

PART III CONSTRUCTION COMPONENTS

TITLE 63 ELECTRICITY, NAUTICS AND ELECTRONICS

SECTION 8 NAUTICS AND ELECTRONICS

CHAPTERS

- A TEST SPECIFICATION FOR TYPE APPROVAL OF EQUIPMENT AND COMPONENTS OF CONTROL, PROTECTION, SAFETY AND INTERNAL COMMUNICATION SYSTEMS
- B GUIDELINES ON APPROVAL PROCEDURE FOR ONBOARD LOADING COMPUTERS

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CHAPTER A
TEST SPECIFICATION FOR TYPE APPROVAL OF
EQUIPMENT AND COMPONENTS OF CONTROL,
PROTECTION, SAFETY AND INTERNAL
COMMUNICATION SYSTEMS

CHAPTER CONTENTS

A1. SCOPE

A1. SCOPE

100 Application
[IACS UR E10.1]

101 This test specification is applicable, but not confined, to all equipment used for:

- a. Control, protection and safety
- b. Internal communication.

102. The tests are applicable to the equipment, accessories and materials covered by Part II, Title 11, Section 8 and when specified, Part II, Title 11, Section 7.

Note: These test requirements are harmonised with

- a. IEC 60092-504 “Electrical Installations in Ships - Part 504: Special features Control and Instrumentation”; and
- b. IEC 60533 “Electrical and electronic installations in ships - electromagnetic compatibility”.

A2. TESTING

100. Testing
[IACS UR E10.2]

101. These tests are to demonstrate the ability of the equipment to function as intended under the specified testing conditions.

102. The extent of the testing (i.e. the selection and sequence of carrying out tests and number of pieces to be tested) is to be determined upon examination and evaluation of the equipment or component subject to testing giving due regard to its intended usage.

103. Equipment is to be tested in its normal position if otherwise not specified in the test specification.

104. Relevant tests are as listed in Table T.A2.104.1 regarding Type testing for Equipment covered by Part II, Title 11, Section 8 and when specified, Part II, Title 11, Section 7.

105. Navigational and Radio Equipment Test conditions as specified in:

- a. IEC 60945 (Marine navigational and radiocommunication equipment and systems - General requirements, Methods of testing and required test results) are to be applied for the above mentioned equipment.

106. Electrical and electronic equipment on board ships, required neither by classification rules nor by International Conventions, liable to cause electromagnetic disturbance, shall be of type which fulfill the test requirements of test specification items 19 and 20 in Table T.A2.104.1 below.

**TABLE T.A2.104.1 – TYPE TESTING FOR EQUIPMENT COVERED BY
PART II, TITLE 11, SECTION 7 AND SECTION 8**

No.	TEST	PROCEDURE ACC. TO *	TEST PARAMETERS	OTHER INFORMATION																														
1	Visual inspection			- conformance to drawings, design data																														
2	Performance test	Manufacturer performance test programme based upon specification and relevant Rule requirements.	- standard atmosphere conditions - temperature: 25°C ± 10°C - relative humidity: 60% ± 30% - air pressure: 96 KPa ± 10KPa	- confirmation that operation is in accordance with the requirements specified for particular system or equipment; - checking of self-monitoring features; - checking of specified protection against an access to the memory; - checking against effect of unerroneous use of control elements in the case of computer systems.																														
3	External power supply failure		- 3 interruptions during 5 minutes; - switching-off time 30 s each case	The time of 5 minutes may be exceeded if the equipment under test needs a longer time for start up, e.g. booting sequence																														
4	Power supply variations a) electric b)Pneumatic and hydraulic		<p align="center">AC SUPPLY</p> <table border="1"> <thead> <tr> <th>Combination</th> <th>Voltage variation permanent %</th> <th>Frequency variation permanent</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>+6</td> <td>+5</td> </tr> <tr> <td>2</td> <td>+6</td> <td>-5</td> </tr> <tr> <td>3</td> <td>-10</td> <td>-5</td> </tr> <tr> <td>4</td> <td>-10</td> <td>+5</td> </tr> <tr> <td></td> <td>voltage transient 1,5 s %</td> <td>frequency transient 5 s %</td> </tr> <tr> <td>5</td> <td>+20</td> <td>+10</td> </tr> <tr> <td>6</td> <td>-20</td> <td>-10</td> </tr> </tbody> </table> <p align="center">DC SUPPLY</p> <table border="1"> <tbody> <tr> <td>Voltage tolerance continuous</td> <td>±10%</td> </tr> <tr> <td>Voltage cyclic variation</td> <td>5%</td> </tr> <tr> <td>Voltage ripple</td> <td>10%</td> </tr> </tbody> </table> <p align="center">Electric battery supply: - +30% to -25% for equipment connected to charging battery or as determined by the charging/discharging characteristics,</p>	Combination	Voltage variation permanent %	Frequency variation permanent	1	+6	+5	2	+6	-5	3	-10	-5	4	-10	+5		voltage transient 1,5 s %	frequency transient 5 s %	5	+20	+10	6	-20	-10	Voltage tolerance continuous	±10%	Voltage cyclic variation	5%	Voltage ripple	10%	<p>- For equipment which requires booting, one additional power supply interruption during booting to be performed</p> <p>Verification of: - equipment behaviour upon loss and restoration of supply; - possible corruption of programme or data held in programmable electronic systems, where applicable</p>
Combination	Voltage variation permanent %	Frequency variation permanent																																
1	+6	+5																																
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3	-10	-5																																
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6	-20	-10																																
Voltage tolerance continuous	±10%																																	
Voltage cyclic variation	5%																																	
Voltage ripple	10%																																	

No.	TEST	PROCEDURE ACC. TO *	TEST PARAMETERS	OTHER INFORMATION
			including ripple voltage from the charging device; - +20% to -25% for equipment not connected to the battery during charging Pressure: ±20% Duration: 15 minutes	
5	Dry heat	IEC Publication 60068-2-2	Temperature: 55° ± 2°C Duration: 16 hours or Temperature: 70°C ± 2°C Duration: 2 hours (see note 1)	- equipment operating during conditioning and testing; - functional test during the last hour at the test temperature.
6	Damp heat	IEC Publication 60068-2-30 test Db	Temperature: 55°C Humidity: 95% Duration: 2 cycles 2 x (12 +12 hours)	- measurement of insulation resistance before test; - equipment operating during the complete first cycle and switched off during second cycle except for functional test; - functional test during the first 2 hours of the first cycle at the test temperature and during the last 2 hours of the second cycle at the test temperature; - recovery at standard atmosphere conditions; - insulation resistance measurements and performance test.
7	Vibration	IEC Publication 60068-2-6 Test Fc	2^{+3-0} Hz to 13.2 Hz – amplitude ±1mm ⁰ 13.2 Hz to 100 Hz – acceleration ± 0.7 g. For severe vibration conditions such as, e.g. on diesel engines, air compressors, etc.: <ul style="list-style-type: none"> ○ 2.0 Hz to 25 Hz – amplitude ±1.6 mm ○ 25.0 Hz to 100 Hz – acceleration ± 4.0 g. Note More severe conditions may exist for example on exhaust manifolds of diesel engines especially for medium and high speed engines. Values may be	- duration in case of no resonance condition 90 minutes at 30 Hz; - duration at each resonance frequency at which $Q \geq 2$ is recorded – 90 minutes; - during the vibration test, functional tests are to be carried out; - tests to be carried out in three mutually perpendicular planes; - it is recommended as guidance that Q does not exceed 5. - where sweep test is to be carried out instead of the discrete frequency test and a number of resonant frequencies is detected close to each other, duration of the test is to be 120 min.

No.	TEST	PROCEDURE ACC. TO *	TEST PARAMETERS		OTHER INFORMATION															
9 (cont)	Insulation resistance		<table border="1"> <tr> <td data-bbox="981 145 1229 248">Rated supply voltage U_n (V)</td> <td data-bbox="1229 145 1476 248">Test voltage U_n (V)</td> <td colspan="2" data-bbox="981 145 1476 185">Min. insulation resistance</td> </tr> <tr> <td data-bbox="981 248 1229 312">$U_n \leq 65$</td> <td data-bbox="1229 248 1476 312">$2 \times U_n$ min 24V</td> <td data-bbox="981 185 1229 248">before test M ohms</td> <td data-bbox="1229 185 1476 248">after test M ohms</td> </tr> <tr> <td data-bbox="981 312 1229 344">$U_n > 65$</td> <td data-bbox="1229 312 1476 344">500</td> <td data-bbox="981 248 1229 312">10</td> <td data-bbox="1229 248 1476 312">1,0</td> </tr> <tr> <td data-bbox="981 344 1229 464"></td> <td data-bbox="1229 344 1476 464"></td> <td data-bbox="981 312 1229 344">100</td> <td data-bbox="1229 312 1476 344">10</td> </tr> </table>	Rated supply voltage U_n (V)	Test voltage U_n (V)	Min. insulation resistance		$U_n \leq 65$	$2 \times U_n$ min 24V	before test M ohms	after test M ohms	$U_n > 65$	500	10	1,0			100	10	<ul style="list-style-type: none"> - For high voltage equipment, reference is made to part II, title 11, Section 7, Chapter I. - insulation resistance test is to be carried out before and after: damp heat test, cold test, salt mist test and high voltage test; - between all phases and earth; and where appropriate, between the phases. <p>Note: Certain components e.g. for EMC protection may be required to be disconnected for this test.</p>
Rated supply voltage U_n (V)	Test voltage U_n (V)	Min. insulation resistance																		
$U_n \leq 65$	$2 \times U_n$ min 24V	before test M ohms	after test M ohms																	
$U_n > 65$	500	10	1,0																	
		100	10																	
10	High voltage		<table border="1"> <tr> <td data-bbox="981 464 1229 568">Rated voltage U_n (V)</td> <td data-bbox="1229 464 1476 568">Test voltage (A.C. voltage 50 or 60Hz) (V)</td> </tr> <tr> <td data-bbox="981 568 1229 600">Up to 65</td> <td data-bbox="1229 568 1476 600">$2 \times U_n + 500$</td> </tr> <tr> <td data-bbox="981 600 1229 632">66 to 250</td> <td data-bbox="1229 600 1476 632">1500</td> </tr> <tr> <td data-bbox="981 632 1229 663">251 to 500</td> <td data-bbox="1229 632 1476 663">2000</td> </tr> <tr> <td data-bbox="981 663 1229 695">501 to 690</td> <td data-bbox="1229 663 1476 695">2500</td> </tr> </table>		Rated voltage U_n (V)	Test voltage (A.C. voltage 50 or 60Hz) (V)	Up to 65	$2 \times U_n + 500$	66 to 250	1500	251 to 500	2000	501 to 690	2500	<ul style="list-style-type: none"> - For high voltage equipment, reference is made to part II, title 11, Section 7, Chapter I. - separate circuits are to be tested against each other and all circuits connected with each other tested against earth; - printed circuits with electronic components may be removed during the test; - period of application of the test voltage: 1 minute 					
Rated voltage U_n (V)	Test voltage (A.C. voltage 50 or 60Hz) (V)																			
Up to 65	$2 \times U_n + 500$																			
66 to 250	1500																			
251 to 500	2000																			
501 to 690	2500																			
11	Cold	IEC Publication 60068-2-1	<p>Temperature: $+5^\circ\text{C} \pm 3^\circ\text{C}$ Duration: 2 hours or Temperature: $-25^\circ\text{C} \pm 3^\circ\text{C}$ Duration: 2 hours (see note 2)</p>		<ul style="list-style-type: none"> - initial measurement of insulation resistance; - equipment not operating during conditioning and testing except for functional test; - functional test during the last hour at the test temperature; - insulation resistance measurement and the functional test after recovery 															
12	Salt mist	IEC Publication 60068-2-52 Test Kb	Four spraying periods with a storage of 7 days after each.		<ul style="list-style-type: none"> - initial measurement of insulation resistance and initial functional test; - equipment not operating during conditioning; - functional test on the 7th day of each storage period; - insulation resistance measurement and performance test 4 to 6h after recovery. (see Note 3) 															
13	Electrostatic discharge	IEC 61000-4-2	<p>Contact discharge: 6kV Air discharge: 8kV Interval between single discharges: 1 sec. No. of pulses: 10 per polarity According to level 3 severity standard.</p>		<ul style="list-style-type: none"> - to simulate electrostatic discharge as may occur when persons touch the appliance; - the test is to be confined to the points and surfaces that can normally be reached by the operator; 															

No.	TEST	PROCEDURE ACC. TO *	TEST PARAMETERS	OTHER INFORMATION
				- Performance Criterion B (See Note 4).
14	Electromagnetic field	IEC 61000-4-3	<p>Frequency range:</p> <p>80 MHz to 2 GHz</p> <p>Modulation**: 80% AM at 1000Hz</p> <p>Field strength: 10V/m</p> <p>Frequency sweep rate: $\leq 1.5 \times 10^{-3}$-3 decades/s (or 1%/3 sec)</p> <p>According to level 3 severity standard.</p>	<p>- to simulate electromagnetic fields radiated by different transmitters;</p> <p>- the test is to be confined to the appliances exposed to direct radiation by transmitters at their place of installation.</p> <p>- Performance criterion A (See Note 5)</p> <p>**If for tests of equipment an input signal with a modulation frequency of 1000 Hz is necessary a modulation frequency of 400 Hz may be chosen.</p>
15	Conducted low frequency		<p>AC:</p> <p>Frequency range: rated frequency to 200th harmonic;</p> <p>Test voltage (rms): 10% of supply to 15th harmonic reducing to 1% at 100th harmonic and maintain this level to the 200th harmonic, min 3 V r.m.s, max 2 W.</p> <p>DC:</p> <p>Frequency range: 50 Hz - 10 kHz;</p> <p>Test voltage (rms): 10% of supply max. 2 W</p>	<p>- to stimulate distortions in the power supply system generated for instance, by electronic consumers and coupled in as harmonics</p> <p>- performance criterion A (see Note 5).</p> <p>- See figure - “Test set-up”</p>
16	Conducted radio frequency	IEC 61000-4-6	<p>AC, DC, I/O ports and signal/control lines:</p> <p>Frequency range: 150 kHz - 80 MHz</p> <p>Amplitude: 3 V rms (See Note 6)</p> <p>Modulation ***: 80% AM at 1000 Hz</p> <p>Frequency sweep range: $\leq 1.5 \times 10^{-3}$ decades/s (or 1%/3sec.)</p> <p>According to level 2 severity standard</p>	<p>- Equipment design and the choice of materials is to stimulate electromagnetic fields coupled as high frequency into the test specimen via the connecting lines.</p> <p>- performance criterion A (see Note 5).</p> <p>*** If for tests of equipment an input signal with a modulation frequency of 1000 Hz is necessary a modulation frequency of 400 Hz may be chosen</p>
17	Burst/Fast Transients	IEC 61000-4-4	<p>Single pulse time: 5 ns (between 10% and 90% value)</p> <p>Single pulse width: 50 ns (50% value)</p> <p>Amplitude (peak): 2kV line on power supply port/earth;</p> <p>1kV on I/O data control and communication ports (coupling clamp)</p> <p>Pulse period: 300 ms;</p> <p>Burst duration: 15 ms;</p>	<p>- arcs generated when actuating electrical contacts;</p> <p>- interface effect occurring on the power supply, as well as at the external wiring of the test specimen;</p> <p>- performance criterion B (see Note 4).</p>

No.	TEST	PROCEDURE ACC. TO *	TEST PARAMETERS	OTHER INFORMATION																								
			Duration/polarity: 5 min According to level 3 severity standard.																									
18	Surge/voltage	IEC 61000-4-5	Pulse rise time: 1.2 μVs (between 10% and 90% value) Pulse width: 50 μVs (50% value) Amplitude (peak): 1kV line/earth; 0.5kV line/line Repetition rate: ≥ 1 pulse/min No of pulses: 5 per polarity Application: continuous According to level 2 severity standard.	- interference generated for instance, by switching “ON” or “OFF” high power inductive consumers; - test procedure in accordance with figure 10 of the standard for equipment where power and signal lines are identical; - performance criterion B (see Note 4).																								
19	Radiation emission	CISPR 16-1, 16-2	<p>For equipment installed in the bridge and deck zone.</p> <table border="1" data-bbox="999 547 1451 772"> <thead> <tr> <th>Frequency range:</th> <th>Limits:</th> </tr> </thead> <tbody> <tr> <td>0.15 - 0.3 MHz</td> <td>80 - 52 dBμV/m</td> </tr> <tr> <td>0.3 - 30 MHz</td> <td>50 - 34 dBμV/m</td> </tr> <tr> <td>30 - 2000 MHz</td> <td>54 dBμV/m</td> </tr> <tr> <td>except for:</td> <td></td> </tr> <tr> <td>156 -165 MHz</td> <td>24 dBμV/m</td> </tr> </tbody> </table> <p>For equipment installed in the general power distribution zone.</p> <table border="1" data-bbox="999 884 1451 1054"> <thead> <tr> <th>Frequency range:</th> <th>Limits:</th> </tr> </thead> <tbody> <tr> <td>0.15 - 30 MHz</td> <td>80 - 50 dBμV/m</td> </tr> <tr> <td>30 - 100 MHz</td> <td>60 - 54 dBμV/m</td> </tr> <tr> <td>100 - 2000 MHz</td> <td>54 dBμV/m</td> </tr> <tr> <td>except for:</td> <td></td> </tr> <tr> <td>156 - 165 MHz</td> <td>24 dBμV/m</td> </tr> </tbody> </table>	Frequency range:	Limits:	0.15 - 0.3 MHz	80 - 52 dBμV/m	0.3 - 30 MHz	50 - 34 dBμV/m	30 - 2000 MHz	54 dBμV/m	except for:		156 -165 MHz	24 dBμV/m	Frequency range:	Limits:	0.15 - 30 MHz	80 - 50 dBμV/m	30 - 100 MHz	60 - 54 dBμV/m	100 - 2000 MHz	54 dBμV/m	except for:		156 - 165 MHz	24 dBμV/m	- procedure in accordance with the standard but distance 3 m between equipment and antenna
Frequency range:	Limits:																											
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No.	TEST	PROCEDURE ACC. TO *	TEST PARAMETERS	OTHER INFORMATION																
20	Conducted Emission	CISPR 16-1, 16-2	<p>For equipment installed in the bridge and deck zone.</p> <table border="1" data-bbox="1003 204 1456 319"> <thead> <tr> <th>Frequency range:</th> <th>Limits:</th> </tr> </thead> <tbody> <tr> <td>10 - 150 kHz</td> <td>96 - 50 dBμV</td> </tr> <tr> <td>150 - 350 kHz</td> <td>60 - 50 dBμV</td> </tr> <tr> <td>350 kHz - 30 MHz</td> <td>50 dBμV</td> </tr> </tbody> </table> <p>For equipment installed in the general power distribution zone.</p> <table border="1" data-bbox="1003 427 1456 542"> <thead> <tr> <th>Frequency range:</th> <th>Limits:</th> </tr> </thead> <tbody> <tr> <td>10 - 150 kHz</td> <td>120 - 69 dBμV</td> </tr> <tr> <td>150 - 500 kHz</td> <td>79 dBμV</td> </tr> <tr> <td>0.5 - 30 MHz</td> <td>73 dBμV</td> </tr> </tbody> </table>	Frequency range:	Limits:	10 - 150 kHz	96 - 50 dB μ V	150 - 350 kHz	60 - 50 dB μ V	350 kHz - 30 MHz	50 dB μ V	Frequency range:	Limits:	10 - 150 kHz	120 - 69 dB μ V	150 - 500 kHz	79 dB μ V	0.5 - 30 MHz	73 dB μ V	
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0.5 - 30 MHz	73 dB μ V																			
21	Flame retardant	IEC 60092-101 or IEC 60695-11-5	<p>Flame application: 5 times 15 s each. Interval between each application: 15s or 1 time 30s.</p> <p>Test criteria based upon application. The test is performed with the EUT or housing of the EUT applying needle-flame test method</p>	<ul style="list-style-type: none"> - the burnt out or damaged part of the specimen by not more than 60 mm long. - no flame, no incandescence or - in the event of a flame or incandescence being present, it shall extinguish itself within 30 s of the removal of the needle flame without full combustion of the test specimen. - any dripping material shall extinguish itself in such a way as not to ignite a wrapping tissue. The drip height is 200 mm \pm 5 mm. 																

*Note: indicates the testing procedure which is normally to be applied. However, equivalent testing procedure may be accepted RBNA provided that the requirements stated in the other columns are fulfilled.

Notes to Table : T.A2.104.1 – type testing for equipment covered by Part II, Title 11, Section 7 and Section 8:

1. Equipment to be mounted in consoles, housing etc. together with other equipment are to be tested with 70°C.
2. For equipment installed in non-weather protected locations or cold locations test is to be carried out at –25°C.
3. Salt mist test is to be carried out for equipment installed in weather exposed areas.
4. Performance Criterion B: (For transient phenomena): The EUT shall continue to operate as intended after the tests. No degradation of performance or loss of function is allowed as defined in the technical specification published by the manufacturer. During the test, degradation or loss of function or performance which is self recoverable is however allowed but no change of actual operating state or stored data is allowed.
5. Performance Criterion A: (For continuous phenomena): The Equipment Under Test shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed as defined in relevant equipment standard and the technical specification published by the manufacturer.
6. For equipment installed on the bridge and deck zone, the test levels shall be increased to 10V rms for spot frequencies in accordance with IEC 60945 at 2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz.

FIGURE F.A2.104.1 - TEST SET-UP – CONDUCTED LOW FREQUENCY TEST

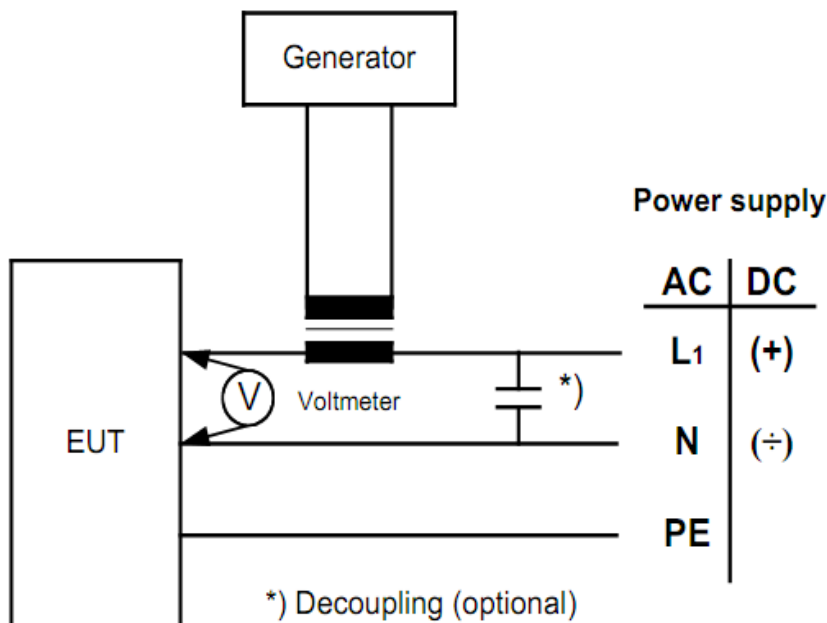


Figure - Test Set-up – Conducted Low Frequency Test

CHAPTER B
GUIDELINES ON APPROVAL PROCEDURE FOR
ONBOARD LOADING COMPUTERS
[IACS Rec 21]

100. General

101. Preamble: These Guidelines apply to control of onboard loading computers and relevant computer programs used for ship stability calculations, when approved by RBNA. If the computer performs also strength calculations the Part II, Title 11, Section 1, Chapter J, Subchapter J7 (UR S1) from these Rules, with "Loading Guidance Information", is to be observed in addition.

102. The onboard computer shall be considered supplemental to the information required by the Flag regulations. These information shall be made available at anytime in case of failure of the computer.

103. The onboard computer must be capable of producing print-outs of the calculations. The print-outs shall make clear what items have been checked by the computer.

104. T any specific loading condition to all relevant stability and/or strength requirements within a time interval acceptable to RBNA. If any of these items is not checked by the computer, the user should be properly informed when using the computer so that each such item can be checked by other means.

200. Type approval/hardware

201. The manufacturer should submit details of the computer to be installed on board. This information will be examined and if found satisfactory the manufacturer will be advised accordingly.

202. Environmental testing such as vibration, temperature, humidity etc should be carried out in the presence of the RBNA Surveyor according to the RBNA's requirements for type approval of control and electrical equipment.

203. For a computer which has already been type approved by another recognized authority, the manufacturer should submit a complete report of performance and environmental testing, and subject to the results being satisfactory, may be accepted in lieu of witnessed tests.

204. RBNA must be advised of any alteration in the hardware specifications.

300. Type approval/programs to be used with a dedicated approved computer

301. Details of program logic should be submitted together with a list of the uses for which the program is intended, e.g. intact and damage stability, longitudinal strength etc.

302. The approval consists in running the programs for a certain number of test ships, on the dedicated approved computer. This aims to check at least the ability of the program as to:

- a. correct handling of the mathematic orders in connection with a specific technical problem,
- b. criteria and minimum values or limits from Codes and Requirements/Administration, Classification, e.g. maximum admissible angle of inclination in case of damage, minimum lever arms for intact stability or maximum admissible shear forces, bending moments and torsional moments,
- c. comparison of results with stored criteria and minimum values,
- d. safeguarding that container stowage places will not be used twice, tanks will not be overfilled,
- e. the correct use of all input data, e.g. ship's body, sub-compartments, etc,
- f. calculations with clear numerical and graphical illustration of results like GM, righting arms, areas below lever curves, range of stability etc.
- g. ascertaining that all relevant requirements have been complied with before stating that a condition is acceptable.

400. Specific approval

401. The specific approval is intended for the association of one onboard computer + programs + one ship. The decisive reference for all specific approval is to be found in a "mainframe" computer program which is acceptable to the respective Maritime Authority. The approval may be granted when the calculation results submitted by the manufacturer are in close accordance with the results given by the mainframe computer program and in particular close to the stability criteria.

402. Depending on the use for which the computer is to be approved, i.e. intact stability, damage stability, longitudinal strength etc, specific test conditions will be selected to cover anticipated range of all relevant parameters such as draught, loading arrangement, specific gravity of cargo and trim. The selected test conditions should utilise all the damageable compartments.

403. Details of the test conditions should be submitted to RBNA together with all relevant data concerning hull form definition and compartment definition.

404. A formal Certificate detailing the uses for which the computer is approved will be given when the RBNA's representative has checked the instrument after installation,

using approved test conditions intended for in-service verification. The identification numbers of hardware and software are to be recorded in the computer Certificate.

405. Instruction manuals for hardware and software have to be detailed and understandable.

500. In-service verification

501. It is assumed that the onboard computer is handled correctly.

502. At annual intervals, the RBNA's representative should verify the performance of the computer using the in-service test conditions.

503. If the vessel on which the computer is installed undergoes modifications affecting subdivision, lightweight or loading pattern, the existing approval will be considered null and void.

504. To obtain re-certification of the onboard computer, procedure given in paragraph "specific approval" should be adopted.

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