CCS Rule Change Notice For:

Rules for Classification of Sea-Going Steel Ships

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PART ONE PROVISIONS OF CLASSIFICATION

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Appendix 1 LIST OF CLASS NOTATIONS FOR SEA-GOING SHIPS

Other Notations **Table K**

Class notation	Description		Technical requirements to be complied with
EOM	Ship's energy efficiency real-time on-line monitoring	Capable of monitoring ship's operation in real time and supporting decision on operational energy efficiency management and optimization by collecting operational parameters of ship's energy-consuming equipment and navigational equipment and synchronizing with shore-based equipment	~~Guidelines for Application of Ship's Energy Efficiency Real-time On-line Monitoring~~ Sec. 7, Ch. 6, Pt. 1 of the Rules

CHAPTER 6 SURVEYS RELATED TO CLASS NOTATIONS

Section 7 SURVEYS RELATED TO CLASS NOTATIONS FOR EOM

6.7.1 EOM system function and composition

EOM (Online Comprehensive monitoring of Ship Energy Efficiency) system is a computerized system for ship's energy efficiency real-time on-line monitoring, which is capable of automatic acquisition of energy consumption and operating condition of ship's energy-consuming equipment such as main engine, generator engine, boiler, etc., as well as operating parameters of navigational equipment such as shaft power meter, GPS, anemorumbometer, speed and distance measuring device, electronic clinometer (if such equipment has signal access to EOM software system) and echo-sounding device (if such equipment has signal access to EOM software system), and capable of data synchronization with the shore-based system at regular time, for the purpose of realizing on-line monitoring of operating condition of ship's energy-consuming equipment and consumption of energy as well as realizing the function of ship equipment monitoring, energy management and energy efficiency management by means of analysis of collected data.

6.7.2 Examination of plans

6.7.2.1 The following plans and documents are to be submitted to the plan approval center for approval:

(1) electrical system of EOM system (including system power supply, system input and output signal circuit and list of parameters);

(2) electrical system and arrangement of shaft power meter;

(3) fuel oil supply piping of main engine, generator engine and boiler.

6.7.2.2 After the above plans are approved by the plan approval center, any non-principled revision may be reviewed and approved by the site Surveyor.

6.7.2.3 Mooring test and sea trial program of EOM system are to be reviewed and approved by the site Surveyor.

6.7.3 Product certification requirements and on-site check

6.7.3.1 Certification requirements for related hardware equipment are given in the table below:

No.	Product name	Document		Approval mode				Plan approval	Remarks
		C/E	W	DA	TA-B	TA-A	WA	PA	
1	EOM system computer	—	X	—	X	—	—	X	Applicable to hardware, type approval is not necessary where two computers are provided either of which can be used as a stand-by computer to the other one
2	Shaft power meter	—	X	—	X	O	—	X	
3	Flowmeter	—	X	—	X	O	—	X	
4	Speed and distance measuring device (SDME)	X	—	—	X	O	—	X	
5	Electronic positioning	X	—	—	X	O	—	X	

No.	Product name	Document		Approval mode				Plan approval	Remarks
		C/E	W	DA	TA-B	TA-A	WA	PA	
	equipment								
6	Echo-sounding device	X	—	—	X	O	—	X	
7	Tank liquid level measuring system	X	—	—	X	O	—	X	For liquid level measurement outside cargo tank
8	Engine room monitoring and alarm system	X	—	—	X	O	—	X	

Symbols:

1) C – Marine Products Certificate; E – Equivalent document; W – Manufacturer‘s document; X – Applicable; O – Optional.

2) DA – Design approval; TA-B – Type approval B; TA-A – Type approval A; WA – Works approval.

6.7.3.2 For flowmeters and shaft power meters which are installed on ships applying for EOM notation and delivered before 31 December 2015, the existing type test report or other equivalent documents may be accepted by CCS.

6.7.4 Requirements for on-site survey

6.7.4.1 Equipment installation and system testing of EOM system are to be carried out in accordance with approved plans and equipment installation techniques approved by CCS (where applicable), and functional tests are to be carried out during mooring test and sea trial. Upon inspection and confirmation of peripheral hardware of EOM system and signal access to such system, the site Surveyor is to confirm relevant functions of modules related to ship equipment monitoring, energy management and energy efficiency management in EOM software system in accordance with approved test program.

6.7.4.2 Installation and survey of relevant signal acquisition equipment

For the following equipment within the statutory and class scope, in addition to complying with statutory and class inspection requirements for such equipment, they are also to be inspected in accordance with the following requirements:

(1) Shaft power meter:

a) Installation survey is to be carried out in accordance with approved plans and manufacturer’s instructions.

b) Taking into account the effect of ship deformation and local vibration on the performance of shaft power meter, the stator mounting base of shaft power meter is to be welded firmly, generally on ship’s strength members and it is not permitted to be welded on the shell plating.

c) Witnessing calibration process and result of shaft power meter.

(2) Flowmeter:

a) Checking the verification report of flowmeter.

b) Installation survey is to be carried out in accordance with approved plans and manufacturer’s instructions. Flowmeter is also to be installed by satisfying the requirements of Appendix 1.

(3) Electronic clinometer (if such equipment has signal access to EOM software system):

a) Installation survey is to be carried out in accordance with approved plans and manufacturer's instructions.

b) The electronic clinometer is to be calibrated during the performance test, confirming the output results of 0° and other angles of inclination.

(4) Anemorumbometer:

a) Installation survey is to be carried out in accordance with approved plans and manufacturer's instructions.

b) Survey of the performance test.

(5) Echo-sounding device (if such equipment has signal access to EOM software system):

a) Installation survey is to be carried out in accordance with approved plans and manufacturer's instructions.

b) Survey of the performance test.

(6) Global Position System (GPS):

a) Installation survey is to be carried out in accordance with approved plans and manufacturer's instructions.

b) Survey of the performance test.

(7) Speed and distance measuring device:

a) Installation survey is to be carried out in accordance with approved plans and manufacturer's instructions.

b) Survey of the performance test.

(8) Engine room monitoring and alarm system:

a) Installation survey is to be carried out in accordance with approved plans.

b) Survey of the performance test.

c) Checking that the range of signal output to EOM system satisfies the minimum requirements for ship condition monitoring parameters in Appendix 2.

(9) Tank liquid level measuring system:

a) Installation survey is to be carried out in accordance with approved plans and manufacturer's instructions.

b) Survey of the performance test.

(10) Ship's draft measuring system (if such equipment has signal access to EOM software system):

a) Installation survey is to be carried out in accordance with approved plans and manufacturer's instructions.

b) Survey of the performance test.

6.7.4.3 Checking signal input and output of signal acquisition equipment:

(1) Checking the integrity of range of parameter input into EOM system (see Appendix 2).

(2) Checking the consistency between the parameter data of receiving end of EOM software system and that of sending end of signal acquisition equipment.

6.7.4.4 Verification of function of EOM software

To verify the following functions of the modules such as equipment monitoring, energy management and energy efficiency management in EOM software system:

(1) Equipment monitoring: to verify the real-time acquisition of the following parameter data within acquisition cycle by software system:

a) Power, pressure, temperature of energy-consuming equipment such as main engine, generator engine and boiler (see the parameters required to be selected in Appendix 2);

b) Flow of the fuel oil flowmeter of energy-consuming equipment such as main engine, generator engine and boiler;

c) Shaft revolution, torque, power of shaft power meter of the main engine;

d) Wind direction, wind forcer of anemorumbometer;

e) Position, course, speed of the Global Position System (GPS);

f) Water speed of the speed and distance measuring device;

g) Angle of heel of electrical clinometer (if such equipment has signal access to EOM software system);

h) Depth value of echo-sounding device (if such equipment has signal access to EOM software system);

i) Ship's draft of ship's draft measuring system (if such equipment has signal access to EOM software system).

(2) Energy management: to verify the indication of the following energy consumption indexes by the software system:

a) Fuel consumption per hour;

b) Daily fuel consumption.

(3) Energy efficiency management: to verify the calculation of the following main energy efficiency indexes by software system:

a) EEOI;

b) Fuel consumption per mile;

c) Fuel consumption per transport work;

d) CO_2 emissions per mile;

e) CO_2 emissions per ton.

(4) The verification of software function above may be carried out by examining function of software system or outputting the report.

(5) Ship-shore communication: to verify the data transmission smoothly between ship side and shore side of EOM software system.

Appendix 1 REQUIREMENTS FOR INSTALLATION OF FLOWMETER

1 Requirements for installation position of flowmeters of fuel oil system of main/generator engine

1.1 The installation position of flowmeter is to satisfy the requirements for onboard arrangement.

1.2 Inlet flowmeter: where the signal of existing oil supply unit is available, the flow signal supplied by such unit may be used. Where the signal of existing oil supply unit is unavailable, an additional flowmeter may be fitted near the flowmeter of existing oil supply unit, generally positioned after fuel oil supply pump and before fuel oil circulation pump in order to avoid calculation of fuel oil circulation.

1.3 Outlet flowmeter: in accordance with the conventional arrangement plan of fuel oil system, after passing through a three-way valve, one way of return flow of main engine is returned to the air separator and such amount of oil is not included in repetitive calculation; one way is returned to the daily service tank. It is recommended to fit the flowmeter of return flow on the pipe returning to the daily service tank.

2 Requirements for installation position of a set of flowmeters of fuel oil system shared by main and generator engine

2.1 Reference may be made to plan 1 for installation position of flowmeter. In order to calculate the oil consumption of generator engine, separate flowmeters are to be fitted on the inlet and outlet main pipes of fuel oil system of generator engine. Although some fuel oil participates in the circulation, the calculated circulation data is not large due to low oil consumption of generator engine.

3 Requirements for installation position and number of flowmeters of fuel oil system of boiler

3.1 Reference may be made to installation plan of flowmeter of main engine. In case of no return flow or return flow is only returned to the air separator, the installation of return flow flowmeter is not necessary.

4 Requirements for installation of flowmeters

4.1 The flowmeter is to be provided with a by-pass device so that normal supply of fuel oil can be ensured in case of failure of the flowmeter.

4.2 With regard to the pressure requirement of the flowmeter, the operating pressure in way of instrument is at least to be greater than medium flash pressure + 3 times pressure loss of instrument itself, where the operating pressure means the operating pressure in way of instrument instead of the operating pressure supplied by the upstream source (see Figure 2).

P_{out} = outlet pressure

P_{dp} = pressure loss in way of instrument

P_{vp} = medium flash pressure

$$P_{\text{out}} \geq (3 \times P_{\text{dp}}) + P_{\text{vp}}$$

Figure 2 Pressure of Flowmeter

The flowmeter in general generates pressure loss of approximately 0.2 bar, not including pressure loss caused by other parts of the pipeline, e.g. bend, necking etc. Where the circulating medium has a low viscosity, the pressure loss can be calculated accurately. But where the HFO used has a high viscosity, the pressure loss within pipeline and instrument cannot be controlled satisfactorily, which will give rise to flow fluctuation or even no circulation during practical application. For the use of HFO medium, the operating pressure is to be supplied by pump in order to ensure that the pipeline is unblocked and the flow is steady.

4.3 The flowmeter is to be installed to avoid siphon and air pocket. During installation, the vertical down or inclined down direction is to be avoided, because a flowmeter installed in such a way may give rise to siphon. Additionally, where the outlet of a flowmeter installed horizontally is provided with a long pipeline in the vertical down direction, air pocket may occur (see Figure 3 for specific installation examples).

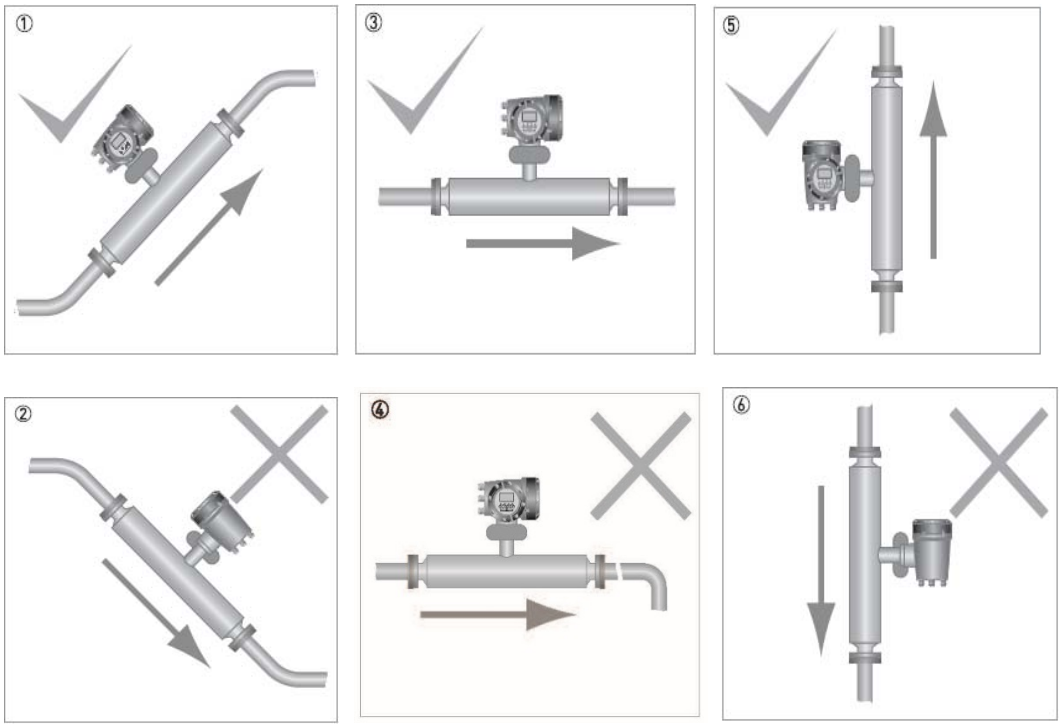

Figure 3 Installation of Flowmeters

4.4 In addition to the above requirements for installation of flowmeters, the requirements of the manufacturer may be accepted.

Appendix 2 SUMMARY OF PARAMETERS OF ENERGY EFFICIENCY EQUIPMENT

1. Alarm systems

The normal monitoring parameters of the operating conditions of ship's energy-consuming equipment such as main engine, generator engine and boiler may be selected from the summary of parameters below; the parameters with "*" are those required to be selected for EOM software system and others are optional monitoring parameters; a slight difference is permitted based on different design of ships. "#X" is the multi-equipment number and the corresponding parameters may be increased taking into account the number of equipment.

No.	English name of switch-in parameters	Unit	Remarks
Parameters of main engine			
1	M/E JACKET C F W INLET PRESS.*	MPa	
2	M/E C W IN AIR COOLER PRESS.	MPa	
3	M/E EXHAUST VALVE SPRING AIR INLET PRESS.	MPa	
4	M/E CONTROL AIR INLET PRESS.	MPa	
5	M/E JACKET C F W IN TEMP.*	℃	
6	M/E #X CYL C F W OUTLET TEMP.*	℃	
7	M/E C F W IN AIR COOLER TEMP.	℃	
8	L T F W PRESS.	MPa	
9	L T F W TEMP.	℃	
10	COOLING S W TEMP.	℃	
11	COOLING S W PRESS.	MPa	
12	M/E MAIN & THRUST BRG L O INLET PRESS.*	MPa	The monitoring points may be in common use or be substituted for each other based on design
13	M/E MAIN BRG L O INLET PRESS.*	MPa	
14	M/E THRUST BRG L O INLET PRESS.*	MPa	
15	M/E L O &P C O INLET PRESS.*	MPa	
16	M/E P C O INLET PRESS.	MPa	
17	M/E T/C L O INLET PRESS.	MPa	
18	M/E #X T/C L O INLET PRESS.	MPa	
19	M/E T/C L O OUTLET TEMP.	℃	
20	M/E #X T/C L O OUTLET TEMP.	℃	
21	M/E MAIN BRG L O IN TEMP.*	℃	The monitoring points may be in common use or be substituted for each other based on design
22	M/E THRUST BEARING PAD TEMP.*	℃	
23	M/E L O & P C O IN TEMP.*	℃	
24	M/E P C O IN TEMP.*	℃	
25	M/E #X PISTON COOL O OUTLET TEMP.*	℃	
26	M/E F O INLET PRESS.*	MPa	
27	M/E F O IN TEMP.*	℃	
28	FO VISCOSITY	cSt	
29	M/E T/C REVOLUTION	rpm	
30	M/E #X T/C REVOLUTION	rpm	
31	SHAFT REVOLTION COUNT	10R	
32	SHAFT REVOLUTION*	rpm	
33	FO IN SERVICE		
34	MDO IN SERVICE		
35	M/E SCAV AIR PRESS.*	MPa	
36	M/E #X SCAV AIR BOX TEMP.*	℃	
37	M/E SCAV AIR TEMP. BEFORE AIR COOLER	℃	

No.	English name of switch-in parameters	Unit	Remarks
38	M/E SCAV AIR TEMP. AFTER AIR COOLER	℃	
39	M/E SCAV AIR RECEIVER TEMP.*	℃	
40	M/E #X CYL EXH GAS OUTLET TEMP.*	℃	
41	M/E T/C IN EXH GAS TEMP.*	℃	
42	M/E #X T/C IN EXH GAS TEMP.*	℃	
43	M/E T/C OUT EXH GAS TEMP.*	℃	
44	M/E #X T/C OUT EXH GAS TEMP.*	℃	
Parameters of shafting			
45	INTERMED SHAFT BRG TEMP.	℃	
46	S/T FORE BRG TEMP.	℃	
47	S/T AFT BRG TEMP.	℃	
48	S/T AFT BRG(P) TEMP.	℃	
49	S/T AFT BRG(S) TEMP.	℃	
Parameters of boiler			
50	COMP BLR STEAM PRESS.*	MPa	
51	COMP BLR F O TEMP.	℃	
52	BOILER F O PRESS.	MPa	
53	COMP FO IN SERVICE		
54	COMP MDO IN SERVICE		
Parameters of generator engine			
55	G/E F O IN TEMP.*	℃	An oil supply unit may be shared with main engine and substituted with main engine temperature based on design.
56	#X G/E CONTROL AIR INLET PRESS.	MPa	
57	#X G/E CHARGE AIR PRESS.	MPa	
58	#X G/E L O INLET PRESS.*	MPa	
59	#X G/E F O INLET PRESS.*	MPa	
60	#X G/E H/T F W INLET PRESS.*	MPa	
61	#X G/E H/T F W IN TEMP.	℃	
62	#X G/E L O IN TEMP.*	℃	
63	#X G/E H/T F W OUTLET TEMP.*	℃	
64	#X G/E #X CYL EXH GAS OUTLET TEMP.*	℃	To be determined based on the number of cylinders, the form of grouping may be selected or substituted by temperature of exhaust manifold
65	#X G/E #1,2,3 EXH G T/C IN TEMP.*	℃	
66	#X G/E #4,5,6 EXH G T/C IN TEMP.*	℃	
67	#X G/E EXH G T/C IN TEMP.*	℃	
68	#X G/E L/T F W A/C INLET PRESS.	MPa	
69	#X G/E L/T F W A/C IN TEMP.	℃	
70	#X G/E EXH G T/C OUTLET TEMP.	℃	
71	#X G/E CHARGE AIR IN TEMP.	℃	
72	#X G/E BEARING TEMP.*	℃	May be substituted for each other based on design.
73	#X G/E FORE BEARING TEMP.*	℃	
74	#X G/E AFT BEARING TEMP.*	℃	
75	#X G/E POWER*	kW	
76	G/E FO IN SERVICE		
77	G/E MDO IN SERVICE		

No.	English name of switch-in parameters	Unit	Remarks
Parameters of fuel oil tank			
78	#X HFO SERV TK TEMP.	℃	
79	#X HFO SETT TK TEMP.	℃	
80	#X L S HFO SERV TK TEMP.	℃	
81	#X L S HFO SETT TK TEMP.	℃	
82	#X MDO /MGO SERV TK TEMP.	℃	
83	#X MDO /MGO SETT TK TEMP.	℃	
84	#X L S MDO /MGO SERV TK TEMP.	℃	
85	#X L S MDO /MGO SETT TK TEMP.	℃	
86	#X MDO/MGO TK （P/C/S）TEMP.	℃	
87	#X L S MDO /MGO TK（P/C/S）TEMP.	℃	
88	#X HFO TK（P/C/S）TEMP.	℃	
89	#X L S HFO（P/C/S） TK TEMP.	℃	
90	#X HFO SERV TK LEVEL	cm/m^3	
91	#X HFO SETT TK LEVEL	cm/m^3	
92	#X L S HFO SERV TK LEVEL	cm/m^3	
93	#X L S HFO SETT TK LEVEL	cm/m^3	
94	#X MDO /MGO SERV TK LEVEL	cm/m^3	
95	#X MDO /MGO SETT TK LEVEL	cm/m^3	
96	#X L S MDO /MGO SERV TK LEVEL	cm/m^3	
97	#X L S MDO /MGO SETT TK LEVEL	cm/m^3	
98	#X MDO/MGO TK （P/C/S）LEVEL	cm/m^3	
99	#X L S MDO /MGO TK（P/C/S）LEVEL	cm/m^3	
100	#X HFO TK（P/C/S）LEVEL	cm/m^3	
101	#X L S HFO（P/C/S） TK LEVEL	cm/m^3	
102	F O OVERFLOW TK LEVEL	cm/m^3	
Parameters of ship’s draft			
103	SHIP'S DRAFT (FORE)	m	
104	SHIP'S DRAFT (PORT)	m	
105	SHIP'S DRAFT (STARBOARD)	m	
106	SHIP'S DRAFT (STERN)	m	
Fuel oil flowmeter			
107	M/E F O FLOW*	L	
108	M/E F.O.FLOW COUNTER	L/h	
109	M/E & D/G COMM FO FLOW*	L	
110	M/E F O RETURN FLOW*	L	If the main and generator engine share the inlet flow counter, the parameter may also indicate that the main and generator engine share the return oil.
111	G/E F O FLOW*	L	
112	G/E F O RETURN FLOW*	L	
113	COMP BLR H F O FLOW*	L	
114	COMP BLR D F O FLOW	L	
115	COMP BLR FO RETURN FLOW*	L	

2. Anemorumbometer

No.	English name of switch-in parameters	Unit	Remarks

No.	English name of switch-in parameters	Unit	Remarks
1	WIND SPEED*	kts	
2	WIND DIRECTION*	°	
3	WIND SPEED UNIT		If any
4	T/R FLAG		
Remarks			

3. Electronic clinometer

No.	English name of switch-in parameters	Unit	Remarks
1	X*	°	
2	Y*	°	
Remarks	The calibration for the installation of electronic clinometer is to be carried out to ensure that the electronic clinometer output the inclining conditions of the ship accurately		

4. Shaft power meter

No.	English name of switch-in parameters	Unit	Remarks
1	SHAFT REVOLUTION*	rpm	
2	SHAFT TORQUE*	kNm	
3	SHAFT POWER*	kW	
4	SHAFT THRUST	kN	If any
Remarks	The data may be accessible in the navigation bridge as an independent signal or together with the main signal of the engine room		

5. Global Position System

No.	English name of switch-in parameters	Unit	Remarks
1	LATITUDE*		
2	N/S		
3	LONGITUDE*		
4	E/W		
5	SPEED OVER GROUND*		
6	COURSE OVER GROUND*		
7	UTC*		
Remarks			

6. Speed and distance measuring device

No.	English name of switch-in parameters	Unit	Remarks
1	LONGITUDIAL WATER SPEED*	knots	
2	TRANSERSE WATER SPEED	knots	If any
3	LONGTITUDIAL GROUND SPEED	knots	If any
4	TRANSVERSE GROUND SPEED	knots	If any
5	STERN TRANSVERSE WATER SPEED	knots	If any
6	STERN TRANSVERSE GROUND SPEED	knots	If any
7	TOTAL CUMULATIVE WATER DISTANCE	NM	
8	WATER DISTANCE SINCE RESET	NM	
9	TOTAL CUMULATIVE GROUND DISTANCE	NM	
10	GROUND DISTANCE SINCE RESET	NM	
Remarks	Note 1 The number of parameters is determined according to the number of cylinders of the ship’s main engine, #X is the number of cylinder		

7. Echo-sounding device

No.	English name of switch-in parameters	Unit	Remarks
1	WATER DEPTH RELATIVE TO TRANSDUCER*	m	
2	OFFSET FROM TRANSDUCER	m	
3	MAXIMUM RANGE SCALE IN USE	m	
Remarks			

Appendix 3 CHECKLIST OF SYSTEM FUNCTIONS OF EOM SOFTWARE

To verify the following functions of the modules such as data acquisition and monitoring, energy management and energy efficiency management in EOM software system:

1. Data acquisition and monitoring: to verify the real-time acquisition of the following parameter data within acquisition cycle by software system:

No.	Items to be surveyed	Result
1	Power, pressure, temperature of energy-consuming equipment such as main engine, generator engine and boiler	
2	Flow of the fuel oil flowmeter of energy-consuming equipment such as main engine, generator engine and boiler	
3	Shaft revolution, torque, power of shaft power meter of the main engine	
4	Wind direction, wind force of anemorumbometer	
5	Position, course, speed of Global Position System (GPS)	
6	Water speed of speed and distance measuring device	
7	Angle of heel of electronic clinometer (if such equipment has signal access to EOM software system)	
8	Depth value of echo-sounding device (if such equipment has signal access to EOM software system)	
9	Ship's draft of ship's draft measuring system (if such equipment has signal access to EOM software system)	

2. Energy management: to verify the indication of the following energy consumption indexes by the software system:

No.	Items to be surveyed	Result
1	Fuel consumption per hour	
2	Daily fuel consumption	

3. Energy efficiency management: to verify the calculation of the following main energy efficiency indexes by software system:

No.	Items to be surveyed	Result
1	EEOI	
2	Fuel consumption per mile	
3	Fuel consumption per transport work	
4	CO_2 emissions per mile	
5	CO_2 emissions per ton	

Place of survey: Attending surveyor:

Date of survey: