|  |
| --- |
| Front cover. Data on this page comes from the title page and can be edited there. Delete “Document No. …” if you do not use it. |

**Bilag A2**

SAR Vessel Technical Standard

|  |
| --- |
| SAR Vessels for Denmark  SAR Vessel Technical Standard  Ministry of Defence, Denmark |
| **Report No.:** 2017-0316, Rev. 3  **Document No.:** [Document No.]  **Date:** 09.11.2017 |

|  |  |  |
| --- | --- | --- |
| Title page. 1) Displayed on front cover. 2) Displayed in footer on Page 1 onwards. | |  |
| Project name:1 | SAR Vessels for Denmark | DNV GL Maritime  MCANO872  Tel: +47 67 57 99 00 |
| Report title:1 | SAR Vessel Technical Standard |
| Customer:1 | Ministry of Defence, Denmark, |
| Customer contact: | Henrik Pierre Christensen |
| Date of issue:1 | 09.11.2017 |
| Project No.: | 87211124 |
| Organisation unit: | MCANO872 |
| Report No.:1,2 | 2017-0316, Rev.1,2 3 |
|  |  |
| Applicable contract(s) governing the provision of this Report: | | |

Objective:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Prepared by: |  | Verified by: |  | Approved by: |
|  |  |  |  |  |
| Stefan Palm Senior Principal Engineer |  | Odd Arne Lyngstad  Senior Principal Engnineer |  | Christine Adal Head of Section |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

|  |  |
| --- | --- |
| Copyright © DNV GL 2017. All rights reserved. Unless otherwise agreed in writing: (i) This publication or parts thereof may not be copied, reproduced or transmitted in any form, or by any means, whether digitally or otherwise; (ii) The content of this publication shall be kept confidential by the customer; (iii) No third party may rely on its contents; and (iv) DNV GL undertakes no duty of care toward any third party. Reference to part of this publication which may lead to misinterpretation is prohibited. DNV GL and the Horizon Graphic are trademarks of DNV GL AS. | |
|  |  |
| DNV GL Distribution: | Keywords: |
| ☐ Unrestricted distribution (internal and external) |  |
| ☐ Unrestricted distribution within DNV GL Group |
| ☒ Unrestricted distribution within DNV GL contracting party |
| ☐ No distribution (confidential) |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rev. No. | Date | Reason for Issue | Prepared by | Verified by | Approved by |
| A | 2017-03-30 | First issue for client comment. |  |  |  |
| 0 | 2017-03-07 | Final. |  |  |  |
| 1 | 2017-10-16 | Revised based on client comments. |  |  |  |
| 2  3 | 2017-10-19  2017-11-09 | Errors and omissions.  Errors and omissions corrected by DALO |  |  |  |

Table of contents

1 introduction 1

1.1 Background 1

2 vessel specifics 1

3 applicable standards 2

4 hull Construction 2

4.1 General 2

4.2 Structural strength 2

4.3 Buoyancy elements 2

4.4 Ventilation openings 3

4.5 Weather deck 3

5 superstructures and Wheelhouse 3

5.1 General 3

5.2 Windows 3

5.3 Access 4

5.4 Comfort 4

6 interiors 4

6.1 Accommodation 4

6.2 Storage spaces 4

6.3 Injury treatment space 4

7 Moorings and anchoring 5

7.1 Mooring 5

7.2 Towing 5

7.3 Anchoring 5

8 intact Stability 6

8.1 Conditions of stability 6

8.2 Stability criteria 6

8.3 Self-righting 6

8.4 Testing of intact stability 7

8.5 Stability information 7

9 Stability in damaged state 7

9.1 Damage cases 7

9.2 Permeability 7

9.3 Buoyancy and stability in damaged condition 8

9.4 Self-righting. 8

10 Propulsion 9

10.1 General provisions 9

10.2 Arrangement 9

10.3 Engine room 9

10.4 Engines 9

10.5 Propellers and shafting 9

11 steering arrangement 10

11.1 General 10

11.2 Steering gear 10

11.3 Rudder 10

11.4 Station keeping 10

12 Systems 10

12.1 Fuel system 10

12.2 Exhaust system 11

12.3 Cooling water 11

13 Electrical installations 11

13.1 General provisions 11

13.2 Electric supply to radio installations. 11

14 fire safety 11

14.1 General 11

14.2 Structural fire protection 11

14.3 Fire detection 11

14.4 Fire extinction 12

15 lIFE SAVING APPLIANCES 12

15.1 Life jackets and buoys 12

15.2 Life rafts 12

15.3 Pyrotechnics 12

16 NAVIGATION 13

17 RADIO EQUIPMENT 13

18 Rescue from water 14

18.1 Rescue zone 14

18.2 Crane 14

19 Other equipment 14

20 ADDITIONAL INSTALLATIONS 14

# introduction

## Background

The Danish Ministry of Defence will have the responsibility for the procurement of coastal SAR vessels for use in Denmark. At present there is no Danish national stand-alone standard for the construction and equipment of such a vessel, but there are number of relevant Danish standards and class rules available:

* Technical Regulation 2, 10.03.2003 issued by the Danish Maritime Administration (DMA).
* Notice B, issued by DMA (Referred to in Technical Regulation 2)
* Notice F, issued by DMA (Referred to in Technical Regulation 2)
* DNVGL class rules (Technical Regulation 2 also refers to class rules)

Technical Regulation 2 provides a standard particularly for SAR vessels but also refers to Notice B and F which prescribe solutions that may not be suitable for a vessel of this size and/or type. Technical Regulation 2 has also been nullified by DMA and is no longer in force. A need is therefore to specify rules for harbour based SAR vessels based on the intentions behind the original Technical Regulation 2 in order to incorporate the safety level that the user must expect also to be present in future harbour based SAR vessels.

The objective of the present work has been to compile such a standard. This document has been built mainly on the standards listed above with due regard to possible conflicts between the standards. DNVGL generated a draft to which the client specified certain modifications, which were implemented. Consequently, the standard reflects the client’s requirements to such a standard. The document issued by DNVGL technical report.

The standard is based on the vessel being built to class in DNVGL to a specific class notation. Details about class notations are given in Sect. .

# vessel specifics

The present standard has been developed for a vessel with a length between 17 m and 24 m. In addition the vessel shall have the following characteristics:

* The vessel shall have seating for 12 passengers.
* The vessel shall be self-righting in intact condition and under different damage conditions as described in Sect.8.3.
* All machinery, including electrical components and fittings, shall be capable of functioning following a 360° roll.
* The vessel shall have a dedicated rescue zone aiding the retrieval of people from the water, as described in Sect. .
* The vessel shall have a space where it is possible to do minor treatments to injured people, as described in Sect. .
* A crane or other suitable equipment, approved for lifting persons out of the water, as described in Sect.
* The vessel shall be able to maneuver and to keep its position in conditions as specified in this document.

# applicable standards

The vessel shall be built and equipped in accordance with DNVGL class rules with one of the following notations:

+ **1A HSLC Patrol R1 E0**

+ **1A LC Patrol R1 E0**

as per the DNVGL class rules with respect to vessel speed, and with the additions as specified in this document.

# hull Construction

## General

The following transverse watertight bulkheads shall be fitted:

* forepeak bulkhead
* bulkhead forward and aft of the machinery space
* between the steering gear space and the space forward of the steering gear space (if there is a space between the machinery and steering gear spaces)

Hatches or doors in bulkheads shall be designed to the same strength as the bulkhead, be watertight and be provided with the following text: "To be kept closed while at sea. To be opened only in case of passage." Indicators to the bridge shall show the opening status of each door. There shall be no hatches or doors in the forepeak bulkhead.

An inboard watertight barrier shall be fitted throughout the hull at a distance from side shell of minimum 300 mm measured from the waterline at maximum draft and perpendicular to ships centerline. This barrier shall to greatest possible extent be filled with approved buoyancy material.

## 

## Structural strength

The hull shall be constructed in agreement with the rules specified in Sect. 3, but with loads and design pressures equal to twice the loads and design pressures specified in these rules. In no case shall a design pressure, after doubling, be taken lower than 30 kN/m2.

The inboard watertight barrier shall be designed for the static sea pressure specified in the rules, Sect. 3, for the relevant depth multiplied with a factor of two. The inboard watertight barrier shall not be included in the calculation of the global strength of the hull.

Strength of propeller protection shall be determined assuming grounding. This load case to be determined as vessel out of water, supported only on the propeller protection and fore most part of the keel at any heel angle.

## Buoyancy elements

Means of buoyancy which form part of the hull shall be Type Approved by DNVGL, another Class Society or can be approved on a case-by-case basis. Means of buoyancy shall preferably be fitted in enclosed spaces.

## Ventilation openings

It shall be ensured that water ingress through ventilation openings is not possible by means of fitting water traps and/or automatic means of closing. Leakage of water from the water traps and into the vessel or machinery shall be avoided.

## Weather deck

Efficient non-slip deck surfaces and suitable holding points on deck shall be fitted.

Bulwarks shall not lead to accumulation of water on deck.

A guard rail 1 m in height shall be fitted all around the vessel, with consideration to the requirements to the rescue zone, Sect. 18.

# superstructures and Wheelhouse

## General

The wheelhouse shall be self-draining within 2 minutes at any filling.

The superstructures and wheelhouse shall be constructed in agreement with the rules specified in Sect. 3, but with loads equal to twice the loads specified in these rules. In no case shall a design pressure, after doubling, be taken lower than 30 kN/m². Requirements to windows are given in Sect. 5.2.

Superstructures and wheelhouse shall in addition to the rules specified above be designed for the relevant water head when the vessel is in the 180° position (upside down) multiplied with a factor of two. The strength shall comply with the rules specified in Sect. 3.

The superstructure and wheelhouse strength shall be sufficient to withstand grounding upside down with all vessel weight evenly distributed on the top roof. Local damages are acceptable in this condition, as this requirement is intended to prevent global failure of the superstructure.

## Windows

The area of windows in the wheelhouse shall be the maximum possible in order to ensure best possible view while taking into account the requirements to the structural strength of the wheelhouse specified elsewhere in this document.

Windows or other apertures to spaces below deck are not permitted except for access openings.

Windows shall be fitted in fixed frames of a strength and with mounts equivalent to twice the normal standard used for commercial shipping.

All windows in the front of the wheelhouse and at least one window on each side shall be provided with windscreen wipers and heating sufficient for keeping the windows free of frost and mist. Alternative and well-documented means for securing clear sight may be accepted.

Windows in wheelhouse front shall be designed for a pressure equal to 60 kN/m2.

Windows in superstructure sides and wheelhouse sides and aft bulkheads shall be designed for a pressure equal to 30 kN/m2.

All windows including frames shall in addition be designed for the maximum relevant water head when the vessel heel is in any location between 0° and 180° position (upside down) multiplied by a factor of two. The strength shall comply with the rules specified in Sect. 3.

In no case shall the thickness of glass be smaller than 10 mm, or equivalent if another material is used.

## Access

Access to the superstructure and/or wheelhouse from open deck shall be from a position protected against weather and sea. Alternatively, an airlock is acceptable

## Comfort

The wheelhouse shall be supplied by a ventilation system with a capacity of 15 air changes per hour. It shall be possible to control the system from the wheelhouse in an easy and convenient manner.

# interiors

## Accommodation

Sharp corners and edges shall be avoided in all spaces. Where this is not possible, padding shall be fitted.

Handgrips/handrails shall be fitted along all gangways and where there are no places to be seated.

The vessel shall be heated either by electricity or by engine cooling water or other means that do not require the use of flammable liquid or gas.

## Storage spaces

Spaces used for storing articles of any nature shall be fitted with easy to use sea fastening like e.g. shelves with poundboards or similar.

All hinged hatches and lockers shall be possible to secure in the closed position.

Signs shall be fitted on the outside of all lockers and compartments for equipment as well as next to holders indicating in an appropriate way what equipment is found in a locker or for what component the holder is intended.

## Injury treatment space

A dedicated space for treatment of minor injuries to persons shall be arranged.

It shall be possible to comfortably access the treatment space with a stretcher, and the space shall contain a suitably located and fastened stretcher.

The seats in the treatment space shall be provided with safety belts.

Electric red lighting shall be fitted.

The treatment space shall be supplied by a ventilation system with a capacity for a minimum of 10 air changes per hour. If the treatment space is arranged with connection to the wheelhouse a minimum of 15 air changes pr. minute is required.

# Moorings and anchoring

## Mooring

There shall be at least two mooring fittings and a strong bollard fitted both fore and aft.

The strong bollards shall be designed for a load P given by:

P = (4.3LOA – 5.4) kN

LOA Length overall in meters

with a strength of the bollard and its supporting structure as specified in th5 rules, Sect. 3.

## Towing

The vessel shall be fitted with a towing arrangement designed for a towing force equal to at least the vessels bollard pull.

The arrangement shall include a winch with minimum 200 meters of tow line. The winch shall be fitted with a brake designed for the towing force.

The winch pulling force on first layer of wire shall not be smaller than the vessels bollard pull.

The brake holding force on outmost layer shall not be smaller than the vessels bollard pull.

A towing release device operated from the wheelhouse shall be arranged.

The winch shall be positioned aft of wheelhouse and as far forward as possible.

A rope/wire guide to be arranged to minimizing heel if wire is thwart ships.

## Anchoring

There shall be two anchors, one of a type designed for shallow water and one of a type designed for sandy sea floor. The largest of the anchors shall be placed in a hawse or skids ready for lowering and raising.

The weight of the both anchors and diameter of chains shall be as specified in the rules specified in Sect. 3.

The main anchor shall be lowered and hauled in by means of a hydraulic or electric winch that can be operated from the wheelhouse. It shall also be possible to operate the winch manually.

The anchor line shall be steel wire type with chain leader.

# intact Stability

## Conditions of stability

Conditions of loading for light ship and for all operating conditions that occur in practice, including ice accretion and operation of the crane shall be assessed.

The following wind pressure P shall be applied:

P = 500(*VW*/30)2 (N/m2)

*VW* = wind speed (m/s), corresponding to the worst intended conditions.

The angle of heel due to wind shall not exceed 16° or 80 % of the angle of deck-edge immersion (whichever is less).

The weather criteria according to “*International Code on Intact stability* (2008 Edition) Sect. 2.3” shall be applied for all intact loading conditions, also including ice accretion

Use of the crane, Sect. , shall be included except with respect to self-righting. The heeling angle shall be less than 3° when using the crane with a weight 300 kg at 2.0 m outreach.

## Stability criteria

The area under the righting lever curve (GZ curve) shall not be smaller than 0.07 m.rad up to θ = 15° when the maximum righting lever (GZ) occurs at θ = 15°, and 0.055 m.rad up to θ = 30° when the maximum righting lever occurs at θ = 30° or above. Where the maximum righting lever occurs at angles of between θ = 15° and θ = 30°, the corresponding area under the righting lever curve shall not be smaller than:

A = 0.055 + 0.001 (30° - θmax ) (m.rad)

θmax = angle of heel at which the righting lever curve reaches its maximum (°).

The area under the righting lever curve between θ = 30° and θ = 40° or between θ = 30° and the angle of flooding θF if this angle is smaller than 40°, shall not be smaller than 0.03 m.rad. The area under the righting lever curve between 0° and 40° or between 0° and F, if this angle is smaller than 40°, shall not be smaller than 0.09 m.rad. In applying this criterion, small openings through which progressive flooding

cannot take place need not be considered open.

The righting lever GZ shall be at least 0.2 m at an angle of heel equal to or greater than 30°.

The maximum righting lever shall occur at an angle of heel not less than 15°, but preferably larger than 25°.

The initial transverse metacentric height GMT shall not be less than 0.15 m when corrected for free surface effect.

## Self-righting

The stability shall be positive (GZ >0) up to and including 180° (the vessel shall be self-righting) for all operating conditions, including ice accretion. The self righting ability of the vessel shall be confirmed by testing, Sect. 8.4.2.

## Testing of intact stability

### Inclining test

An inclining test shall be carried out for each vessel.

### Self-righting test

Self-righting capability shall be confirmed by testing of each vessel in intact condition in accordance with an approved test procedure. The test shall confirm that the stability lever arm, GZ, is positive for every 10° from 0° to 180°. The vessel shall be held in a static condition for every 10°, where the uprighting force is measured by a calibrated dynamometer. During the test, engines, instruments etc. may be replaced by models of the same weight, cubic capacity and location of the centre of gravity.

## Stability information

The stability information for use by the master shall also state the rolling period for each predicted condition.

# Stability in damaged state

## Damage cases

The following damaged case shall apply:

* All spaces below deck flooded, except space filled with buoyancy foam, with the superstructure and wheelhouse intact.
* The wheelhouse and remaining superstructure are open to the sea while the spaces below deck are intact.

## Permeability

The buoyancy shall be calculated based on the permeabilities specified in the table below.

|  |  |
| --- | --- |
| **PERMEABILITIES** | |
| **Space** | **Permeability (%)** |
| Stores | 60 |
| Accommodation | 95 |
| Machinery | 85 |
| Intended for liquids | 0 or 95  (whichever is the most severe) |
| Void | 0 if filled with buoyancy foam  95 otherwise |

Buoyancy shall be ensured by using fixed means of buoyancy.

## Buoyancy and stability in damaged condition

The stability, which shall be calculated for the most unfavorable loading condition, shall be calculated based on the specified permeabilities, Sect. 9.2, and shall be ensured by using fixed and approved means of buoyancy.

Following any of the specified damages specified in Sect. 9.1, the following requirements apply for the worst intended loading conditions, i.e. also including ice accretion:

* The vessel shall have positive stability in the whole stability range from 0° to 360°.
* The area under the GZ curve from 0° to 15° shall not be less than 0.015 m.rad.
* The metacentric height GMT shall not be smaller than 0.30 m in the final state of a damaged condition
* The final waterline shall be located below the level of any opening through which further flooding could take place.
* There shall be a positive freeboard of at least 76 mm from the damage waterline to the main deck.
* The vessel shall in still water have sufficient buoyancy and positive stability to simultaneously ensure that the angle of inclination of the craft from the horizontal does not exceed 15° in any direction.
* The vessel shall not trim forward more than is required for the reserve buoyancy volume forward of the centre of buoyancy to be at least as large as the reserve buoyancy volume aft thereof.
* Essential emergency equipment, emergency radios, power supplies and public address systems needed for organizing the evacuation shall remain accessible and operational.
* Asymmetric flooding may be accepted and cross flooding arrangements, where applicable, shall be automatic, and equalization shall occur within a period not exceeding 2 minutes. During equalization, the list shall not exceed 7°.

## Self-righting.

Calculations showing the self-righting capability from 0° to 360° in all the damaged conditions, Sect. 9.1, shall be carried out for the most critical loading conditions, including ice accretion.

# Propulsion

## General provisions

Propulsion system means propulsion engine, gears, propeller shaft, propeller, starting equipment, maneuvering equipment, fuel system, cooling system, lubricating system, monitoring equipment and other necessary equipment for safeguarding propulsion.

The propulsion system shall be fully functioning following a 360° roll.

The propulsion system shall be capable of operating continually during repeated rolling up to 140° (70° to each side) and with a trim of 20°.

## Arrangement

The vessel shall be provided with minimum two independent propulsion systems. Failure of one propulsion system shall not prevent continued operation of the other propulsion system and the ability to maneuver.

The propulsion systems shall be located in separate engine rooms. Port side and starboard propulsion systems shall be identical.

## Engine room

The ventilation system of the engine rooms shall be designed with an effective arrangement which automatically closes the ventilation opening to the outside of the vessel during lists exceeding 70°.

## Engines

The engines shall be capable of running for at least 5 minutes at rated power without supply of cooling water.

All fuel oil high-pressure pipes on the engines shall be of the double pipe type. Other fuel oil pipes and hoses shall be screened so that oil spray from bursts or leaks cannot come into contact with hot surfaces.

It shall be possible to start, stop and regulate the engines from the conning position.

## Propellers and shafting

Propellers, shafts and gears shall be dimensioned in accordance with DNVGL RU-SHIP Pt.6 Ch.6 Sec.1 corresponding DNVGL class notation **Ice(1C)** corresponding to Swedish-Finnish ice class 1C.

The propellers and rudders shall be protected against grounding and damage as a result of the vessel pulling alongside a disabled vessel.

Shaft lines shall be provided with shaft brakes preventing injury to persons in the water.

# steering arrangement

## General

The steering system shall be capable of operating continually during repeated rolling up to 140° (70° to each side) and with a trim of 20°.

The steering arrangement shall be fully functional following a 360° roll.

## Steering gear

Each steering gear shall be hydraulic and provided with two cylinders, each dimensioned so that they are, jointly and each of them individually, capable of putting the rudder over from 35° on one side to 35° on the other side with the vessel running ahead at maximum service speed in not more than 10 seconds.

A separate power supply shall be arranged for each cylinder. A manually operated pump shall be fitted in the steering console for use as auxiliary steering gear. Cross-over valves for the hydraulic system for use of the emergency steering gear shall be located in the wheelhouse.

## Rudder

The maximum rudder force determined based on the maximum speed ahead and astern in accordance with the rules specified in Sect. 3. This force shall be multiplied by a factor of two when used for dimensioning the rudder, rudder horn, rudder stock, coupling, bearings and other load bearing structure.

## Station keeping

The vessel shall be able to keep its position at zero speed with vessel side facing wind speed of at least 20 m/s, obtained e.g. by fitting of a bow thruster system

# Systems

## Fuel system

Continuous fuel supply to the engines shall be available during repeated rolling up to 140° (70° to each side) and with a trim of 20°.

The fuel system shall be fully functional following a 360° roll.

The ventilation arrangement of fuel tanks shall be designed in such a way that fuel oil does not run out of nor seawater run into the tanks if the vessel capsizes or go through a 360° roll.

The capacity of the fuel tanks shall be as large as possible, but not less than that required for 20 hours operation at rated engine load.

Internal lines between fuel tanks belonging to the same propulsion system is permitted.

Pumping of fuel oil from one propulsion system to another during operation shall be possible by using a hand pump.

The suction pipe in the tank shall be located such that the tank can only be emptied to 100 mm above the bottom of the tank (not counting wells).

The fuel system shall not have remote-controlled quick shut-off valves. There shall be an arrangement for preventing the formation of air in the fuel system.

## Exhaust system

There shall be an arrangement for preventing water entering the exhaust pipe during operation and during a roll.

## Cooling water

Cooling water pumps shall be self-priming.

Freshwater cooling shall be provided with suitable anti-freeze equipment.

# Electrical installations

## General provisions

Continuous fuel supply to the engines shall be available during repeated rolling up to 140° (70° to each side) and with a trim of 20°.

The electrical power supply shall be fully functional following a 360° roll.

## Electric supply to radio installations.

Electrical power sufficient to operate the radio installations and to charge any batteries used as part of a source or sources of energy for the radio installations shall be available while the vessel is at sea.

The radio installations shall be connected to the vessel's main source of energy and to a separate radio battery by means of an automatic reverser.

An alarm shall be fitted next to the radio equipment which is activated when the radio equipment is being driven solely by the separate radio battery.

The lighting and navigational equipment required which is connected to the vessel's radio equipment shall be connected to the same source of energy as the radio equipment.

If the vessel is engaged on voyages in sea area A2, the VHF-DSC and the MF-DSC shall be capable of simultaneously being supplied by the radio battery for at least 6 hours.

# fire safety

## General

If the vessel is fitted with a galley the following limitations apply:

* No open flame appliances shall be fitted.
* Electrical equipment generating more than 5 kW of power shall not be fitted.

## Structural fire protection

## Fire detection

The requirements for DNVGL class notation specified in Sect. 3 do not apply.

An approved fixed fire-detection shall be fitted in each machinery space. In addition, two approved 6 kg ABC handheld fire extinguishers for each engine room. The extinguishers shall be mounted at the entrance descending to each engine room

The fire-detection system shall be so designed and the detectors so positioned as to detect rapidly the onset of fire in any part of those spaces and under any normal conditions of operation of the machinery and variations of ventilation as required by the possible range of ambient temperatures.

The detection system shall initiate audible and visual alarms in the accommodation and at the conning position.

## Fire extinction

The requirements for DNVGL class notation specified in Sect. 3 do not apply.

A class approved fixed fire-extinguishing system shall be fitted in all machinery spaces.

One approved ABC fire-extinguisher of at least 6 kg shall be fitted in accommodation and rescue spaces and mounted immediately inside of the entrance.

One approved ABC fire-extinguisher of at least 6 kg shall be fitted in the wheel house mounted immediately inside of the entrance.

# lIFE SAVING APPLIANCES

## Life jackets and buoys

One lifejacket of an approved type fitted with an approved light shall be carried for each crew member and for each of the number of rescued persons the vessel is designed to carry.

One approved immersion suit shall be carried on for each crew member. Immersion suits shall be located close to the life-saving appliances and, insofar as possible, so that they are accessible from open deck.

Two approved lifebuoys with an electric light and a buoyant line of at least 27.5 m shall be carried.

The Lifebuoys shall be marked with the name and port of registry of the vessel in legible block capitals in the Roman alphabet.

## Life rafts

Inflatable “SOLAS” life rafts with sufficient capacity to accommodate the normal crew and the number of rescued persons the vessel is designed to carry shall be carried on both sides.

The life rafts shall be appropriately positioned having regard to the lowering of the rafts and protection against the sea.

The life rafts shall not be fitted with hydrostatic release units.

Life rafts shall be arranged so that they can immediately be moved for release from either side of the vessel.

## Pyrotechnics

12 approved rocket parachute flares and 12 approved red hand flares shall be carried.

At least 2 orange smoke signals and 6 white star rockets for showing the life-saving signals stipulated in Notice B from the Danish Maritime Authority, chapter V, regulation 16.

In addition to the lights prescribed in the International Regulations for Preventing Collisions at Sea, the coastal rescue vessel shall be fitted with a blue flashing light.

# NAVIGATION

The vessel shall be equipped with the following navigation equipment:

* A magnetic compass.
* ECDIS.
* A suitable radar.
* A suitable echo sounder.
* A receiver for a global satellite navigation system capable of automatically determining and updating the position of the vessel at all times during the entire planned voyage.
* At least two suitable searchlights for use in search and rescue operations during the night.
* A daylight signaling lamp.
* “The International Code of Signals” and signal flags relevant to the coastal rescue service and “the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual”.
* A suitable pair of binoculars and night binoculars.

# RADIO EQUIPMENT

The vessel shall when at sea be capable of transmitting ship-to-shore distress alerts by at least two separate and independent means, each using a different radio-communication service;

- of receiving shore-to-ship distress alerts

- of transmitting and receiving ship-to-ship distress alerts

- of transmitting and receiving search and rescue coordinating communications

- of transmitting and receiving on-scene communications

- of transmitting and receiving maritime safety information

- of transmitting and receiving general radio communications to and from shore based radio systems or networks subject to regulation

- of transmitting and receiving bridge-to bridge communications.

Fulfilling the above functional requirements the ship shall be fitted as a minimum with following radio equipment:

* 2 off VHF-DSC
* 1 off MF-DSC
* 1 off EPIRB manual
* 1 off SART
* 1 off Portable VHF
* 1 off NAVTEX

The radio installation shall be fitted with reliable, permanently installed electrical lighting providing adequate light for the operating facilities of the radio installation.

DSC and any Inmarsat equipment shall be continually and automatically supplied with information on the position of the vessel from the navigational equipment.

The radio installation shall be clearly marked with the vessel's name, call sign and MMSI number.

The vessels shall be fitted with mobile telephone (GSM).

Effective means to communicate between wheelhouse and working areas on deck shall be provided without involving any operation of the communication equipment by the deck personnel.

# Rescue from water

## Rescue zone

The vessel shall have dedicated rescue zones on both sides in which the railing can be opened to facilitate the boarding of rescued persons.

It shall be possible to deploy a boarding net in the rescue zone which extends from the deck to a least 1 m below the waterline. The lowest part of the boarding net shall be fitted with ballast to enable it to sink below the surface of the water.

It shall be possible to illuminate the rescue zone, the deck in the rescue zone and the water surrounding the rescue zone.

## Crane

A crane approved for lifting persons out of the water at sea state 3 with a capacity of SWL 300 kg at 2.0 meters outreach (over the side of the boat) shall be fitted for application in the both rescue zones.

Alternative and efficient arrangements may be fitted instead of the crane or with the crane, for example net scoops.

# Other equipment

The coastal rescue vessel shall have efficient fenders. The fenders shall prevent the vessel from being damaged when it pulls alongside another vessel in rough weather in the open sea.

The vessel shall be provided with an effective megaphone.

There shall be two approximately 4 meters long boathooks and one approximately 4 meters long pole fitted with a suitable ring approximately 50 cm in diameter.

An approved line-throwing appliance with four projectiles and four lines shall be carried on board. The vessel shall carry hauling lines, mooring equipment and tow ropes as necessary.

The vessel shall carry medicine and medicaments, etc. in accordance with the rules in force for cargo ships in the relevant service area. In addition, such medicine and medicaments, etc. may be carried as may be required in accordance with the function of the coastal rescue vessel.

A suitable hoistable stretcher shall be carried.

A suitable number of woolen blankets or similar shall be carried for use by rescued persons.

It shall be possible to prepare hot drinks or hot soup for rescued persons.

# ADDITIONAL INSTALLATIONS

In general, all equipment, etc. on board shall be fixed, lashed, placed in fittings, compartments or the like, and no equipment may have been placed unsecured on board.

No equipment may be stowed in engine spaces or steering gear spaces.

The vessel shall be painted in highly visible colors.

About DNV GL

Driven by our purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. We provide classification and technical assurance along with software and independent expert advisory services to the maritime, oil & gas and energy industries. We also provide certification services to customers across a wide range of industries. Operating in more than 100 countries, our professionals are dedicated to helping our customers make the world safer, smarter and greener.