

Measurement of Noise Level on Board Vessels (Machinery Part)

1. **Scope** This Japanese Industrial Standard specifies the measuring methods for noise levels in the machinery space of an ordinary merchant ship during official sea trials.

2. **Reference standards** The following standards form part of the requirements of this Standard when quoted. The latest edition of these standards (including revisions and supplements) shall be applied.

JIS C 1502	Sound level meters
JIS C 1505	Precision sound level meters

3. **Purpose of measurement** Measurement is made to assess noise levels in spaces within the machinery space where monitoring, manoeuvring and general maintenance work are carried out.

4. Measuring conditions

4.1 **Ship's conditions** The ship shall be either in a ballast condition or in a full load condition at sea trials and measurements shall be taken when the ship proceeds on a straight line.

4.2 **Operating conditions of machinery** The operating conditions of machinery shall be such that the main engine is operated at the normal service output with the necessary auxiliaries running normally.

It is desirable that machinery for intermittent operations is at rest.

4.3 Others

- The machinery space skylight, if provided, shall be closed.
- Measurements shall be taken with the machinery space entrance doors and windows closed. When measurements are taken within a space enclosed by the machinery casing, all doors shall be closed and the space shall be in an unmanned condition. If it is impossible to leave the space unmanned, a request shall be made to keep silence. The number of persons stationed within the space shall be noted in the record of measurements.

Examples: Engine Control Room, Workshop, etc.

5. Measuring procedures

5.1 Measuring instruments

- Sound level meters specified in **JIS C 1502**, precision sound level meters specified in **JIS C 1505**, or sound level meters with equivalent or better performance or frequency analyzers shall be used.
- Sound level meters shall be those that have successfully passed the inspections required under the Measurement Law.

5.2 Weighting network for use and measurements presentation

- Measurements shall be taken of noise levels, but frequency analyses shall be carried out for the specified spaces.
- Noise levels shall be measured using the weighting network on A scale with measurements expressed in dB(A).
- Frequency analyses shall be as follows:

- A-weighted frequency analyses or C-weighted frequency analyses shall be carried out. The octave-band analyses in terms of the centre frequencies given in **Table 1** shall be carried out.
- When C-weighted frequency analyses are carried out, it is desirable that sound pressure levels are also shown.

Table 1 Octave-band centre frequencies

Center frequency (Hz)	63	125	250	500	1000	2000	4000	8000
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- Measurements shall be expressed in dB.

When A-weighted analyses are carried out, letter symbol (A) shall be suffixed to dB.

5.3 Dynamic characteristics to be used and reading indicated values

- a) **Dynamic characteristics** "Slow" shall, as a rule, be used.
- b) **Reading indicated values** When the pointer swings significantly, the maximum level and the minimum level shall be recorded, and the median shall represent them. The expression in this case shall be as follows:

Example: 80 (73, 89) dB (A)

Maximum level

Minimum level

Median (not always to be their average)

5.4 Application of microphones

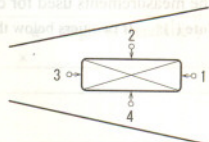
- a) The height of a microphone shall be approximately 1.2 m from the floor surface.
- b) The direction of a microphone shall be horizontal and be directed towards the centre of the machinery space.
- c) Spaces where there are effects of wind velocity shall be avoided as far as practicable. If unavoidable, a wind screen shall be provided for the microphone.
- d) When a dynamic microphone is used, precautions shall be taken especially for magnetic fields (transformers, generators, electric motors, etc.).

5.5 Sites of measurements

The required sites of measurements shall be as given in Table 2.

Center frequency (Hz)	63	125	250	500	1000	2000	4000	8000
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Table 2 Measurement sites

No.	Site	Direction of microphone	Octave-band analysis	Remarks
1	Around propulsion machinery or engine opening (on each deck)	Towards the centre of propulsion machinery or engine opening	×	 Locations 1 - 4 are about 1 m apart from propulsion machinery or opening end
2	Center of uppermost tier in machinery space	Downward to machinery space	×	Center of uppermost tier within engine casing and where personnel can look down into machinery space
3	Center of engine control room	Towards centre of machinery space	○	
4	Center of workshop	Towards centre of machinery space	○	
5	In front of burner	Boiler	×	Only when boiler is in operation
6	In front of main switchboard	Towards centre of machinery space	×	Unnecessary where installed in engine control room
7	In front of propulsion machinery manoeuvring gear (local)	Propulsion machinery	×	
8	Purifier room	Towards centre of machinery space	×	
9	Machinery space exit	Towards centre of machinery space	×	
10	Others	Towards centre of machinery space	×	Locations where work or monitoring is carried out

Remark: Measuring procedures for detailed noise level measurements are shown in **Reference Fig. 5**.

6. Methods to summarize measurements

6.1 Measurements shall, at least, contain the following items referring to **Annexes 1 through 4**.

- Particulars of the ship measured** Ship's name, kind of ship, tonnages (DWT and GT), dimensions (Length between perpendiculars L_{pp} × breadth moulded B × depth D × load draft d × length of machinery space l), ship class
- General conditions when measurement was taken** Drafts, sea and weather conditions and wind speed
- Particulars of sources of noise in machinery space and operating conditions when measurement was taken**

Examples: Main engine, propeller, generator, forced draft fan, air compressor, etc.

- Instruments used** Types of instrument, applicable code or standard, model, manufacturer's name
- Measurements** The following items shall be recorded in accordance with **Annex 2**.
 - Noise level representing the machinery space
 - Locations
 - Measuring level (noise level and the results of octave-band analysis)
 - Physical feeling of noise (auditory judgement) and other remarks
- Noise frequency analysis diagram** For graphically showing the results of frequency analyses, C-weighted octave band levels shall be expressed in accordance with **Annex 3**, and A-weighted octave band levels shall be expressed in accordance with **Annex 4**.
- Location** Locations of measuring points corresponding to those indicated in **e)** above shall be indicated on a general arrangement plan. A plan showing the approximate locations of measuring points noted with approximate dimensions is desirable.

Annex 1 (Requirements) Record of measurements Format 1

Kind of ship		Tonnage	DWT				GT
Classification		Dimensions	L_{pp}	B	D	d	length of machinery space l m

Date and time of measurement							
Ship's condition	CSO, MCO, M/E STOP ()				BALLAST, FULL, DRAFT (Draft m)		
Weather	Sea state				Wind velocity		m/s
Instrument	Sound level meter				Applicable standard		
	Octave band analyzer				Applicable standard		
	Type				Manufacturer's name		

Particulars				Running condition when measurement is taken		Remarks
Item	No.	Capacity		No.	Loading condition	
Propulsion machinery	Type					
	MCR		kW/ rpm			
	Normal output		kW/ rpm			
Turbocharger (diesel ships only)		Type			rpm	
Propeller		Type: No. of blades:				
Generator	T/G		kW/ rpm		kW	
	D/G		kW/ rpm		kW	
Main/auxiliary boiler						
Fan for machinery space	Supply					
	Exhaust					
Air compressor						
Fd. W.P. & T.						