceptibility to corrosion; wear, chafe, abrasion.
- Highly loaded regions (static, fatigue, vibration, environmental, etc.).
- Structures which are related to personal safety.

Routine inspection results should be of sufficient quality and consistency so that comparisons to earlier pre-service inspections and future in-service inspections can be drawn.

B Levels of Inspection

Inspections on tall ship rigs are grouped in four characteristic levels, which are distinguished by the aspects:

- How often a rig is inspected
- To what level a rig is inspected
- Who is inspecting the rig
- What is the purpose of inspection

B.1 Level “R” Routine inspection

B.1.1 Objective

In-service routine inspection is carried out in appropriate intervals by an **Educated Expert**.

The principle purpose of routine inspections is to detect deficiencies occurring in the short-terms, affecting structural integrity of the rig as well as personal safety. Changes out of the ordinary shall be detected. The intervals can range between “daily” and “bi-annually”, depending on the use of the rig and the functionality of the item inspected. The intervals shall be determined or proposed by the operator and documented in the Rig-Log. Findings of inspections shall also be reported in the rig-log.

B.1.2 Scope and depth

Routine inspections of the rig shall include a global visual check of essential and critical areas of the rig. Focus of routine inspection shall be put on extra-ordinary chafe and wear of running or standing rigging and the safety rigging. Furthermore the rig column shall be checked on local damages or global distortions. The inspection frequency very much depends on the individual characteristics of the vessel, its rig and the usage and can reach down to a daily basis. Routine inspections shall be carried out as thoroughly as possible but without the removal of protective coatings and without using invasive inspection practices. Deficiencies detected can be assessed using the criteria defined in [E](#).

B.1.3 Rig assembly condition

Fully assembled and ready for use or even during operation.

B.2 Level “C” Annual inspection

B.2.1 Objective

Inspection carried out by an **Inspector** on the basis of 1 year¹ recurrence. After the inspection, a report of findings will be issued after approval and authorization of a **GL Surveyor**.

Principle purpose of annual inspections is to lend an unbiased view from an independent party to check/confirm whether Level R routine inspections are effective.

Should a vessel operate less than 180 days at sea per calendar year, the period can be extended to 2½ * years.

B.2.2 Scope and depth

Annual inspections of the rig shall include a visual check of essential and critical areas of the complete rig as indicated in [Annex A](#), possibly accompanied by non-destructive inspection methods, where found necessary, and by other random checks like removing protective coating/covering from wires ropes, at the discretion of the attending inspector for cause.

The actual scope of tests and examinations is at the discretion of the inspector, whereby negative findings may trigger further examinations or measures. Deficiencies detected shall be assessed using criteria defined in [E](#).

B.2.3 Rig assembly condition

Typically, the rig needs not to be disassembled. Annual inspection in general will be performed on the rig in in-service condition with the vessel at rest. If it seems necessary and/or upon special agreement, underway inspection may be required to evaluate dynamic behaviour of rig and equipment.

B.3 Level “B” 5-year inspection

B.3.1 Objective

Comprehensive inspection carried out by an Inspector on the basis of a 5 year recurrence. After inspection, a report of findings will be issued after approval and authorization of a GL Surveyor.

The purpose of the 5-year¹ inspection is to confirm or generate a solid technical basis for the subsequent operation and also annual inspections. Level “B” inspections should be performed at the shipyard.

In accordance with these Guidelines, Level “B” inspections shall extend and complement the Level C inspection.

B.3.2 Scope and depth

Educated random determination of deficiencies of all rigging parts. Random ultrasound thickness measurements on spars and in critical areas, going more in-depth, if findings require so. Random dye checks of critical welds on fixture bands and butt welds in plates. Inspection of shafts and sheaves for clearance.

¹ with a tolerance of +/- 3 months

Inspection of nuts and bolts, possibly random destructive testing. Check for air tightness of hollow air-tight spars by pressure testing (internal conservation facilitating low oxygen level usually for spars with lower thickness plating).

Inspection of standing rigging by spot checking condition by removal of protection in areas most affected by seawater. The Inspector is entitled to demand load tests if deemed necessary.

B.3.3 Rig assembly condition

For the ease of inspection and possible maintenance, but at the discretion of the **Inspector/GL Surveyor**, it is recommended but not required to have:

Topgallant masts, yards, gaffs, booms (especially if non-metallic) and associated rigging and components taken off the rig.

B.3.4 Further

Upon the result of this inspection, the inspector will set the date for the Level “A” inspection, whether it be a 10-year or a 15-year inspection. In case of the latter, another Level “B” inspection is to follow. See also [Fig. 2.1](#) for comprehension.

B.4 Level “A” 10-year inspection

B.4.1 Objective

Comprehensive inspection carried out by an Inspector on the basis of a 10-year¹ recurrence. After inspection, a comprehensive report of findings will be issued after approval and authorization of a GL Surveyor.

The purpose of the 10-year refit and inspection is the renewal of structural integrity and to confirm a solid structural and technical basis.

In accordance with these Guidelines, 10-yearly examinations shall provide a full representation of overall structural conditions of the rig and provide a sound basis for the subsequent 10-years period.

Upon the results of the previous Level “B” inspection (see B.3), the period can be extended to 15¹ years. See also [Fig. 2.1](#) for comprehension.

B.4.2 Scope and depth

Fully individual deficiency determination of all rigging parts. Fully representative NDT thickness measurements of all spars by inspector or nominated expert. Removal of coating and/or protection from standing rigging wire to an extent as necessary for the purpose of inspection and possible refit (if not replaced). Proof-testing of selected fraction or representative samples of standing rigging including their end connections, should there be a prospect of further use.

B.4.3 Rig assembly condition

For the ease of inspection and possible maintenance/refit, but at the discretion of the inspector/GL Surveyor, it is recommended but not required to have:

The complete rig un-stepped, all-inclusive disassembly of components including lower masts and top-masts, if not in one piece. When masts are welded to the ship structure, the inspection may take place with the lower masts standing as far as it does not limit the thoroughness of the inspection and refit. Scaffolding or other access means to the masts may be required.

Section 2 Inspections

Year ("y")	High frequency inspection regime		Low frequency inspection regime		Sample of individual inspection regime	
0	Lever "R" inspections	Start	Lever "R" inspections	Start	Lever "R" inspections	Start
1		Level C y1				
2		Level C y2				
3		Level C y3		Level C y2.5		Level C y2.5
4		Level C y4				
5		Level B y5		Level B y5		Level B y5
6		Level C y6				Level C y6
7		Level C y7		Level C y7.5		Level C y7
8		Level C y8				Level C y8
9		Level C y9				Level C y9
10		Level A y10		Level B y10		Level A y10
11						
12				Level C y12.5		
13						
14						
15				Level A y15		

Fig. 2.1 Varying inspection regimes

C Pre-inspection Information

Before planning and carrying out inspections on rigs at level A or level B, it will be of considerable benefit to ensure that a Rig-log, a dossier or history of information that contains available information on the design, manufacture, operating service and previous inspections will be available. Information desired for a rig inspection is listed for guidance in [Table 2.1](#).

D Generic Inspection Program

The generic inspection program displayed in [Annex A](#) presents a plan on inspecting tall ship rigs. This program does not intend to be all-inclusive. Routine inspection might in some cases reveal the need for more in-depth investigation, which may require the involvement of an Inspector beyond the regular inspection routines.

D.1 Inspection methods

Provisions, conditions and detailed specification of the testing methods used during tall ship rig inspections, like:

- measurement,
- visual testing,
- dye penetrant testing,
- ultrasound testing and
- others

are detailed in GL Rules for [Principles and Test Procedures \(II-1-1\)](#), [Section 3](#), and particularly for welded joints in the GL Rules for [Design, Fabrication and Inspection of Welded Joints \(II-3-2\)](#), [Section 4](#).

D.2 Assessment

On each structural component of a tall ship rig, various deficiency or degradation aspects are to be considered during inspection. Typical aspects are:

- corrosion,
- distortion (bend/dents/misalignment),
- cracking,
- wear and chafe,
- unacceptable fit / bearing clearances and
- rigging tension.

D.2.1 Assessment criteria

In order to be able to assess the condition of an inspected item of a tall ship rig and to decide whether a certain deficiency leads to an unacceptable situation so that a further safe operation of the vessel is considered unsafe, assessment criteria are offered, as described in [E](#).

D.2.2 Deficiency conditions

In order to make an assessment of an individual component effective, referable and also traceable for subsequent inspections, inspection results are categorised as follows:

Condition 1:

The condition of the component or item, considering all relevant deficiency aspects, is **good or very good**. No remedial measures are required, most probably not for a longer period.

Condition 2:

The condition of the component or item, considering all relevant deficiency aspects, is **fair**. Deficiencies or degradation discovered are developing but are still within a tolerable range, so that no immediate remedial measures are required, most probably not before the next Level C or even Level B inspection.

Condition 3:

The condition of the component or item, considering all relevant deficiency aspects, is **poor**, deficiencies or degradation discovered are critical and beyond the tolerable range, so that immediate remedial measures are required. Findings shall be explicitly recorded in the inspection list and report.

D.2.3 Time for deficiency elimination

Deficiencies found during inspection have to be eliminated. The time to solve the deficiencies depends on the above mentioned conditions and the risk assessment associated with the part.

1. Immediately

The deficiency must be eliminated before the rigging is used next time.

2. Within 4 weeks

Gives the operator enough time to source spare parts.

3. Within 3 months

This period is chosen when technological urgency is minor.

4. Till next Level C inspection

Evidence that the deficiency has been repaired should be sent to the inspector. Evidence can be photographs and certificates.

Table 2.1 Inspection documentation

R	C	B	A	
	x	x	x	In-scale Rig Plan
	x	x	x	Spar plan including dimensions, plate thickness and material specifications
		x	x	Engineering drawings of the structural elements of rig
	x	x	x	Standing rigging plan and list including specifications of standing rigging wire ropes including end fittings
	x	x	x	Running rigging plan and list including specification of ropes
		x	x	Material and components technical specifications and/or certificates; e.g. wire ropes, end fittings, blocks, materials etc.
	x	x	x	Rig-Log
	x	x	x	History of modifications, replacements and repairs
	x	x	x	Service and maintenance records

D.3 Inspection item list / Result of inspection

The “inspection item list” (see separate document *Inspection_maintenance_program.xls*) presents a specific extensive checklist for tall ship rig inspections. It is a typical list for square and gaff rigged tall ships with steel spars.

E Deficiency Criteria

E.1 General notes

The following definitions on allowances regarding deformation, wear, tolerances etc. are to be considered as guidance.

In cases of doubt, GL Head Office shall be consulted.

Any damaged, worn or corroded part which is not replaced, shall, once the tolerances have been exceeded, be restored to the original dimensions using equivalent materials.

For worn or corroded parts which are close to reaching the tolerance limits, the inspector may determine a time period for repair or replacement (see [D.2.3](#)).

Additional guidance on deficiency criteria is given in [Annex B](#).

E.2 Welded joints

E.2.1 Cracks in welded joints are not acceptable. Repairing of visible cracks is mandatory.

E.2.2 Wherever cracks are found during sailing periods, a reduction of the nominal load of the affected parts is mandatory.

E.2.3 The repair procedure of welded joints has to be agreed with the inspector and GL Head Office and depends on parameters like significance of the welded structure, materials, applicable loads and weld design. Repaired welds shall be re-inspected.

E.2.4 Reference literature

For further information the following standards are referenced:

- GL Rules for [Design, Fabrication and Inspection of Welded Joints \(II-3-2\)](#)
- GL Rules for [Loading Gear on Seagoing Ships and Offshore Installations \(VI-2-2\)](#)
- DIN EN ISO 22825: Non-destructive testing of welds
- IACS No. 47: Shipbuilding and Repair Quality Standard; Part B – Repair Quality Standard for existing Ships

The above list is only indicative.

E.3 Acceptable reduction of plate thickness

E.3.1 Guidance on corrosion

Corrosion particularly occurs:

- At points where moisture tends to collect, thus facilitating the origination and propagation of corrosion, e.g. gaps and sumps.
- In areas with “shadow effects”, which impede the coating work (such as open, deep gaps).
- Where humidity permanently condenses, e.g. in areas of large temperature gradients, i.e. when a mast leads through a refrigerating space.
- Where condensed water accumulates, e.g. under permanent welding backing plates inside a hollow spar.
- On complex non-flat surfaces and in proximity of stiffeners and attachments.
- Close to or below interrupted welds.
- On non-rounded burrs and sharp edges. The minimum radius should be 2 mm.
- In hollow components which are not accessible and not sealed off completely and permanently.
- When two metals of different electrochemical potential are in direct contact without insulation.
- On edges of positive fit assemblies such as clamped reinforcement bands or non-welded butt joints.

E.3.2 For plates, profiles and pipes, the maximum acceptable reduction of plate thickness is 10 %.

E.3.3 In cases of limited local corrosion or wear, a reduction of plate thickness of up to 20 % is acceptable provided this does not result in a reduction of the load-bearing capacity of the cross-section.

E.3.4 In cases of isolated pitting, a reduction of plate thickness of up to 30 % is acceptable.

E.3.5 Due to the above reductions of plate thickness, the characteristic values of the cross-section under consideration shall be weakened by not more than 5 %.

E.4 Acceptable cracks

In general, cracks in Category 1 components (see [Table 2.2](#)) are not acceptable.

Where a visual inspection gives reason for this, the inspector may request crack detection tests, using the procedure appropriate to the case at hand.

E.5 Acceptable deformations

E.5.1 Deflections

E.5.1.1 Compression bars/spars

Under the maximum permissible loading, compression bars/spars shall not display permanent deflection greater than the equivalent of the bar length divided by 250.

Compression bars/spars which are Category 1 components, may not exhibit permanent deflection greater than the equivalent of the bar length divided by 500.

E.5.1.2 Tension bars/trusses

Tension bars shall not, when unstressed, display uniform deflection greater than the equivalent of the bar length divided by 50.

E.5.2 Deformation of chords and flanges

E.5.2.1 I-Beams

Each half-flange may individually or together be deformed by up to 15 % of its breadth, measured from web to outer edge.

E.5.2.2 Angle profiles

Flanges of angle profiles may individually or together be deformed by up to 15 % of their breadth, measured from flange to outer edge.

E.6 Acceptable indentations

The following requirements imply smooth transition pieces and apply provided that no bends, folds, cracks or thinning have developed.

E.6.1 Compression bars/spars

The categorization of components is defined in [Table 2.2](#).

E.6.1.1 Cylindrical pipes

E.6.1.1.1 Pipes forming Category 1 components

The following conditions are to be observed:

$$\ell \leq d$$

$$b \leq 0.25 \cdot d$$

$$f \leq 0.5 \cdot t$$

where:

ℓ : length of indentation measured in the longitudinal direction of the pipe

b : breadth of indentation

f : depth of indentation (depth gauge)

d : outer diameter

t : wall thickness

E.6.1.1.2 Pipes forming Category 2 components

The following conditions are to be observed:

5. central range ($1/3\ell$)

$$\ell \leq d$$

$$b \leq 0.5 \cdot d$$

$$f \leq t$$

6. outer range

$$\ell \leq 1.5 \cdot d$$

$$b \leq 0.7 \cdot d$$

$$f \leq 2 \cdot t$$

E.6.1.2 Rectangular tubes and box girders

E.6.1.2.1 In the case of rectangular tubes and box girders, indentations at the corners may have a depth corresponding to 8 % of the smallest side dimension.

E.6.1.2.2 For acceptable indentations of plates, the requirements for cylindrical pipes (refer to [E.6.1.1/2](#)) similarly apply. Instead of the diameter, the side dimension of the plate under consideration is to be taken.

Table 2.2 Categorization of components into categories of order

Category of order	Component description
1st order	Components essential for the total safety of the structure as well as its safe operation and which, where applicable, are exposed to local or also multi-axial stresses in addition to global stresses.
2nd order	Components essential for safe operation and functional capability.

E.6.1.3 I-Beams

The webs of I-Beams may not have any indentations.

E.6.1.4 Angle profiles

Angle profiles may not have any indentations at their corners.

E.6.2 Tension bars

In the case of tension bars, the indentation depth may be up to one third of the indentation length. The outer dimensions of hollow profiles, however, shall not be reduced by more than 25 % in the indentation area.

E.6.3 Girders subject to bending

E.6.3.1 Indentations at bearing or load introduction points are not acceptable.

E.6.3.2 In areas other than mentioned in [E.6.3.1](#), indentations up to the dimensions defined in [E.6.1.1](#) and [E.6.1.2](#) are acceptable on the tension side; on the compression side, only dimensions of half that size.

E.7 Acceptable wear on rope-sheaves

E.7.1 The side wall thickness of discs, or spoked rope sheaves made from normal-strength material shall meet the following condition at the bottom of the groove:

$$t \geq \sqrt{0.85 \cdot F_s}$$

where:

t : side wall thickness [mm]

F_s : safe working load [kN]

Rope-sheaves of grey cast iron are not acceptable.

E.7.2 In case of rope imprints at the bottom of the rope groove, the pairing of rope and rope-sheave should be changed.

E.8 Acceptable wear of pins / Increase of bearing clearances

E.8.1 Pins

In terms of load-bearing capacity, a reduction in diameter of 10 % is acceptable.

E.8.2 Bearing clearance

E.8.2.1 Foot bearings

The tolerable increase of bearing clearance is two times the initial clearance.

E.8.2.2 Bearings in general

Clearances exceeding those stated in [E.8.2.1](#) are acceptable if the pin's load-carrying capacity and ability to function are not adversely affected, and if no alternating load exists.

E.8.2.3 Rope-sheave bearings

The following bearing clearances are acceptable.

- In antifriction bearings: 1 mm
- In sliding bearings : 2 mm

E.9 Wooden spars and parts

E.9.1 General

The following Guidelines are for non-hollow, one piece solid wooden spars. They do not apply to assembled spars or to segmented or laminated sections. The Guidelines cover mainly aspects of deterioration of wooden spars but are also applicable to deterioration of other structural parts made of wood. Defects of wood or lumber crucial for spar new-construction are not covered.

E.9.2 Fractures of wood

The influence of fractures on the load-bearing capacity of a wooden part depends on:

- fracture geometry,
- fracture orientation and
- loading/stress patterns

E.9.2.1 Cracks

A "crack" is a fracture perpendicular to the grain direction. Cracks are not acceptable in general. Most often cracks are a sign for overloading of a component, wrong use or unsuitable installation of an attachment, e.g. a fitting.

A repair of cracks is - if at all - only acceptable after consultation of and approval by GL Head Office.

E.9.2.2 Checks

A "check" is a separation fracture parallel to the grain direction, most commonly occurring due to the natural drying process with different degrees of shrinkage and swelling in the different directions of a wooden part. A "split" is a check that continues all the way through a structural component.

For spars or individual components or areas of such mainly subjected to bending and/or compression (e.g. free length of yards, et al.), reduction of strength capacity due to checks is not as critical as for spars or individual components or areas of such which are loaded by shear and/or torsion (e.g., masts in the proximity of cross trees, truss attachments, et al.). However, it is very difficult to assess which spars and components are subject to these relevant loadings or not. Thus, a unified criterion was derived.

The following criteria serve as a generic guidance for evaluation of checks:

A check can be assumed uncritical if it does not exceed the following dimensions:

- Depth t : 30 % of spar diameter
- Width at spar surface: 5 % of spar diameter and
- Length: 20 % of spar length.

The depth criteria is also valid for multiple checks, where the depth of multiple checks is the greatest sum of the depths of two checks on opposite or near opposite sides ($t_1 + t_2$) as shown in [Fig. 2.2](#).

Checks exceeding the dimensions given above may be acceptable after individual assessment by the inspector. This evaluation will, amongst other aspects, need to consider probability and consequences of failure and structural importance of the respective component.

In case of doubt an inspector has to be consulted for deciding individually if a check has reached or exceeded the critical dimensions.

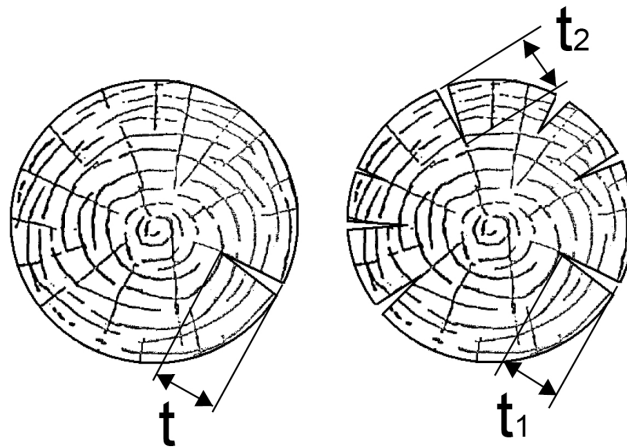


Fig. 2.2 Single and multiple checks in wooden spars

E.9.2.3 Indentations

Indentations are caused by compressive loads perpendicular to the grain (e.g. gaff clew bearing on spar). Indentations require individual assessment, depending on the structural arrangement.

E.9.2.4 Others

A “shake” is a separation or a weakness of fibre bond and appears parallel to the annual rings. It is critical to shear loading of a spar. A shake may not appear on the surface and is thus hard to detect. Also, a shake may allow water and moisture to enter the structure.

E.9.3 Decay

Due to high humidity at sea wooden parts are very vulnerable to diverse infestations like fungus. Fungus destroys the cellular structure of the wood and thus the load-carrying ability. Other aspects of organic deterioration are wood boring beetles.

Infestations in wooden parts are difficult to detect. When infestations have reached the surface, the internal structure may have already been damaged to an unrecoverable extent.

The assessment of organic deterioration is subject to assessment by an inspector.

E.10 Wire ropes

E.10.1 Characteristic deficiencies of wire ropes

Depending on fabrication, materials, lays and construction of a wire rope, aging effects can vary. Nevertheless the following deficiency aspects are the most common:

- Abrasion
- Fatigue
- Corrosion
- External or internal cracks due to excess load, shear
- Mechanical damages

A complete list of all deficiency aspects can be found on ISO 4309.

E.10.1.1 Abrasion

Insufficient lubrication leads to abrasion. Due to mechanical abrasion the rope diameter decreases.

E.10.1.2 Fatigue

Fatigue cracks in individual wires mostly occur at contact points between the outer layers of the wire rope and the sheaves or hoisting drums. Abrasion and corrosion increase crack growth. Well-lubricated wire ropes have increased fatigue strength.

E.10.1.3 Corrosion

E.10.1.3.1 Galvanized wire ropes

Two kinds of corrosion are found on wire ropes: atmospheric corrosion which results in a constant corrosion layer all over the wire rope and pitting corrosion which builds large holes on poorly conserved parts of the rope. A corroded rope has reduced strength and flexibility. Also, corroded wire surfaces are very vulnerable to fatigue cracks. Corrosion can also be found on the inner layers of wire ropes. Such internal corrosion can be difficult to detect and may be indicated by an increased rope diameter.

Wherever possible, protective coatings and/or good lubrication are highly recommended.

E.10.1.3.2 Stainless steel wire ropes

Wire ropes directly subjected to humid sea atmosphere primarily suffer from crevice corrosion and pitting inside the rope (between the individual wires, where those are in direct contact), rather than corrosion on the external surfaces.

In general, the amount of corrosion observed on stainless steel wire ropes is much less than on galvanized wire ropes, but possibly it is more difficult to detect. Above mentioned corrosive effects occur within end terminations, where the oxygen level is low and the salt concentration is high. This especially occurs with swaged terminations. Different stainless steel grades show different vulnerability to above mentioned effects.

Insufficient quality stainless steel wire ropes can also suffer from inter- and trans-crystalline corrosion. Chromium-nickel austenitic stainless steels are prone to this form of corrosion when in contact with certain types of corrosive media.

E.10.1.4 Cracks

External cracks can be caused by excess loads or shear. They are often accompanied by a large amount of already existing fatigue cracks. Cracks can be a result of high tensile forces in combination with in situ lateral pressures or plastic deformation.

E.10.1.5 Further damages

External damages are most commonly a result of mechanical damage during operation. The damaged layers will quickly show cracks caused by abrasion and corrosion. Distorted wire ropes change geometry which decreases strength and causes problems with respect to sheave or block clearance. Distorted wire ropes will often also display internal damages.

Ropes which move to or from sheaves under deflection angles will be damaged after a certain period of time. Too tight or even stuck sheaves will damage and distort the rope. Too loose sheaves cannot support the rope efficiently inducing in situ pressure and, consequently, cracks.

The above mentioned issues also affect the sheave itself. It can be damaged and will eventually warp, increasing the described effects.

E.10.2 Wire ropes to be discarded

The assessment for continued use of a wire rope showing deficiencies largely depends upon judgement of the inspector by evaluating residual strength of the used wire rope (see [E.10](#)) guided by the following principles.

E.10.2.1 Wire ropes shall be discarded when, over a length equal to 8 times the rope diameter d_s , the number of detected broken wires is greater than 10 %, with lang lay ropes 5 %, of the total number of wires in the rope.

Wire ropes shall also be discarded when:

- Reduced rope diameter d_s , owing to friction or wear, by more than 10 % of the nominal diameter, or in case of wear to the core.
- Six broken wires in one rope lay length, or three broken wires in one strand lay length.

Section 2 Inspections

- One broken wire within one rope lay length of any end fitting.
- Pitting due to corrosion, or nicks, extending one lay length or more.
- Deformations of the rope, such as "bird caging", formation of loops, buckling, kinking, crushing, loosening of individual wires or strands, etc.
- Corrosion (external or internal); for further guidance, see [Table 2.3](#)
- Reduced residual strength to less than 80 % of the original value.

Table 2.3 Limit values for external and internal wire rope corrosion (for galvanised steel wire ropes)

	Visible wire cracks		Corroded load bearing wires	External and internal corrosion	Decrease of wire rope diameter
	Round strand wire ropes with 6 or 8 strands				
Condition	Regular Lay	Lang Lay	in % surface wire rope diameter	Characterisation	
1	0 – 5 %	0 – 2.5 %	2.5 – 10 %	Wire rope surface not or slightly degraded. No significant decrease of the wire rope diameter.	3 – 6 %
2	10 %	5 %	20 %	Wire rope surface degraded. Noticeable decrease of wire rope diameter. Small gaps between the external wires.	9 %
3	15 – 20 %	7.5 – 10 %	30 – 40 %	Wire rope surface severely degraded. Obvious decrease of wire rope diameter. Obvious gaps between the external wires, reaching up to and exceeding 1/8 of initial wire diameter.	12 – 15 %

E.11 Fibre ropes

E.11.1 Characteristic deficiencies of fibre ropes

The most common deficiencies and aging effects of fibre ropes are listed below.

- Rope wear
- Fatigue
- Breaking strength loss
- Chafing
- Stretch-out
- Cutting
- Kinking
- Rust
- Deformations (hockle, twist, kink, corkscrew)
- Degradation (sunlight, chemical, heat)
- Dirt and grit
- Rot (for organic ropes)

Ropes of different size, construction or material can show substantial differences in longevity in the same application. Therefore the below mentioned effects are neither exhaustive nor do they apply to every fibre rope. In cases of doubt the rope manufacturer should be consulted.

E.11.1.1 Rope wear

External wear is characterised by a fine nap or fuzz distributed uniformly on strand surfaces.

Internal wear may be noted as a fuzzed or fused condition between strands. External wear of natural fibre ropes is indicated by flattened areas (where fibres have broken away). Initially, natural rope section will have clean inner fibres, the ends of which protrude from twisted inner strands. Internal wear may be detected as a powdery appearance between the strands.

E.11.1.2 Fatigue

Due to cyclic tension synthetic fibres can break down. The most common mechanism is fibre to fibre abrasion. The rope will gradually lose strength. Fatigue damages can be detected visually by broken yarns in the outer or inner braid. The rope may become extremely hard due to internal compaction of broken fibres. A fuzzy appearance on the outside can also indicate fatigue damages.

E.11.1.3 Breaking strength loss

The strength of fibre ropes can be reduced significantly from shock loading, and dynamic loading at high levels. Similarly cut and worn strands affect the strength of the rope.

E.11.1.4 Chafing

Synthetic rope chafing can be identified by the presence of a hard outer layer composed of fibres fused together by frictional heat. Chafing in natural fibre ropes appears as localized broken yarns which hang from the rope. These chafed ropes are troublesome in running rigging because they might impair use of blocks, sheaves, and capstans.

E.11.1.5 Stretch-out

A visible reduction in rope circumference is indicative of stretch-out (usually a result of excessive loading). To determine stretch-out, both the circumference of the reduced area and that of a normal rope section shall be measured.

E.11.1.6 Cutting

A synthetic rope damaged by cutting will usually show brooming and yarn end protrusion.

E.11.1.7 Rust

Rust can be recognized by the characteristic reddish-brown to brownish-black colour. Ordinarily, rust stains appear in localized rope areas because of contact with corroding steel. Rust will not stain polypropylene or appreciably reduce the strength of polyester. Stains that are removable with soap and water on other fibre ropes have no adverse effects on rope strength. However, persistent stains extending into the cross-section of natural fibre and nylon fibre yarns can lower rope strength.

E.11.1.8 Aging / degradation

Outer rope yarns will become weak and brittle when exposed to ultra-violet radiation. Some ropes may discolour. Strength testing of a few surface fibres in comparison to some inner fibres may indicate actual degradation.

When exposed to high temperatures or chemicals a rope can degrade very quickly depending on the fibre materials.

Sea water that has dried can leave a salt deposit in the rope that increases abrasion. Oil and dirt can have the same effects on a fibre rope as salt water.

E.11.2 Fibre ropes to be discarded

Damages may not be detectable by visual or tactile inspection.

Therefore it is highly recommended to establish a regime for retirement of each specific fibre rope in use. This should consider conditions of use, experience with the application and the degree of risk.

Section 2 Inspections

Fibre ropes shall be discarded when, over a length equal to 8 times the rope diameter d_s , more than 10 %, of the total number of yarns in the rope, are broken.

Fibre ropes shall also be discarded in case of:

- breakage of strand,
- mechanical damage or wear,
- release of fibre particles,
- rotting and
- larger fused patches on synthetic fibre ropes.

E.12 End attachments

E.12.1 Characteristic deficiencies of end attachments

Terminations of wire ropes for the purpose of end attachment are of manifold style and making. Typical end attachments are:

- eye splices
- spelter sockets
- swaged ferrule terminations
- racking seizing

Aging effects and deficiencies occurring on these end terminations cannot be summarized in a generic way, but need to be considered case-by-case.

E.12.2 End attachments to be discarded

Attachments which are meant to be re-used must be thoroughly inspected visually and with NDT. Cracks and broken wires are not permitted in or near end attachments. Such attachments shall be discarded.

E.13 Recommended literature for wire ropes, fibre ropes and end attachments

The subsequent is a list summarizes literature recommended for further information.

- GL Rules for [Tall Ship Rigs \(I-4-1\)](#)
- GL Rules for [Loading Gear on Seagoing Ships and Offshore Installations \(VI-2-2\)](#)
- ISO 4309: Cranes – Wire Ropes – Care and Maintenance, Inspection and Discard
- Casar: Wire Rope Forensics
- EN 13411: Terminations for Steel Wire Ropes
- Cordage Institute: Fibre Rope - Inspection and Retirement Criteria CI 2001-04

This list is not exhaustive.

E.14 Rigging tension

An appropriate level of initial tension (“pre-tension”) in standing rigging is required for the proper operation of a tall ship rig. Amongst others, the following aspects are essential for a proper rig set-up:

- Keeping the rig (lower mast, topmast, topgallant mast) stable and in column by sighting mast column, bowsprit and jib-booms for shape, rake and position.
- Allowing only little movement of masts; greater tensioned rigging has less sag due to the running riggings’ own weight and thus allows less movement.
- Limiting the sag of the sail-carrying stays for better “upwind performance”.
- Enabling safe climbing on ratlines, also on leeward side.
- Balanced and even tension from shroud to shroud, side to side; progressively lower tensions from lowers to uppers, from inner to outer stays
- Considering creep of associated components, e.g. new eye splices.

Section 2 Inspections

- Avoiding too high tension, as this can cause excessive loading on structural members including the mast column and the ship structure. Resulting high tension in sail carrying stays can generate low sags and thus over-proportionally high tension in stays and thus rigging.
- Performance under sail in various conditions; control of dynamic “pumping” or too much movement or sag to leeward.

The magnitude of pretension is primarily driven by the request to satisfy the above mentioned aspects.

The magnitude of hydrostatic stability of the vessel, characterised by the GM value, may have impact on the necessary level of pretension.

The magnitude of required rigging tension also depends on hull type, hull material, rig type, spar material, standing rigging material and type.

Section 3 Maintenance

A	Scope	3-1
B	Maintenance Schedule	3-1

A Scope

The following guidelines provide general information about the maintenance procedures and the maintenance intervals for sailing rigs of traditional sailing vessels. The provided guidelines are not exhaustive; they are to be considered as a tool of information and are not mandatory. Nevertheless Germanischer Lloyd highly recommends the usage of the guidelines for establishing an individual maintenance program on board. With thoroughly performed maintenance lifetime of sailing rigs can be prolonged.

A.1 Standing rigging maintenance

Wire ropes used for standing or running rigging applications, are often made from stainless or galvanised steel. These wire ropes are protected by different means, either to prevent premature aging (corrosion) or to prevent sails from suffering chafing. Typically, galvanised steel wire rope is internally and externally greased in delivery condition. Additionally, tarring wire ropes down can make their surface smooth and less prone to chafe on them. Wire ropes can be served for further protection, or even wormed, parcelled and served, often in proximity to end fittings. In order to maintain a certain level of protection, each of those protective methods should be renewed in appropriate intervals. Fully packed protections should be unwrapped by spot check and renewed whenever there is suspicion of water ingress and thus the possibility of hidden corrosion.

A.2 Steel component maintenance

Moving steel components like chains, shackles, bottle screws, etc. should be coated with appropriate anti-corrosive agent, e.g. a paint conditioner and a penetrating rust inhibitor.

A.3 Wooden part maintenance

All timber shall be protected by several coats of suitable protective paint, and by means of impregnation with a proven wood preservative, against fungi and insect infestation. Impregnation is the preferred method for interior surfaces of components which are exposed to water or weather (e.g. spars, blocks) and which have received a coat of paint impervious to vapour pressure. In the sense of a constructive protection, any moisture shall have the possibility to drain from wooden parts thus enabling them to dry.

B Maintenance Schedule

B.1 General

It is obvious that maintenance and inspection cannot be totally separated and thus overlap and influence each other. Maintenance routines can also be used for a quick visual inspection. On the other hand, results of inspections can make maintenance necessary. Therefore the following list is to be understood as a suggestion of a combined inspection and maintenance schedule.

Control and maintenance works should be carried out at certain intervals which depend on the usage rate of the vessel and the ambient conditions the vessel is operating in.

Once maintenance works are identified during a routine control, they should be performed instantly or be planned for the near future.

B.2 Typical schedule

B.2.1 Every sailing day

- Control of sails, ropes and shackles by eyesight on wear, chafe and damages.
- Control of hydraulic winches on leakage and wear.

B.2.2 Every week

- Control of sail seams on wear and damage.
- Control of ropes and splices on wear and damage.
- Control of shackles on mousings and damage.
- Control of blocks on cracks and wear.

B.2.3 Every month to third month

- Grease each grease point at the goosenecks, steel blocks, truss arms/ sliders and tub parrals.
- Grease the jarwis-winches.
- Clean the threads of the bottle screws from salt and apply grease when not protected with marlin and sailcloth.
- Oil the pinrails and the fiferails.
- Control the fittings of standing and running rigging at the masts (and mast-tops) on wear and cracks.
- Control the fittings of standing and running rigging on deck on wear and cracks.
- Control the tension of the standing rigging.
- Conserve leather with appropriate weather protection on all edges of the sails and at the shrouds.
- Conserve serving on wire ropes before drying out using appropriate agent.
- Conserve bare steel wire ropes using an appropriate agent.
- Control all footropes, the security net at the bowsprit and all ratlines.
- Conserve steel chains using appropriate oil
- Clean and grease the blocks.

B.2.4 Every third to sixth month

- Conserve galvanised wire ropes using an appropriate agent by demand

B.2.5 Every half year

- Grease and/or tar down all bare, served or parcelled standing rigging and running rigging wire ropes made from galvanised steel which are initially greased and/or tarred, using appropriate protective grease/tar.

B.2.6 Every 1 year

- Consider re-coating of wooden parts depending on their condition.

B.2.7 Every 5 years

- Disassemble topgallant masts, yards, booms and gaffs including associated rigging,
- Re-coat spars and refit or replace rigging if necessary.

B.2.8 Every 10/15 years

- All-inclusive refit as per [Section 2](#).
- Possibly replace standing and running rigging as per [Section 2](#).

Section 4 Certification

A	General	4-1
B	Certificate	4-1

A General

Compliance with these Guidelines may be certified by GL upon application.

Certification is possible also for non-classed vessels, which have not been built under survey and/or in accordance with GL Rules for [Tall Ship Rigs \(I-4-1\)](#). For those rigs, the condition “as-built” or “as-designed” will be taken as a basis for evaluation. For this purpose, a minimum number of relevant design drawings shall be available as a reference.

B Certificate

B.1 Purpose

The “Rig Inspection and Maintenance Certificate” provides verification that a tall ship rig is under continuous inspection of condition, maintenance measures are performed in accordance with these Guidelines and prescribed surveys are accomplished by their due dates as constituted on page 2 of the certificate.

B.2 Initiation

For admission, the certification process will be actuated by an initial survey. If the rig is not new, the scope of this survey shall be similar to a Level “A” inspection in general.

B.3 Periodicity

The certification interval starts with the date of the initial survey.

The certificate only will be valid together with the latest relevant Survey Statement.

The validity of a certificate will be through one complete period of Level A Inspection. A sample certificate is shown in [Annex C](#).

The certification will however be stalled after the provided periodicity of surveys will not be followed.

Annex A Generic Inspection Program

Documentation

- Check scope of available rig design drawings/documentation.
- Check rig-log; maintenance work, repairs and/or modifications since last inspection.
- Read through the last inspection report and note the deviations that were reported.
- Check for and read through the last maintenance report.
- Look carefully at the comments that were made.
- Check the certificates for components replaced/modified.

Rig spars

- Examine mast/rig column.
- Inspect spar tubes incl. reinforcements.
- Inspect step, partners, wedges, bearings, etc.
- Inspect crosstrees, spreaders, hounds, etc.
- Inspect steel-work, bands, tangs, reinforcements, doublers, etc.

Rig structural components

- Inspection of welded joints. Particular attention to welds where the paint has broken or that show a lot of corrosion.
- Check the structure for dents, bend, severe rusting and other damage. Check the fixing of parts to each other.
- Check all bolt and pin connections and their locking, including parts where there may be risks of falling.
- Check the groove wear on sheaves.
- Check bearings on play, position and clearance.
- Check for chafing along structural parts.
- Check lubrication.
- Evaluate protective coating.

Standing rigging cables

- Evaluate rigging tension.
- Inspect standing rigging wires for broken strands, deformation, chafe and corrosion.
- Check wire protective coating/covering.
- Check end terminations for creep, corrosion, deformation, wear.
- Check associated fittings like turnbuckles etc. for corrosion, lubrication, deformation, etc.
- Check chain plates; evaluate condition.
- Check the cables being used for conformance with specification, rig-log and certificates.
- Check the measured diameter of cables. It must be in accordance with cable specification and design documentation.

Running rigging

- Inspect wire rope for chafe, wear, deformation, corrosion etc.
- Inspect rope for chafe, wear, deformation, corrosion etc.
- Inspect general conditions of end terminations, end fittings.
- Check the cables being used for conformance with specification, rig-log and certificates.

- Check the measured diameter of cables. It must be in accordance with cable specification and design documentation.
- Inspect blocks and associated fittings on functionality, wear, corrosion etc.
- Check if shackles and other connections seized/moused.
- Check if bolts are secured against loosening.
- Check splices, soft eyes, end connections, etc.

Deck hardware

- Inspect winches on functionality.
- Check the grooves for wear.
- Check the flanges of the drum for wear or sharp edges or deformation caused by wear.
- Check for excessive play of the bearings.
- Check the working of the pawl and the brake lining of the belt brake.
- Inspect tracks, travellers, pad eyes, turning blocks, pin rails, cleats and bollards.

Safety equipment

- Inspect conditions of ratlines; distance, end termination, chafe and wear.
- Inspect footropes, hand rails, safety fix points and strops.
- Inspect safety lines.
- Inspect safety netting.

Annex B Assessment / Evaluation Criteria

	Typical deficiency aspects					deficiency criteria	recommended literature	Newbuild Design	Newbuild Materials	Newbuild Manufacture
	corrosion	distortion	crack	wear	clearance					
Steelwork	x	x	x	x		GL VI-2-2 Sect 13- F		GL I-4-1	GL VI-2-2 Sect 2	GL VI-2-2-Sect 11
Tubes	x	x	x			GL VI-2-2 Sect 13- F			GL II-1-2 Sect 2	GL II-1-2 Sect 2-A
Angle sections	x	x	x			GL VI-2-2 Sect 13- F			GL VI-2-2 Sect 2	GL VI-2-2-Sect 11
Eyeplates	x	x	x	x	x	GL VI-2-2 Sect 13- F	ISO 8146, EN 10025			
Bolts, bushes	x	x	x	x	x	GL VI-2-2 Sect 13- F.7				
Pins	x	x	x							
Standard parts (screws, nuts)	x	x	x						GL VI-2-2 Sect 2	GL VI-2-2-Sect 2-H
Sleeves	x	x	x							
Tappets	x	x	x							
Shafts	x	x	x	x	x					
Hooks	x	x	x							DIN EN 818
Chains and chain links	x	x	x							
Shackles	x	x	x							
Pulleys	x	x	x	x		GL VI-2-2 Sect 13- F.6	CASAR "Wire rope forensics"		GL VI-2-2 Sect 8-B.4	GL VI-2-2-Sect 11
Lubricating nipples	x	x	x							
Welds	x	x	x			GL II-3-2 Sect 4	DIN EN ISO 22825		GL VI-2-2 Sect 11	GL VI-2-2-Sect 11
Wooden parts		x	x	x	x		BWB - VG 81244	GL I-4-1	GL II-2-2 Sect 1	GL II-2-2 Sect 1
Wire ropes	x	x		x		GL VI-2-2 Sect 8-E	ISO 4309	GL I-4-1	GL VI-2-2 Sect 8	GL VI-2-2-Sect 11
Ropes		x		x	x	GL VI-2-2 Sect 8-E	Cordage Institute CI 2001-04	GL I-4-1	GL VI-2-2 Sect 8-C	GL VI-2-2-Sect 11
Lanyards		x		x	x	GL VI-2-2 Sect 8-E			GL VI-2-2 Sect 8	GL VI-2-2-Sect 11
Endfittings	x	x	x	x		GL VI-2-2 Sect 8-E	for example EN 13411		GL VI-2-2 Sect 8-D	GL VI-2-2-Sect 11

Annex C Sample Certificate

Sample



Rig Inspection and Maintenance Certificate

Certificate No. 77777 HH

This is to certify that the rig of Sailing Vessel

"Name"

GL-Reg.-No. 111111
Call Sign: 3ABC3
IMO No.: 98765432

Flag Germany
Port of Registry Hamburg
Owner Company Inc.
Year of built 1963
Rig Type Barkentine

is under continuous inspection of condition and performing maintenance measures in appropriate accordance with GL Rules for Classification and Construction:

I- 4- 4 Guidelines for Maintenance and Inspection of Tall Ship Rigs

This is provided that prescribed surveys are accomplished by their due dates as constituted on page 2 of this certificate. This certificate is valid together with the latest relevant Survey Statement. The certificate will be renewed upon successful completion of Level A inspection.

Hamburg, 23. Oktober 2013
Germanischer Lloyd

(Tobias Funk)

(Hasso Hoffmeister)

Page 1/2

Chairman of the Supervisory Board: Dr Wolfgang Peiner • Executive Board: Erik van der Noordaa (Chairman) • Dr Joachim Segatz • Pekka Paasivaara
Germanischer Lloyd SE, Registered Office Hamburg No. HRB 115442
Place of performance and jurisdiction is Hamburg. The latest edition of the General Terms and Conditions of Germanischer Lloyd is applicable. German law applies

Survey Endorsements

Initial survey endorsement

(Place and date of survey)

(Inspector)

1st "Level C" survey endorsement*

(Place and date of survey)

(Inspector)

(2nd "Level C" survey endorsement)*

(Place and date of survey)

(Inspector)

(3rd "Level C" survey endorsement)*

(Place and date of survey)

(Inspector)

(4th "Level C" survey endorsement)*

(Place and date of survey)

(Inspector)

1st "Level B" survey endorsement

(Place and date of survey)

(Inspector)

(2nd "Level B" survey endorsement)*

(Place and date of survey)

(Inspector)

1st "Level A" survey endorsement

(Place and date of survey)

(Inspector)

*= Please relate to GL Guidelines for insight concerning flexibility in survey intervals

Page 2/2

Chairman of the Supervisory Board: Dr Wolfgang Peiner • Executive Board: Erik van der Noordaa (Chairman) • Dr Joachim Segatz • Pekka Paasivaara
Germanischer Lloyd SE, Registered Office Hamburg No. HRB 113442
Place of performance and jurisdiction is Hamburg. The latest edition of the General Terms and Conditions of Germanischer Lloyd is applicable. German law applies