

TECHNOLOGY FOR SALE AND PURCHASE OF SHIPS	
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1. GENERAL REMARKS

1.1 Terms and Procedures of the Memorandum of Agreement
(MoA-SALEFORM)

The sale and purchase of a vessel is usually performed according to the standard terms and conditions, stipulated in a contract called "Memorandum of Agreement", code name "SALEFORM" (revised 1966, Layout 1974; latest revision 1983 with some essential modifications. Codename "SALEFORM 1983").

This saleform has been adopted by the Baltic and International Maritime Conference and is considered to cover the interests of both contracting parties equally in establishing a step-by-step business. Additional clauses and/or deletions from the printed form may be mutually agreed.

The main financial stipulations are not subject of the following explanations, but rather the commercial details necessary for technical consultancy and supervision.

Basically the sale and purchase procedure is performed in three steps.

- 1st : Signing of the MEMORANDUM of AGREEMENT (MoA) as contract with a fixation of price and a 10% deposit in a joint account for Sellers and Buyers, and authorization for the Buyers to sight the vessel's class records.
- 2nd : Inspection afloat with prompt acceptance thereafter or refusal. Should the latter be the case the 10% deposit is immediately released to the Buyers.
- 3rd : Inspection in drydock and delivery with underwater parts either in order or made good to the satisfaction of the classification society.

More than often, however, this classic procedure is modified in such a way that prior to signing the contract class records and inspection afloat are carried out in the very beginning.

1.2 Survey of Class Records

Once a vessel has been chosen for purchase the Buyers should not fail to have the class records carefully inspected and reported.

A full scale record will inform the Buyers with regard to the previous technical performance of his new investment. If it is carefully studied with all details available, it will make his technical staff sensitive. The following results may be obtained:

- a) Technical history of the vessel including eventual problems already encountered during building stage.

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- b) Operational problems and experiences the Seller encountered during vessel's service and details as to how they had been dealt with.
- c) Inspection results from major casualties and special surveys with reference values essential for further maintenance.
- d) Inherent weakness of machinery or hull may be concluded from repeated failures, reported in the records.
- e) Special attention may be called forth by the record analysis for items of the superficial inspection, i.e. checking items of previous repaired damages, locations of Metalock, crankshaft grinding etc.
- f) Previous recommendations, qualifications and/or notations may be identified as well as the last and existing class status.

With this full information from records the Buyers may precisely proceed to either accept the vessel as a reasonable investment or to

- discuss the purchase price,
- insist on having technical items settled prior to delivery,
- insist on having parts opened and examined during superficial inspection,
- determine the range of underwater hull and tailshaft inspection upon delivery drydocking,
- withdraw the purchase offer.

1.3 Inspection Afloat

The superficial inspection is pin-point part of the acceptance/delivery procedure.

It enables the Buyers to visually inspect the vessel (sometimes with certain openings agreed) in order to ascertain whether the vessel is suitable for his purposes. After the inspection the Buyer has to decide either to take the vessel or withdraw from the agreement.

A careful examination during this inspection should reveal the following:

- suitability of the vessel for the intended purpose,
- general condition of hull and superstructure, including a cost assessment for items of further maintenance and operation,
- condition of the main propulsion system and the auxiliary power systems including the available spares on board,
- actual defects of the vessel and aspects of possible counteractions/maintenance,

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- the actual performance values of the vessel, speed, output, consumption rates and carrying performances,
- the status of the documentation with the relevant papers and certificates on board in order to ensure actual conformance with the respective national and international rules and regulations.

To perform this inspection efficiently some check forms are attached and the following hints are given:

If 'openings' have been agreed to be carried out during superficial inspection, the attending inspector should choose the most sensitive parts which are liable to damage or wear down:

- crankshaft deflection to be measured, including journal clearances,
- a journal or bottom end or crosshead bearing, as deemed necessary in the light of the class record analysis,
- the piston/liner condition with the highest working hours (which will also suit Sellers' interest for maintenance),
- tooth condition of reduction gear and/or thrust bearing values,
- fore peak or aft peak and/or forward wing tanks, the latter being most liable to internal defects on account of bad weather, whereas aft peak suffers mainly from propeller vibration damages, and fore peak with double bottom tanks 1 are liable to pounding damage.

After finalization of the superficial inspection the Buyer has to declare his acceptance or withdraw. If a Buyer accepts the vessel knowing of defects which may or may not be the concern of the class or without having had full access to the vessel, he shall not wait until delivery inspection - it is then too late - but make his acceptance subject to the following:

- a) Defects now ascertained and not considered tolerable should be clearly expressed and the acceptance may be declared only if the Sellers agree to remove them on their account. Otherwise it might be understood that Buyers have accepted these defects, especially if they do not directly concern maintenance of class.
- b) Compartments or machinery parts, not accessible during the inspection (due to cargo in holds, a boiler presently not operable, etc.) should be expressively excluded from inspection results, thus making a "subject to be examined during drydocking survey upon which defects found to be removed on Sellers' account to satisfaction of class surveyor."
- c) Should such items of concern exist without a relevant involvement of a vessel's classification (e.g. bow thruster unit, diving equipment in supply vessels etc.), a proper proportion of the purchase price may be agreed as special deposit for release of the party which might suffer from the defective item if not made good prior to delivery.

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If after the superficial inspection the vessel has been accepted, this acceptance is final and strictly binding both parties to the further steps of the MoA until delivery.

Remark: Should a superficial inspection be agreed and made prior to the fixing of the MoA, as it is practise in some circumstances, the tentative Buyer is nevertheless well advised prior to the inspection

- a) to obtain the class records and
- b) to follow the inspection procedure as indicated above.

1.4 The Role of the Class

According to the SALEFORM the vessel's classification society has to participate during the drydocking inspection. However, unless otherwise specified the role of the class is limited only to the drydocking survey of parts below summer load line and even notations have to be accepted. "Notes, if any, in the surveyor's report which are accepted by the classification society without qualification are not to be taken into account." (see "Drydocking-Remark")

For the attitude and role of the class surveyors it should be borne in mind that before the vessel is actually transferred to the Buyer, vessel's class surveyor can only follow the instructions of the Seller as owner of the vessel.

Class attendance must be requested by the Seller and he will be the instructing party to the surveyor for the drydocking survey and the issue of the "maintenance of class certificate". Unless other class items are due for survey according to the pending survey periods the class surveyor will only confirm the validity of class, but not re-examine other parts of hull and/or machinery.

A class inspection or survey exceeding the drydocking items will usually not be required by the Sellers and may not be requested by the Buyers according to the printed SALEFORM text unless it has been specially fixed with additional agreements in the MoA.

In the interest of a Buyer it should therefore specially be stipulated that "upon delivery and together with the drydocking survey vessel's hull and machinery to be (superficially) inspected by the class surveyor in order to make sure that the operational condition of the vessel is fully maintained and damages affecting class are not existing..."

A "superficial" inspection of the class would imply that "openings" would not be necessary unless a direct concern arises during inspection.

Instead of the above wording it may also be mutually agreed in the MoA that upon drydocking a class survey should be performed "to the extent as carried out upon class prolongation surveys".

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For the Sellers the role of the class is finalized with the issue of the "Maintenance of Class Certificate".

This certificate/report will contain the results of the underwater survey of hull and machinery parts, but otherwise only confirm the vessel's class status as per the periodical surveys previously performed - unless specially instructed by the Sellers - or other periodical surveys being due.

The "Maintenance of Class Certificate"/report will contain any qualifications and/or recommendations, but not necessarily notations otherwise registered for the internal purpose of the classification society. The relevant terms are defined below.

1.5 Qualifications, Recommendations, and Notations

For the terms used by the classification societies the following definitions may be established:

a) Qualifications

are restrictions which limit the value of the present class status. A qualification imposes on the vessel either trading limits or repairs or further examinations which have to be carried out within a defined time.

b) Recommendations

are substantially identical with qualifications, limiting the existing class status, advising certain conditions under which the vessel may proceed, or imposing repairs and/or examinations to be dealt with within a defined time.

Qualifications and recommendations are different terms used for describing the same status of class restrictions. Both terms do affect a "clean class certificate".

c) Notations

are remarks in the survey reports not necessarily affecting the "clean and valid class certificate". Thus a removal of a defect or even a supposed defect is not required within a specified date.

Notations are made to draw the attention of a surveyor to a certain item in order to keep the subject under control. Notations may result after further examinations in recommendations - if the condition is seriously worsening - or may be finally deleted - if remaining sound and within accepted tolerances.

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The definition "maintenance of class" is fully existing without qualifications/recommendations, but difficulties may arise if the class is maintained when "notations" exist. The classification societies handle this delicate matter rather differently, but generally it must be accepted that "notations" exist if the class reports indicate that certain items have to be kept under control.

Only if items are reported as being with the vessel and not affecting her class worthiness at all or "may remain indefinitely", it can be concluded that they do not affect vessel's class.

For easy reference see our analysis of notations as extracted from Lloyd's Register Regulations (LR-Notations for deferred repairs).

d) Pending items

according to Germanischer Lloyd definitions are "recommendations" in the above cited terms. They are printed out in the respective status reports of the GL. "Notations" are not entered in these reports, they are handled as "remarks" and classified as "Schönheitsfehler" - blemish or stain.

LR-Notations for deferred repairs

Identification	Definition	Damage	Form of Report
CATEGORY 1	"Qualification" Recommendation Repairs cannot be left to Owners' convenience	Main structures affected	Head Office Certi- ficates & Interim Certificates
CATEGORY 2 A	- Record - "Items noted do not affect main- tenance of class" Repairs to owners' convenience.	Not compromising structures	Endorsed on back Head Office Certi- ficates. Contained in special reasons list.
CATEGORY 2 B	- Notes - Repairs to Owners' convenience.	Indentations to shell	Not in certificates. Reported for inclusion in the appendix of special reasons list.

The above general remarks may assist Buyers as well as Sellers to prepare the MoA precisely according to their options and to interpret the saleform accordingly.

The following sections 2 and 3 are deemed to establish proper inspection results and smooth cooperation upon delivery.

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2. ACCEPTANCE PROCEDURE

2.1 Inspection afloat

The following stipulations of the MoA SALEFORM 1983 describe the procedure for inspection afloat:

"The Sellers shall provide for inspection of the vessel at and the Buyer shall undertake the inspection without undue delay to the vessel."

"During the inspection the vessel's log books for engine and deck shall be made available for Buyers' examination."

The check forms contained in Appendix A may be considered a suitable instrument to establish the necessary survey data and to detect possible defects.

It is recommended to use a pocket dictaphone and a camera for easy writing and providing photo material showing tool racks, spare part assemblies, etc. to avoid later disputes, should things have disappeared.

"If the vessel is accepted after such inspection, the purchase shall become definite provided the Sellers have received written notice hereof within 48 hours after completion of such inspection."

It should therefore officially be stated: the date and time of completion of the inspection with a countersignature of the master, which may be written as follows:

"To whom it may concern

This is to certify that m.v. "....." has been inspected during 2nd to 4th April 1981 with inspection completed on 4th April 1981 at 21.30 hours local time.

Master _____ Surveyor _____"

2.2 Notice of Acceptance

If the vessel has proved suitable to the Buyer, after inspection afloat a respective note may be telexed or otherwise forwarded through his broker:

"From: (Buyers' name)
to: (authorized Sellers)
re: m.v. "....." - Inspection

After completion of inspection on at hours we agree to accept the vessel according to the terms and conditions of the MoA dated

kind regards"

Should there be a "subject" due to defects found, this should be clearly stated as mentioned under 1.3.

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2.3 Spare parts at the time of inspection

"All spare parts and spare equipment including spare tail-end shaft(s) and/or spare propeller(s), if any, belonging to the vessel at the time of inspection, used or unused, whether on board or not, shall become the Buyers' property, but spares on order to be excluded. Forwarding charges, if any, shall be for the Buyers' account. The Sellers are not required to replace spare parts including spare tail-end shaft(s) and spare propeller(s) which are taken out of spare and used as replacement prior to delivery, but the replaced items shall be the property of the Buyers.

The Sellers have the right to take ashore crockery, plate cutlery, linen and other articles bearing the Sellers' flag or name, provided they substitute same with an adequate number of similar unmarked items for officers and crew. Library, forms, etc. exclusively for use in Sellers' vessel shall be excluded without compensation."

As it is difficult to totally ascertain the spares on board during a superficial inspection, photographs should be taken or copies made from spare lists if available on board.

Information may be obtained for equipment presently stored ashore or under repair in workshops.

"Spares on order" should be specially mentioned. They are excluded from the sale according to the revised wording of the SALEFORM 1983.

2.4 Guidelines for Reporting

The acceptance - or refusal - of the vessel is purely based upon the results established from checking the class records and finally from the findings gained during the superficial inspection afloat.

"GUIDELINES FOR INSPECTION AFLOAT" have therefore been prepared and attached as Section C, making a complete survey and data processing more effective.

The guidelines are applicable for all types of vessels, but special equipment or special purpose vessels may require additional and precise checking. Other relevant check forms may be obtained upon request through our office.

It may also be pointed out that detailed and careful examinations will take time unless the inspection is performed with more than one surveyor.

It is an advantage for the inspector to have the possibility to attend the vessel during a shorter sea passage. Any possibility to do so should be used.

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3. DELIVERY PROCEDURE

3.1 Drydocking

The procedure is defined in clause 6 of the MoA as follows:

"In connection with the delivery the Sellers shall place the vessel in drydock at the port of delivery for inspection by the Classification Society of the bottom and other underwater parts below the Summer Load Line. If the rudder, propeller, bottom or other underwater parts below the Summer Load Line be found broken, damaged or defective, so as to affect the vessel's clean certificate of class, such defects shall be made good at Sellers' expense to (the name of the Classification Society to be inserted)

satisfaction without qualification on such underwater parts. (Notes, if any, in the Surveyor's report which are accepted by the Classification Society without qualification are not to be taken into account.)

Whilst the vessel is in drydock, and if required by the Buyers or the representative of the Classification Society, the Sellers shall arrange to have the tail-end shaft drawn. Should same be condemned or defective so as to affect the vessel's clean certificate of class, it shall be renewed or made good at the Sellers' expense to the Class Society's satisfaction without qualification.

The expenses of drawing and replacing the tail-end shaft shall be borne by the Buyers unless the Classification Society requires the tail-end shaft to be drawn (whether damaged or not), renewed or made good in which event the Sellers shall pay these expenses.

The expenses in connection with putting the vessel in and taking her out of drydock, including drydock dues and the Classification Surveyor's fees shall be paid by the Sellers if the rudder, propeller, bottom, other underwater parts below the Summer Load Line or the tail-end shaft be found broken, damaged or defective as aforesaid or if the Classification Society requires the tail-end shaft to be drawn (whether damaged or not). In all other cases the Buyers shall pay the aforesaid expenses, dues and fees.

During the above mentioned inspections by the Classification Society the Buyers' representative shall have the right to be present in the drydock but without interfering with the Classification Surveyor's decisions.

The Sellers shall bring the vessel to the drydock and from the drydock to the place of delivery at their own expense."

The above wording of the revised SALEFORM 1983 especially mentions "underwater parts below the Summer Load Line" in contrast to the previous stipulations which made no reference to the load line. Hull indentations above this line may therefore, strictly speaking, not be considered as part of the delivery and drydocking procedure.

As it is not stipulated - but general practice - to clean the vessel for the underwater hull inspection and afterwards to recoat with anti-corrosive and anti-fouling, a special clause should be added to MoA for defining a thorough cleaning procedure, acceptable for fitting new underwater coatings. Cost for paint material, application and/or excessive time in drydock for Buyers' coating work only is usually for Buyers' account.

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The same should be applicable for renewal of zinc anodes etc.

For the performance of the underwater hull inspection check forms are attached as per Appendix B, also for interpreting various tolerances.

3.2 Bunkers and Lub.oils

Clause 7 of the MoA defines the procedure:

"The Buyers shall take over remaining bunkers, unused lubricating oils and unused stores and provisions and pay the current market price at the port and date of delivery of the vessel."

Bunkers should therefore be carefully sounded and computed, preferably during stay in drydock, when vessel is on even keel. Water indicating paste may be used to deduct any undue amount of water.

Lub.oils at that stage should be identified by chemical analysis if the quality is doubtful.

3.3 Certificates

Part of clause 8 "Documentation" reads as follows:

"The Sellers shall, at the time of delivery, hand to the Buyers all classification certificates as well as all plans etc. which are on board the vessel. Other technical documentation which may be in the Sellers' possession shall promptly upon the Buyers' instructions be forwarded to the Buyers. The Sellers may keep the log books, but the Buyers to have the right to take copies of same."

It should be understood and amended in the MoA that this relates also to all other trading certificates which are part of the vessel's characteristics and/or of the equipment. It should further be understood and amended that all relevant instruction books, manuals etc., necessary for the operation of the vessel, are included in the transfer of all plans in Sellers' possession.

3.4 Radio Installation and Nautical Instruments

"The radio installation and navigational equipment shall be included in the sale without any extra payment if same is the property of the Sellers." (see clause 7).

3.5 Change of Name

"The Buyers undertake to change the name of the vessel and alter funnel markings."

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3.6 Delivery Condition

Clause 11 expressively defines the condition of the vessel upon delivery:

"The vessel with everything belonging to her shall be at the Sellers' risk and expense until she is delivered to the Buyers, but subject to the conditions of this contract, she shall be delivered and taken over as she is at the time of inspection, fair wear and tear excepted.

However, the vessel shall be delivered with present class free of recommendations. The Sellers shall notify the Classification Society of any matters coming to their knowledge prior to delivery which upon being reported to the Classification Society would lead to the withdrawal of the vessel's class or to the imposition of a recommendation relating to her class."

Disputes arising "in connection with the interpretation and fulfilment of this contract" can only be mutually agreed or finally decided by Arbitration. (Clause 15: Arbitration)

Delivery may be deemed as completed after signing a Delivery Note, which may read as follows:

" This is to certify
that m.v. "....." has today been
delivered by Sellers Messrs.
to the Buyers Messrs.
in accordance with the terms and conditions of
the MoA dated

Place/date/time
.....

for Sellers
authorized representative

for Buyers
authorized representative"

3.7 Guidelines for Delivery

As per clause 5 line 36 "..... the vessel shall be delivered and taken over at / in"

Delivery and taking over is therefore a mutual and parallel procedure with Sellers' and Buyers' staff fully involved, exchange of necessary information, handover of tools, drawings, keys, etc., and with the necessary checks performed along with the intentions of the MoA.

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Along and after drydocking we propose for final taking over the following steps:

1. Handover of safety equipment:

A complete inspection of the safety equipment may be performed either along with vessel's Fire Fighting and Safety Plan or by using respective check forms of the relevant authorities.

This check will include i.a.:

- lifeboat equipment
- emergency signals
- fire fighting equipment and installation.

As this is a major step, necessary for all ships which change flag, the above procedure should be specially agreed in the MoA and the Class Surveyor consulted at the same time to issue the required new Safety Equipment Certificate.

2. Handover of bridge equipment:

Operation and true running of the bridge and navigation equipment should be established, signals, books, charts, tools, spares, etc. should be handed over.

The same relates to the radio station.

3. Handover of machinery department:

Stores, workshops, and machinery spaces should be mutually inspected as part of the delivery/taking over procedure. Unused lub. oils and remaining bunkers have to be measured and calculated for delivery time.

Spare parts etc. should be available as per M.o.A. definitions.

4. Handover of deck department:

The deck compartments, machinery installations, and outfit including stores, cargo and hatch cover gear, together with the keys and tools.

5. Handover of catering department:

Galley compartment, galley equipment, dry and cold department should be inspected, including bond stores, linen stores, pantries, steward equipment, laundries, etc.

If the above handover can be performed as described, department by department, it may ease the cooperation between Sellers and Buyers.

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After each handover inspection a relevant statement may be signed; any deficiencies - if any - may be noted. It avoids disagreement and Buyer or Seller personally may decide later if such deficiencies are to be dealt with according to the MoA.

6. Handover of certificates and documentation:

The final step is deemed to be delivery and acceptance of all relevant ship and trading certificates and the purchase documents, together with the delivery note, finally signed by both parties.
The attached check forms may assist in providing all necessary documents.

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SECTION B - REVIEW

RECOMMENDED AMMENDMENTS TO SALE FORM

- Modification of printed SALE FORM TEXT:
Lines 31, 44, 45, 50, 53, 54, 55, 63, 71, 74, 81/82.
- Additional Clauses:
 - A = Usual additional clause
 - B = Usual clause in respect of certificates
 - C = Familiarization for Buyers' crew
 - D = Condition of vessel
 - E = Cleanliness
 - F = Delivery procedure
 - G = Parts of vessel not sighted during inspection afloat
 - H = Definition of openings
 - I = Maintenance of Class Survey

Recommended amendments to SALEFORM
Suggested terms for Buyers

Line	SUBJECT	MODIFICATION/AMENDMENT
31	written notice of acceptance:	insert "72 hours" at least
44	Underwater parts	Insert "including side thrusters, stabilizers, fins etc. if fitted"
45	Drydocking - defective parts	Insert "including side thrusters, stabilizers, fins etc. if fitted"
50	Drydocking work	Insert after 'drawn': "... the rudder/tailshaft clearances checked and the opening and closing of all sea and outlet valves"
53	Drydocking expenses	Insert after 'shaft': "measuring rudder/tailshaft clearances and opening/closing of sea- and outlet valves"
54	" "	Insert after 'Society requires': "these items and/or".....
55	" "	Add: "The cost for grinding of sea/outlet valves for internal coating and repacking to be for Buyers' account."
63	Buyers' rights in drydock	"Buyers have the right to renew the zinc anodes and to paint the underwater hull at their expense. Should the vessel be delayed due to Buyers' work, dock expenses for such extended period shall be for Buyers' account."
71	Spares on order	".....but list of such spares to be telexed incl. costs after inspection"

Recommended amendments to SALEFORM
Suggested terms for Buyers

Line	SUBJECT	MODIFICATION/AMENDMENT
74	Spare parts on board	Add: "However, usable spares on board upon delivery to correspond at least to the requirements of class."
81/82	payment for unused provisions and stores	Change text to: "The Buyers shall take over and pay the current market price for remaining bunkers and unused lub.oils and take over all provisions and all other stores on board at delivery without further costs. Bonded stores/cigarettes, tobacco etc., liquor, wine, beer etc. shall be taken over and paid for as per original invoices;"
110	Delivery: operational condition of vessel	See: Additional clause (D)
114	Delivery: cleanliness prior delivery	See: Additional clause (E)
	Delivery procedure	See: Additional clause (F)

Recommended amendments to SALEFORM
Suggested terms for Buyers

SUBJECT

MODIFICATION/AMENDMENT

A The usual additional clause (A)

"Vessel to be delivered with class maintained free of recommendations and free of average damage affecting class"

Cancel "average", insert "any", at least enter "any visible" or "any damage detected during survey"

B Additional clause (B) Certificates

"Vessel to be delivered with all class and trading certificates as necessary for her present flag and her trading area of class, all these documents to be clean and valid for at least 6 months without extension."

"True copies of all national certificates, which cannot be delivered with the ship, shall be handed over by the Sellers in duplicate upon delivery."

C Additional clause (C)

Familiarization of Buyers/crew

"4 - 6 weeks prior delivery Buyers to have the right to place on board 2 - 4 of their crew members for familiarization purposes of running the ship.

They shall not interfere with the Sellers' operations and be on Buyers' risk and expense. Sellers shall provide accommodation and provisions as usual for their own crew. Victualling and communication expenses to be for Buyers' account."

"Cost per person and day on board: US\$"

Recommended amendments to SALEFORM Suggested terms for Buyers	
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Operational condition of vessel (D)

The vessel shall be delivered substantially in the same condition as upon inspection afloat, fair wear and tear accepted. Notwithstanding the above, vessel's machinery, cargo gear, hatch systems, galley and catering equipment, navigation and radio equipment, safety equipment and installations shall be delivered in normal working condition.

For this purpose the following tests to be carried out in presence of Buyers' representatives:

1. Running of all diesel generators and parallel operation.
2. Function test of emergency generator and attached devices
3. Suction and delivery test of all pumps.
4. Function test of all compressors with the loading of all air receivers to full pressure.
5. Function test of all units in reefer and air conditioning plant.
6. Function test of oil fired boiler with steam supply and return in all heated systems.
7. Running test of all ventilators.
8. Running test of cargo gear and anchoring/mooring winches.
9. Hose test of hatch covers and opening/closing test.
10. Pressure test of fire line.
11. Function test of sewage plant and bilge de-oiler.
12. Function test of bridge equipment.
13. Function test of radio equipment.
14. Function test of galley and catering equipment.
15. Inspection of all safety devices and installations according to vessel's safety equipment list.

The above function tests/inspections may be carried out during sea voyage prior to delivery with Buyers' crew members attending. Otherwise these exercises shall be finalized during delivery/handover procedure at the port of delivery.

Missing or defective parts have to be rectified by Sellers.

Should a dispute arise in the above technical matters, a class surveyor shall attend. His decision shall be final and binding both parties.

Recommended amendments to SALEFORM Suggested terms for Buyers	
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Cleanliness of vessel (E)

The vessel shall be delivered with dry and clean, swept/washed cargo compartments, free of cargo and garbage residues and free of smell.

The cargo hold bilges, engine bilges/bilges of machinery spaces shall be empty apart from such rests which cannot be pumped.

Vessel's sludge tank(s) and/or old oil tanks shall not be filled higher than 1/3 of their capacities.

Vessel's decks shall be free of garbage; garbage tank shall not contain more than 1/3 of the filling capacity.

Accommodation including galley stores and sanitary spaces shall be clean in an ordinary manner.

Recommended amendments to SALEFORM
Suggested terms for Buyers

Handover procedure (F)

Prior to vessel's delivery the following handover procedure to be mutually performed between both parties:

1. Handover of safety equipment

Both parties agree to consult the class surveyor for checking the vessel's safety equipment to the extent as necessary for Buyers to receive the Safety Equipment Certificate under the respective flag.

Any and all items which might be required for the Buyers' flag only are Buyers' concern. Sellers only to be responsible for delivery of the existing standard as required under Sellers' flag, but missing and/or defective items of

- lifeboat equipment,
- emergency signals and
- fire fighting equipment

shall be replaced or rectified at Sellers' expense.

2. Handover of bridge and radio equipment

Function tests of all respective equipment units shall be made and indicate the true running together with respective valid certification.

All manuals, books, charts, tools, spares etc. should be shown to Buyers' representative and the stations afterwards be locked and all keys kept ready for final handover.

3. Handover of machinery department

Unused lub.oils and remaining bunkers on board to be mutually measured and calculated for the time of delivery.

The operational tests shall be carried out in presence of Buyers' representatives and a respective statement be signed afterwards.

Stores, tools, workshops etc. should be mutually sighted and checked as far as necessary. Respective compartments to be locked afterwards and all keys kept ready for final handover.

4. Handover of deck department

The deck and accommodation compartments/units shall be inspected/tested with Buyers' representatives, store rooms and workshops areas afterwards closed and locked as far as possible and all keys kept ready for final handover.

A list of narcotics remaining on board shall be countersigned by the new master, ditto a list of the bonded stores which remain on board.

5. Handover of catering department

Galley, pantry, and washing/cleaning machines and units to be function tested and proved in service condition. Equipment of the department to be checked and store rooms afterwards to be locked and all keys kept ready for final handover.

Inoperational equipment to be satisfactorily repaired prior delivery.

Recommended amendments to SALEFORM

Suggested terms for Buyers

Parts of the Vessel Not Sighted during Inspection Afloat (G)

All cargo compartments or tanktops in holds which were not accessible to Buyers' representative during superficial inspection are to be inspected by Buyers' representative at the time of drydocking. Any defects and/or damages found which would result in class recommendations are to be made good to class satisfaction prior delivery at Sellers' expense and time. This, however, does not give Buyers the right to reject the vessel. Should a dispute arise, the class surveyor shall attend and make his decisions which are final and binding the parties.

Definition of Openings (H)

During inspection afloat, the crank case doors of the main engine(s) shall be opened for examination and the engine deflections be measured in presence of the inspector.

Also inspection covers of reduction gear(s) to be opened for visual examination.

The above facilities for inspection shall not be deemed as "openings" which may or may not be otherwise agreed.

Maintenance of Class Survey (I)

Together with drydocking survey, Sellers to instruct the class that vessel's hull and machinery is superficially inspected by the class surveyor for issuing a "Class Maintenance Certificate" which shall expressly state that damages affecting class are not existing.

For this purpose the surveys for hull and machinery shall be conducted at least to the extent as of annual surveys. Any assigned annual survey and during drydocking will be deemed in accordance with these stipulations.

TECHNOLOGY FOR SALE AND PURCHASE OF SHIPS	
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SECTION C - REVIEW

GUIDE LINES FOR INSPECTION AFLOAT

HULL PART

1. Log Book Performance Data
2. Status of Trading Certificates
3. Navigation Aids, Instruments & Equipment
4. General Condition of Superstructure
5. General Condition of Hull Sides and Decks
6. Hatch Covers
7. Cargo Compartments
8. Cargo Gear
9. Deck Machinery

MACHINERY PART

1. Log Book Performance Data
2. Classification Status
3. Maintenance Status
4. Condition of Machinery Compartments
5. Visual Examination of Main Engine
 - 5.1 Without Openings
 - 5.2 With Openings
 - 5.3 Visual Examination of Reduction Gear(s)
6. Visual Examination of Diesel Generators
7. Visual Examination of Essential Pumps
8. Visual Examination of Reduction Gear(s)

GUIDE LINES FOR INSPECTION AFLOAT	
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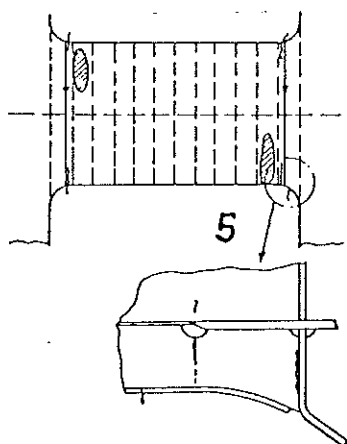
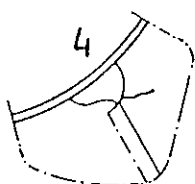
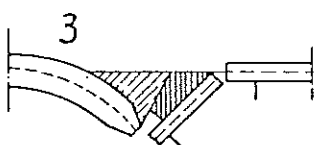
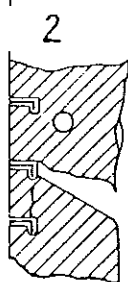
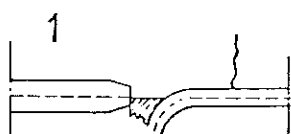
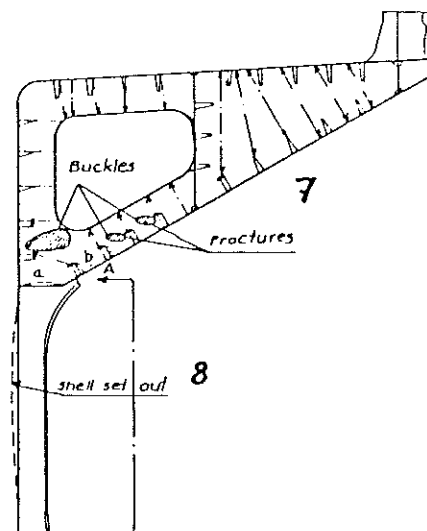
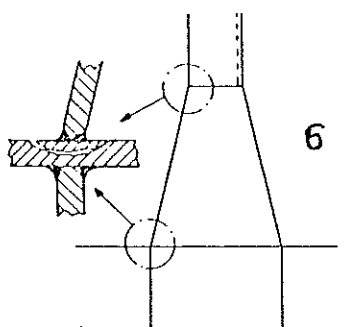
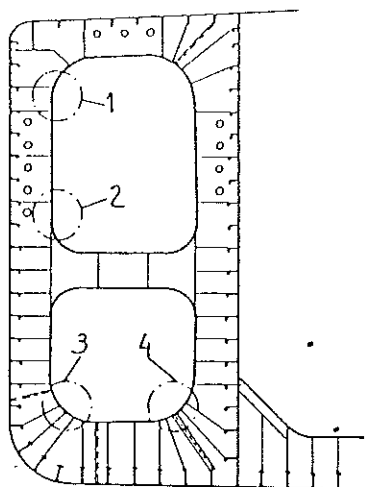
The following pages are deemed as general guidance for the inspector. The adopted system of inspection procedure is based upon our experiences and logical pattern:

- a) to obtain in the beginning all those data which can be made available by desk work when the inspection is discussed with master and chief engineer;
- b) to examine thereafter the actual condition of the respective compartments, machinery and equipment.

Time limitation may lead to more superficial results and not cover all compartments, but whenever possible, the main pattern of this inspection scheme should be followed. It will provide a complete and rational picture. Together with the examination of the vessel's class records, full assessment of the future investment can be provided.

Any compartments not fully inspected due to reason of cargo in holds, ballast condition or similar reasons, should be excluded from vessel's acceptance and be a subject of further inspection at other occasions or during drydocking time. (See Section A)

HULL PART INSPECTION - HOLDS / TANKS -



POS.	PARTS	POSSIBLE DEFECTS
1	flanges	cracks at conn ections
2	web plates	fractures + buckling
3	flanges/webs	distortion after cracking
4	scallops	cracks

Main areas of stress concentration are concentrated to webframe corners and along tierods.

Further in way of cut outs or scallops, especially along the bottom and deck plating webs, where the longitudinals are passing.

5	hatch corners	buckling of deckplating, fractures aside of reinforced plates
6	bulkheads	fractures at corrugated connections to stool and tank-top
7	wing tank webframes	fractures and buckling
8	side shell	bagging effects together with frame bucklings

Liable to above damages are especially forward and aft structures.

Bulkhead connections to be checked as close as possible upon surveying condition.

Case no.	Age (yr)	Sex	Occupation	Family history
1	25	M	Student	None
2	25	M	Student	None
3	25	M	Student	None
4	25	M	Student	None
5	25	M	Student	None
6	25	M	Student	None
7	25	M	Student	None
8	25	M	Student	None
9	25	M	Student	None

1000 900 800 700 600 500 400 300 200 100 0

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ISSUED	VALID	REMARKS
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Last annual survey

Safety Equipment Certificate

International Load Line Certificate

Last annual load line survey

Cargo gear 4 or 5 year examination

Cargo gear last annual survey

Intern.Oil Poll.Prevention Certificate

IOPP-Certificate last survey

Deratting Examination Certificate

International Tonnage Certificate

Panama Canal Tonnage

Suez Canal Tonnage Certificate

Life Raft Inspection Certificate

CO₂ fire exting. plant insp. Certificate

Fire Extinguisher Servicing Certificate

EXPERT SHIPPING SERVICE · HAMBURG

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GUIDE LINES FOR INSPECTION AFLOAT
(HULL PART)

3. NAVIGATION AIDS/INSTRUMENTS & EQUIPMENT

Item	Last service or certificate	Funct.test carried out	Remarks
Auto steering gear			
Off course alarm			
Echo sounder			
Radar 1			
Radar 2			
Radio direct. finder			
Satellite navigator			
Magnetic compass			
Magnetic spare compass			
Day signal lamp			
Barometer/graph			
Thermometer(s)			
Chronometer			
Sextant			
other(s)			
Navigation lights			
Emergency lights			
Last compass compensation			
Last direct.finder compensation			

Note available inventory books
or lists for

- pilot books ect.
- sea charts
- bridge equipment

GUIDE LINES FOR INSPECTION AFLOAT
(HULL PART)

4. GENERAL CONDITION OF SUPERSTRUCTURE

Item	good	satis- fact.	poor	Remarks
Compass deck and signalmast(s) and equipment in way				
Bridge deck(s) Navigation room(s)				
Radio room & equipment Operators cabin				
Boat deck Life boats davits				
.... deck engine skylights				
.... deck and parts				
Mess room(s) Officers Pantry Saloon(s)				
Mess room Crew Pantry Recreation room				
Accommodation Master Accommodation Chief Eng.				
Accommodation Officers Accommodation Crew				
Sanitary spaces Officers Sanitary spaces Crew				
Laundry				
Galley Drystore Reefer store				

GUIDE LINES FOR INSPECTION AFLOAT
(HULL PART)

5. GENERAL CONDITION OF THE HULL SIDES, DECKS

(Check items for indentations, deformations, corrosion, maintenance)

ITEM	good	satis- fact.	poor	Remarks
Port side shell above waterline ----- Bow part Mid ship sections Aft body				
Starboard shell above waterline ----- Bow part Mid ship sections Aft body				
Fore castle deck ----- Anchor/mooring winches Chains/stoppers/lines Intercom. and fairleads Signal mast				
Port side weather deck ----- Bulwark/rails Hatch coamings + cover securing Pipe lines on deck other fittings (air pipes, ventilators etc.)				
Starboard weatherdeck ----- Bulwark/rails Hatch coamings + coversecuring Pipelines on deck Other fittings (airpipes, ventilators etc.)				
Poop deck ----- Mooring winch(es) Stern anchor/wire/lines Intercom. and fairleads Accommodation ladder p/s Accomodation ladder stb. Garbage tank/box/bag etc. Provision loading equipment				

GUIDE LINES FOR INSPECTION AFLOAT
(HULL PART)

6. HATCH COVERS - HATCH NO. _____

(Inspect Hatch covers for tightness, structural defects, operational fitness, corrosion effects and securing system. For each cover use a single copy of this sheet)

ITEM	good	satis- fact.	poor	Remarks
<u>Structural integrity of panels</u> - side plating starboard - side plating port - top plating - cross members				
<u>Watertightness of seals</u> - longitudinal rubber profile - transverse rubber profile - corner pieces - coaming sealing bars p.+ s. - cross sealing bars - rain gutters				
<u>Cleats and fittings</u> - transverse joints cleating - longitudinal cleats - rollers and wheels - hinges - drains - jack ups				
<u>Hydraulic system(s)</u> - tightness piping and couplings - condition of stainless steel cylinders - condition of drives - condition of hydraulic pump unit - condition of control panel				
<u>Hatch coaming top plate</u> - Wear down of cover seats - Wear down of roller channels - Coaming drains				

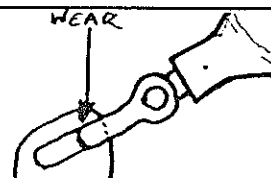
GUIDE LINES FOR INSPECTION AFLOAT
(HULL PART)

7. CARGO COMPARTMENTS - HOLD NO.

(Check each cargo hold for integrity of structures, access ladders and fittings, pipes, cable ducts, coating condition, lights, bilges, corrosion effects etc. Use for each hold a copy of this sheet)

Item	good	satis- fact.	poor	Remarks
<u>Structural Condition</u> - forward transverse bulkhead - starboard side shell - aft transverse bulkhead - port side shell - under deck starboard - under deck port - tanktop and ceiling - bilges				
<u>Coating Condition</u> - under deck - shell sides - bulkheads - tank top - bilges				
<u>Safety Arrangements</u> - access ladder/stair fwd. - access ladder/stair aft - cable ducts - hold lights - ventilator grids and ducts - CO ₂ piping - Pipe protections				
<u>Cargo Fittings</u> - container arrangements - Grain U-bars, stanchions, boards - cargo battens				

GUIDE LINES FOR INSPECTION AFLOAT
(HULL PART)



BOOM HEAD FITTINGS

3. C A R G O G E A R

Check each derrick system and enter criteria "good", "ok" or "poor" under the respective derrick number.

ITEM	1	2	3	4	5	6
Purchase (cargo) wire						
Purchase tackle						
Purchase swivel, hook						
Purchase winch						
Winch foundation						
Topping wire(s)						
Topping tackle(s)						
Topping winch(es)						
Winch foundation						
Guy wires + tackles						
Guy winches + found.						
Preventers						
Boom head fittings						
Gooseneck bearings						
Mast top fittings						
Control stand/handles						
Limit switches						
General condition						

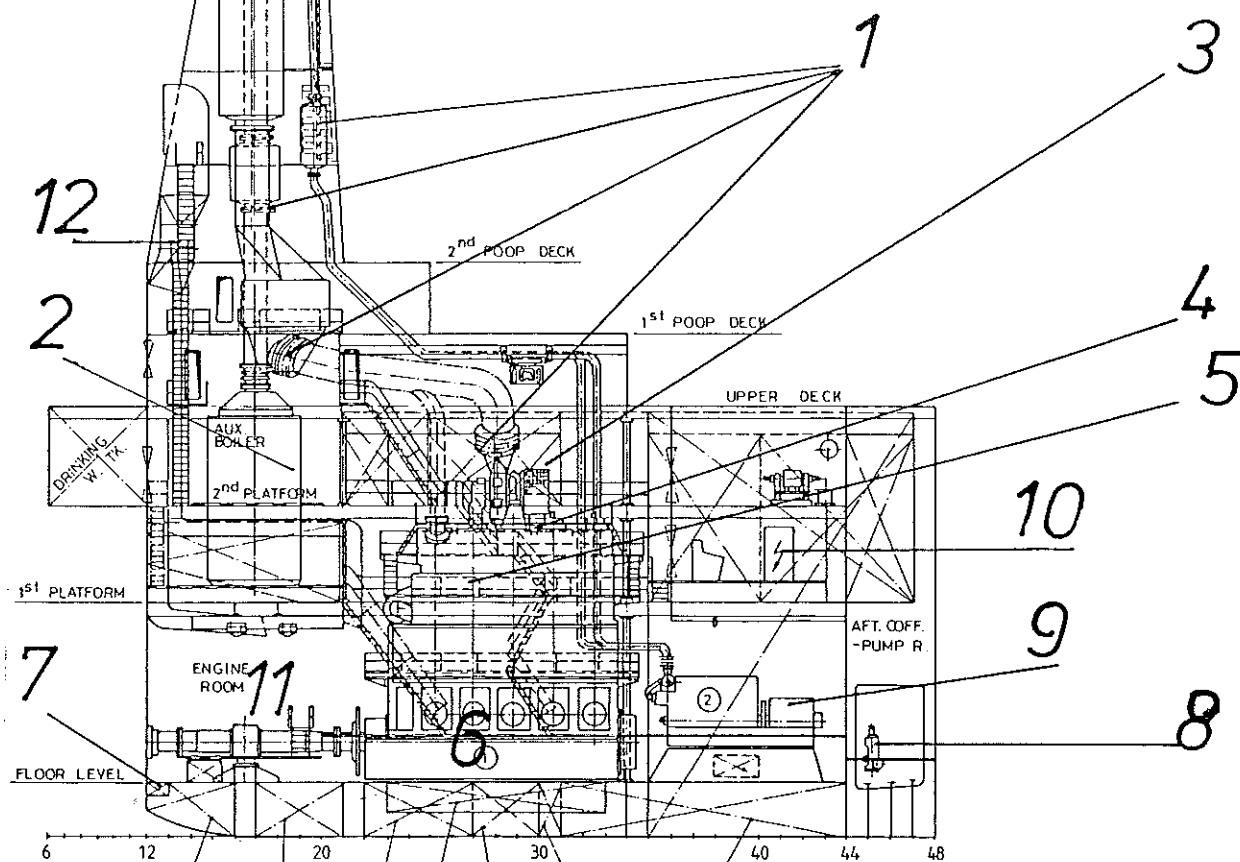
Check also hydraulic machinery spaces and /or electric cabinets.

GUIDE LINES FOR INSPECTION AFLOAT
(HULL PART)

9. DECK MACHINERY

Item	good	ok	poor	Remarks
<u>Windlass</u> - General upkeep and lubrication - Chain sprockets: wear down - Brake linings: wear down - Open drive wheels: tooth condition - Shifting gear: spindles and clutches - Drive motor - Control stand and panel				
<u>Mooring gear forward</u> - General upkeep - Brakes - Auto control devices - Manual controls - Mooring ropes/wires				
<u>Hoisting equipment for gangway etc.</u> - Wires, tackles port - Drive motors and gear part - Accommodation ladder port - Wires and tackles starboard - Drive motors and gear starboard - Accommodation ladder starboard				
<u>Mooring gear aft</u> - General upkeep - Brakes - Auto control devices - Manual controls - Mooring ropes/wires				

MACHINERY PART INSPECTION - M/E COMPARTMENT -



POS.	PART	POSSIBLE DEFECTS
1	Exhaust Lines	wear out of elastic mounting, sagging of piping, gas leakage at compensators, damaged insulation
2	Boiler/ Steam System	loose or fractured mountings, oil in cascade tank, leakages missing instrumentation, damaged insulation
3	Turbo Charger	missing filters, loose mountings, gas leakage, washing arrange- ment
4	Cylinder Station	cooling water leakage, fuel leakage, missing instrumentation
5	Control Side	worn linkages, missing instruments, camshaft cam pittings, excessive leakages oil, fuel water
6	Foundation	loose bolts, chocks, stoppers, corrosion, pipe leakage, excessive stain
7	Bilges	excessive height of water, bearing oil/fuel level, leakage at tailshaft
8	Pumps/ Piping	leakages at stuffing boxes, poor pressure, corrosion, missing parts, pipe welds, repair sleeves
9	Alternators	sparking bushes, stained filters, internally dirty, excessive vibration, earthing strap
10	Switchboard	missing instruments or control handles, dirty internal gear, loose parts, disconnection, earthing
11	Shafting	foundation of support bearing, corrosion of shaftline, coup- lings
12	Ventilators	elastic mounting, excessive noise, fire flaps

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

1. LOG BOOK PERFORMANCE DATA

1.1 Consumption Figures:	Min.	Max.	Remarks
- Heavy fuel ____ cSt of M/E			
- Cylinder lubrication oil M/E			
- Crank case circulation oil M/E			
- MDO class M1, M2, M3 of D/G			
- Lubrication oil for D/G			
- Heavy fuel ____ cSt for boiler burner			
- Domestic freshwater			
- Boiler feedwater			
- Evaporator fresh water output			

1.2 Unattended machinery performance

(Engine log or data logger prints should be checked over the past 6 months and failures noted below)

Date	Alarm No.	Cause / Defect

1.3 Operational Performance

M/E continuous operation on heavy fuel with min. RPM of ____ (ECO-Speed)

M/E is operated on heavy fuel ☐ at sea only

☐ from berth to berth

☐ until ☐ minutes before finish with engines

No. ____ of D/G in operation at sea ____ t/day

No. ____ of D/G in operation at piloting ____ t/day

No. ____ of D/G in operation at idle in port ____ t/day

No. ____ of D/G in operation at cargo work ____ t/day

GUIDE LINES FOR INSPECTION AFLOAT (MACHINERY PART)

2. CLASSIFICATION STATUS REVIEW

(Check respective last class or other surveys done)

Item	Made	Valid to	Remarks
Annual survey			
Drydocking with sea/outlet valve check			
Tailshaft drawing			
Boiler internal survey			
Automation equipment survey			
Inert gas plant			
Internal survey air receivers			
Internal survey hydrofor tanks			
Internal survey calorifier			
Internal survey heat exchanger			
Last exchange of elastic coupling M/E			
of elastic coupling D/G			
Last megger test of electric plant			

Recommendation or notation of class:

Evaluation of continuous survey status:

Total number of machinery items _____ = 100 %
 Total number of items already surveyed _____ = %
 Remaining number of survey items _____ = %

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

3. MAINTENANCE STATUS

3.1 Total operating hours of M/E components (since renewal):

Cylinder	1	2	3	4	5	6
Cover						
Outlet valves						
Inlet valves						
Liner						
Piston						
Bottom-end bearing						
Crosshead bearing						
Internal bearing						
Inject. pump						
TC rotor			Vibration damper.			
TC gas casing						

3.2 Total working hours of M/E running parts (since last overhaul):

Cylinder	1	2	3	4	5	6
Outlet valve(s)						
Inlet valve(s)						
Piston						
Inject. valve						
Inject. pump						
Bottom end-bearing						
Crosshead bearing						
Journal bearing						
T/C rotor						

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

3.3 MAINTENANCE STATUS OF D/G UNITS

ITEM	No. 1	No. 2	No. 3	
Total operating hours				
Last complete overhaul (l.c.o.)				
Running hours after l.c.o.				
Last lub oil change				
Last T/C complete overhaul				
Running hours of T/C after l.c.o.				
Oversize crank bearings				
Oversize journal bearing				
Oversize spare bearings				
Alternator				
Running hours since last workshop overhaul				
Running hours of bearings				
Last Meg. test readings				

Available spare parts	new	re-cond.	old	

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

4. CONDITION OF MACHINERY COMPARTMENTS

Item	good	satisf	poor	Remarks
<u>Control room</u> - Instrumentation <u>external</u> defects - Cleanliness behind panels - Alarming functions - Manoeuvring printer - Failure recorder/printer - General upkeep				
<u>Machinery casing and uptake</u> - Exhaust piping insulation - Exhaust compensators and elastic mountings - gas leakages - Other piping - Lighting and upkeep				
<u>Main engine compartment</u> - Cleanliness of main engine - Cleanliness of other systems and components - Cleanliness of walls, floors, bulkheads etc. - Pipe/valve leakages in fuel system - Pipe/valve leakages in steam system - Pipe/valve leakages in cooling water system - Pipe/valve leakages in seawater system - Pipe/valve leakages in sewage system - Lighting and upkeeps - Effect of ventilation system - Water/fuel oil in bilges				

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

4. CONDITION OF MACHINERY COMPARTMENTS (continued)

Item	good	satisf	poor	Remarks
<u>Diesel Generator compartment/station</u> - Cleanliness of diesel generators - Cleanliness of the compartment - Leakages of pipe systems/gas, water, oil - Lighting and upkeep - Effect of ventilation system				
<u>Separator compartment/station</u> - General upkeep and lightning - Steam leakages at heaters - Oil leakages at components and pipes - Oil in bilges underneath - Condition of insulation - Spares and tools - Effect of ventilation - Condition of control panels				
<u>Shaft tunnel/station</u> - General upkeep - Corrosion along shaftline - Leakages of pipes - Condition of support bearings - Condition of shaft stuffing box - Water in bilge				

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

4. CONDITION OF MACHINERY COMPARTMENTS (continued)

Item	good	satisf.	poor	Remarks
<u>Steering gear compartment</u> - General upkeep - Leakages - Condition of shaft bearing - Condition of steering gear - Controls and instrumentations - Emergency steering arrangements				
<u>Refrigerating compartment</u> - General upkeep - Leakages & ice formation - Instrumentations and panels - No. of spare bottles of gas available				
<u>Airconditioning compartment</u> - General upkeep - Corrosion underneath of units - Conditions of filters - Condition (noise) of ventilators - Condition of compressor unit - No. of spare bottles gas available				
<u>CO₂-Compartment</u> - Condition of bottles - Pipes and fittings - No. of spare bottles available				

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

5. VISUAL EXAMINATION OF MAIN ENGINE(S)

5.1 Without openings

Items	good	ok	poor	Remarks
<u>External condition</u> ----- - Engine generally clean, dry, properly serviced? - Instrumentation complete (local/remote)? - Attached piping, cables, parts defective? - Injection pumps and high press. pipes leaking? - Cylinder lubrication external defects/leakage? - Fuel/lub.oil filters external defects/leakage? - Viscosity control components defects/leakage? - Elastic coupling: belts free of cracks? - Turbochargers external defects/gas leakage?				
<u>Crankcase inspection</u> ----- - Colour of oil splashed area - Mode of oil deposits (normal slime, rough particles etc.) - Defects at inner parts (pipes, bolts/nuts bearings, slides) - Particles in way of bed plate - Condition of lub oil				
<u>Tests</u> ----- - Result of deflection measurement - Hammer test of foundation bolts - Flow of circulation oil with standby pump - Cooling water high tank: ph-paper test - Nozzle cooling water tank: fuel on surface? - Drain scavenging duct: water? - Drain T/C air and gas side: water?				

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

5.1 Without openings

Available spare parts	New	Recond.	Scrap	Remarks

5.2 With openings

Items	good	ok	poor	Remarks
Piston drawing No. ----- - Deposit on piston crown and ring grooves - All rings loose - All rings still in order - Upper chrome ring: condition of chrome - Upper ring groove clearance/condition - Condition of guide belts (if fitted) - General condition of liner surface - Condition of cyl. cover seats and valves - Condition of bottom end/crosshead bearing				
Wheel drive inspection ----- - Surfaces of wheel teeth - Chain suspension position - Particles in lub.oil residues				
Bearing inspection No. ----- - Running surfaces on upper/lower half - Outer sides of bearing shells smooth - Pretension measurement of shells (thin shells only) - Condition of respective pin - Clearances before and after inspection				

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

5.2 With openings

Items	good	ok	poor	Remarks
Camshaft inspection ----- - Condition of contact surfaces of cams - Condition of contact surfaces of rollers - Position marks of cams equal - Ahead/astern camshaft manouvability				
Stuffing box bottom inspection ----- - Cleanliness of floors - Condition of piston rods - Condition of stuffing boxes - Condition of liner shirts				

5.3 VISUAL EXAMINATION OF REDUCTION GEAR(S)

Item	good	ok	poor	Remarks
External Condition ----- - Instrumentation complete (local/remote) - External attachments and pipes defects - Leakages/cleanliness - Oil level measuring rod accessible - Standby pump and cooler in order - Foundation bolts/wedges tight - Indication of bilge water level at gear casing (float into gear)				

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

5.3 VISUAL EXAMINATION OF REDUCTION GEAR(S) (continued)

Item	good	ok	poor	Remarks
<p>Examination through covers -----</p> <ul style="list-style-type: none"> - Pinion teeth with pitting/markings - Wheel teeth without pittings/markings - Thrust bearing axial clearance at pinion - Thrust bearing axial clearance at prop.shaft - Condition of lub.oil - Condition of oil distribution with standby pump working - Condition of PTO-drive/teeth 				

Remark: A diagram of the reduction gear should be made and the last bearing clearances be obtained and entered. Photographs of teeth pictures are advisable to show the load distribution. Otherwise small sketches should be made.
If possible check also lub.oil fine filter with magnet for metal particles.
Measure the external control distance for the elastic coupling at pinion and obtain respective installation value together with maker's tolerance.

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

6. VISUAL EXAMINATION OF DIESEL GENERATORS

Item (enter condition as "good", "ok" or "poor")	No. 1	No. 2	No. 3
<ul style="list-style-type: none"> - Checked in running condition (YES/NO) - Leakages at cylinder covers - Instrumentation complete - Leakages fuel, lub.oil, water, gas - Vibration - Exhaust colour from indicators - Attached piping and components - Elastic couplings/hoses - Foundation bolts/elastic mountings - Condition of alternator - General upkeep/cleanliness - Lub.oil drop test 			
<p>- Readings obtained from running</p> <hr/> <ul style="list-style-type: none"> - - Cooling water temperature in/out - - Lub.oil temperature in/out - - Exhaust gas temperature in/out - - Cooling water pressure - - Lub.oil pressure 			

Spare parts available for Diesel engines (list spare parts under resp.)	new	recond.	old

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

7. VISUAL EXAMINATION OF ESSENTIAL PUMPS

Item (enter condition as "good", "ok" or "poor")	No. 1	No. 2	
<u>Air compressors</u> - Seen in running condition - general upkeep - Instrumentation - Elastic couplings			
<u>Cooling water pumps (fresh water)</u> - Seen in running condition - General upkeep - Leakages - Actual suction/delivery pressure			
<u>Cooling water pumps (sea water)</u> - Seen in running condition - General upkeep - Leakages - Actual suction/delivery pressure			
<u>Boiler feed water pumps</u> - Seen in running condition - General upkeep - Leakages - Actual suction/delivery pressure			
<u>M/E lub.oil pumps</u> - Seen in running condition - General upkeep - Leakages - Actual suction/delivery pressure			

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

7. VISUAL EXAMINATION OF ESSENTIAL PUMPS etc. (continued)

Item (enter condition as "good", "ok" or "poor")	No. 1	No. 2
Heavy fuel (No. 1) and MDO (No. 2) transfer pumps ----- - Seen in running condition - General upkeep - Leakages - Actual suction/delivery pressure		
Heavy fuel booster pumps ----- - Seen in running condition - General keep up - Leakages - Actual suction/delivery pressure		
HF Separators ----- - Seen in running condition - General keep up - Damages - Leakages - Control panel		
Luboil / MDO Separators ----- - Seen in running condition - General keep up - Damages - Leakages - Control panel		

GUIDE LINES FOR INSPECTION AFLOAT
(MACHINERY PART)

8. VISUAL INSPECTION OF ESSENTIAL APPARATUS

Item (enter condition as "good", "ok" or "poor")	No. 1	No. 2
Air receiver (instrumentation/upkeep) Hydrofor tanks (instrumentation/upkeep) HF- preheaters Cooling water high tank/Nozzle cooling water tank Fire fighting pump/E fire pump Sewage plant (=1), Bilge water separator (=2) Evaporator (=1), Calorifier (=2) F/F settling tanks HF service tanks (=1), MDO service tanks (=2) FW cooler(s) with thermostatic valve(s) Lub.oil cooler with thermostatic valve(s) Lifting gear for ME (=1) and D/G (=2) Hydraulic tools for M/E (=1) and D/G (=2)		
Boilers (1 = oilfired/ 2 = exhaust)	No. 1	No. 2
----- - Water level indicators - Tightness of valves and pipes - Insulation - Alarming devices - Oil in condensate detector - Salinity indicator - Steam pressure control valve - Steam temperature control - Water treatment - Steam condensator - Cascade tank / observation tank - Burner equipment		

TECHNOLOGY FOR SALE AND PURCHASE OF SHIPS	
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SECTION D - REVIEW

DOCKING INSPECTION AND DELIVERY
- SURVEY FORMS AND CHECKLISTS -

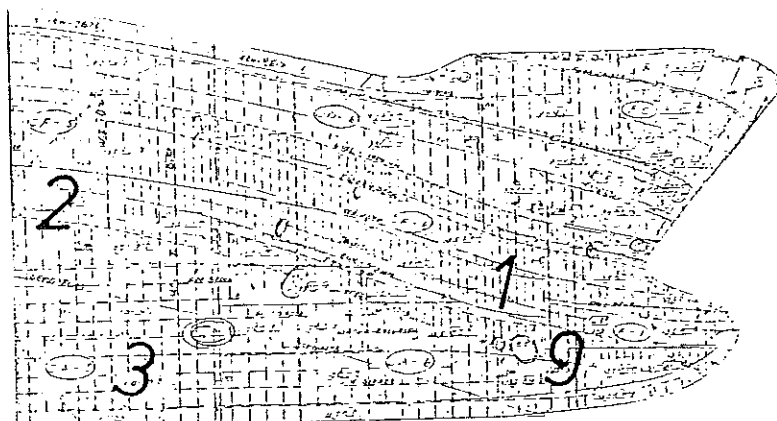
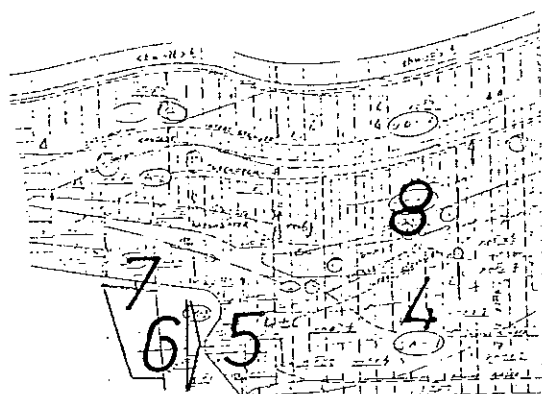
1. DRYDOCKING SURVEYS

- 1.1 Underwater Hull Condition
- 1.2 Sterntube Seals
 - SIMPLEX with slide ring/compact type
 - CEDERVALL
- 1.3 Tailshaft Inspection
 - Class Requirements
 - White Metal Bearing
 - Lignum Vitae Bearings
- 1.4 Propeller Condition
 - 3-blade
 - 4-blade
 - 5-blade
- 1.5 Rudder Condition
- 1.6 Sea- and Outlet Valves
- 1.7 Cathodic Protection
- 1.8 Anchor Chain Calibration

2. DELIVERY CHECKS

- 2.1 Check List Prior to Hand Over
- 2.2 Documents and Validity upon Delivery

DRYDOCKING INSPECTION



POS.	PARTS	POSSIBLE DEFECTS
1	Seams and butts	Worn welding seams and butts especially at fwd and aft body of hull
2	Bilge keels	Torn welding connections especially at ends and between scallons. Under/upper weldings !
3	Bottom and shellsides	Excessive corrosion defects, indents, leakages, damaged echosounder/log fittings
4	Seachests	Excessive corrosion, barnacles in pipes, defective pipeelongations, gratings
5	Propellershaft	Excessive clearances, leakages at oil seal, missing cover, defects at bearings, tube or outer/inner seal, cracks at taper
6	Propeller	Blade fractures, surface cavitation excessive worn edges, loose fit, missing cap, deformation
7	Rudder and shaft	Sagging of rudder/carrier, excessive clearance of bearings, loose bushes/sleeves, loose couplings, corr.welds, leakages of body, twisted shaft, misalignment
8	Sea- and outlet valves	Excessive corrosion/reduced thickness, worn seats + shafts, leaking seals, defects at hull penetrations of pipes
9	Side thrusters	Worn weldings around tunnel openings, excess corrosion in tunnel duct plating, defects of propeller, shaft seal, coupling, grating

Underwater Hull Condition				
No.	Item	Definition-Analysis	Effect	Check
1	Fouling	Seaweed (green) Barnacles 2,4,6,8 mm Tube Worms 1 - 10 mm State location and % of hull area	High pressure cleaning. Scraping and high pressure cleaning if build-up is heavy.	
2	Coating	Complete loss at sides and bottom (100 % - 75 %)	Surface treatment, renewal of coating min. 75 μ	
		Large scale wear-out in certain locations (50 % - 75 %)	Surface treatment, renewal of coating min. 75 μ	
		General wear-out but less than 50 %	Local touch up and 1 x coating	
3	Zinc Anodes	Complete wear-down indicates corrosion of hull and propeller	1 or 2 year protection? Define type and numbers for replacement. Consider correct application in way of stern frame	
4	Corrosion	Large scale wear-down of 20% thickness and more	At special survey, renewal in long strakes	
		Local wear-down of 25% and more	At special survey, renewal of plates locally	
		Local wear of welding seams and butts or of rivets	Rewelding to stop further increase	
5	Deformation and Indents	Hull girders and structural integrity affected	Qualification of class repair not to convenience	
		Local structures affected	In way half length from midships: qualification or subject to further examinations	
		Internals not affected	Repair to convenience with notation	
		Tolerances Flat indents up to 2 x plate thickness	May remain without notation	
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				- 52 -

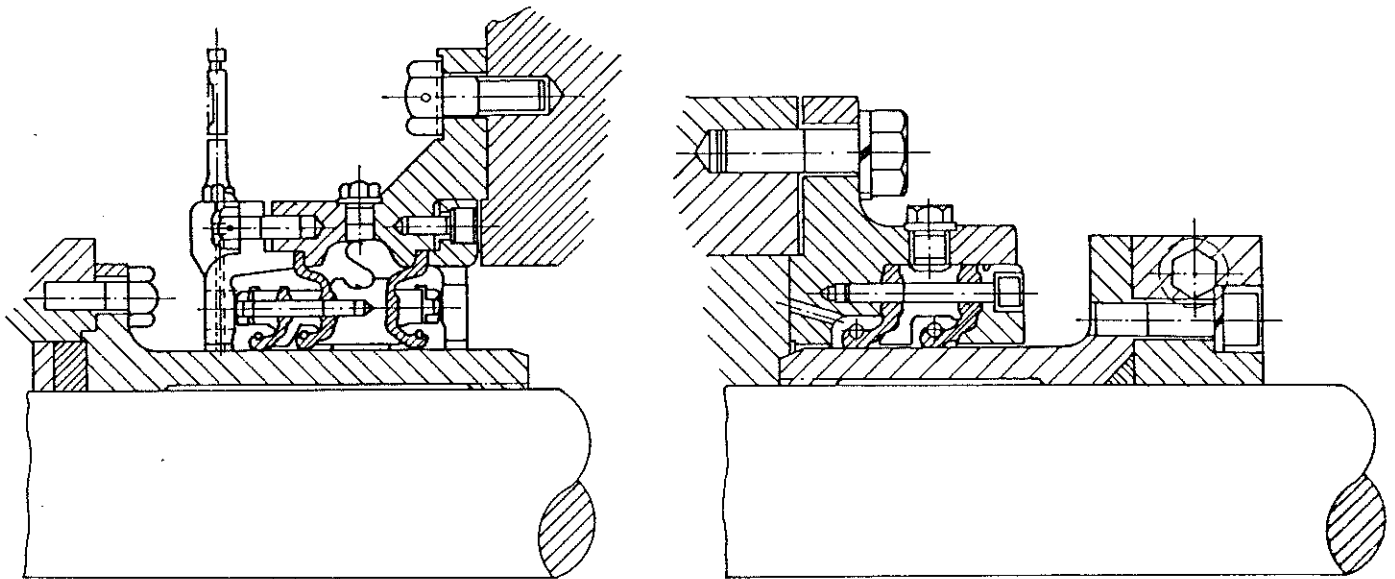
Underwater Hull

Condition

No.	Item	Definition-Analysis	Effect	Check
6	Rough- ness	After 15 years, 750-875 microns as average deterioration	Reduction of speed and/or increase of fuel consumption	
		After 10 years 500-750 microns as average	(1 % increase in power consumption	
		375-500 microns after 5 years. Newbuilding delivery standard 75 - 100 microns.	for every 10 microns above 100 microns)	

- Sterntube Seal

SIMPLEX-Check



1.0 Outboard Seal

- 1.1 No oil leakage (with pressure on sealing high tank).
- 1.2 Leakage _____
- 1.3 Ropeguard dismantled.
- 1.4 Oil annulus discharged, condition of oil _____
- 1.5 Oil renewed, air vented, drain plug checked for tightness.
- 1.6 Wear down measurements: top = _____ mm, bottom = _____ mm.
- 1.7 Flange between sterntube and seal oiltight.
- 1.8 Flange between propeller boss and seal oiltight.
- 1.9 Stud bolts at flanges secured by stainless steel wire.

2.0 Inboard Seal

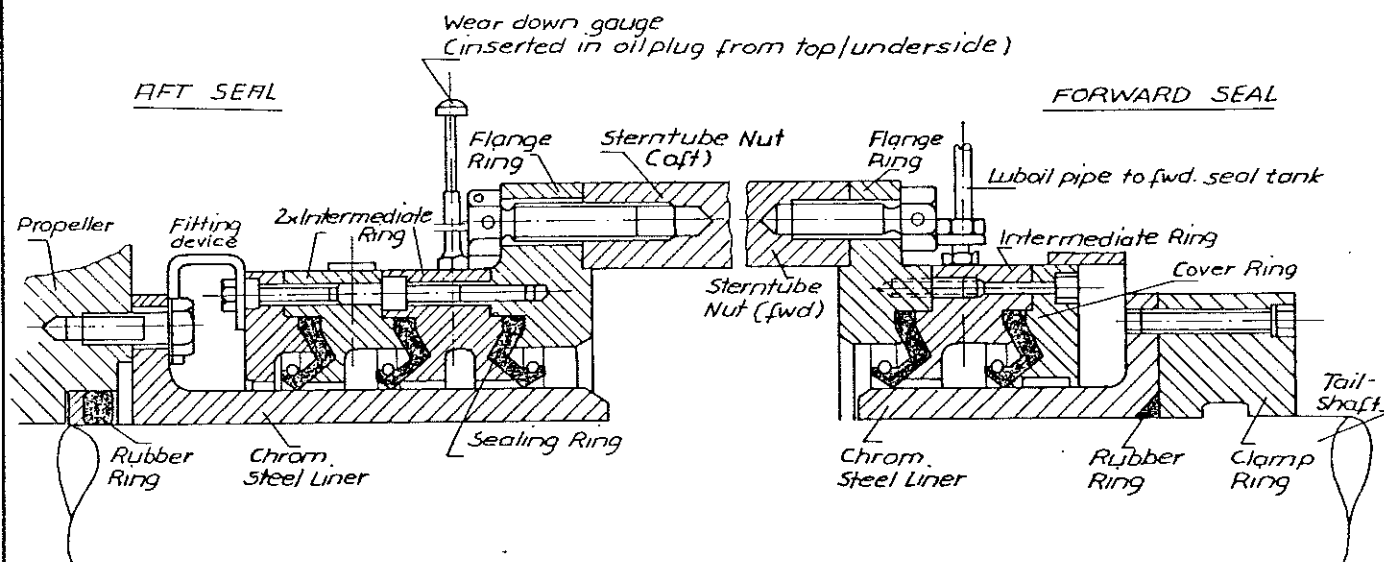
- 2.1 No oil leakage under operating conditions at flange to sterntube
- 2.2 No oil leakage under operating conditions at lip seals.
- 2.3 Leakage _____
- 2.4 Measurement taken between shaft liner and casing _____ mm
(see respective drawing value)
- 2.5 Oil exchanged and air vented.

3.0 Repairs/Renewals of sealing parts (to be carried on overleave)

SIMPLEX COMPACT

Sterntube Seal

Condition Check



1. Outboard Seal

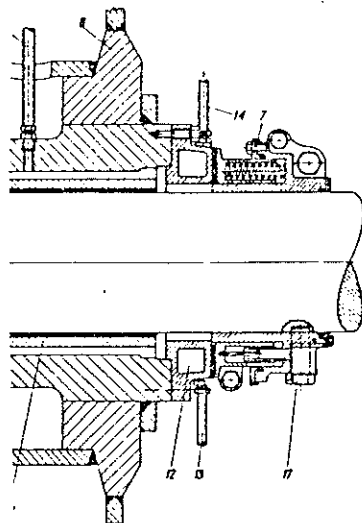
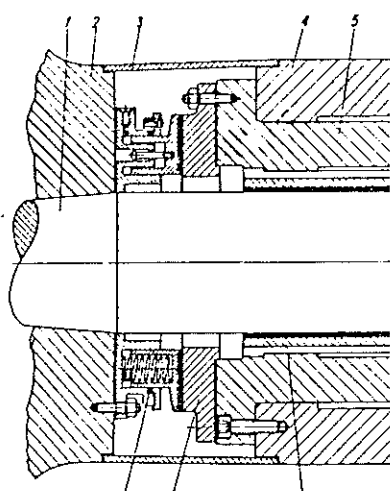
- ☐ 1.1 No oil leakage (with pressure on sealing high tank).
- ☐ 1.2 Leakage _____
- ☐ 1.3 Rope guard dismantled.
- ☐ 1.4 Oil annulus discharged, condition of oil _____
- ☐ 1.5 Oil renewed, air vented, drain plug checked for tightness.
- ☐ 1.6 Wear down measurements: top = _____ mm, bottom = _____ mm.
- ☐ 1.7 Flange between sterntube and seal oiltight.
- ☐ 1.8 Flange between propeller boss and seal oiltight.
- ☐ 1.9 Stud bolts at flanges secured by stainless steel wire.

2. Inboard Seal

- ☐ 2.1 No oil leakage under operating conditions at flange to sterntube.
- ☐ 2.2 No oil leakage under operating conditions at lip seals.
- ☐ 2.3 Leakage _____
- ☐ 2.4 Measurements taken between shaft liner and casing _____ mm.
(see respective drawing value)
- ☐ 2.5 Oil exchanged and air vented.

3. Repairs/Renewals of sealing parts (to be carried out on overleave).

- Sterntube Seal
Cedervall-Check



- 1 Tailshaft
- 2 Propeller
- 3 Cover
- 4 Sternboss
- 5 Sterntube
- 6 Shaft bearing aft/forward
- 7 Forward seal gland
- 8 Casing to propeller
- 9 Bearing ring carrier
- 10 Gland seal
- 11 Spring
- 12 Cooling ring
- 13 Cooling water in
- 14 Cooling water out
- 15 Stop bolt

1. Check in position

- 1.1 Hydraulic pressure from light sterntube lub.oil tank maintained during checking
- 1.2 Leakage to be controlled: oil and/or water
- 1.3 Upon leakage: protection covers to be removed
- 1.4 Sealing externally to be checked for damage/leakage
- 1.5 Nut locks in order
- 1.6 Leakage removed by dismantling (split construction): check as under 2.
- 1.7 Prior refloating: air vent to be opened, oil pumped into seal

2. Check upon drawing tailshaft

- 2.1 Overhaul in workshop
- 2.2 Renewal of stainless steel springs
- 2.3 Built in length _____ mm
- 2.4 Preset tension length _____ mm
- 2.5 White metal thickness _____ mm
- 2.6 Oil grooves in white metal ok
- 2.7 Bearing surfaces touched up
- 2.8 Gland sealing renewed, material _____
- 2.9 After refitting all nuts to be locked and oil pumped in outer seal.

REMARKS:

Tailshaft Drawing
Class Requirements

IACS (International Association of Classification Societies) have modified tailshaft drawing requirements according to the technical developments made in this field and the actual system provided in a vessel.

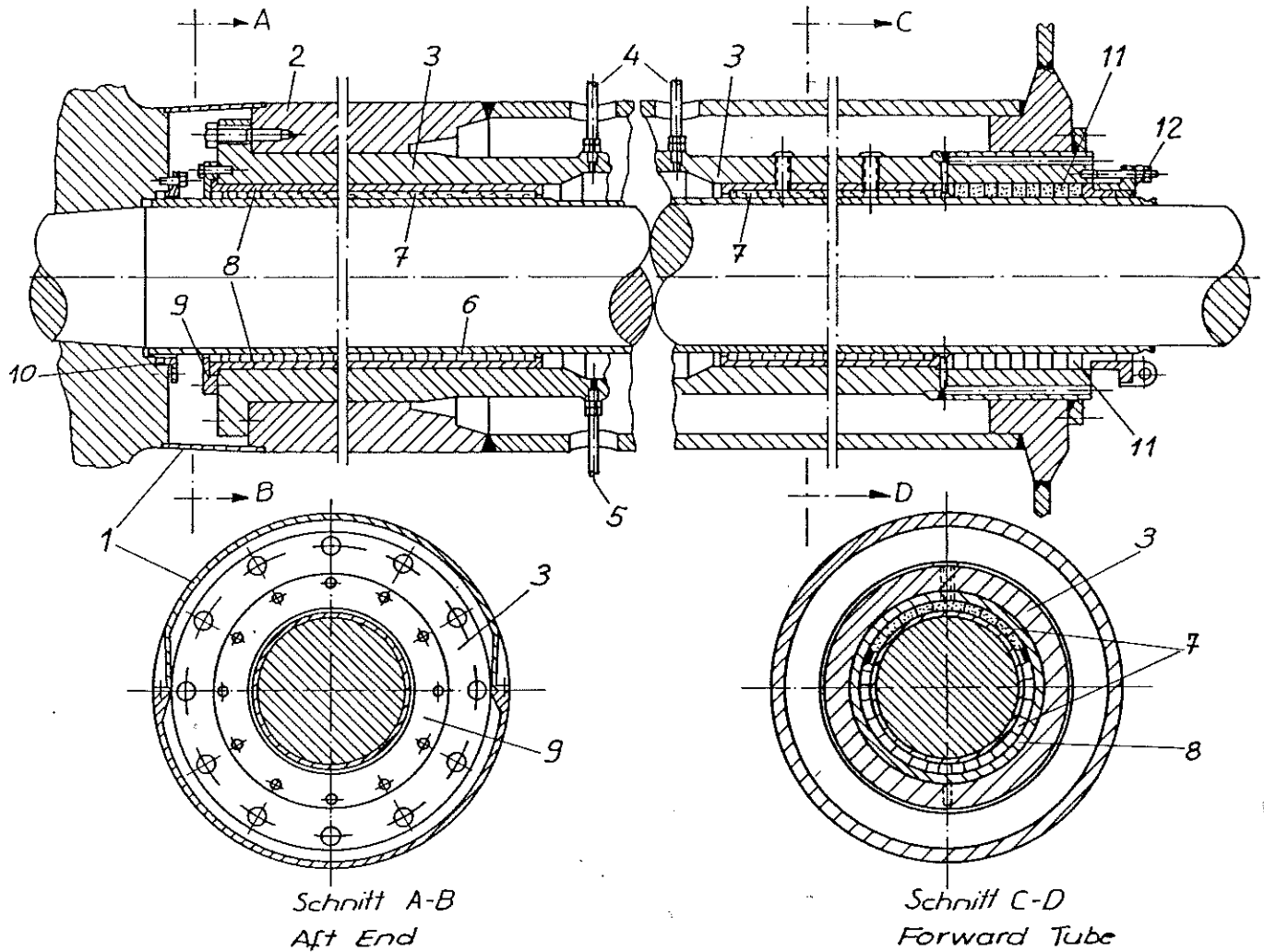
Routine surveys may therefore be adapted to the following scheme:

POS.	PERIOD	TECHNICAL ARRANGEMENTS / REQUIREMENTS
1	2.5 years	for shafts without seal and corrosion resistant material.
2	3.0 years	for single shaft vessels without seal, but corrosion resistant material.
3	4.0 years	for such vessels as above (2), but with 2 shaft lines and more.
4	5.0 years	for tailshafts without oil seal glands, but with continuous liner, or of corrosion resistant material (approved design).
5	7.5 years	for lubricated shafts and oil seals when the propeller is keyed to the shaft taper, subject to partial survey after 5 years.
6	7.5 years	for lubricated shafts and oil seals when the propeller is without key or fitted to a solid flange coupling when a new oil seal <u>cannot</u> be installed without removing the propeller, but subject to a modified survey after 5 years.
7	10 years	for such tailshafts as above (6) when new oil seals can be fitted without removing the propeller, but subject to a modified survey after 5 years.

Note: The extended survey periods have to be approved by the respective society and especially granted for the vessel.

Tailshaft Inspection (White Metal Bearings)		
1. STERN TUBE and BEARINGS	AFT	FORWARD
1.1 Visual condition of bearings (surface smooth, no cracks, fit ok) 1.2 Visual check of tube (no leakages from aft peak, attached pipings ok) 1.3 Measurement data sheet to be made (Wear down tolerable, ditto excentricity) 1.4 Examination of outer fit- ring screws (Screws tight, securings ok, rings and packings ok) 1.5 Zinc anodes in way of outer tube ring ok or to be renewed 1.6 Additional observations		
2. TAILSHAFT and PROPELLER CONE	AFT	FORWARD
2.1 Non-destructive test accord- ing class (taper + keyway surfaces without cracks) 2.2 Visual examination of nut threads cone and shaft (no corrosion, running sur- faces smooth, no imbalance by ovality) 2.3 Measurement data sheet to be made (Wear down values ok, excen- tricity tolerable, otherwise workshop grinding) 2.4 Additional observations		
3. DETAILS FOR COUPLING	BEFORE	AFTER
3.1 Check flange marks for propeller blade position and shaft couplings to propulsion unit 3.2 Measure gap between tail- and intermediate shaft before drawing and before refitting		
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Tailshaft Inspection Lignum vitae bearing



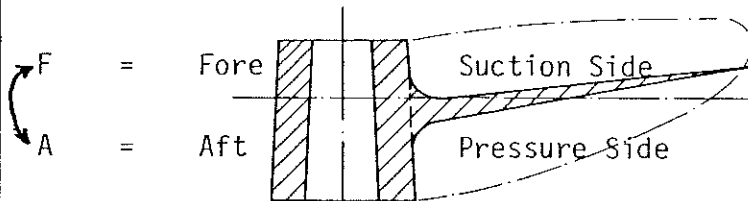
Details of arrangement

- 1 - cover
- 2 - stern tube
- 3 - stern boss
- 4 - cooling water pipes
- 5 - drain pipe
- 6 - tailshaft sleeve
- 7 - lignum vitae rods
- 8 - bearing tube
- 9 - outer protection ring
- 10 - propeller gland
- 11 - forward tube seal packing
- 12 - " " " gland

Tailshaft Inspection (Lignum Vitae)		
1. STERN TUBE and BEARINGS ...	AFT	FORWARD
1.1 Visual condition of lignum vitae rods. (Not splintered, bracing rods sound, enough lignum vitae thickness aside of bracing rods, preventing contact to tailshaft) 1.2 Examination of outer and inner bearing liner fittings (Tightness of screws, fitting rings, bracing rods) 1.3 Examination of inner stern tube part (No leakages from aft peak side, no corrosion defects, pipe connections ok and flushed/blown out, cooling water spaces clean) 1.4 Outer tube ring zinc anodes to be ok or renewed.		
2. TAILSHAFT and PROPELLER CONE	AFT	FORWARD
2.1 Non-destructive examination of cone according to class rules (Taper, keyway surfaces without cracks) 2.2 Visual examination of nut threads, cone, and shaft. (No corrosion, running surfaces smooth, no imbalance by ovality) 2.3 Examination of tailshaft sleeve for tight fit (hammer test) and corrosion at sleeve ends 2.4 Measurement data sheet to be made (wear down values ok, eccentricity tolerable, otherwise grinding in workshop necessary)		
3. DETAILS for COUPLING	BEFORE	AFTER
3.1 Measure gap between couplings before drawing and before re-fitting of reamer bolts 3.2 Check flange marks for propeller blade position in correct position to intermediate shaft and propulsion unit. 3.3 Check inner tube packings for suitable material and size, fitting with rings inserted 90° displaced (and not in spirals)		
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Propeller

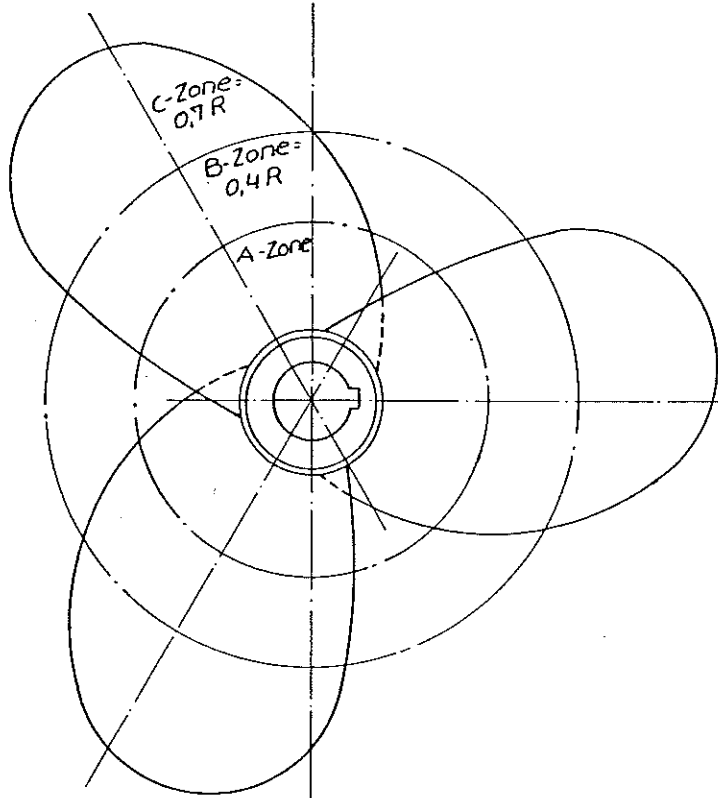
Condition Check



PROPELLER MARKINGS:

FAILURE INDICATION MARKS:

- _____ bending, direction:
F = forward, A = aft
- ~~~~~ crack in mm (state length, breadth, deepness)
- broken parts (give measurements)
- oooooo pittings (state area and deepness)
- xxxxx erosion (state area and deepness)



DOCKING CONDITION				MAINTENANCE & REPAIRS					REMARKS
Zone	smooth	rough	very rough	faired	welded	ground	metal bonded	casting	
A F									
A A									
B F									
B A									
C F									
C A									

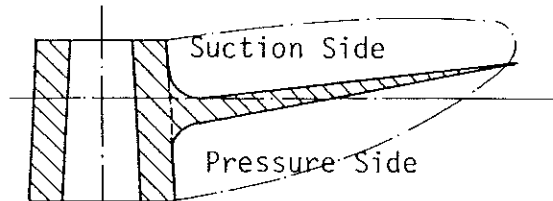
Propeller

Condition Check



= Fore =

= Aft =



PROPELLER MARKINGS:

FAILURE INDICATION MARKS:

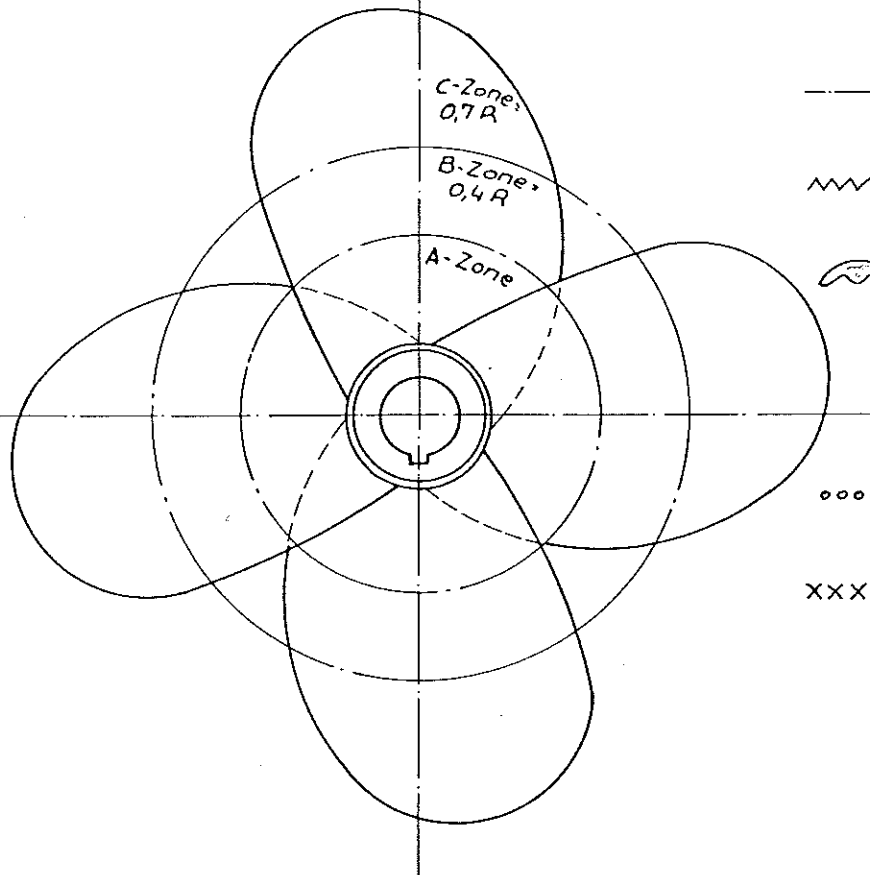
— bending, direction:
F = forward, A = aft

~~~~~ crack in mm (state length, breadth, deepness)

broken parts (give measurements)

ooooo pittings (state area and deepness)

xxxxx erosion (state area and deepness)



### DOCKING CONDITION

### MAINTENANCE & REPAIRS

### REMARKS

| Zone |   | smooth | rough | very rough | faired | welded | ground | metal bonded | casting |  |
|------|---|--------|-------|------------|--------|--------|--------|--------------|---------|--|
| A    | F |        |       |            |        |        |        |              |         |  |
|      | A |        |       |            |        |        |        |              |         |  |
| B    | F |        |       |            |        |        |        |              |         |  |
|      | A |        |       |            |        |        |        |              |         |  |
| C    | F |        |       |            |        |        |        |              |         |  |
|      | A |        |       |            |        |        |        |              |         |  |
|      |   |        |       |            |        |        |        |              |         |  |

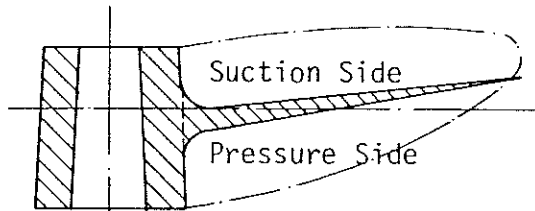
# Propeller

## Condition Check



= Fore =

= Aft =



### PROPELLER MARKINGS:

### FAILURE INDICATION MARKS:

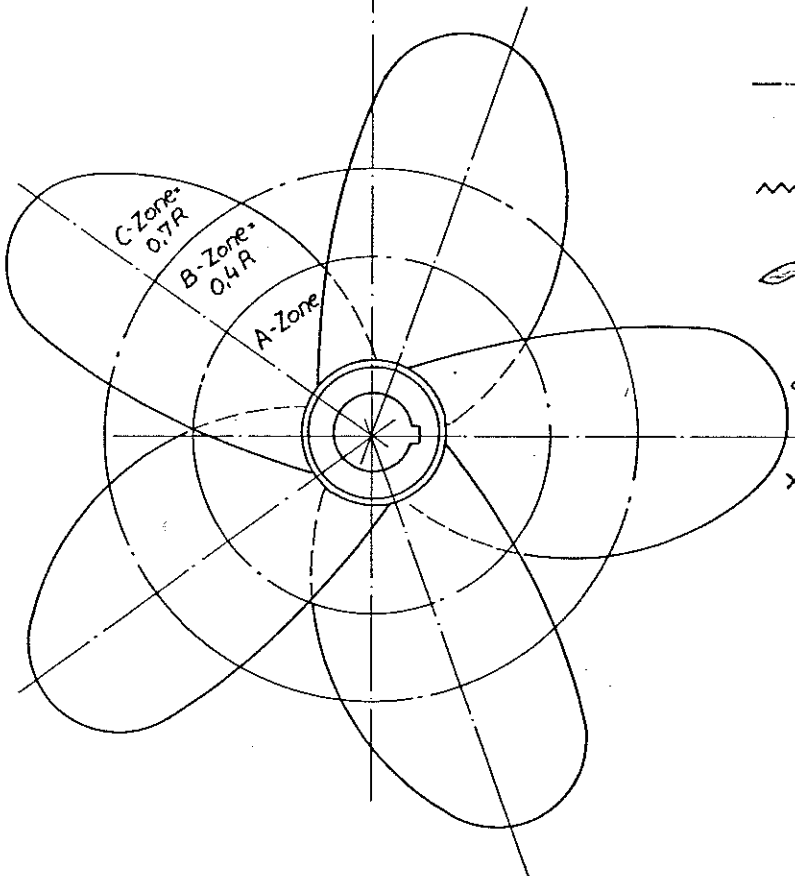
— bending, direction:  
F = forward, A = aft

~~~~~ crack in mm (state length, breadth, deepness)

broken parts (give measurements)

ooooo pittings (state area and deepness)

xxxxx erosion (state area and deepness)



DOCKING CONDITION

MAINTENANCE & REPAIRS

REMARKS

| Zone | smooth | rough | very rough | faired | welded | ground | metal bonded | casting | |
|------|--------|-------|------------|--------|--------|--------|--------------|---------|--|
| A | F | | | | | | | | |
| | A | | | | | | | | |
| B | F | | | | | | | | |
| | A | | | | | | | | |
| C | F | | | | | | | | |
| | A | | | | | | | | |
| | | | | | | | | | |

Inspection of Rudder and Bearings

Date:

(Insert below a sketch of the rudder arrangement)

Instructions:

Ruddershaft coupling(s) to be without any breathing. Securing unit(s) and washer(s) to fit with power jack and to be spot welded for safety. Such spot weldings to be thoroughly inspected.

Liners of rudder bearings to be secured by holding down steel rings. The condition of these rings and weldings to be checked.

Clearances between liners and bushes to be measured. Acceptable tolerances depending from diameter of pintles and the material of liner/bush.

Rudder body especially to be checked at welding seams at forward and aft ends, in way of bottom and top plates (Pittings/corrosion spots).

Check possible leakages. After repairs, air pressure test (0,3-0,4 bar).

| | | | | | | | |
|-----|-------------------------------------|---------------|----|-------------------------|----------------|-------|---------|
| 1.0 | Rudder Clearances
(in mm) | | A | P | S | total | REMARKS |
| | 1. Upper bearing | | | | | | |
| | 2. Lower bearing | | | | | | |
| 2.0 | Examination bearings | Shaft bearing | | | Pintle bearing | | |
| | Nuts & washer | | | | | | |
| | Securing plates | | | | | | |
| | Welding seams | | | | | | |
| | Liner | | | | | | |
| | Bushes | | | | | | |
| 3.0 | Inspection Rudderbody | Yes | No | REMARKS/WORKS PERFORMED | | | |
| | 1. Leakages | | | | | | |
| | 2. Weldings ok | | | | | | |
| | 3. Corrosions found | | | | | | |
| | 4. Drainplug ok | | | | | | |
| | 5. Indentations found | | | | | | |
| 4.0 | Inspection Flange
type couplings | Yes | No | REMARKS/WORKS PERFORMED | | | |
| | Cracks at flange sides | | | | | | |
| | Reamer bolts loose | | | | | | |
| | Cement filling loose | | | | | | |

Sea and Outlet Valves

Inspection Record

A. CONDITION CHECK:

- 1 = Body and bonnet in-/externally sound, seat ring tight. (Hammering test or, if doubtful, magnaflux or dyecheck or thickness ultrasonic measurement.)
 2 = Disc and stem with packing gland free from defects.
 3 = Valve seats locally eroded up to 0,5 mm.
 4 = Valve seats all around eroded up to 0,5 mm.
 5 = Valve seats heavily eroded (deeper than 0,5 mm).

B. RE-ASSEMBLY CHECK:

- 6 = Operation of disc, hinge, stem, and/or drive okay.
 7 = Bonnet and stem gland tight.

| Identification | Seachest 1 | | | | | | | Seachest 2 | | | | | | | Outlets S/S | | | | | | | Outlets P/S | | | | | | | Remarks |
|--------------------------------|------------|---|---|---|---|---|---|------------|---|---|---|---|---|---|-------------|---|---|---|---|---|---|-------------|---|---|---|---|---|---|---------|
| | A | | | | | B | | A | | | | | B | | A | | | | | B | | A | | | | | B | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| Cooling Main | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ballast | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fire Main | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fire Emerg. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SW Refrig. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SW Evaporator | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SW Auxiliaries | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blow out | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hold Bilges Discharge | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Engine Bilges Discharge | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Grey Water Discharge | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Black Water Discharge | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Laundry Water Discharge | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hospital Grey Discharge | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hospital Black Discharge | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sewage Water Discharge | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Oily Water Separator Discharge | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

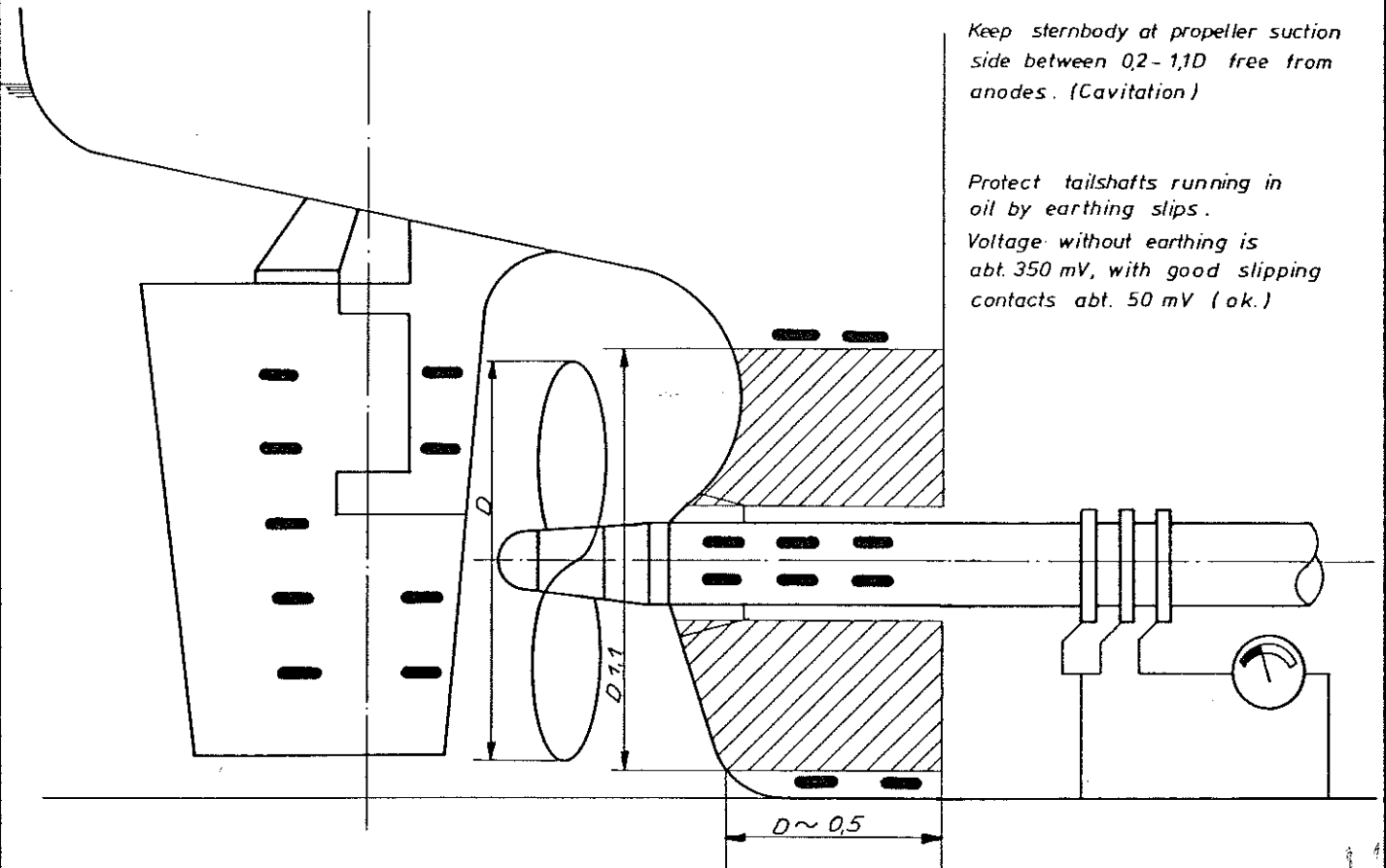
Cathodic Protection

Stern Arrangement

Keep sternbody at propeller suction side between 0,2-1,1D free from anodes. (Cavitation)

Protect tailshafts running in oil by earthing slips.

Voltage without earthing is abt. 350 mV, with good slipping contacts abt. 50 mV (ok.)



1. PROTECTIVE REQUIREMENTS

Example

Actual

Hull including rudder below WL:
 Propeller surface
 Current density hull 6 mA/m² - 10 mA/m²
 Current density propeller 300 mA/m²
 Current for hull 4.850 m² x 6 mA/m²
 Current for propeller 33 m² x 300 mA/m²
 Total Current Requirement

4.820 m²
 33 m²
 -
 -
 29,1 A
 9,9 A
 39,0 A

2. ANODE CHARACTERISTICS

Size (mm)
 Weight (kgs)
 Current density (A) = output per piece
 Life of anode (years)
 Material

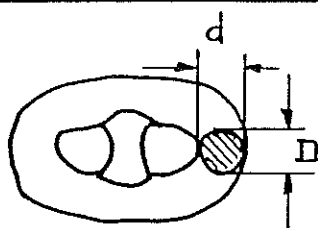
50 x 100 x 500
 15,7
 0,52
 2,5
 Zinc alloy

3. NUMBER OF ANODES

Hull 21,1 A : 0,52 A
 Propeller 9,9 A : 0,52 A

42
 19

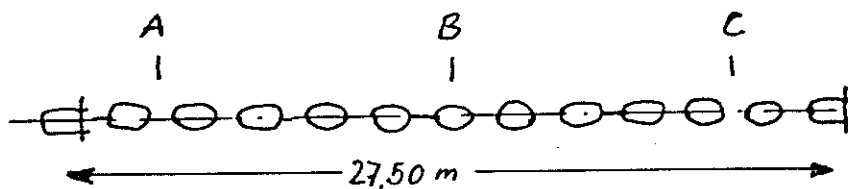
Anchorchains
Calibration results



$$D' = \frac{D+d}{2}$$

D = nominal diameter:

_____ mm



| | Starboard Side | | | | | | Port Side | | | | | |
|-----------|----------------|---|---|---|---|---|-----------|---|---|---|---|---|
| | A | | B | | C | | A | | B | | C | |
| | D | d | D | d | D | d | D | d | D | d | D | d |
| Length 1 | | | | | | | | | | | | |
| Length 2 | | | | | | | | | | | | |
| Length 3 | | | | | | | | | | | | |
| Length 4 | | | | | | | | | | | | |
| Length 5 | | | | | | | | | | | | |
| Length 6 | | | | | | | | | | | | |
| Length 7 | | | | | | | | | | | | |
| Length 8 | | | | | | | | | | | | |
| Length 9 | | | | | | | | | | | | |
| Length 10 | | | | | | | | | | | | |
| Length 11 | | | | | | | | | | | | |
| Length 12 | | | | | | | | | | | | |

Forerunner

Anchorshakle

Endlink

Biglink

Swivel

CHECKLIST FOR S & P HAND-OVER

1. Drawings, instruction books, maintenance schemes etc. from owners' office
2. Preparation of list of certificates
3. Preparations for name and port change at vessel's hull
4. Statement of Facts with regard to any cargo remaining on board (if vessel is continuing a liner service etc.)
5. List of unused stores Deck
6. List of unused stores Machinery
7. List of unused stores Catering
8. List of provisions on board upon delivery
9. List of narcotics on board
10. List of master's slopchest items
11. List of cigarettes, alcohol etc. under customs seal
12. List of soft drinks on delivery
13. Transportation of crew to hotels, airport, railway station
14. Cost statement for buyers' representatives on board (radio communication costs, expenses on the vessel)
15. Renewal of De-ratting Certificate
16. Signing off preparations
17. Closing of muster roll
18. Closing of log books
19. Forwarding personal property and log books etc. to owners.
20. Any unrepaired hull/engine damages to be reported/surveyed to underwriters
21. Sounding and calculation of
 - bunkers incl. MDO/gas oil
 - lub.oil stores
 - freshwater/boiler water stores
22. Oxygen and acetylene bottles not belonging to the vessel
23. List of equipment not property of vessel
24. Invoice for underwater painting and paint material
25. Invoice for fitting new zinc anodes
26. List of stores on order
27. National documents to be returned to owners (buyers may have photocopies: Measurement Certificate etc.)

| Delivery Documents | | |
|-----------------------------------|---|---|
| No. | Document | valid to |
| 01 | International Tonnage Measurement | |
| 02 | Suez Tonnage Measurement | |
| 03 | Panama Tonnage Measurement | |
| 04 | Certificate of Deletion | |
| 05 | Protocol of Delivery and Acceptance | |
| 06 | Declaration of Class Maintenance | |
| 07 | Radio Station Licence | |
| 08 | Radar Station Licence | |
| 09 | Direction Finder Licence | |
| 10 | Safety Radio Certificate | |
| 11 | Safety Equipment Certificate | |
| 12 | Safety Construction Certificate | |
| 13 | Loadline Certificate 5 years/annual | |
| 14 | Certificate for Liferafts | |
| 15 | Certificate for Navigation Lights | |
| 16 | Certificate for Magn. Compass/last adjustment | |
| 17 | Certificate for Boat Compasses | |
| 18 | Certificate for Gyro Compass | |
| 19 | Certificate for Chronometer | |
| 20 | Certificate for Barometer | |
| 21 | Certificate for Thermometer | |
| 22 | Cargo Gear Book 4 years/annual | |
| 23 | Class Certificate Hull | |
| 24 | Class Certificate Machinery | |
| 25 | Deratting Certificate | |
| 26 | Stability Book for General Cargo | |
| 27 | Stability Book for Grain Cargo | |
| 28 | Certificate for Grain Carriage | |
| 29 | IOPP-Certificate | |
| 30 | Unattended Machinery Operation Survey | |
| 31 | Intergas Plant Survey | |
| 32 | CO ₂ -Equipment Survey | |
| 33 | Bill of Sale | |
| 34 | | |
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| TECHNOLOGY
FOR
SALE AND PURCHASE OF SHIPS | |
|---|--|

SECTION E - REVIEW

REFERENCE DATA FOR SURVEY RESULTS

1. DATA FOR ADMISSIBLE TOLERANCES

- 1.1 Hull Identations and Acceptable Tolerances and Repair Advice
- 1.2 Wear Down/Corrosion Limits
- 1.3 Rudder Bearing Clearances
- 1.4 Sterntube Bearing Clearances
- 1.5 Simplex Liner Wear Tolerances
- 1.6 Crankshaft Deflection Tolerances
- 1.7 Machinery Clearances
- 1.8 Galvanic Bearings: Service Lifetime Criteria
- 1.9 Meggertest: Minimum Values

2. ACCEPTED REPAIR METHODS

- 2.1 Hints for Propeller Repairs
- 2.2 Propeller Damages and Repair Advice
- 2.3 Rudder Installation - Damages/Repair Advice
- 2.4 Rudder Bearings - Material Combinations

3. MINIMUM SPARE PARTS

- 3.1 Machinery Spare Parts
- 3.2 Electric Spare Parts
- 3.3 Inventory List for German Flag Vessels

Hull Indentations

Acceptable Tolerances

No definite rules can define hull damages, for much depends on the location, its extent and severity together with the general condition of the vessel, her age, size, and construction (riveted, welded). The tolerance values given below are deemed as guideline for interpretation.

| Part | Item | Newbuilding Tolerances
Limits (mm) | | | Tolerances *
without in-
ternal dis-
tortion | Repairs re-
commended for
deformations
as under |
|---|---|---------------------------------------|---------|---------|---|--|
| | | JSQS | Germ FS | VIS 530 | | |
| Shell
Plating | Parallel
sides (0,6 L) | 6 | 7 - 9 | 6 | 2 x plate
thickness | B C |
| | Fore/aft
parts | 7 | 7 - 9 | 6 | 2,5 x plate
thickness | B D |
| Bottom
Plates | Parallel
bottom(0,6 L) | 6 | 7 - 11 | 6 | 2 x plate
thickness | A |
| | Tanktop | 6 | 8 - 12 | 6 | 2,5 x plate
thickness | B |
| Strength
Deck | Parallel
part (0,6 L) | 6 | 6 - 10 | 6 | 2 x plate
thickness | A C |
| | Fore + aft
part | 9 | 6 - 10 | 6 | 2,5 x plate
thickness | A C |
| Internals | Web of
Girder | 7 | | 6 | 1 x plate
thickness | D |
| | Floor
Plates | 8 | | 6 | 1 x plate
thickness | D |
| Poop,
Forecastle,
Superstruc-
ture Decks | Bare
Part | 6 | 6 | 6 | 2,5 x plate
thickness | A |
| | Covered
Part | 9 | 10 | 9 | 2,5 x plate
thickness
+ 5 mm | A |
| Bulkheads | Longitudinal
Transverse
Wash Bulk-
heads | 8 | 8 - 10 | 6 | 3 x plate
thickness | A E |

* With sharp and punctured indents, local notch strength to be considered.

Hull Deflections

Damage Analysis

| Pos. | ACTING FORCES | DAMAGE | CAUSES | REPAIR ADVICE |
|------|--|--|--|---|
| A | Plating under compression (stresses in line with plate surface) | Bucklings of plate, one up, one down (in deck plating bulkheads, bottom longitudinally) | Weak design, overloaded parts, slamming into heavy breakers | Fairing as far as possible and fitting of stiffenings |
| B | Plating under bending stresses (stress transversal to plate surface) | Plating between longitudinals and cross beams/ frames set inward (foreship, bottom, in cargo-holds of bulk-carriers set outward = "bagging") | Weak design, panting of forebody, liquid movements in tanks, heavy cargoes along shellsides. | Renewal of plates with additional stiffeners to reduce field size. |
| C | Plating submitted to shearing stresses (diagonal to plate surface) | Bucklings diagonal in plate spaces including beams and mountings. | Weak design, torsional movements at sea or due to weight distribution. | Fitting of thicker plates and/or additional stiffeners, transversal to direction of buckling. |
| D | Tilting of profiles. | Frames, especially in fore and aft body sections pressed out of line. | Weak design, ice pressure, heavy slamming of forebody. | Fair as possible and fit additional stringers, brackets, or curlings. |
| E | Deformation of large panels or sections. | Plate sections including stiffenings and mountings displaced in or out. | Weak design, overstressed sides or bottom plates. | If deformation is permanent, strength is inadequate. Reinforcements necessary. |

Wear down
Corrosion / Abrasion

According to classification rules, wear down of hull parts and equipment items is limited to the following extend:

| Item | Renewal when wear down has reached |
|-------------------|---|
| Anchor | 20 % of the weight |
| Anchor Cable | 20 % of the cross sectional area |
| Cargo Gear Parts | 10 % of the cross sectional area or thickness |
| Wire Cable | when on 1 = 8 d the number of visisble broken wires = 0,1 Z is or when fractures or extensive rust is visible |
| Structural Parts* | 20 % material thickness over large areas
25 % material thickness locally |

* Remark:

The rusting down of 25 % of material thickness is not generally permissible on structural parts. If large areas (i.e. decks or bottom) are corroded strongly, renewal should be carried out strake wise.

Rudder Bearings

Clearances/Tolerances

Tolerances acceptable for rudder bearing clearances are interdependent to some degree with the following:

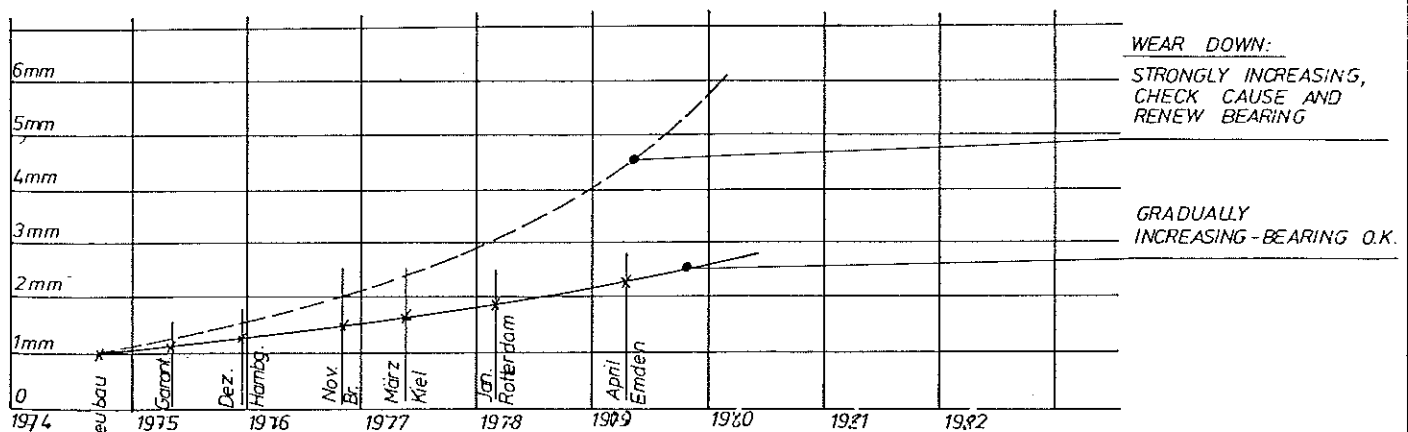
- Arrangement of rudder shaft and bearings
- Type of steering gear (effects of rudder shaft to turning device/rudder carrier)
- Bearing material and effects of swelling with non-metal materials
- Induced vibration
- Scheduled running time to next drydocking.

As generally not all of the above criteria can accurately be determined, precise tolerance values have not yet been established neither by ship-builders nor by the classification societies, but the following thumb rules are practised: above 120 mm diameter 5 % of diameter but max. 8 mm or as pintle clearances above 100 mm diameter $0,01 D + 4 \text{ mm}$.

Permitted maximum clearances, upon which renewal is due:

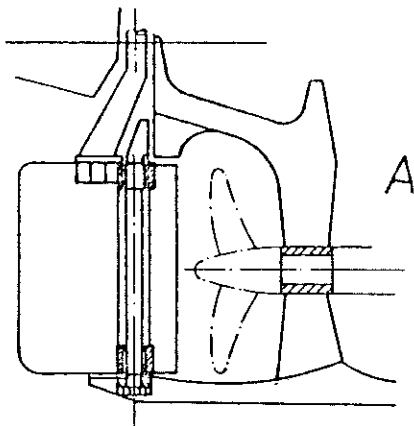
| Pintle/shaft diameter (mm) including sleeve | A + B Arrangement | | C + D Arrangement* | | Remarks |
|---|-------------------|--------|--------------------|--------|---|
| | Pintles | Shafts | Pintles | Shafts | |
| up to 50 | 3,0 | 2,25 | 2,25 | 1,7 | For non-metal bearings see manufacturers' instructions or add % of swelling to the clearances as measured in dry condition. Upon renewal, min. clearances may be calculated as follows:
Metal bearings
$0,001 D + 1 \text{ mm}$
Synthetic bearings
$0,002 D + 1 \text{ mm}$ |
| 60 | 4,0 | 3,0 | 3,0 | 2,3 | |
| 80 | 4,5 | 3,4 | 3,4 | 2,6 | |
| 100 | 5,0 | 3,75 | 3,75 | 2,8 | |
| 150 | 5,5 | 4,1 | 4,1 | 3,0 | |
| 200 | 6,0 | 4,5 | 4,5 | 3,4 | |
| 250 | 6,5 | 4,9 | 4,9 | 3,6 | |
| 300 | 7,0 | 5,25 | 5,25 | 3,9 | |
| 350 | 7,5 | 5,6 | 5,6 | 4,2 | |
| 400 | 8,0 | 6,0 | 6,0 | 4,5 | |
| * or shaft length above coupling less than 1/4 of rudder height | | | | | |

To keep the bearing wear down under control, GL recommends to plot the clearances regularly upon each drydocking, in order to ensure smooth performance and to enlight sudden raise of wear. See example:

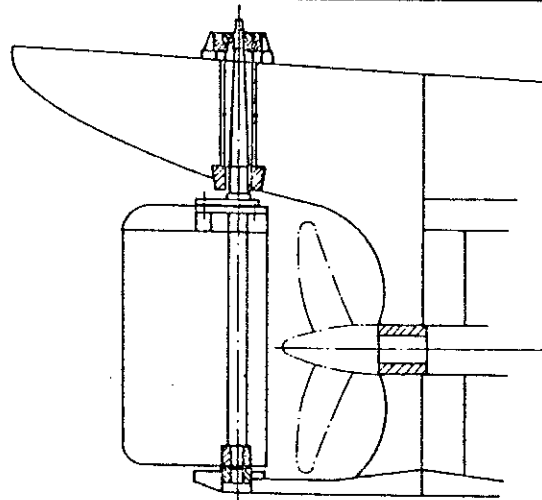


Rudder Types

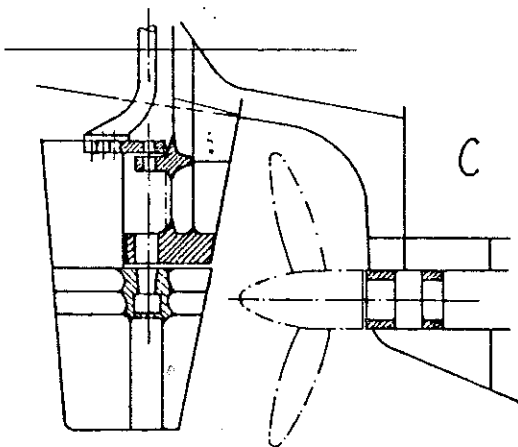
Arrangement



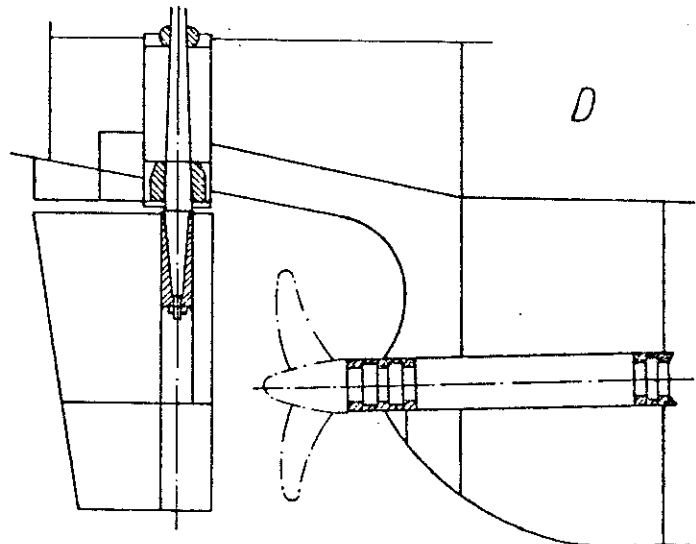
A



B



C



D

- A = Semi-balanced rudder with rudder stock bearings -
- B = Semi-balanced rudder with on line rudder stock and shaft, bearings at heel and shaft -
- C = Half balanced spade rudder with rudder carrier and pintle bearings -
- D = Semi-balanced spade rudder with shaft bearings -

The classification of the arrangement in type A - D corresponds with the suggested tolerances A/B and C/D.

Sterntube

Clearances

1. Sterntube Clearances in White Metal Bearings:

| Shaft Diameter | Minimum Clearance
= 0,001 d + 0,1 | Clearances
Actual
Fitting Values | Renewal of
Bearings with abt. |
|----------------|--------------------------------------|--|----------------------------------|
| mm | mm | mm | mm |
| 100.....200 | 0,2.....0,3 | 0,4.....0,5 | 0,6 |
| 200.....300 | 0,3.....0,4 | 0,5.....0,6 | 0,8 |
| 300.....400 | 0,4.....0,5 | 0,6.....0,7 | 0,9 |
| 400.....500 | 0,5.....0,6 | 0,7.....0,9 | 1,1 |
| 500.....600 | 0,6.....0,7 | 0,8.....1,0 | 1,2 |
| 600.....700 | 0,7.....0,8 | 0,9.....1,1 | 1,3 |
| 700.....800 | 0,8.....0,9 | 1,0.....1,3 | 1,5 |
| 800.....900 | 0,9.....1,0 | 1,1.....1,4 | 1,6 |
| 900.....1000 | 1,0.....1,1 | 1,2.....1,5 | 1,8 |

2. Sterntube Clearances in Rubber Bearings:

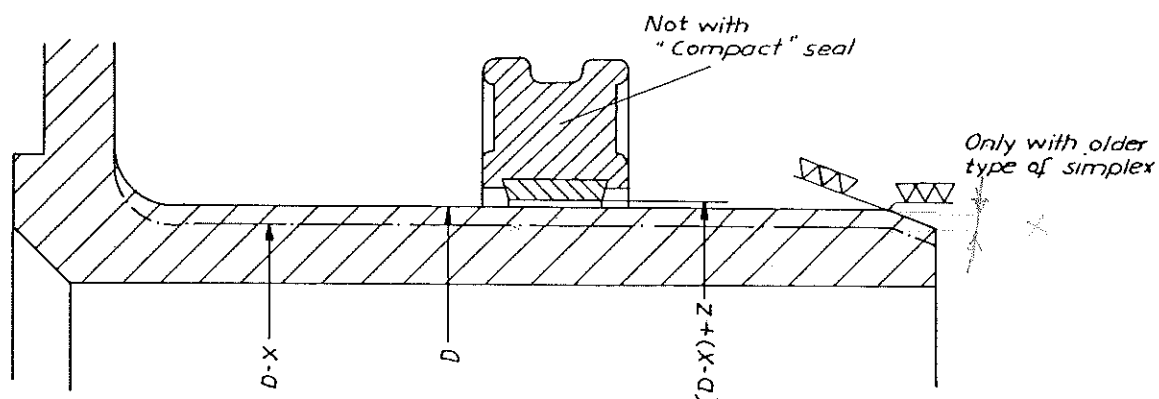
| Shaft Diameter | Clearances | Production Tolerances |
|----------------|------------|-----------------------|
| mm | mm | mm |
| 80.....100 | + 0,25 | + 0,10 |
| 100.....120 | + 0,30 | + 0,10 |
| 120.....140 | + 0,40 | + 0,20 |
| 140.....175 | + 0,50 | + 0,20 |
| 175.....200 | + 0,60 | + 0,20 |
| 200.....250 | + 0,80 | + 0,20 |
| 250.....400 | + 1,00 | + 0,20 |
| 400.....500 | + 1,20 | + 0,20 |
| 500..... | + 1,50 | + 0,20 |

3. Sterntube Clearances in Lignum Vitae Bearings:

| Shaft Diameter | Minimum
Clearance | Clearances
Actual
Fitting Values | Renewal of
Bearings with abt. |
|----------------|----------------------|--|----------------------------------|
| mm | mm | mm | mm |
| 100 | 0,5 | 0,8.....1,0 | 3,0 |
| 200 | 0,8 | 1,0.....1,2 | 4,1 |
| 300 | 1,2 | 1,2.....1,5 | 5,2 |
| 400 | 1,4 | 1,5.....1,8 | 6,1 |
| 500 | 1,6 | 1,8.....2,0 | 7,0 |
| 600 | 1,7 | 2,0.....2,5 | 7,0 |
| 700 | 1,7 | 2,5 | 7,2 |

SIMPLEX Sterntube seal

TOLERANCES OF LINER WEAR

Instructions:

1. For repair skimming and polishing of the forward and aft chrome steel liners is permissible down to the dimensions "D - X".
2. For every 1 mm of reduced diameter of the liner, the springs have to be shortened by 3 mm.
3. If the guide ring clearance (older SIMPLEX type) is greater than "Z max", the inner surface of ring is to be remetalled and then to be machined to obtain $(D - X) + Z$ with a tolerance of + 0,05 mm.

| Size D | X max | Z min/max | Actual |
|--------|-------|-----------|--------|
| 155 | 2,5 | 0,2/0,4 | |
| 170 | 2,5 | | |
| 190 | 2,6 | | |
| 200 | 2,6 | | |
| 220 | 2,7 | 0,25/0,5 | |
| 240 | 2,7 | | |
| 260 | 2,8 | | |
| 280 | 2,8 | | |
| 300 | 2,9 | | |
| 330 | 3,0 | | |
| 355 | 3,0 | 0,3/0,6 | |
| 380 | 3,1 | | |
| 400 | 3,1 | | |
| 420 | 3,2 | | |
| 450 | 3,3 | 0,35/0,7 | |
| 480 | 3,4 | | |
| 500 | 3,4 | | |
| 530 | 3,5 | | |
| 560 | 3,6 | | |

| Size D | X max | Z min/max | Actual |
|--------|-------|-----------|--------|
| 600 | 3,7 | 0,4/0,8 | |
| 630 | 3,8 | | |
| 670 | 3,9 | | |
| 710 | 4,0 | | |
| 750 | 4,1 | | |
| 800 | 4,2 | 0,5/1,0 | |
| 850 | 4,4 | | |
| 900 | 4,5 | | |
| 950 | 4,6 | | |
| 1000 | 4,8 | 0,6/1,2 | |
| 1060 | 4,9 | | |
| 1120 | 5,0 | | |
| 1180 | 5,2 | | |
| 1250 | 5,4 | 0,7/1,4 | |
| 1320 | 5,6 | | |
| 1400 | 5,8 | | |
| 1500 | 6,1 | 0,8/2,1 | |
| 1600 | 6,3 | | |

Crankshaft Deflection

Causes / Tolerances

1. CAUSES OF DEFLECTIONS

The crankshaft deflection is an indicator for the alignment of an engine. Major variation may reflect either defects of the engine itself or of the machinery foundation / hull girders.

1.1 External Factors

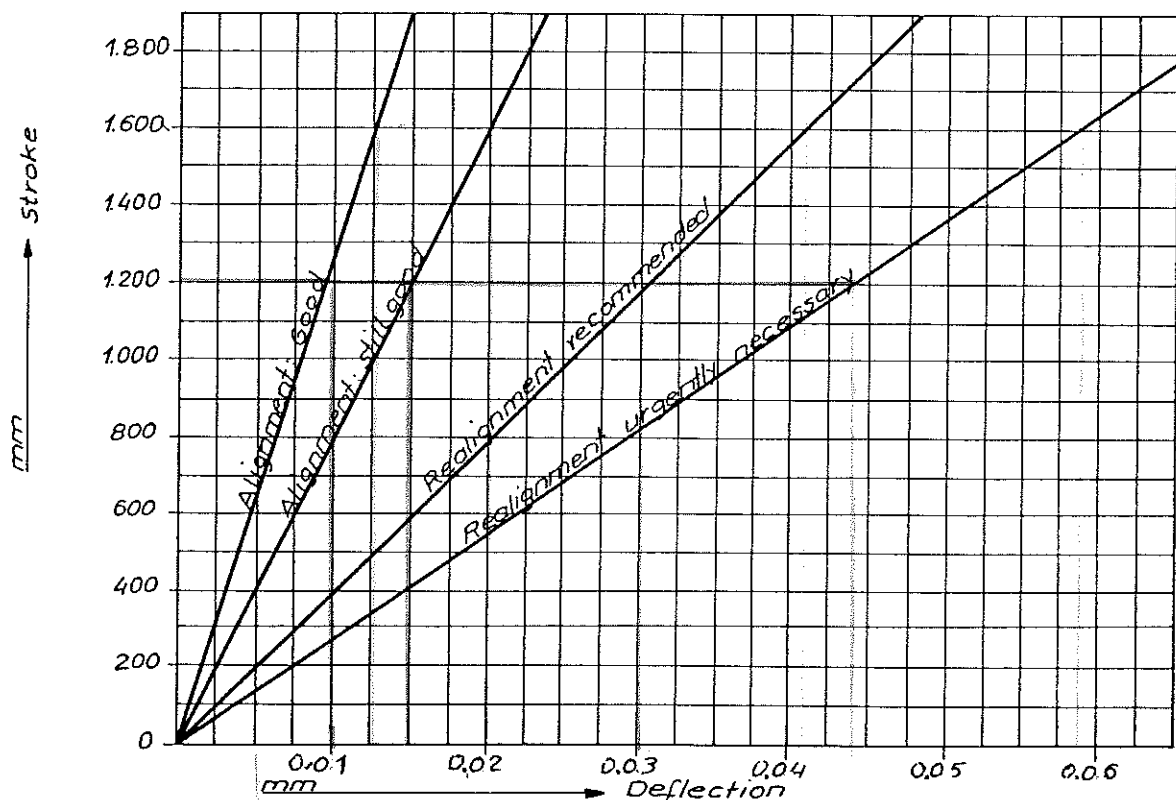
- Loading condition of vessel (quality of cargo and distribution, hogging/sagging in way of engine room, ballast or light ship condition)
- Position of heavy hatchcovers and ramps (open or closed)
- Vessel in drydock or afloat
- Weak design and construction of the engine foundation.

1.2 Motorside Factors

- Temperature of engine and foundation
- Clearances of journal bearings excessive
- Fit and pretension of foundation bolts
- Pretension of tierods
- Condition of outer shaft bearings
- Condition and tolerances of couplings
- Condition, materials and fit of foundation chocks and stoppers.

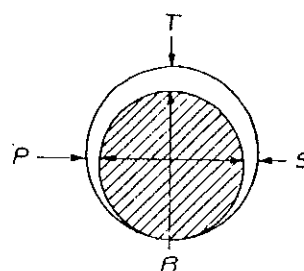
2. DEFLECTION TOLERANCE VALUES

If makers' instructions are not available, the following diagram may be used:



1. Definition:

Clearances in sleeve bearings as used below, are formed by the arithmetic sum of 2 opposite clearances, either top and bottom clearance or the side clearances port and starboard. In some special circumstances, the maximum clearance may, however, also be ascertained in a diagonal direction, either by reason of the construction or by reason of asymmetrical loads and wear-down in operation.



$$\begin{array}{rcl}
 T & = & 0,32 \\
 + B & = & 0,00 \\
 \hline
 "C" & = & 0,32
 \end{array}
 \qquad
 \begin{array}{rcl}
 S & = & 0,18 \\
 + P & = & 0,20 \\
 \hline
 "C" & = & 0,38
 \end{array}$$

2. General Rule:

As general marine practise for running clearances in bearings allows 1/1000 of a millimetre per millimetre of shaft diameter. With a 300 mm shaft diameter, acceptable clearance would then be 0,3 mm.

Excessive clearance is considered, if such values are three times exceeded, in our example 0,9 mm.

For diesel engines, the above thumb rule is normally too great, 75 % - 50 % of the values are considered as reasonable.

3. Standard Sleeve Clearances for Diesel Engines

These clearances are given as general reference only. In all specific circumstances, makers' specifications to be referred to.

| Part/Position | Standard | Max.Limits | Remarks |
|------------------------------|-------------|------------|--|
| Journal bearings | 0,45 - 0,55 | 0,8 | |
| Crankpin bearings | 0,45 - 0,55 | 0,8 | |
| Camshaft bearing | 0,09 - 0,13 | 0,25 | |
| Piston gudgeon bearing | 0,2 - 0,3 | 0,5 | |
| Piston pin bearing | 0,2 - 0,5 | 0,1 | in piston each side |
| Pressure bearing (axial) | 0,25 - 0,65 | 0,8 | |
| Wheel drive tooth clearances | 0,18 - 0,22 | 0,25 | |
| <u>Piston rings (axial)</u> | | | |
| in piston crown | 0,29 - 0,33 | 0,60 | Chrome coated |
| in piston skirt | 0,15 - 0,20 | 0,40 | <u>piston rings</u> |
| <u>Piston rings (radial)</u> | | | |
| in piston crown | 2,00 - 2,55 | 10,0 | to be renewed, if chrome layer is worn in one place. |

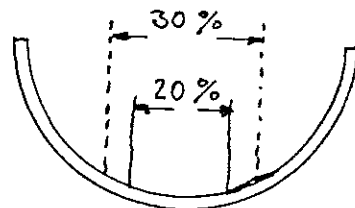
Galvanic Motor Bearings Service Life Criteria

Galvanic bearings are very thin multi-material bearings consisting of a steel shell of a few mm thickness only with a bearing material (0.5 - 1.5 mm) of lead-bronze or aluminium-tin and a galvanic coating as running surface (20 - 60 µm).

The galvanic coating has a better running-in and carrying quality than the bearing materials underneath. The galvanic coating should therefore be maintained and kept sound. No scraping in is tolerable. The bearings are manufactured ready to fit.

Wear limits:

- bearings to be renewed if the galvanic coat is worn off by 30% of the total bearing surface.
- Built-in lifetime of 40 000 operating hours, thereafter renewal necessary.
- During major overhauls bearings to be renewed if wear-down has reached already 20% or after 30 000 operating hours, otherwise running-in may prove difficult.

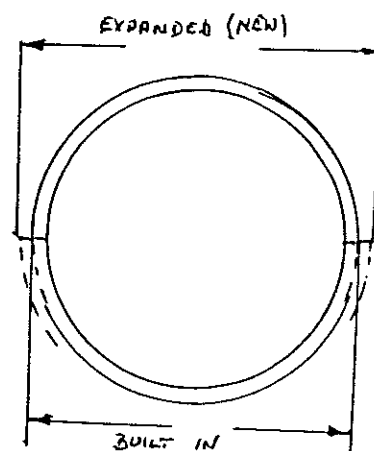


Checking:

1. After exchange of bearings or if used bearings have been re-installed, the bearing covers shall be checked after abt. 30 minutes running-in under no load and again after abt. 5 hours with successive load increase.
Upon checking these bearings should be without thermal overload and at the same temperature as other neighbouring bearings.
2. When the galvanic coating is already locally worn out after 5000 hours or if after abt. 10 000 hours already 20% have disappeared, this indicates insufficient lub.oil cleaning and dirty circulation oil.
3. Galvanic bearings require continuous purifying of circulation oil and sound filtering devices with constant control of the lub.oil quality.

Bearing pretension:

Bearing shells to have initial expansion for final tight fitting. The pretension of the bearing shell can be measured. Shells without pre-extension shall not be used any longer as they do not grant tight fit.

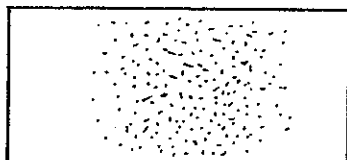


Bearing pictures:

The engine makers have instruction sheets with qualifications for the judgement of bearing surfaces. In dispute these info-tables should be used. The criteria as exhibited on the attached sheet summarize some major effects.

Galvanic Motor Bearings
Service Life Criteria

1



grey, smooth
surface at
loaded zone = ok

2



galvanic coat
partly worn
still = ok

3



smooth load
equally dis-
tributed = ok

4



load at corners
only (one side or
both sides)
renew bearing,
check stool and
pinion geometry
= not tolerable

5



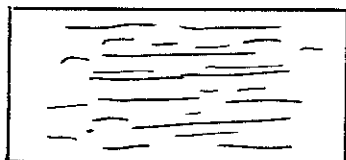
one-sided load
at outer bearings
admissible if de-
flection in order.
Not tolerable at
other bearings.
Check tierod pre-
tension etc.

6



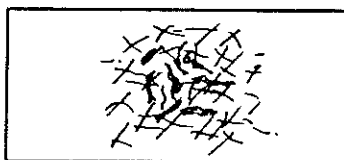
load picture at
bearing joint.
Check bearing
stool and align-
ment.
Not tolerable.

7



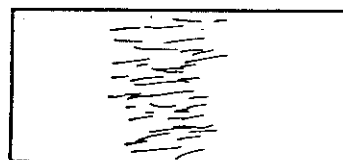
Scorings not deeper
than galvanic coat = ok
Scorings wider than
10 mm
influence lubrication.
Check pinion surface,
exchange bearing.

8



Many small surface
cracks or loosening
of coating
= exchange bearing
ditto if discoloured
blue (overheating)
magnetic particle
test of pin necessary.

9



Roughness of
loaded area =
exchange bearing
smooth pin.

Megger Test
admissible values

Insulation breakdown and respective electrical faults can be traced by measuring Ohm-resistance values.

A megger or test meter is to be used which can deliver 500 V DC.

Electronic parts may be damaged by the test voltage; diodes, transistors, thyristors etc. shall therefore be disconnected. Condensators in a megger test subsystem should also be disconnected as they may cause faulty results.

$1 \text{ M}\Omega = 1000 \text{ } 000 \Omega$ or $1000 \text{ k}\Omega$

Thumbrule:

The insulation value of generators and motors should not be less than $1000 \times \text{nominal voltage}$.
The same relates to each 100 m cable length without attached consumers.
Example: $1000 \times 220 \text{ V} = 220 \text{ } 000 \Omega = 0,2 \text{ M}\Omega$

| SYSTEM | MEASURING INSTRUCTIONS | MIN. VALUE |
|------------------------------------|---|--|
| Switchboard | Between bus bar and hull (earth).
- all consumer and feeder switches to be open
- all fuses for instrumentation and indicator lights to be removed. | $1 \text{ M}\Omega$ |
| Power supply and lighting circuits | Each single conductor against each other earthed conductor of a circuit.
- switches or fuses to be open
- all consumers shut down. | $1 \text{ M}\Omega$ |
| Generators and motors | The results may vary due to ambient temperature. Measurements to be obtained with warm engines:
$\frac{\text{Nominal Voltage}}{1000} \cdot \text{M}\Omega$ | $220 \text{ V} = 0,22 \text{ M}\Omega$
$460 \text{ V} = 0,46 \text{ M}\Omega$ |
| Heaters, galley range, etc. | Each heating coil or each group of coils | $220 \text{ V} = 0,22 \text{ M}\Omega / 1 \text{ kW}$
$460 \text{ V} = 0,46 \text{ M}\Omega / 1 \text{ kW}$ |

Propeller

Special Hints for Repairs

1. Repair Welding in Situ

Welding on propellers fitted on the shaft may only be carried out if

- a) faults cannot be ground out
- b) temporary repair according to section 2. is not advisable
- c) if position of the fault permits an expertly welding and heat treatment which might be necessary due to the material and classification of the propeller.

In all other cases the propeller has to be repaired in a specialized workshop.

2. Temporary Repairs

Temporary repairs might be advisable if due to technical reasons or shortage of time permanent repairs cannot be carried out or the propeller cannot be permanently repaired and the ship has to be kept trading with the damaged propeller for a limited time. Provided that manoeuvrability and seaworthiness of the vessel are maintained with the temporarily repaired propeller.

2.1 Blade edge cracks

If blade edge cracks cannot be repaired by grinding abt. 5 mm deeper than the crack and welding of a segment is not possible, the crack can be drilled at the end with a 20-25 mm diameter hole. In these cases the torque has to be reduced by cutting down propulsion revolutions according to following formula

$$n_2 = k \cdot \sqrt{1 - \frac{1}{B} \cdot n_1}$$

- $n_2 \text{ (min}^{-1}\text{)}$ = reduced propulsion rate of revolutions
- $l \text{ (mm)}$ = length of crack
- $B \text{ (mm)}$ = Width of blade in way of the edge crack
 - = 0,8 for leading edge area A
 - = 0,9 for trailing edge area A and leading edge area B
 - = 1,0 for trailing edge area B

2.2 Corrosion, cavitation, and erosion

To stop progression of corrosion or erosion of all kinds in blade areas A, B, C until permanent repair, a temporary repair might be carried out by filling the faults or by coating the faulty area with a suitable plastic resin.

2.3 Broken off blade tips, blade fractures

To avoid serious imbalances, the opposite blade tip (propeller with even number of blades) or the opposite blade tips (propellers with uneven number of blades) should be cut off to regain the balance of the opposite propeller blades.

If more than one blade tip is missing, temporary repair should be carried out similarly. Often a shortening of all blades is more advisable for the restoration of the balance than just the shortening of two blades. Otherwise the rate of revolutions of the propeller has to be reduced so far as to regain a satisfactory quietness of the shaft in its bearings and temperatures of the aft sterntube bearing and the remaining bearings can be kept in a satisfactory range.

3. Synthetic Resin Repairs

Synthetic or plastic resin in propeller repairs are only used to fill cavities and to avoid welding.

3.1 Properties of the plastic resin

- a) Pull-shear strength after 50 days continuous influence of seawater on 10 mm overlapped plastic weld of plates of the alloy CuAl10Fe according DIN 176652 kg/mm²
- b) Continuous pulsating shear strength at 2×10^7 load reversal of the plastic weld as aforementioned0,2 kg/mm²
- c) Elastic constant after 50 days exposure of the bonded synthetic glue in seawater250 kg/mm²
- d) Setting time until abt. 50 % of the pull shear strength is reached according to a) = 4-5 hours
Setting time until 100 % of the pull shear strength is reached according to a) = 8-10 hours
- e) Erosion resistance under the influence of advancing water (abt. 50 m/sec at blade tip) and a specific surface pressure (up to abt. 5 kg/cm²) corresponding with a $(p \cdot V)_{\max} = 100 \text{ mkg/sec cm}^2$

3.2 Processing

The faulty locations have to be thoroughly cleaned and to improve the adhesion slightly to be roughened up (grain size 100). Special attention has to be paid to the rim of the application to avoid surface holes.

The adding of dyers, bronze powder etc. for adaption of resin to the colour of the propeller is inadmissible. The admixture of glass fibre shreds or equal to increase the strength of the plastic resin should be omitted with regard to the decreasing of the elasticity of the resin.

3.3 Reinspection

If faults on propeller blade surfaces are covered with synthetic resin, the propeller has to be re-examined by the classification surveyor latest after 12 months.

(Reference GL-Propeller Test Instruction December 1971)

| Propeller | | Damages and Repairs | |
|--|-------------------------|--|---|
| Representation
(Picture)
of Damage | | Causes | Repair Advice |
| 1 | Rough Surface | Corrosion or cavitation found primarily on outer part of propeller blades impairing the efficiency. This can lead to complete ruggedness of blade surface and eventually to partial loss of affected blade areas. | In minor cases grinding or incase of strong corrosion chiseling and grinding and control of pitch. Small local erosion or cavitation on pressure side A and B preferably to be machined in retaining the form of profile. Deeper erosions on pressure and suction side of area B can be ground troughlike and covered and filled with an approved plastic resin. |
| 2 | Erosion | Porosity under the surface or zinc extraction in the bronze alloy can reduce the working toughness of the blades and can be the cause of cavitation. | |
| 3 | Cracks in Edges | Striking of firm objects by the propeller or stress corrosion can be origin of endurance fractures. Broken out edges can cause erosions. | In way of area A grinding or drawing in of blade edges. Grinding to extend abt. 5 mm more than length of crack. Longer cracks in edges to be welded or a new segment to be cut out, fitted and welded. |
| 4 | Structural Cracks | Faulty realignment of the blade or signs of intercrystalline or intergranular corrosion in stainless alloys. Also signs of hot cracking extending to the surface or intercrystalline tension crack corrosion due to faulty welding or heating. | Blade cracks in areas A and B can in general only be repaired effectively, if there are no signs of fatigue fractures but caused during casting, faulty heating, inexpertly welding, or other such causes. Temporary mending of blade cracks by grinding well over the ends of the crack. If the profile shape or the momentum of resistance are affected, a reducing of the propulsive power might be necessary. |
| 5 | Cracks in Propeller Hub | Cracks on the outside between the blades are usually caused by local overheating during force fitting or withdrawal of the propeller. | Grinding out down to sound material. Padding weld should be avoided. Filling of the ground out cavity with suitable resin when it is deeper or just leaving it should be preferred. |
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| | | | - 85 - |

Propeller

Damages and Repairs

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| Representa-
tion
(Picture)
of Damage | | Causes | Repair Advice |
|---|---------------------------------|--|---|
| 6 | Bendings
or
Cut offs | Caused by grounding or other damages. Can be the starting point of cavitation. | Aligning of bent propeller blades may only be done, if the blade is free of cracks in way of the bending.
Preheating and heating during the process is necessary.
Sufficient stress relieving can be achieved by local reheating and slow cooling down (covering with asbestos mats) if it is not necessary for restoration of the grain structure to carry out a special heat treatment.
Pitch control should be carried out. |
| 7 | Blade Fracture | Mainly in area between propeller hub and 0,5 R usually start with a fatigue crack. Origin of this might be a fault in the structure reaching up to the surface on the pressure side or a welding point. In a faultless cast it might be the location of highest working stress. | Only above the area of 0,7 R and on bigger propellers, only up to a thickness of abt. 60 mm repair can be carried out by welding on or casting on a new blade tip. |
| 8 | Shrinkage Cavities and Porosity | If the meld contains too much gas, this can cause shrinkage cavities, air pockets and porosities on the blade surface and in the inner structure. This can impair the strength of the blade and leads to difficulties when welding. | |
| 9 | Erosion | Natural erosion of the propeller material may over the course of years cause slow reducing of profile thickness especially in outer area of blade and on leading edge due to friction forces between the water and the blade.

This may cause so-called "singing" of the propeller in certain revolution ranges. | Chamfering of blade edges by grinding. |

| Rudder Installation | | | |
|---|---|---|--|
| Damages | | | |
| Part | Damage | Cause | Repair Advice |
| Rudder body | Corrosion and pittings especially on front edge, bottom - and after edge | Erosion due to alternate tension and compression and propeller wash. Inadequate coating and cathodic protection. | Fitting of doublers. Newbuildings 25 % increased plating. Checking of number and arrangement of anodes |
| | Cracks at welding to ruddershaft | Inadequate structural strength in way of torsional stress. | Reinforcement of construction for better transmission of power between ruddershaft and rudderbody. |
| Rudder post | Cracks in transom plate and shell plating connection. Cracks below coupling flange. | Insufficient construction. Consequence of increased clearances. | Reinforcement in way of connection with hull. Rounding of transitions of flanges. |
| Rudder pintle | Erosion on taper | Faulty fit. Inadequate securing of nut. Loosened nut. | Check fit and fitting pressure. taper to be fitted with packing ring. |
| Rudder bearing | Bushing/Casing loose and corroded underneath. Clearance too extensive. | Faulty matching of bearing material. Insufficient shrinkage of bushing or casing. Extensive wear. Extensive vibration. | See rudder bearing matching of material. Fit with approved plastic steel bond. |
| Rudder shaft | Shaft twisted, cracks on coupling flange, coupling bolts loose.

Corrosion. | Navigating in ice. Grounding or alike. Considerable vibrations.

Insufficient coating / cathodic protection. | Twist not to be turned back. Crack test to be carried out.
If twisted more than 10°, to be rejected. Otherwise stress-free annealing (550-650°). Higher temperatures to be avoided. |
| Rudder carrier | Ruddercarrier fractured. Corrosion. Bearing loose. One side carriage. | Navigation in ice. Grounding, clearance too extensive in guide bearings. Vibration. Leakage due to insufficient seal lubrication. | Lubrication and alignment to be checked. |
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Rudder Bearings
Material Combinations
Bush / Sleeve

| No. | Material
Mat.No. | Grain
structure | Brinell
hardness
(average) | Corrosions
resistence | Sliding
ability | Com-
pres.
strength | Suit-
Combi-
nation | Remarks |
|-----|-----------------------------------|---|----------------------------------|--------------------------|--------------------|---------------------------|---------------------------|---|
| 1 | G-X 15 | austenitic | 190 | excellent | poor | 60 | 7,8,9,
10 | Contact
surfaces
with
ordinary
steel
to be
protec-
ted
against
sea
water
admis-
sion. |
| 2 | C-X 22
CrNi17 | Due to intercrystalline corrosion
in seawater not longer recommended | | | | | 5 | |
| 3 | G-X 120
CR 29
14086 | Ferristic
carburate | 300 | good | good | 90 | 4 | |
| 4 | G-X 32
CrNi 281 | Ferristic
austenitic | 210 | good | good | 70 | 2,3 | |
| 5 | GGG
NiCr 202 | austenitic
+ graphite | 190 | medium | excellent | 50 | 2 | |
| 6 | G-CuSn10Zn
(Rg 10)
2.1086 | | 80 | good | good | 28 | 2, 10 | |
| 7 | Resin
laminated
plastic | laminated
fabric | | | | 12-17 | 1 | Rods to be
parallel
to running
surfaces.
Swelling
factor to
be con-
sidered. |
| 8 | Polyamide | Block-Poly-
merisation | | | | 1 | | |
| 9 | hot-press.
bronze-
graphite | hot-press.
powder | 60-70 | | | 25-30 | 1,2,3
4,5 | |
| 10 | Lignum
vitae | | 20-25 | | | | 1,6 | |

Remark:

Material for bush : Bronze, lignum vitae, resin laminate (Ferrozell, Laminex)
Material for sleeve: Chrome steel (Remanit, Geronit)
Usual Combination : Bush = Ferrozell / Sleeve = Remanit

MACHINERY SPARE PARTS
as per Class Requirements

A = world wide and restricted international trading
B = all other trading areas

The following listed spares are the minimum requirements which have to be on board of each vessel.

The rules apply to each engine type for the same mode of operation.

Numbers in brackets indicate that the respective spares are recommended to be on board.

| 1. COMBUSTION ENGINES | required | | actually on board | |
|---|-----------------------|-----------------|-------------------|---------|
| 1.1 Main Engines | A | B | new | used/ok |
| Journal bearings

Bearings or bearing shells of each type with shims, screws and nuts | 1 | - | | |
| Thrust bearing (internal)

Thrust pads for single disc bearings for "ahead" side, respectively
complete white metal thrust ring respectively
inner and outer roller bearing | 1 set
1
1 | 1 set
1
1 | | |
| Cylinder liner

Cylinder liner, complete with seal rings | 1 | - | | |
| Cylinder cover

Cylinder cover, complete with valves including fuel valves and gaskets
For engines without covers the resp. valves including fuel valves
Cylinder cover screws and nuts for 1 unit | 1
1 set
1/2 set | -
-
- | | |

MACHINERY SPARE PARTS
as per Class Requirements

| 1. COMBUSTION ENGINES | required | | actually on board | |
|--|----------|---------|-------------------|---------|
| 1.1 Main Engines | A | B | new | used/ok |
| Valves

Exhaust valves, complete with casings, seats, springs and outfit for 1 unit | 2 sets | 1 set | | |
| Inlet valve, complete with casing, seat, springs and outfit for 1 unit | 1 set | 1 set | | |
| Starting valve, complete with casing, seat, springs and outfit | 1 | 1 | | |
| Safety valve, complete | 1 | 1 | | |
| Fuel valves of each type complete with all outfit for 1 engine | 1 set | 1/4 set | | |
| Connecting rod bearing

Crankpin bearing or bearing shells of each type with shims, screws and nuts for 1 unit | 1 set | - | | |
| Upper connection rod bearing resp. crosshead bearing or -shells of each type with shims, screws, and nuts for 1 unit | 1 set | 1 set | | |
| Pistons

Crosshead engines:
Piston of each type ready for installation, with piston rod, stuffing box, piston skirt, rings, screws, and nuts | 1 | - | | |
| Trunk engines:
Connecting rod of each type ready for installation with piston, piston skirt, rings, piston bolts, screws, and nuts | 1 | - | | |
| Piston rings

Piston rings for 1 unit | 1 set | - | | |

MACHINERY SPARE PARTS
as per Class Requirements

| 1. COMBUSTION ENGINES | required | | actually on board | |
|---|-----------------------------|---------------------|-------------------|---------|
| | A | B | new | used/ok |
| 1.1 Main Engines | | | | |
| Piston cooling

Telescopic or linkage pipes ready for installation with outfit for 1 unit | 1 set | - | | |
| Wheels or chain drive for camshaft

Tooth wheel drive:
Wheels (complete) for camshaft drive for 1 engine

Chain drive:
Links with bolts and rolls of each type as applied

Bearing bushes of each type | 1 set

6
1 set | -

-
- | | |
| Cylinder oilers

Cylinder lubricator, complete, largest type including chain drive or tooth wheels | 1 | - | | |
| Fuel pumps

Fuel pump, complete, or if exchange is possible at sea, 1 complete set of moving parts for 1 pump (piston, sleeves, valves, springs, etc.) | 1 | - | | |
| Fuel injection pipes

Fuel injection pipes of each type, complete with joints | 1 | - | | |
| Scavenge air compressors (including turbochargers)

Rotor, rotorshaft, nozzle rings, tooth wheels or resp. working part if other design applied | 1 set | - | | |

MACHINERY SPARE PARTS
as per Class Requirements

| 1. COMBUSTION ENGINES | required | | actually on board | |
|--|----------------------|------------|-------------------|---------|
| 1.1 Main Engines | A | B | new | used/ok |
| Note:
Spares may be omitted if upon failure of a blower, emergency operation of engine is possible. | | | | |
| Scavenge air system

Suction and pressure valves for one pump of each type | 1 set | - | | |
| Reversing and/or reduction gear (flanged)

Complete bearing bush of each size fitted in the gear
Roller or ball bearings of each size fitted in the gear | 1 set

1 set | -

- | | |
| Attached air compressors

Piston rings of each type
Suction and pressure valves of each type, complete | 1 set

1/2 set | -

- | | |
| Sealing rings and gaskets

Special seal rings and gaskets of each type for cylinder covers and liners for 1 unit | - | 1 set | | |

Note: With multi-engine plants required spares for 1 engine only

MACHINERY SPARE PARTS
as per Class Requirements

| 1. COMBUSTION ENGINES | required | | actually on board | |
|---|--------------------------------------|-----------------------|-------------------|---------|
| | A | B | new | used/ok |
| 1.2 Auxiliary engines for generator drive of essential consumers | | | | |
| Journal bearings

Journal bearings or shells of each type, complete with shims | 1 | - | | |
| Valves

Exhaust valves, complete with casings, seats, springs and outfit for 1 unit
Inlet valves, complete with casings, seats, springs and outfit for 1 unit
Starting valve, complete with casing, seat, springs and outfit
Safety valve, complete
Fuel valves of each type complete with all outfit for 1 engine | 2 sets
1 set
1
1
1/2 set | -
-
-
-
- | | |
| Connecting rod bearings

Crankpin bearings or shells of each type, complete with shims, screws, and nuts for 1 unit
Upper connecting rod bearing or bearing shell assembly, complete with shims, screws, and nuts for 1 unit
Trunk engine:
Piston bolt with bush for 1 unit | 1 set
1 set
1 set | -
-
- | | |
| Piston rings

Piston rings for 1 unit | 1 set | - | | |
| Piston cooling

Telescopic pipe with outfit, ready for installation for 1 unit | 1 set | - | | |

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MACHINERY SPARE PARTS
as per Class Requirements

| 1. COMBUSTION ENGINES | required | | actually on board | |
|---|------------------|------------|-------------------|---------|
| 1.2 Auxiliary engines for generator drive of essential consumers | A | B | new | used/ok |
| Fuel injection pumps

Fuel pump, complete, or if exchange is possible at sea, 1 complete set of moving parts for 1 pump (piston sleeves, valves, springs etc.) | 1
or
1 set | -

- | | |
| Fuel injection pipes

Fuel injection pipes of each type, complete with joints | 1 | - | | |
| Sealing rings and gaskets

Special seal rings and gaskets of each type for cylinder covers and liners for 1 unit | 1 set | - | | |

Note: If the number of generators is bigger than required by rules (including standby), no spares are required for the auxiliary engines.

| 1.2 Diesel engines for emergency fire pumps and lifeboats | A | B | new | used/ok |
|---|-------|-------|-----|---------|
| Injection nozzle* | 1 | 1 | | |
| Fuel injection pipe* | 1 set | 1 set | | |
| Valve with springs and seats for 1 unit* | 1 set | 1 set | | |
| Piston rings of each type* | 1 set | 1 set | | |

MACHINERY SPARE PARTS
as per Class Requirements

| 1. COMBUSTION ENGINES | required | | actual on board | |
|---|----------|--------|-----------------|---------|
| 1.3 Diesel engines for emergency fire pumps and lifeboats | A | B | new | used/ok |
| Gaskets* | 1 set | 1 set | | |
| Drive belts | 1 set | 1 set | | |
| Filter inserts | 1 set | 1 set | | |
| Ignition device
Cartridge (box)
Hot wire spiral | 1
1 | 1
1 | | |
| Normal tools with special wrenches | 1 set | 1 set | | |
| Pump wheel for cooling water pump | 1 | 1 | | |

* These spares have to be on board for each type of diesel engine and up to 3 diesel engines of the same type.

| 2. STEAM PISTON ENGINES | required | | actual on board | |
|---|----------|-------|-----------------|---------|
| 2.1 Main engines | A | B | new | used/ok |
| Piston rings with springs for each type of piston | 1 set | 1 set | | |
| Crosshead bearing with screws and nuts | 1 set | - | | |
| Crankpin bearing with screws and nuts | 1 | 1 | | |
| Journal bearing screws with nuts | 1 set | - | | |

MACHINERY SPARE PARTS
as per Class Requirements

| 2. STEAM PISTON ENGINES | | required | | actually on board | |
|---|--|----------|-------|-------------------|---------|
| 2.1 Main engines | | A | B | new | used/ok |
| Valve of each type including shaft, rolls, and intermediate link, springs with valve operated engines | | 1 | - | | |
| Shuttle valve rod of each type | | 1 | - | | |
| Piston rods and valves for attached pumps | | 1 set | - | | |
| Coupling screws for couplings of each crankshaft type | | 1 set | - | | |
| Springs of each type for safety valves of engines and apparatus | | 1 | 1 | | |
| Condensate pipes of each condensor | | (2%) | - | | |
| 2.2 Auxiliary engines | | A | B | new | used/ok |
| Piston rings of each type | | 1 set | 1 set | | |
| Crosshead bearing complete with screws and nuts | | 1 set | - | | |
| Crankpin bearing complete with screws and nuts | | 1 | 1 | | |

MACHINERY SPARE PARTS
as per Class Requirements

3. STEAM TURBINES

required

actually on board

3.1 Main turbines

A

B

new

used/ok

Rotor bearings

Bearing shells of each type
and size for turbine rotors

1 set

-

Thrust bearings

Thrust pads of each size for one
side, with shims or thrust rings
of each size with correctly fitt-
ing shims

1 set

1 set

Shaft seal rings

Graphite-seal rings where applied,
with springs for each type and
size of seals

1 set

-

Oil filters

Strainers of inserts of each type
and size for filters with special
design

1 set

-

Note: If more than 1 main turbine are installed in a vessel, only
spares necessary for 1 main turbine are required.

3.2 Auxiliary turbines for generator
drive of essential consumers

A

B

new

used/ok

Rotor bearings

Bearing shells or roller bearings
of each type and size for turbine
rotors

1 set

-

MACHINERY SPARE PARTS
as per Class Requirements

3.2 Auxiliary turbines for generator
drive of essential consumers

A

B

new

used/ok

Thrust bearings

Thrust pads for one side with shims
or thrust rings with correctly fitting shims

1 set

1 set

Shaft seal rings

Graphite-seal rings where applied,
with springs for each type and
size of seals

1 set

-

Oil filters

Strainers or inserts of each type
and size for filters with special
design

1 set

-

Note: If the number of generators exceed the requirements of
the rules (including standby), no spares are required
for auxiliary turbines.

4. STEAM BOILERS

required

actually on board

A

B

new

used/ok

Springs of each type for safety
valves

1

1

Pipe plugs for boiler and
economizer pipes of each size
for each boiler

2%

2%

Glass pipes for level indicators
of each boiler

4 sets

2 sets

MACHINERY SPARE PARTS
as per Class Requirements

| 4. STEAM BOILERS | required | | actually on board | |
|--|----------|--------|-------------------|---------|
| | A | B | new | used/ok |
| Glass and fluorescent plates for water level indicators for each boiler including resp. sealing material | 2 sets | 2 sets | | |
| Wear-down parts for each burner | 1 set | 1 set | | |
| Burner complete with rotating nozzles, a spare rotor including bearings for each boiler | (1) | (1) | | |
| 5. GEARS, COUPLINGS | required | | actually on board | |
| | A | B | new | used/ok |
| Bearing shells of each type and size | 1 set | - | | |
| Coupling screws with nuts of each type of coupling of the pinion shafts | 1 set | - | | |
| Wear-down parts of attached gear oil pump or one complete lub.oil pump if no standby pump is provided | 1 set | - | | |
| With built-in thrust bearings, thrust pads for one side if all pads are of identical type and size. Otherwise a complete set of pads is to be provided | 1 set | 1 set | | |
| Spring elements for elastic couplings. Excepted are reinforced fibre rubber tyres with fibres of organic or plastic material and vulcanized natural rubber elements of admitted coupling types | 1 set | 1 set | | |

MACHINERY SPARE PARTS
as per Class Requirements

5. GEARS, COUPLINGS

| | required | | actually on board | |
|---|----------|---------|-------------------|---------|
| | A | B | new | used/ok |
| Roller bearings if exchangeable by devices on board | (1 set) | (1 set) | | |

6. SHAFTING

| | required | | actually on board | |
|--|----------|-------|-------------------|---------|
| | A | B | new | used/ok |
| Coupling screws with nuts for all couplings which have to be opened if the propeller shaft is being withdrawn | 1 set | - | | |
| Thrust pads for main thrust bearing. Thrust pads for one side, if all fitted pads are of identical type and size. Otherwise one complete set of pads | 1 set | 1 set | | |

7. AIR COMPRESSORS

| | required | | actually on board | |
|--|----------|---------|-------------------|---------|
| | A | B | new | used/ok |
| Piston rings of each type and size for 1 piston | 1 set | 1 set | | |
| Suction and pressure valves of each type, complete | 1/2 set | 1/2 set | | |

MACHINERY SPARE PARTS
as per Class Requirements

8. PUMPS

| | required | | actually on board | |
|---|--------------------|--------------------|-------------------|---------|
| | A | B | new | used/ok |
| Piston pumps

Valves with valve seats and
springs of each size fitted
Piston rings of each type
and size for one piston | 1 set

1 set | 1 set

1 set | | |
| Impeller pumps

Bearings of each type and size
Shaft seals of each type and
size | 1

1 | 1

1 | | |
| Tooth wheel and screw
spindling pumps

Bearings of each type and size
Shaft seals of each type and size | 1

1 | 1

1 | | |

Note: If a system is provided with a standby pump of sufficient output, spares may be omitted.

9. HYDRAULIC PLANTS

| | required | | actually on board | |
|---|----------|--------|-------------------|---------|
| | A | B | new | used/ok |
| (steering plants, anchor winches,
hatchcover activators, shell closing
devices, lifting appliances) | | | | |
| Pressure hoses,
minimum 1 of each size | 20 % | 20 % | | |
| Pressure pipes with screw joints | abt.5 % | abt.5% | | |
| Safety valve of each type | 1 | 1 | | |
| Spring, gaskets, sleeves | 1 set | 1 set | | |

MACHINERY SPARE PARTS
as per Class Requirements

| 10. OTHERS | required | | actually on board | |
|--|----------|------|-------------------|---------|
| | A | B | new | used/ok |
| Safety valve resp. cone with valve spring of each type of pressure receivers | 1 | 1 | | |
| Hose connection fitted in engines and pipe systems | 20 % | 20 % | | |
| Testing device for fuel injection valves | 1 | 1 | | |
| Pressure release device for hydraulically fitted couplings | 1 | 1 | | |
| Condensator pipes with screw joints | (2%) | - | | |
| Pipes for intercooler of steam air pumps | 10 % | - | | |

According to the size of the machinery plant, a sufficient number of suitable tools and special tools must be available. Further a number of standard screws, bolts, nuts, splints, filter mesh or strainers for seawater and lub.oil filter, zinc plates, etc., round and flat materials of steel and non-ferrous materials have to be on board. 10 % of the springs used in the machinery plant, at least however 1 piece of each type, have to be carried as spare.

ELECTRIC SPARE PARTS
as per Class Requirements

| 1. ELECTRIC MACHINERY | required | actually on board | |
|--|---|-------------------|---------|
| | | new | used/ok |
| 1.1 Machinery

Plain or roller bearings
Carbon brushes
Brush holders | 1 set
1 set
2 pieces | | |
| 1.2 Propeller drive engines

Plain or roller bearings
Carbon brushes
Brush holders
Drive motors for separate ventilators | 1 set
1 set/engine
1 set
1 piece | | |
| 1.3 Ventilators for reefer plants with Certificate (KAZ)

Ventilator motor | 1 piece | | |
| 1.4 Slip couplings

Exit coil
Carbon brushes
Brush holders | 1 piece
1 set
1 set | | |
| 2. SWITCHBOARD PLANTS | | | |
| 2.1 Circuit breakers for high voltage plants according to special agreement | | | |
| 2.2 Circuit breakers for low voltage plants

a) with test cyclus P 1 tested acc. to IEC-Publ. 157-1 or CEE-Publ.19 or VDE 0641
Circuit breaker (complete) with overload relay and relay coil | 1 piece | | |

ELECTRIC SPARE PARTS
as per Class Requirements

| | required | actually on board | |
|--|---------------------------------------|-------------------|---------|
| | | new | used/ok |
| b) with test cyclus P 2 tested acc.
to IEC-Publ.157-1
Switching elements
Springs
Relay coil | 1 set
1 set
1 piece | | |
| 2.3 Circuit breakers above 40 A
nominal current

Switching elements
Auxiliary switches
Magnetic coil | 1 set
1 set
1 piece | | |
| 2.4 Circuit breakers up to 40 A
nominal current

Circuit breakers complete | 1 piece | | |
| 2.5 Motor switch, motor protection relay

Complete device | 1 piece | | |
| 2.6 Fuses

Plug fuses | 1 set | | |
| 2.7 Buss lamps

Light bulbs | 1 set | | |
| 3. <u>ELECTRONICS</u>

Semi-conductor fuses
Power semi-conductor
Exchange function units,
e.g. printed cards and elements
if there are no redundant elements | 2 sets
2 pieces

1 piece | | |

ELECTRIC SPARE PARTS
as per Class Requirements

| | required | actually on board | |
|-----------------------------|----------|-------------------|---------|
| | | new | used/ok |
| <u>4. NAVIGATION LIGHTS</u> | | | |
| Tested light bulbs | 1 set | | |
| Control relay | 1 piece | | |

5. CABLING AND INSTALLATION ACCESSORIES

Several lengths of cabling and cables of different diameters, connecting boxes, cable shoes, soldering and insulating material.

6. MEASURING DEVICES

A mega testing device for min. 500 V has to be provided with generator installations of an output exceeding 100 kVA/80 kW.

Furthermore measuring devices have to be provided according to the type and size of the electric plant, enabling the detection of eventual failures or damages.

7. TOOLS

- a) Tools for performance of repair work normally encountered.
- b) Special tools as pulling devices for couplings and roller bearings, special wrenches, etc.

INVENTORY LIST FOR GERMAN FLAG VESSELS
(SBG-Requirements)

| Item | world
wide | great
coast
wise | actually on board |
|--|-----------------------------|------------------------|-------------------|
| 1. Mechanical foghorn | 1 | 1 | |
| 2. Patent log or other
speed recorder | 1 | 1 | |
| 3. Helicopter and line
throwing rescue info board | 1 | 1 | |
| 4. Tools for deck/machinery
department | as necessary | | |
| 5. Welding plant | 1 | 1 | |
| 6. Voltage tester | 1 | 1 | |
| 7. Electric multi tester | 1 | 1 | |
| 8. Meg. tester | 1 | 1 | |
| 9. Ex-proof hand lights | 3 | 2 | |
| 10. Insulated plier,
insul. side cutter,
insul. screw driver,
insul. gripping screw driver | each 1 | each 1 | |
| 11. Rubber mat for insulation
of a working position | 1 | 1 | |
| 12. Insulating covering blanket | 1 | 1 | |
| 13. Pair of insulated gloves | 1 | 1 | |
| 14. Face protection | 1 | 1 | |
| 15. Pair of insulated boots/
overschoes | 1 | 1 | |
| 16. For ships with voltage of
220 V and above:
Isolating transformer or
failure current safety switch
as plug with failure current
protection | 2 | 1 | |
| 17. Windhoses on tankers | acc. No. of
compartments | | |
| 18. Pilot ladder | 1 | 1 | |
| 19. Storm oil | 50 kg | 10 kg | |
| 20. Gas detector for calibrating
of toxic gases and vapours | 1 | 1 | |
| 21. Additional ex-proof measuring
detection for vessels which
may expose mixtures of in-
flammable gases or air vapours | | | |

| | |
|---|--|
| TECHNOLOGY
FOR
SALE AND PURCHASE OF SHIPS | |
|---|--|

SECTION F - REVIEW

DELIVERY COSTS

- Pre-Calculation Scheme for Buyers
- Delivery Costs - Sellers' Calculation

DELIVERY COSTS - CALCULATION SCHEME

MONEY TRANSFER & REGISTRATION

- Deposit interest costs and fees :
- Money transfer costs :
- Mortgage fees :
- Registration costs :
- Classification survey costs :
- Costs for name change :

DRY DOCKING EXPENSES

- Dry docking costs (if not for sellers) :
- Underwater hull paint :
- Cathodic protection :
- Sea/outlet valve grinding :
- Tailshaft drawing :
- Other poss. docking costs :

CREW MATTERS

- Expenses for Buyers' crew members
on board before delivery :
- Expenses for transportation :
- Crew hotel accommodation at port
of delivery :
- Cash advance to crew :
- Agency fees upon delivery :
- Signing on expenses :

EXTRA PURCHASE COSTS

- Leased equipment :
- Spares on order :
- Catering stores :
- Lub. oil :
- Fuel on board :
- Unbroken other stores :

NEW PROVISION & STORES

- Lub. oil :
- Provisions :
- Other equipment :
- Additional fuel :

PORT CLEARANCE

- Agency fee :
- Piloting costs :
- Port dues :
- Tug assistance :
- Unmooring :

| | |
|---------------------------------------|--|
| DELIVERY COSTS - SELLERS' CALCULATION | |
|---------------------------------------|--|

Entering Port of Delivery

- Pilotage, tugs, mooring
- Agency, clearance fee
- Superintendent(s) attending costs
- Quay dues (before/after drydocking)

Drydocking

- 1st and 1 - 2 days
- Entering / leaving
- Tugs and pilots
- Mooring / unmooring
- Classification

Dock Works

- High pressure washing
- Rudder and tailshaft clearances
- Overhaul sea/outlet valves
- Overhaul shaft seals
- Tailshaft drawing

Crew Matters

- Discharge of crew
- Transportation
- Immigration

Deletion

- Deletion of Mortgage
- Deletion from Register
- Notary/consulate fees for legalisation

Other Costs

- Commissions to brokers
- Return of leased equipment
- Return of personal property