

SC 242 Arrangements for steering capability and function on ships fitted with propulsion and steering systems other than traditional arrangements for a ship's directional control

(Jan 2011)
(Corr.1
Aug 2011)
(Rev.1
Apr 2016,
Deleted
on 20
Dec 2017)
(Corr.1
Aug 2011
reinstated
from 21
Dec 2017)
(Rev.2
Jan 2020)

(Chapter II-1, Regulations 28.3, 29.1, 29.2.1, 29.3, 29.4, 29.6.1, 29.14, ~~28.2 and 28.3~~ and 30.2)

Introduction

The SOLAS requirements for steering gears have been established for ships having a traditional propulsion system and one rudder. For ships fitted with alternative propulsion and steering arrangements, such as but not limited to, azimuthing propulsors or water jet propulsion systems, SOLAS Regulations II-1/28.3, 29.1, 29.2.1, 29.3, 29.4, 29.6.1, 29.14 ~~28.2~~ and ~~28.3~~ 30.2 are to be interpreted as follows, except 29.14, which is limited to the steering systems having a certain steering capability due to ~~vessel~~ ship speed also in case propulsion power has failed.

Note:

- 1) This UI is to be uniformly implemented by IACS Members and Associates for propulsion and steering systems other than traditional arrangements for a ship's directional control:
 - a) when an application for certification of non traditional steering systems is dated on or after 1 January 2012; or
 - b) which are installed in a new ship for which the date of contract for construction is on or after 1 January 2012.
- 2) Rev.1 of this UI is to be uniformly implemented by IACS Societies for propulsion and steering systems other than traditional arrangements for a ship's directional control:
 - a) when an application for certification of non traditional steering systems is dated on or after 1 July 2017; or
 - b) which are installed in a new ship for which the date of contract for construction is on or after 1 July 2017.
- 3) Rev.1 of this UI is deleted on 20 Dec 2017 and Corr.1 Aug 2011 is reinstated from 21 Dec 2017.
- 4) The "contracted for construction" date means the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. For further details regarding the date of "contract for construction", refer to IACS Procedural requirement (PR) No.29."
- 5) Rev.2 of this UI is to be uniformly implemented by IACS Societies for propulsion and steering systems other than traditional arrangements for a ship's directional control:
 - a) when an application for certification of non traditional steering systems is dated on or after 1 July 2020; or
 - b) which are installed in a new ship for which the date of contract for construction is on or after 1 July 2020.

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Regulation 28 - Means of going astern

Regulation 28.3

28.3 The stopping times, ship headings and distances recorded on trials, together with the results of trials to determine the ability of ships having multiple propellers to navigate and manoeuvre with one or more propellers inoperative, shall be available on board for the use of the master or designated personnel.

Interpretation

The stopping times, ship headings and distances recorded on trials, together with the results of trials to determine the ability of ships having multiple propulsion/steering arrangements to navigate and manoeuvre with one or more of these devices inoperative, shall be available on board for the use of the master or designated personnel.

Regulation 29 – Steering Gear

Regulation 29.1

29.1 Unless expressly provided otherwise, every ship shall be provided with a main steering gear and an auxiliary steering gear to the satisfaction of the administration. The main steering gear and the auxiliary steering gear shall be so arranged that the failure of one of them will not render the other one inoperative.

Interpretation

For a ship fitted with multiple steering systems-propulsion units, such as but not limited to azimuthing propulsors or water jet propulsion systems each of the steering-propulsion units shall be provided with a main steering gear and an auxiliary steering gear or with two or more identical steering actuating systems in compliance with interpretation of SOLAS regulation II-1/29.6.1 The main steering gear and the auxiliary steering gear shall be so arranged that the failure of one of them will not render the other one inoperative.

For a ship fitted with a single steering-propulsion unit, the requirement in SOLAS II-1/ regulation II-1/29.1 is considered satisfied if ~~each of the steering gear is provided with two or more steering actuating systems is equipped with its own dedicated steering gear and is in compliance with interpretation of SOLAS regulation II-1/29.6.1.~~ A detailed risk assessment is to be submitted in order to demonstrate that in the case of any single failure in the steering gear, control system and power supply the ship steering is maintained.

Regulation 29.2.1

29.2.1 All the steering gear components and the rudder stock are to be of sound reliable construction to the satisfaction of the Administration. Special consideration shall be given to the suitability of any essential component which is not duplicated. Any such essential component shall, where appropriate, utilize anti-friction bearings such as ball bearings, roller bearings or sleeve bearings which shall be permanently lubricated or provided with lubrication fittings.

Interpretation

All components used in steering arrangements for ship directional control are to be of sound reliable construction to the satisfaction of the ~~classification society.~~ Administration or recognized organizations acting on its behalf. Special consideration shall be given to the

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suitability of any essential component which is not duplicated. Any such essential component shall, where appropriate, utilize anti-friction bearings such as ball bearings, roller bearings or sleeve bearings which shall be permanently lubricated or provided with lubrication fittings.

Regulation 29.3

29.3 *The main steering gear and rudder stock shall be:*

- .1 *of adequate strength and capable of steering the ship at maximum ahead service speed which shall be demonstrated;*
- .2 *capable of putting the rudder over from 35° on one side to 35° on the other side with the ship at its deepest seagoing draught and running ahead at maximum ahead service speed and under the same conditions, from 35° on either side to 30° on the other side in not more than 28 s; where it is impractical to demonstrate compliance with this requirement during sea trials with the ship at its deepest seagoing draught and running ahead at the speed corresponding to the number of maximum continuous revolutions of the main engine and maximum design pitch, ships regardless of date of construction may demonstrate compliance with this requirement by one of the following methods:*
 - .1 during sea trials the ship is at even keel and the rudder fully submerged whilst running ahead at the speed corresponding to the number of maximum continuous revolutions of the main engine and maximum design pitch; or*
 - .2 where full rudder immersion during sea trials cannot be achieved, an appropriate ahead speed shall be calculated using the submerged rudder blade area in the proposed sea trial loading condition. The calculated ahead speed shall result in a force and torque applied to the main steering gear which is at least as great as if it was being tested with the ship at its deepest seagoing draught and running ahead at the speed corresponding to the number of maximum continuous revolutions of the main engine and maximum design pitch; or*
 - .3 the rudder force and torque at the sea trial loading condition have been reliably predicted and extrapolated to the full load condition. The speed of the ship shall correspond to the number of maximum continuous revolutions of the main engine and maximum design pitch of the propeller;*
- .3 *operated by power where necessary to meet the requirements of paragraph 3.2 and in any case when the Administration requires a rudder stock of over 120 mm diameter in way of the tiller, excluding strengthening for navigation in ice;*
- .4 *so designed that they will not be damaged at maximum astern speed; however, this design requirement need not be proved by trials at maximum astern speed and maximum rudder angle.*

Interpretation

29.3 The main steering arrangements for ship directional control shall be:

- .1 of adequate strength and capable of steering the ship at maximum ahead service speed which shall be demonstrated;
- .2 capable of changing direction of the ~~ship's directional control system steering-~~
propulsion unit from one side to the other at declared steering angle limits at an

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average rotational turning speed of not less than 2.3°/s with the ship running ahead at maximum ahead service speed;

- .3 for all ships, operated by power; and
- .4 so designed that they will not be damaged at maximum astern speed; this design requirement need not be proved by trials at maximum astern speed and declared steering angle limits.

Ship manoeuvrability tests, such as according to Resolution MSC.137(76) on Standards for ship manoeuvrability, are to be carried out with steering angles not exceeding the declared steering angle limits.

Definition: “Declared steering angle limits” are the operational limits in terms of maximum steering angle, or equivalent, according to manufacturers' guidelines for safe operation, also taking into account the ~~vessels~~ ship's speed or propeller torque/speed or other limitation; the "declared steering angle limits" are to be declared by the directional control system manufacturer for each ship specific non-traditional steering mean; ship manoeuvrability tests, such as those in the Standards for ship manoeuvrability (resolution res. MSC.137(76)) are to be carried out with steering angles not exceeding the declared steering angle limits.

Regulation 29.4

29.4 *The auxiliary steering gear shall be:*

- .1 *of adequate strength and capable of steering the ship at navigable speed and of being brought speedily into action in an emergency;*
- .2 *capable of putting the rudder over from 15° on one side to 15° on the other side in not more than 60 s with the ship at its deepest sea-going draught and running ahead at one half of the maximum ahead service speed or 7 knots, whichever is the greater; ~~and where it is impractical to demonstrate compliance with this requirement during sea trials with the ship at its deepest seagoing draught and running ahead at one half of the speed corresponding to the number of maximum continuous revolutions of the main engine and maximum design pitch or 7 knots, whichever is greater, ships regardless of date of construction, including those constructed before 1 January 2009, may demonstrate compliance with this requirement by one of the following methods:~~*

.1 during sea trials the ship is at even keel and the rudder fully submerged whilst running ahead at one half of the speed corresponding to the number of maximum continuous revolutions of the main engine and maximum design pitch or 7 knots, whichever is greater; or

.2 where full rudder immersion during sea trials cannot be achieved, an appropriate ahead speed shall be calculated using the submerged rudder blade area in the proposed sea trial loading condition. The calculated ahead speed shall result in a force and torque applied to the auxiliary steering gear which is at least as great as if it was being tested with the ship at its deepest seagoing draught and running ahead at one half of the speed corresponding to the number of maximum continuous revolutions of the main engine and maximum design pitch or 7 knots, whichever is greater; or

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.3 the rudder force and torque at the sea trial loading condition have been reliably predicted and extrapolated to the full load condition; and

- .3 operated by power where necessary to meet the requirements of paragraph 4.2 and in any case when the Administration requires a rudder stock of over 230 mm diameter in way of the tiller, excluding strengthening for navigation in ice.

Interpretation

29.4 The auxiliary steering arrangements for ship directional control shall be:

- .1 of adequate strength and capable of steering the ship at navigable speed and of being brought speedily into action in an emergency;
- .2 capable of changing direction of the ship's directional control system from one side to the other at declared steering angle limits at an average ~~rotational~~ turning speed of not less than 0.5°/s with the ship running ahead at one half of the maximum ahead service speed or 7 knots, whichever is the greater; and
- .3 for all ships, operated by power where necessary to meet the requirements of SOLAS regulation II-1/29.4.2 and in any ship having power of more than 2,500 kW propulsion power per ~~thruster unit~~ steering-propulsion unit.

~~Definition: "declared steering angle limits" are the operational limits in terms of maximum steering angle, or equivalent, according to manufacturers guidelines for safe operation, also taking into account the vessels speed or propeller torque/speed or other limitation; the "declared steering angle limits" are to be declared by the directional control system manufacturer for each ship specific non-traditional steering mean; ship's manoeuvrability tests, such as res. MSC.137(76) are to be carried out with steering angles not exceeding the declared steering angle limits.~~

Ship manoeuvrability tests, such as according to Resolution MSC.137(76), are to be carried out with steering angles not exceeding the declared steering angle limits.

The definition of "declared steering angle limits", set out in the interpretation of Regulation 29.3 above, applies.

Regulation 29.6.1

29.6.1 Where the main steering gear comprises two or more identical power units, an auxiliary steering gear need not be fitted, provided that:

- .1 in a passenger ship, the main steering gear is capable of operating the rudder as required by paragraph 3.2 while any one of the power units is out of operation;
- .2 in a cargo ship, the main steering gear is capable of operating the rudder as required by paragraph 3.2 while operating with all power units;
- .3 the main steering gear is arranged so that after a single failure in its piping system or in one of the power units the defect can be isolated so that steering capability can be maintained or speedily regained.

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Interpretation

Definition: Steering Gear Power unit – For the purposes of alternative steering arrangements, the steering gear power unit shall be considered as defined in SOLAS Reg. II-1/3. For electric steering gears refer SOLAS II-1/3., electric steering motor shall be considered as part of power unit and actuator.

~~29.6.1 Where the main steering arrangements for~~ For a ship directional control fitted with a single steering-propulsion unit where the main steering gear comprises two or more identical power units and two or more identical steering actuators, an auxiliary steering arrangements gear need not be fitted provided that the steering gear:

~~.1 in a passenger ship, the main steering arrangements are capable of operating the ship's directional control system as required by paragraph 3.2~~ is capable of satisfying the requirements in interpretation to SOLAS regulation II-1/29.3 while any one of the power units is out of operation;

~~.2 in a cargo ship, the main steering arrangements are~~ is capable of operating the ship's directional control system as required by paragraph satisfying the requirements in Interpretation to SOLAS regulation II-1/29.3-2 while operating with all power units; and

~~.3 the main steering arrangements are~~ is arranged so that after a single failure in its piping system or in one of the power units the defect can be isolated so that, steering capability can be maintained or speedily regained.

~~In~~ For a ship fitted with multiple steering systems, such as but not limited to azimuthing propulsors or water jet propulsion propulsion units, where each main steering system comprises two or more identical steering actuating systems, an auxiliary steering gear need not be fitted provided that each steering gear:

~~.1 in a passenger ship, each of the steering systems is fitted with two or more identical power units,~~ is capable of satisfying the requirements in Reg. 29.3.2 Interpretation to SOLAS regulation II-1/29.3 while any one of the power units steering gear steering actuating systems is out of operation;

~~.2 in a cargo ship, each of the steering systems is fitted with one or more identical power units,~~ is capable of satisfying the requirements in Reg. Interpretation to SOLAS regulation II-1/29.3-2 while operating with all power units steering gear steering actuating systems;

~~.3 each of the steering systems is arranged so that after a single failure in its piping or in one of the power units, ship steering~~ actuating systems. steering capability (but not individual steering system operation) can be maintained or speedily regained (e.g. by the possibility of positioning the failed steering system in a neutral position in an emergency, if needed)

the above capacity requirements apply regardless whether the steering systems are arranged with common dedicated power units.

Definition: Steering gear power unit – For the purposes of alternative steering arrangements, the steering gear power unit is to be considered as defined in SOLAS regulation II-1/3. For electric steering gears, refer to SOLAS regulation II-1/3; electric steering motors are to be considered as part of the power unit and actuator.

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(cont)****Regulation 29.14**

29.14 Where the rudder stock is required to be over 230 mm diameter in way of the tiller, excluding strengthening for navigation in ice, an alternative power supply, sufficient at least to supply the steering gear power unit which complies with the requirements of paragraph 4.2 and also its associated control system and the rudder angle indicator, shall be provided automatically, within 45 s, either from the emergency source of electrical power or from an independent source of power located in the steering gear compartment. This independent source of power shall be used only for this purpose. In every ship of 10,000 gross tonnage and upwards, the alternative power supply shall have a capacity for at least 30 min of continuous operation and in any other ship for at least 10 min.

Interpretation

This interpretation is valid to the steering ~~systems~~ propulsion units having a certain proven steering capability due to ship ~~vessel~~ speed also in case propulsion power has failed.

~~29.14~~ Where the propulsion power exceeds 2,500kW per thruster unit, an alternative power supply, sufficient at least to supply the steering arrangements which complies with the requirements of ~~paragraph~~ SOLAS regulation II-1/29.4.2 and also its associated control system and the steering ~~system~~ gear response indicator, shall be provided automatically, within 45 s, either from the emergency source of electrical power or from an independent source of power located in the steering gear compartment. This independent source of power shall be used only for this purpose. In every ship of 10,000 gross tonnage and upwards, the alternative power supply shall have a capacity for at least 30 min of continuous operation and in any other ship for at least 10 min.

~~Regulation 28 – Means of going astern~~**~~Regulation 28.2~~**

~~28.2 The ability of the machinery to reverse the direction of thrust of the propeller in sufficient time, and so to bring the ship to rest within a reasonable distance from maximum ahead service speed, shall be demonstrated and recorded.~~

Interpretation

~~28.2 The ability of the machinery to reverse the direction of thrust in sufficient time, and so to bring the ship to rest within a reasonable distance from maximum ahead service speed, shall be demonstrated and recorded.~~

~~Regulation 28.3~~

~~28.3 The stopping times, ship headings and distances recorded on trials, together with the results of trials to determine the ability of ships having multiple propellers to navigate and manoeuvre with one or more propellers inoperative, shall be available on board for the use of the master or designated personnel.~~

Interpretation

~~28.3 The stopping times, ship headings and distances recorded on trials, together with the results of trials to determine the ability of ships having multiple propulsion/steering arrangements to navigate and manoeuvre with one or more of these devices inoperative, shall be available on board for the use of the master or designated personnel.~~

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(cont)**Regulation 30 - Additional requirements for electric and electrohydraulic steering gear****Regulation 30.2**

30.2 Each electric or electrohydraulic steering gear comprising one or more power units shall be served by at least two exclusive circuits fed directly from the main switchboard; however, one of the circuits may be supplied through the emergency switchboard. An auxiliary electric or electrohydraulic steering gear associated with a main electric or electrohydraulic steering gear may be connected to one of the circuits supplying this main steering gear. The circuits supplying an electric or electro hydraulic steering gear shall have adequate rating for supplying all motors which can be simultaneously connected to them and may be required to operate simultaneously.

Interpretation

For a ship fitted with multiple steering systems, the requirements in SOLAS regulation II-1/30.2 are to be applied to each of the steering systems.

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