



**DRAFT INTERNATIONAL STANDARD**  
IEC/IEEE DIS 80005-3

Attributed to ISO/TC 8/SC 3 by the Central Secretariat (see page iii)

ISO/IEC voting begins on:  
**2016-07-29**

ISO/IEC voting terminates on:  
**2016-10-21**

Software & Systems Engineering Standards Committee  
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## Utility connections in port — Part 3 Low voltage shore connection (LVSC) systems — General requirements

Alimentation des navires à quai — Partie 3 Systèmes de connexion à quai à basse tension — Exigences générales

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ICS 47.020.60

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## UTILITY CONNECTIONS IN PORT –

### Part 3: Low Voltage Shore Connection (LVSC) Systems – General requirements

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 73 subcommittee 23H: Plugs, socket-outlets and couplers for industrial and similar applications,  
 74 and for electric vehicles, of IEC technical committee 23: Electrical accessories, ISO technical  
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103

## INTRODUCTION

104 The following standard was developed jointly between IEC technical committee 18: Electrical  
105 installations of ships and of mobile and fixed offshore units, ISO technical committee 8: Ships  
106 and marine technology, subcommittee 3: Piping and Machinery, and IEEE IAS PCIC Marine  
107 Industry subcommittee.

108 For a variety of reasons, including environmental considerations, it is becoming an  
109 increasingly common requirement for ships to shut down ship generators and to connect to  
110 shore power for as long as practicable during stays in port.

111 The intention of this standard is to define requirements that support, with the application of  
112 suitable operating practices, efficiency and safety of connections by compliant ships to  
113 compliant low-voltage shore power supplies through a compatible shore-to-ship connection.

114 With the support of sufficient planning, cooperation between ship and terminal facilities, and  
115 appropriate operating procedures and assessment, compliance with the requirements of this  
116 standard is intended to allow different ships to connect to low-voltage shore connection  
117 (LVSC) systems at different berths. This provides the benefits of standard, straightforward  
118 connection without the need for adaptation and adjustment at different locations that can  
119 satisfy the requirement to connect for as long as practicable during stays in port.

120 Ships that do not apply this standard may find it impossible to connect to compliant shore  
121 supplies.

122 Where deviations from the requirements and recommendations in this standard may be  
123 considered for certain designs, the potential effects on compatibility are highlighted.

124 Where the requirements and recommendations of this standard are complied with, low-voltage  
125 shore supplies arrangements are likely to be compatible for visiting ships for connection.

126 Clauses 1 to 12 are intended for application to all LVSC systems. They intend to address  
127 mainly the safety and effectiveness of LVSC systems with a minimum level of requirements  
128 that would standardise on one solution. This standard includes the requirement to complete a  
129 detailed compatibility assessment for each combination of ship and shore supply prior to a  
130 given ship arriving to connect to a given shore supply for the first time.

131 The other annexes in this standard are ship specific annexes that include additional  
132 requirements related to agreed standardisation of solutions to achieve compatibility for  
133 compliant ships at different compliant berths and to address safety issues that are considered  
134 to be particular to that ship type. These annexes use the same numbering as Clauses 1 to 12  
135 with an annex letter prefix. Hence, the numbering is not necessarily continuous. Where no  
136 additional requirements are identified, the clause is not shown.

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## UTILITY CONNECTIONS IN PORT –

### Part 3: Low Voltage Shore Connection (LVSC) Systems – General requirements

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#### 145 **1 Scope**

146 This part of IEC/IEEE 80005 describes low voltage shore connection (LVSC) systems, on  
147 board the ship and on shore, to supply the ship with electrical power from shore.

148 This standard is applicable to the design, installation and testing of LVSC systems and  
149 addresses:

- 150 • LV shore distribution systems;
- 151 • shore-to-ship connection and interface equipment;
- 152 • transformers/reactors;
- 153 • semiconductor/rotating convertors;
- 154 • ship distribution systems; and
- 155 • protection, control, monitoring, interlocking and power management systems.

156

157 NOTE it does not apply to the electrical power supply during docking periods, e.g. dry docking and other out-of-  
158 service maintenance and repair.

159 Additional and/or alternative requirements may be imposed by national administrations or the  
160 authorities within whose jurisdiction the ship is intended to operate and/or by the owners or  
161 authorities responsible for a shore supply or distribution system.

162 It is expected that LVSC systems will have practicable applications for ships requiring up to  
163 1 MVA while at berth. Low-voltage shore connection systems exceeding 250 A, equal or  
164 exceeding 400 V a.c. and up to 1000 V a.c. nominal voltage are covered by this standard.  
165 High-voltage shore connection systems are covered by Part 1 of this standard.

166 This standard does not cover marinas and boatyards, or systems intended to be operated by  
167 ordinary persons as defined by IEC 61439.

#### 168 **2 Normative references**

169 The following referenced documents are indispensable for the application of this document.  
170 For dated references, only the edition cited applies. For undated references, the latest edition  
171 of the referenced document (including any amendments) applies.

172 IEC 60034 (all parts), *Rotating electrical machines*

173 IEC 60076 (all parts), *Power transformers*

174 IEC 60079 (all parts), *Electrical apparatus for explosive gas atmospheres*

175 IEC 60092-101:2002, *Electrical installations in ships – Part 101: Definitions and general*  
176 *requirements*

177 IEC 60092-201:1994, *Electrical installations in ships – Part 201: System design – General*

- 178 IEC 60092-301:1995 Ed. 3.0, *Electrical installations in ships – Part 301: Equipment –*  
179 *Generators and motors*
- 180 IEC 60092-401: 1980, Ed. 3.0, *Electrical installations in ships – Part 401: Installation and test*  
181 *of completed installation*
- 182 IEC 60092-502:1999, Ed. 5.0, *Electrical installations in ships – Part 502: Tankers – Special*  
183 *features*
- 184 IEC 60092-504:2001, *Electrical installations in ships – Part 504: Special features – Control*  
185 *and instrumentation*
- 186 IEC 60146-1 (all parts), *Semiconductor convertors – General requirements and line*  
187 *commutated convertors*
- 188 IEC 60228:2004, *Conductors of insulated cables*
- 189 IEC 60204-1, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*
- 190 IEC 60309-1: *Plugs, socket-outlets and couplers for industrial purposes - Part 1: General*  
191 *requirements*
- 192 IEC 60332-1-2: *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test*  
193 *for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-*  
194 *mixed flame*
- 195 IEC 60947-2:2013 Ed. 4.2, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*  
[IEC/IEEE DIS 80005-3](http://standards.iteh.ai/catalog/standards/cist/bd35d3c-1c6d-45c7-ad8f-2b4d1bb2f2?inc=iec/iee/80005-3)
- 196 IEC 60947-5-1:2003 Ed. 3.0, *Low-voltage switchgear and controlgear – Part 5-1: Control*  
197 *circuit devices and switching elements – Electromechanical control circuit devices*
- 198 IEC 61363-1, *Electrical installations of ships and mobile and fixed offshore units – Part 1:*  
199 *Procedures for calculating short-circuit currents in three-phase a.c.*
- 200 International Convention for the Safety of Life at Sea (SOLAS):1974, *Consolidated edition*  
201 *2009, Ch. II-1/D, Regulations 42, 43 and 45*

## 202 3 Terms and definitions

203 For the purposes of this document, the following terms and definitions apply.

### 204 3.1

#### 205 cable management system

206 all equipment designed to control, monitor and handle the flexible cables, for power and  
207 control, and their connection devices

### 208 3.2

#### 209 plug and socket-outlet

210 a means enabling the connection of a flexible cable to fixed wiring. It consists of two parts:

211 NOTE For the use of plugs, socket-outlets, and ship couplers, see Figure 5 – Diagram showing the use of accessories.

- 212  
213 [SOURCE: IEC 60309-1:2012, 2.1]
- 214 **3.2.1**  
215 **socket-outlet**
- 216 the part intended to be installed with the fixed wiring (shore side) or incorporated in  
217 equipment
- 218 NOTE A socket-outlet may also be incorporated in the output circuit of an isolating transformer.
- 219  
220 [SOURCE: IEC 62613-1:2011, 3.2 modified as follows: the words in the bracket and Note to  
221 entry have been added]
- 222 **3.2.2**  
223 **plug**
- 224 the part intended to be attached directly to one flexible cable, and to be connected to the  
225 shore socket-outlet
- 226 [SOURCE: IEC 62613-1:2011, 3.3 modified as follows: the words “and to be connected to the  
227 shore socket-outlet” have been added]
- 228 **3.3**  
229 **ship coupler**
- 230 a means enabling the connection of a flexible cable to the ship. It consists of two parts:  
231 [SOURCE: IEC 62613-1:2011, 3.4]
- 232 **3.3.1** [IEC/IEEE DIS 80005-3](https://standards.iteh.ai/catalog/standards/sist/abd35dac-1c6d-45c7-ad8f-3b4d11b25ca2/iec-ieee-dis-80005-3)  
233 **ship connector** <https://standards.iteh.ai/catalog/standards/sist/abd35dac-1c6d-45c7-ad8f-3b4d11b25ca2/iec-ieee-dis-80005-3>
- 234 the part intended to be attached to one flexible cable connected to the supply, and to be  
235 connected to the ship inlet
- 236 [SOURCE: IEC 62613-1:2011, 3.5 modified as follows: the words “and to be connected to the  
237 ship inlet” have been added]
- 238 **3.3.2**  
239 **ship inlet**
- 240 the part incorporated in, or fixed to, the ship
- 241 [SOURCE: IEC 62613-1:2011, 3.6]
- 242 **3.4**  
243 **equipotential bonding**
- 244 provision of electric connections between conductive parts, intended to achieve  
245 equipotentiality
- 246 [SOURCE: IEC 60050-195:1998, 195-01-10]
- 247 **3.5**  
248 **low voltage** (abbreviation: LV)
- 249 a set of voltage levels used for the distribution of electricity and whose upper limit is generally accepted  
250 to be 1 000 V a.c.
- 251 [SOURCE: IEC 60050-601, 601-01-26]

- 252 **3.6**  
253 **person in charge**  
254 **PIC**  
255 person responsible for LVSC system operation
- 256 **3.7**  
257 **pilot contact**  
258 a contact of the plug, ship inlet, socket-outlet and ship connector which signals correct  
259 connection and which is a safety-related component
- 260 **3.8**  
261 **receiving point**  
262 connection point of the flexible cable on the ship
- 263 **3.9**  
264 **safe**  
265 condition in which safety risks are minimized to an acceptable level
- 266 **3.10**  
267 **supply point**  
268 the connection point of the flexible cable on shore
- 269 **3.11**  
270 **fail safe**  
271 a design property of an item which prevents its failures from resulting in critical faults  
272 [SOURCE: IEC 60050-195:1998, 191-15-04]
- 273 **3.12** [IEC/IEEE DIS 80005-3](https://standards.iteh.ai/catalog/standards/sist/abd35dac-1c6d-45c7-ad8f-2b4d1bb25ca2/iec-ieee-dis-80005-3)  
274 **IT power system** [https://standards.iteh.ai/catalog/standards/sist/abd35dac-1c6d-45c7-ad8f-](https://standards.iteh.ai/catalog/standards/sist/abd35dac-1c6d-45c7-ad8f-2b4d1bb25ca2/iec-ieee-dis-80005-3)  
275 ungrounded power system [2b4d1bb25ca2/iec-ieee-dis-80005-3](https://standards.iteh.ai/catalog/standards/sist/abd35dac-1c6d-45c7-ad8f-2b4d1bb25ca2/iec-ieee-dis-80005-3)
- 276 **3.13**  
277 **safety relay**  
278 is a fail safe relay as defined by the standards:  
279 [EN ISO 13849-1 and IEC/EN 62061]
- 280 **3.14**  
281 **physical connectors**  
282 electrical connectors between shore and ship are defined as in Annexes  
283
- 284 **4 General requirements**
- 285 **4.1 System description**  
286 A typical LVSC system described in this standard consists of hardware components as shown  
287 in Figure 1.