

**RULES  
FOR THE CLASSIFICATION OF  
SHIPS**

*Part 12 – ELECTRICAL EQUIPMENT  
January 2020*

*Amendments No. 3  
July 2022*

**CROATIAN REGISTER OF SHIPPING**

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By the decision of the General Committee of Croatian Register of Shipping,

Amendments No. 3 to the  
**RULES FOR THE CLASSIFICATION OF SHIPS**  
Part 12 – ELECTRICAL EQUIPMENT

have been adopted on 27th June and shall enter into force on 1st July 2022

## **INTRODUCTORY NOTES**

These amendments shall be read together with the requirements in the Rules for the Classification of Ships, Part 12 – Electrical Equipment, edition January 2020, as amended by Amendments No. 2, edition January 2022.

Table 1 contains review of amendments, where items changed or added in relating to previous edition are given, with short description of each modification or addition. All major changes throughout the text are shaded.

This Part of the Rules includes the requirements of the following international Organisations:

**International Maritime Organization (IMO)**

**Conventions:** International Convention for the Safety of Life at Sea 1974 (SOLAS 1974) and all subsequent amendments up to and including amendments(MSC.364(92)) adopted by Protocol of 1988 relating to the International Convention for the Safety of Life at Sea 1974, as amended (SOLAS PROT 1988).

**International Association of Classification Societies (IACS)**

**Unified Requirements (UR):** E5 (Rev. 1, 2005), E7 (Rev. 5, 2021), E9 (Rev. 1, 2012), E10 (Rev. 8 Corr. 1, 2022), E11 (Rev. 4, 2021), E12 (Rev. 2, 2020), E13 (Rev. 3, 2020), E15 (Rev. 4, 2020), E16 (2002), E17 (Rev. 1, 2021), E18 (Rev. 1, 2014), E19 (Rev. 1, 2005), E20 (Rev. 1, 2009), E21 (Rev. 1, 2021), E22 (Rev. 2, 2010), E24 (Rev. 1, 2018), E25 (Rev. 1, 2019), M64 (Rev. 1, 2004)

**Unified Interpretations (UI):** SC1 (Rev. 2, 2021), SC3 (Rev. 1, 1999), SC4 (1985), SC5 (1985), SC6 (Rev. 1, 2019), SC7 (1985), SC8 (1985), SC9 (1985), SC10 (Rev. 3, 2021), SC11 (Rev. 1, 2021), SC12 (1985), SC13 (1985), SC17 (Rev. 2, 2005), SC70 (Rev. 4, 2021), SC83 (1993), SC94 (Rev. 2 Corr. 1, 2018), SC95 (1994), SC124 (Rev. 1 Corr. 1, 2007), SC134 (2002), SC136 (Rev. 3, 2005), SC151 (1999), SC152 (1999), SC157 (Rev. 1, 2005), SC176 (Rev. 1, 2004), SC180 (Rev. 4, 2021), SC184 (Rev. 1, 2005), SC185 (Rev. 1, 2005), SC186 (Corr. 1, 2010); SC187 (2004), SC194 (Rev. 1, 2021), SC 274 (Rev. 1, 2021), SC290 (2018)

**Recommendations (Rec.):** Rec. 73 (Rev.1 Corr.1 2021), Rec. 35 (Rev.2 2021), Rec. 120 (2015)

## TABLE 1 – REVIEW OF AMENDMENTS

This review comprises amendments in relation to the Rules for the Classification of Ships, Part 12 – Electrical Equipment, edition January 2020, as amended by Amendments No. 2, edition January 2022.

<i>ITEM</i>	<i>DESCRIPTION OF THE AMENDMENTS</i>
<b>SECTION 2 CONSTRUCTION OF ELECTRICAL EQUIPMENT</b>	
Item 2.2.5	Item has been amended to align the requirements with the updated IACS UI SC194 (Rev.1 2021), which unified the way to refer to instruments other than those specified by IACS.
<b>SECTION 3 MAIN ELECTRICAL POWER SOURCES</b>	
Item 3.2.3	Item has been amended to include the requirements of the updated IACS UI SC1 (Rev.2 2021) and IACS UR E17 (Rev.1 2021).
<b>SECTION 5 ELECTRICAL DRIVES FOR SHIP MECHANISMS AND EQUIPMENT</b>	
Item 5.13.1 Item 5.13.2.1 Item 5.13.3.1 Item 5.13.4.2	Items have been amended to align the requirements with the updated IACS UR E21 (Rev.1 2021), which unified the way to refer to instruments other than those specified by IACS.
<b>SECTION 16 CABLES AND CONDUCTORS</b>	
Item 16.1.1	Item has been amended to align the requirements with the updated IACS UR E7 (Rev.5 2021), which unified the way to refer to instruments other than those specified by IACS.
Item 16.8.1.1 Item 16.8.4.3.1	Items have been amended to include the requirements of the updated IACS UI SC10 (Rev.3 2021) and IACS UI SC11 (Rev.1 2021).
Item 16.8.11.7	Item 16.8.11.7 has been deleted (item 16.8.11.3 has same requirements).
<b>SECTION 18 ADDITIONAL REQUIREMENTS FOR ELECTRICAL EQUIPMENT DESIGNED FOR VOLTAGES ABOVE 1 kV TO 15 kV</b>	
Item 18.2.2.1 Item 18.2.3.2 Item 18.3.3 Item 18.4.1 Item 18.5.1 Item 18.6.1 Item 18.6.2.1 Item 18.6.2.5 Item 18.6.4 Item 18.7.1	Items have been amended to align the requirements with the updated IACS UR E11 (Rev.1 2021), which unified the way to refer to instruments other than those specified by IACS.
<b>SECTION 19 SPECIAL REQUIREMENTS FOR ELECTRICAL EQUIPMENT WITH RESPECT TO SHIP PURPOSE</b>	
Item 19.2.1	Item has been amended to align with the IACS unified way to refer to instruments other than those specified by IACS.
Item 19.2.3.1	Item has been amended to align the requirements with the updated IACS UI SC70 (Rev.4 2021), which unified the way to refer to instruments other than those specified by IACS.
Item 19.2.3.5	Item has been amended to align the requirements with the updated IACS UI SC274 (Rev.1 2021).
Item 19.2.4.1	Item has been amended to align with the IACS unified way to refer to instruments other than those specified by IACS.
Item 19.8.6	Item has been amended to align the requirements with the updated IACS UI SC180 (Rev.4 2021), which unified the way to refer to instruments other than those specified by IACS.

## 2 CONSTRUCTION OF ELECTRICAL EQUIPMENT

■ **Head 2.2 ELECTROMAGNETIC COMPATIBILITY**, item 2.2.5 has been changed and should be read as follows:

### 2.2.5 Installation of electrical and electronic appliances on the bridge and vicinity of the bridge

#### 2.2.5.1 General

All electrical and electronic appliances installed on the bridge and vicinity of the bridge other than mandatory navigation and communication equipment having been type tested according to IEC 60945:2002, as well as loose equipment placed on board by the builders or owners shall have been EMC tested for Conducted and Radiated Emission. Bridge and vicinity of the bridge covers deck and bridge zone, i.e.:

- the wheelhouse including bridge wings,
- control rooms, characterized by equipment for inter-communication, signal processing, radio communication and navigation, auxiliary equipment,
- area in close proximity to receiving and/or transmitting antennas and large openings in the metallic structure (equipment beyond 5 meters need not be considered for this pur-poses).

#### 2.2.5.2 Test standards

The following are acceptable test standards:

- IEC 60945:2002,
- IEC 60533:2015.

#### 2.2.5.3 Passive-EM equipment

Passive EM equipment defined below, which is excluded from the scope of the EMC since it is considered not liable to cause or be susceptible to disturbances need not to be tested but shall be provided with an exemption statement.

Equipment is considered a passive-EM equipment if, when used as intended (without internal protection measures such as filtering or shielding) and without any user intervention, it does not create or produce any switching or oscillation of current or voltage and is not affected by electromagnetic disturbances.

Example of equipment which include no active electronic part:

- Cables and cabling systems, cables accessories.
- Equipment containing only resistive loads without any automatic switching device; e.g. simple domestic heaters with no controls, thermostat, or fan.
- Batteries and accumulators.

#### 2.2.5.4 Evidence

All electrical and electronic appliances installed on the bridge and vicinity of the bridge other than mandatory navigation and communication equipment having been type tested according to IEC 60945:2002, as well as loose equipment placed on board by the builders or owners shall be listed and be provided with at least the following information. The list and the evidence of equipment are to be kept onboard.

- equipment description
- manufacturer
- type / model
- evidence of EMC compatibility which may be:
  - type approval certificate covering EMC requirements for bridge installations;
  - test certificate or report / conformity statement; or
  - exemption statement.

### 3 MAIN ELECTRICAL POWER SOURCES

■ **Head 3.2 ELECTRICAL GENERATING SETS**, item 3.2.3 has been changed and should be read as follows:

#### 3.2.3 Shaft driven generator systems

**3.2.3.1** Generators and generator systems, having the ship's main propulsion machinery as their prime mover, may be accepted as part of the ship's main source of electrical power, provided:

1. They are to be capable of operating under all weather conditions during sailing and during manoeuvring, also when the vessel is stopped, within the specified limits for the voltage variation and the frequency variation in 2.1.1.1.
2. Their rated capacity is safeguarded during all operations given under 1, and is such that in the event of any other one of the generators failing, the services given under 3.1.3 can be maintained.
3. The short circuit current of the generator/generator system is sufficient to trip the generator/generator system circuit-breaker taking into account the selectivity of the protective devices for the distribution system. Protection is to be arranged in order to safeguard the generator/generator system in case of a short circuit in the main bus bar. The generator/generator system is to be suitable for further use after fault clearance.
4. Standby sets are started in compliance with the item 3.1.7.

**3.2.3.2** Generators and generator systems, having the ship's main propulsion machinery as their prime mover, but not forming part of the ship's main source of electrical power may be used whilst the ship is at sea to supply electrical services required for normal operational and habitable conditions provided that:

- .1 There are sufficient and adequately rated additional generators fitted, which constitute the main source of electrical power required by 3.1.1.
- .2 Arrangements are fitted to automatically start one or more of the generators, constituting the main source of electrical power required by 3.1.1, in compliance with 3.1.7 and also upon the frequency variations exceeding  $\pm 10\%$  of the limits specified below.
- .3 Within the declared operating range of the generators and/or generator systems the specified limits for the voltage variations and the frequency variations in 2.1.1.1 can be met.
- .4 The short circuit current of the generator and/or generator system is sufficient to trip the generator/generator system circuit-breaker taking into account the selectivity of the protective devices for the distribution system.
- .5 Where considered appropriate, load shedding arrangements are fitted to meet the requirements of 3.1.8.
- .6 On ships having remote control of the ship's propulsion machinery from the navigating bridge means are provided, or procedures be in place, so as to ensure that supplies to essential services are maintained during manoeuvring conditions in order to avoid a blackout situation.

## 5 ELECTRICAL DRIVES FOR SHIP MECHANISMS AND EQUIPMENT

■ **Head 5.13 REQUIREMENTS FOR UNINTERRUPTIBLE POWER SYSTEM (UPS) UNITS AS ALTERNATIVE AND/OR TRANSITIONAL POWER**, items 5.13.1, 5.13.2.1, 5.13.3.1 and 5.13.4.2 have been changed and should be read as follows:

### 5.13.1 Scope

These requirements to UPS units, as defined in IEC 62040-3:2011, apply when providing an alternative power supply or transitional power supply to services as defined in section 9. and 19. these Rules.

A UPS unit complying with these requirements may provide an alternative power supply as an accumulator battery in terms of being an independent power supply for services defined in items 9.3.1.3 – 9.3.1.6 and 19.1.2.1.4 – 19.1.2.1.6 these Rules.

**5.13.2.1** Un-interruptible Power System (UPS) - combination of converters, switches and energy storage means, for example batteries, constituting a power system for maintaining continuity of load power in case of input power failure (IEC 62040-3:2011).

**5.13.3.1** UPS units are to be constructed in accordance with IEC 62040-1:2017, IEC 62040-2:2016, IEC 62040-3:2011, IEC 62040-4:2013 and/or IEC-62040-5-3:2016, as applicable, or an acceptable and relevant national or international standard.

**5.13.4.2** UPS units utilising valve regulated sealed batteries may be located in compartments with normal electrical equipment, provided the ventilation arrangements are in accordance with the requirements of IEC 62040-1:2017, IEC 62040-2:2016, IEC 62040-3:2011, IEC 62040-4:2013 and/or IEC-62040-5-3:2016, as applicable, or an acceptable and relevant national or international standard.



## 16 CABLES AND CONDUCTORS

■ **Head 16.1 GENERAL REQUIREMENTS**, item 16.1.1 has been changed and should be read as follows:

**16.1.1** Cables are to be of a type approved. Cables manufactured in accordance with the relevant recommendation of IEC 60092-350:2020, 60092-352:2005, 60092-353:2016, 60092-354:2020, 60092-360:2014, 60092-370:2019 and 60092-376:2017 will be accepted by the Register provided that are tested to satisfaction.

■ **Head 16.8 CABLING**, items 16.8.1.1, 16.8.4.3.1 and 16.8.11.7 have been changed and should be read as follows:

**16.8.1.1** Non-combustible and flame-retardant cables and conductors with copper cores manufactured in compliance with the requirements of this part of the Rules or approved standards shall be used only. The use of other cables, as well as conductors shall be subject to special consideration by the *Register*.

All electric cables and wiring external to equipment shall be at least of a flame-retardant type (this may be achieved by cables which have been tested in accordance with IEC 60332-1-2:2004+AMD1:2015 or a test procedure equivalent thereto) and shall be so installed as not to impair their original flame-retarding properties (see 16.8.4.3.1 and 16.8.4.3.2).

Cables and wiring serving essential or emergency power, lighting, internal communications or signals shall so far as practicable be routed clear of galleys, laundries, machinery spaces of category A and their casings and other high fire risk areas (high fire risk areas are those considered as such in the *Rules for the classification of ships, Part 17 – Fire protection, Section 9*).

**16.8.4.3.1** Cables laid in bunches shall be type approved in accordance with the IEC 60332-3-22:2018 Category A or equivalent thereto.

**16.8.11.7** The electrical cables to the emergency fire pump are not pass through the machinery spaces containing the main fire pumps and their source of power and prime mover. They are to be of a fire resistant type, in accordance with item 16.8.11.1, where they pass through other high fire risk areas.

## 18 ADDITIONAL REQUIREMENTS FOR ELECTRICAL EQUIPMENT DESIGNED FOR VOLTAGE ABOVE 1kV TO 15kV

■ **Heads 18.2 SYSTEM DESIGN, 18.3 ROTATING MACHINERY, 18.4 POWER TRANSFORMERS, 18.5 CABLES, 18.6 SWITCHGEAR AND CONTROLGEAR ASSEMBLIES and 18.7 INSTALLATION,** items 18.2.2.1, 18.2.3.2, 18.3.3, 18.4.1, 18.5.1, 18.6.1, 18.6.2.1, 18.6.2.5, 18.6.4 and 18.7.1 have been changed and should be read as follows:

### 18.2.2.1 General

Each part of the electrical installation is to be provided with a degree of protection appropriate to the location, as a minimum the requirements of IEC 60092-201:2019.

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### 18.2.3.2 Creepage distances

Creepage distances between live parts and between live parts and earthed metal parts are to be in accordance with IEC 60092-503:2007 for the nominal voltage of the system, the nature of the insulation material and the transient overvoltage developed by switch and fault conditions.

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### 18.3.3 Tests

In addition to the tests normally required for rotating machinery, a high frequency high voltage test in accordance with IEC 60034-15:2009 is to be carried out on the individual coils in order to demonstrate a satisfactory withstand level of the inter-turn insulation to steep fronted switching surges.

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### 18.4.1 General

Dry type transformers have to comply with IEC 60076-11:2018. Liquid cooled transformers have to comply with the applicable Parts of the IEC 60076 Series. Oil immersed transformers are to be provided with the following alarms and protections:

- liquid level (Low)-alarm
- liquid temperature (High)-alarm
- liquid level (Low)-trip or load reduction
- liquid temperature (High)-trip or load reduction
- gas pressure relay (High)-trip

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### 18.5.1 General

Cables are to be constructed in accordance with the IEC 60092-353:2016 and 60092-354:2020 or other equivalent Standard.

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### 18.6.1 General

Switchgear and controlgear assemblies are to be constructed according to the IEC 62271-200:2011 and the following additional requirements.

#### 18.6.2.1 Mechanical construction

Switchgear is to be of metal – enclosed type in accordance with IEC 62271-200:2011 or of the insulation – enclosed type in accordance with the IEC 62271-201:2014.

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#### 18.6.2.5 Internal arc Classification (IAC)

Switchgear and controlgear assemblies shall be internal arc classified (IAC). Where switchgears are accessible by authorized personnel only Accessibility Type A is sufficient (IEC 62271-200:2011; Annex AA; AA 2.2). Accessibility Type B is required if accessible by non-authorized personnel.

Installation and location of the switchgear shall correspond with its internal arc classification and classified sides (F, L and R).

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#### **18.6.4 High voltage test**

A power-frequency voltage test is to be carried out on any switchgear and controlgear assemblies. The test procedure and voltages are to be according to the [IEC 62271-200:2011](#) section 7 / routine test.

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#### **18.7.1 Electrical equipment**

Where equipment is not contained in an enclosure but a room forms the enclosure of the equipment, the access doors are to be so interlocked that they cannot be opened until the supply is isolated and the equipment earthed down.

At the entrance of the spaces where high-voltage electrical equipment is installed, a suitable marking is to be placed which indicates danger of high-voltage. As regard the high-voltage electrical equipment installed out-side a.m. spaces, the similar marking is to be provided.

An adequate, unobstructed working space is to be left in the vicinity of high voltage equipment for preventing potential severe injuries to personnel performing maintenance activities. In addition, the clearance between the switchboard and the ceiling/deckhead above is to meet the requirements of the Internal Arc Classification according to [IEC 62271-200:2011](#) (see 18.6.2.5).

**PART 12**

AMENDMENTS No. 3

## 19 SPECIAL REQUIREMENTS FOR ELECTRICAL EQUIPMENT WITH RESPECT TO SHIP PURPOSE

■ **Head 19.2 OIL TANKERS AND OIL RECOVERY SHIPS**, items 19.2.1, 19.2.3.1, 19.2.3.5 and 19.2.4.1 have been changed and should be read as follows:

### 19.2.1 General provisions

The requirements of this Section apply to the electrical equipment of oil tankers intended for the carriage of liquids having a flash point  $\leq 60^{\circ}\text{C}$  or liquids having a flash point  $> 60^{\circ}\text{C}$  (closed cup test) for which heating is required up to a temperature within  $15^{\circ}\text{C}$  of its flash point and also the electrical equipment of ships intended for the recovery and transporting of oil spill on the sea surface, and they are set forth in addition to the requirements referred to in other chapters of the present Rules, in particular to those in section 2.9.

For oil tankers, for condition as specified in this item have to be according to **IEC 60092-502:1999**.

**19.2.3.1** Following spaces and areas are with risk of explosion which is likely to occur:

#### Zone 0:

- .1 internal cargo compartments and tanks, cargo piping and transfer system;
- .2 open areas at a height up to 1 m above oil-covered water surface (for oil recovery ships);

#### Zone 1:

- .1 cofferdams and other spaces adjoining cargo compartments and tanks;
- .2 enclosed and semi-enclosed spaces containing cargo pumps and cargo piping provided the latter are not all-welded;
- .3 enclosed and semi-enclosed spaces above the deck of cargo compartments and tanks as well as other spaces which have their bulkheads above or in level with the bulk-heads of the cargo compartments and tanks;
- .4 enclosed and semi-enclosed spaces above cargo pump rooms and also above vertical cofferdams adjoining cargo compartments and tanks unless separated by a gastight deck and provided with forced ventilation;
- .5 areas and spaces other than cofferdams adjoining cargo compartments and tanks and located below cargo compartment and tank top level;
- .6 areas and semi-enclosed spaces on the open deck within a radius of 3 m from ventilation outlets, cargo tank manholes and hatches, pump rooms and cofferdams adjoining the cargo tanks;
- .7 areas on the open deck above cargo compartments and tanks (including ballast tanks when used as cargo tanks) over the full width of the ship and 3 m fore and aft of their boundary bulkheads up to a height of 2,4 m above the deck.

For oil recovery ships, this area extends to the full length of the ship;

- .8 **A1** - Areas on open deck, or semi-enclosed spaces on open deck, within 3 m of cargo tank ventilation outlets which permit the flow of small volumes of vapour or gas mixtures caused by thermal variation are defined as Zone 1 as specified by **IEC 60092-502:1999** para. 4.2.2.7;
- .9 **B1** - Areas on open deck, or semi-enclosed spaces on open deck, within a vertical cylinder of unlimited height and 6 m radius centred upon the centre of the outlet, and within a hemisphere of 6 m radius below the outlet which permit the flow of large volumes of vapour or gas mixtures during loading/discharging/ballasting are defined as Zone 1 as specified by **IEC 60092-502:1999** para 4.2.2.8;
- .10 storage spaces for cargo hoses and equipment for collecting spilled oil;
- .11 enclosed or semi-enclosed spaces having exits or other openings directly into one of the above areas and spaces;
- .12 spaces and areas above cofferdams adjoining cargo compartments and tanks and separated from them by oil and gastight bulkheads and decks not adequately ventilated and entered from an upper deck;
- .13 spaces with electrical motors of cargo pumps and stripping pumps and which are located above pump rooms.

#### Zone 2:

- .1 Areas above zone 1 over the full width and length of the ship to a height of 6 m above the deepest load waterline (for oil recovery ships);
- .2 **A2** - Areas within 2 m beyond the zone specified in A1 above are to be considered Zone 2 (as opposed to 1.5 m as specified by **IEC 60092-502:1999** para 4.2.3.1);
- .3 **B2** - Areas within 4 m beyond the zone specified in B1 above are defined as Zone 2 as specified by **IEC 60092-502:1999** para 4.2.3.2.

Spaces and areas not included in zones 0, 1 and 2 are considered safe.

**19.2.3.5** Electrical equipment, cables and wiring shall not be installed in hazardous locations unless it conforms with standards not inferior to those acceptable to the *Register* - IEC 60092-502:1999. However, for locations not covered by such standards, electrical equipment, cables and wiring which do not conform to the standards may be installed in hazardous locations based on a risk assessment to the satisfaction of the *Register*, to ensure that an equivalent level of safety is assured.

Where the prescriptive requirements within SOLAS and related Codes (IBC, IGC) and the standards published by the International Electrotechnical Commission, such as but not limited to IEC 60092-502:1999, are not aligned, the prescriptive requirements in SOLAS and Codes take precedence and are to be applied (see UI SC274).

**19.2.4.1** In hazardous spaces only safe-type (explosion-proof) electrical equipment shall be permitted provided that such equipment is designed, manufactured and tested in compliance with IEC 60079 Series and if the Certificate of type testing issued by the respective Authorities is provided:

- .1 lighting fixtures and navigational lanterns with pressurised enclosures (Exp), with flameproof enclosure (Exd) or with in-creased safety type (Exe);
- .2 junction boxes of increased safety type (Exe) or with flameproof enclosure (Exd);
- .3 Control, monitoring, remote-control and communication equipment of intrinsically safe type (Exi);
- .4 electrical motors:
  - with flameproof enclosure (Exd)
  - at increased safety type (Exe);
  - with pressurised enclosure (Exp)

■ **Head 19.8 BULK CARRIERS**, item 19.8.6 has been changed and should be read as follows:

**19.8.6** Performance standard of electrical equipment (detectors, alarms panel ) are to be in according to IMO Resolution MSC.188(79) and requirements of IACS UI SC 180.