Guideline No.: N-07(201510)

N-07 SPEED LOG

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Foreword:

This Guideline is a part of CCS Rules, which contains technical requirements, inspection and testing criteria related to classification and statutory survey of marine products.

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Historical versions and release date :

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SPEED LOG

1 Application

1.1 This Guideline is applicable to the approval and inspection of logs installed and used on ships.

1.2 This Guideline does not involve the onboard installation and arrangement of speed log units.

2 Normative references

The reference documents of approval and inspection used in this Guideline are as follows:

IMO Res. A.694(17)	General Requirements for Shipborne Radio Equipment Forming part of the Global Maritime Distress and Safety System (GMDSS) and for Electronic Navigational Aids
IMO Res. MSC.96(72)	Adoption of Amendments to Performance Standards for Devices to Measure and Indicate Speed and Distance (Resolution A.824 (19))
IMO Res. MSC.191(79)	Performance Standards for the Presentation of Navigation-related Information on Shipborne Navigational Displays
IMO Res. MSC.334(90)	Adoption of Amendments to Performance Standards for Devices to Measure and Indicate Speed and Distance (Resolution MSC.96(72))
IEC 60945 (2002)	Maritime Navigation and Radio Communication Equipment and Systems –General Requirements –Methods of Testing and Required Test Results
IEC 61023 (2007)	Maritime Navigation and Radio Communication Equipment and Systems –Marine Speed and Distance Measuring Equipment (SDME) – Performance Requirements, Methods of Testing and Required Test Results
IEC 61162-1-2010	Maritime Navigation and Radio Communication Equipment and Systems - Digital Interfaces - Part 1: Single Talker and Multiple Listeners

IEC 62288 Ed.1.0(2008)	Maritime Navigation and Radio Communication Equipment and Systems - Presentation of Navigation-related Information on Shipborne Navigational Displays - General Requirements –Methods of Testing and Required Test Results

3 Terms and definitions

The terms and definitions contained in the abovementioned reference documents are applicable for the purpose of the Guidelines. For convenience of preparation and usage, the Guidelines have quoted some of these terms and definitions or supplemented the following definitions.

3.1Speed log is a navigational instrument which measures the ship's speed and cumulative distance and comprises many different types. Speed log can be categorized into the following types by working mechanism:

3.1.1 Towing log is a type of log which utilizes the water current, through which the ship navigates, to drive the rotor towed in the ship's aft to rotational motion and displays the ship's cumulative distance on an indicator through the log rope, connecting hammer and balance wheel. This type of log features poor linear property, large high-speed error, inconvenient operation and greater susceptibility to the wind and current; however, in view of its reliable performance, towing logs are used as the backup logs on some ships.

3.1.2 Impeller log is a type of log which utilizes the water current, through which the ship navigates, to propel the impeller to rotate to generate electric impulses or mechanical intermittent signals, which are further processed by the electronic circuit for display of the ship's speed and distance on an indicator. This type of log features good linear property and higher low-speed sensitivity; however, its mechanical parts are more liable to wastage due to wear. Except for its application on small crafts, it has been gradually eliminated.

3.1.3 Hydraulic pressure log is a type of log which utilizes the dynamic pressure of the water current through which the ship navigates. This dynamic pressure is transferred via a flow guiding device to the diaphragm of the pressure transmission chamber and converted to a mechanical force, which is further converted by a compensated measuring device into the amount of speed. Then the distance is given by the speed solver. This type of log features relatively reliable performance but is characterized by poor linear property, large low-speed error, inability to measure the astern speed, complex mechanical structure and inconvenient use, and therefore, it has been gradually eliminated.

3.1.4 Electromagnetic log is a type of log which utilizes the water current (conductor) to cut the magnetic field of the electromagnetic sensor mounted on the ship's bottom so that the ship's movement speed relative to water is converted to induced potential which is further converted to speed and distance. It has the advantages of good linear property, high sensitivity and ability to measure the astern speed and is the most widely used type.

3.1.5 Doppler log is a type of log which utilizes the Doppler frequency shift between the emitted sound waves and the reflected waves received from the water at the bottom to measure the ship's

speed relative to water from the hull bottom and cumulative distance. This type of log features good accuracy, high sensitivity and the ability to measure the speed in the longitudinal and transverse directions; however, it is costly. Doppler logs are mainly used on very large ships and used to provide accurate data of the ships 'longitudinal and transverse movements when ships navigate in narrow waterway and enter and depart from ports, or when ships are berthed in or depart from a harbor. As Doppler log is subject to the restriction of operating depth, it becomes a speed-through-the-water log because only the water mass points in the water layer can be used as the reflective layer at the operating depth of greater than hundreds of meters.

3.1.6 Acoustic correlation log is a type of log which utilizes the acoustic correlation principle to measure the time shift when the echo information from the same scattering source at the water bottom reaches the two receivers, so that the information can be solved to obtain the ship's speed through the water and distance. This type of log can be used to measure the astern speed and also be used for sounding. Acoustic correlation log also becomes a log relative to water at the operating water depth of greater than hundreds of meters.

3.2 Speed log may be classified into the following two categories depending on the measuring method and reference object:

3.2.1 Relative log, which can only measure the speed through the water and cumulate the distance.

3.2.2 Absolute log, which can measure the speed over the ground and cumulate the distance, however, when the measuring water depth exceeds its tracking depth range, the absolute log turns into a relative log tracking the water layers.

4 Drawings and documentation

4.1 The following drawings and documentation are to be submitted to CCS for approval:

4.1.1 Product technical specifications or enterprise standard;

4.1.2 General assembly drawing;

4.1.3 Wiring diagram;

4.1.4 System control flow chart;

4.1.5 Electrical circuit diagram;

4.1.6 Panel arrangement plan (including various parts);

4.1.7 External view (including various parts);

4.1.8 Sensor (transducer) structure diagram (if applicable);

4.1.9 Type test plan.

4.2 The following drawings and documentation are to be submitted to CCS for review:

4.2.1 Product nameplate and marking diagram;

4.2.2 Details of main parts and materials;

4.2.3 Instructions for use;

4.2.4 Manufacturing process flow chart.

4.3 Other documentation to be submitted:

4.3.1 Particulars of the manufacturer, including the name, address, history, production capacity, technical and inspection personnel, main products, subordinate relationship, trademark, etc.;

4.3.2 Details of the products for approval;

4.3.3 Main production equipment;

4.3.4 Main test equipment;

4.3.5 Brief production technology of the products for approval;

4.3.6 Quality management documents;

4.3.7 Document of entering to the register of enterprise;

4.3.8 Qualification certificate and/or production license;

4.3.9 Specimen of products quality certificate;

4.3.10 Quality control scheme (where applicable).

5 Design and technical requirements

5.1 Means of display

The display units are to be legible during daytime and night and the display units in positions on the bride are to have the dimming function.

5.1.1 Ship speed

Speed information may be displayed in simulated or digital form. Where digital display is employed, the increment of speed is not to exceed 0.1 knot, where simulated display is employed, 0.5 knot is to be displayed in each grid and a digital mark is to be made at each 5 knots. Where the log can measure the speed in directions other than the forward direction, the ship's navigation direction is to be displayed at the same time when the speed is displayed.

5.1.2 Distance

Distance information is to be digitally displayed. The displaying range of the display screen is to be from 0 to a value not less than 9999.9 nautical miles with a step value not exceeding 0.1 nautical miles. Means are to be provided where appropriate to reset the display unit reading to zero.

5.1.3 Signal output

Means are to be provided to transfer the measured speed and distance data to other equipment on board. The following two requirements are to be met at the same time:

(1) All speed and distance parameters, including information regarding direction, are to be transmitted as per IEC 61162-1 interface criteria;

(2) When such equipment is used for measuring the forward speed, the information is to be capable of being converted for closing the contact point. If so, it will be a contact closure per 0.005 nautical mile distance (200 impulses per nautical mile).

5.1.4 Operation mode switchover and display

If the log can measure both the speed over the ground and the speed through water, the arrangement and indication for switchover between the two operation modes are to be provided.

If the log can measure the speed in multiple directions, the measured speed and direction information may be set as a selectable option of the display unit. All such information is to expressly indicate the navigation direction, operation mode and effectiveness status.

In accordance with the requirements of the Convention, for logs installed on ships of more than 50000 gross tons after July 1st, 2014, two types of logs, one for measuring the speed through water and the other for measuring the speed over the ground, are to be provided respectively, and use of one log capable of measuring both of the speeds is not allowed.

5.2 Measuring accuracy

Where the ship's navigation is not subject to the effects of environmental factors such as hollow water effect, seabed type, electrical current, tide, etc., the error of the logged speed and distance is

not to exceed the following.

5.2.1 Speed measurement and indication error

The error of speed measurement and indication is not to exceed the following values:

(1) For digital display, 2% of ship speed or 0.2 knot, whichever is greater;

(2) For simulated display, 2.5% of ship speed or 0.25 knot, whichever is greater; and

(3) For external data transmission, 2% of ship speed or 0.2 knot, whichever is greater.

5.2.2 Distance measurement and indication error

The error of indicated distance is not to exceed 2% of the ship's navigation distance within an hour or 0.2 nautical miles per hour, whichever is greater.

Where the accuracy of the equipment in measuring the speed and distance is affected, the detailed information on possible effects (e.g. sea conditions, water temperature and salinity, etc.) is to be included in the instructions for use of the equipment.

5.3 Minimum depth

The speed and distance measuring and indicating devices are to be used for normal navigation and ship maneuvering, which are to be capable of, as a minimum, providing the distance and forward speed of the ship through the water or over the ground and providing additional movement data when the ship is navigating in the directions other than the axial direction. Such devices are to fully meet their performance criteria before the ship reaches the maximum forward speed. The devices for measuring speed and distance through the water are to meet the performance criteria for a water depth of more than 3m below the keel. The devices for measuring speed and distance over the ground are to meet the performance criteria for a water depth of more than 2m below the keel.

5.4 Structure and installation

5.4.1 The system is to be designed so that flooding of the ship will not be incurred either when the equipment component is connected to the ship or when any equipment component penetrating the hull is damaged.

5.4.2 If any part of the system is designed to be extendable or retractable from the hull, this design is to ensure that such part is capable of extending, operating properly and retracting at all speeds within the ship's maximum speed range. The positions of extension and retraction are to be clearly identified in the indicating positions.

5.4.3 Product description or installation manual is to include the installation methods

recommended by the manufacturer and particularly the positions of sensors, because the positions of installation and arrangement will affect the measuring accuracy of the speed log.

5.5 Information display on display unit (where applicable)

The display of navigational information by shipborne navigation indicators is to meet the relevant requirements of IEC62288.

6 Requirements for type test and manufacturer test

Requirements for type test and manufacturer test **Table 6**

No.	Test item	Technical requirements and test methods	Manufacturer test	Type test
1	Visual inspection, inspection of structure, enclosure, conductor and internal wiring, earthing, marking	Product technical specifications/enterprise standard/approved drawings	X	X
2	Measuring accuracy	5.2 of the Guidelines	X	X
3	Speed indication	5.1.1 of the Guidelines IEC61023 5.12.1	X	X
No.	Test item	Technical requirements and test methods	Manufactory test	Type test
4	Distance indication	5.1.2 of the Guidelines IEC61023 5.12.2	X	X
5	Distance signal external output test	5.1.3 of the Guidelines IEC61023 5.9.1	X	X
6	Interface inspection and testing	5.1.3 of the Guidelines IEC61023 5.9.2	X	X

Continued table 6

7	Sensors and transducers performance tests	Sensors and transducers are to be verified by an authoritative organization.		X
8	Ship bottom valves test	Ship bottom valves are to be furnished with CCS certificates.		X
9	Voltage withstanding test	2.14 of GD01	X	X
10	Insulation resistance measurement	2.3 of GD01	X	X
11	Inclining and swaying tests	2.6 of GD01		X
12	Display unit information display	4, 7 of IEC62288		X
13	Extreme power supply conditions test	IEC60945 7.1, 5.2.2		X
	Short-term power fluctuation immunity	IEC60945 7.3, 10.7		X
	Power failure immunity	IEC60945 7.4, 10.8		X
14	High temperature test	IEC60945 8.2		X
15	Alternate damp heat test	IEC60945 8.3		X
16	Low temperature test	IEC60945 8.4		X
17	Vibration test	IEC60945 8.7		X
18	Test of degree of protection provided by enclosure	IEC60529		X
19	Salt mist test	IEC60945 8.12		X
20	Equipment noise and alarm signal acoustic intensity	IEC60945 11.1		X

Continued table 6

21	Compass safe distance	IEC60945 11.2		X
22	Conducted emission	IEC60945 9.2		X
23	Shell port radiated emission	IEC60945 9.3		X
24	Test of immunity to conducted disturbances, induced by radio-frequency field	IEC60945 10.3		X
25	Radiated, radio-frequency electromagnetic field immunity test	IEC60945 10.4		X
26	Electric fast transient/burst immunity test	IEC60945 10.5		X
27	Surge immunity test	IEC60945 10.6		X
28	Electrostatic discharge immunity test	IEC60945 10.9		X

Items marked with “X” mean the items to be tested.

7 Unit/batch inspection after approval

The products are to be inspected piece by piece after approval. For inspection items, see the manufacturer test items listed above.