

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



GROUP SAFETY PUBLICATION  
PUBLICATION GROUPEE DE SÉCURITÉ

**Safety requirements for power electronic converter systems and equipment –  
Part 1: General**

**Exigences de sécurité applicables aux systèmes et matériels électroniques de  
conversion de puissance –  
Partie 1: Généralités**



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## CONTENTS

FOREWORD.....	11
INTRODUCTION.....	14
1 Scope.....	16
2 Normative references .....	17
3 Terms and definitions .....	20
4 Protection against hazards .....	33
4.1 General.....	33
4.2 <i>Single fault conditions and abnormal operating conditions</i> .....	33
4.3 Short-circuit and overload protection.....	34
4.3.1 General .....	34
4.3.2 Input short-circuit withstand strength and <i>output short-circuit current</i> ability.....	36
4.3.3 Short-circuit coordination (backup protection) .....	37
4.3.4 Protection by several devices .....	37
4.4 Protection against electric shock.....	37
4.4.1 General .....	37
4.4.2 <i>Decisive voltage class</i> .....	40
4.4.3 Means for <i>basic protection</i> (protection against direct contact).....	44
4.4.4 Means for <i>fault protection</i> (protection against indirect contact) .....	45
4.4.5 Means for <i>enhanced protection</i> .....	55
4.4.6 Protective means for equipment classes .....	56
4.4.7 <i>Insulation</i> .....	58
4.4.8 Compatibility with residual current-operated protective devices (RCD).....	75
4.4.9 Capacitor discharge.....	76
4.5 Protection against electrical energy hazards .....	76
4.5.1 <i>General access areas</i> .....	76
4.5.2 <i>Service access areas</i> .....	77
4.6 Protection against fire and thermal hazards .....	77
4.6.1 Circuits representing a fire hazard .....	77
4.6.2 <i>Components</i> representing a fire hazard .....	77
4.6.3 <i>Fire enclosures</i> .....	79
4.6.4 Temperature limits .....	83
4.6.5 Limited power sources .....	86
4.7 Protection against mechanical hazards .....	87
4.7.1 General .....	87
4.7.2 Specific requirements for liquid cooled <i>PECS</i> .....	88
4.7.3 Mechanical hazards from rotating parts .....	89
4.7.4 Sharp edges .....	90
4.8 <i>PECS</i> with multiple sources of supply .....	90
4.9 Protection against environmental stresses .....	91
4.10 Protection against excessive acoustic noise hazards .....	92
4.11 Wiring and connections.....	93
4.11.1 General .....	93
4.11.2 <i>Insulation</i> of conductors.....	93
4.11.3 Stranded wire .....	95
4.11.4 Routing and clamping .....	95
4.11.5 Identification of conductors and terminals .....	95

4.11.6	Splices and connections .....	96
4.11.7	<i>Accessible connections</i> .....	96
4.11.8	Interconnections between parts of the <i>PECS</i> .....	97
4.11.9	Supply connections .....	97
4.11.10	<i>Field wiring terminals</i> and internal terminals .....	99
4.11.11	Means for shield connection of shielded wire or shielded cable .....	101
4.12	<i>Enclosures</i> .....	101
4.12.1	General .....	101
4.12.2	Handles and manual controls .....	102
4.12.3	Cast metal .....	102
4.12.4	Sheet metal .....	103
4.12.5	Stability requirement for <i>enclosure</i> .....	105
4.12.6	Strain relief .....	106
4.12.7	Polymeric <i>enclosure</i> stress relief .....	106
4.12.8	Polymeric <i>enclosure</i> UV resistance .....	106
4.13	<i>Components</i> .....	106
4.13.1	General .....	106
4.13.2	PTC thermistors .....	107
4.13.3	<i>Mains supply cords</i> .....	107
4.13.4	Capacitors and RC units bridging <i>insulation</i> .....	107
4.13.5	Wound components .....	107
4.13.6	Plug and socket-outlets .....	108
4.14	Protection against electromagnetic fields .....	108
5	Test requirements .....	108
5.1	General .....	108
5.1.1	Test objectives and classification .....	108
5.1.2	Selection of test samples .....	108
5.1.3	Sequence of tests .....	108
5.1.4	Earthing conditions .....	109
5.1.5	General conditions for tests .....	109
5.1.6	Compliance .....	110
5.1.7	Test overview .....	110
5.2	Test specifications .....	112
5.2.1	<i>Visual inspection (type test and routine test)</i> .....	112
5.2.2	Mechanical tests .....	112
5.2.3	Electrical tests .....	121
5.2.4	<i>Abnormal operation</i> and simulated faults tests .....	141
5.2.5	Material tests .....	148
5.2.6	Environmental tests ( <i>type tests</i> ) .....	153
5.2.7	Hydrostatic pressure test ( <i>type test, routine test</i> ) .....	157
5.2.8	Electromagnetic fields (EMF) .....	158
6	Information and marking requirements .....	158
6.1	General .....	158
6.2	Information for selection .....	160
6.2.1	General .....	160
6.2.2	Instructions and markings pertaining to <i>accessories</i> .....	162
6.3	Information for installation and commissioning .....	162
6.3.1	General .....	162
6.3.2	Mechanical considerations .....	162

6.3.3	Environment .....	162
6.3.4	Handling and mounting .....	162
6.3.5	<i>Enclosure</i> temperature.....	163
6.3.6	<i>Open type PECS</i> .....	163
6.3.7	Connections .....	163
6.3.8	Commissioning .....	165
6.3.9	Protection requirements.....	165
6.4	Information for intended use .....	167
6.4.1	General .....	167
6.4.2	Adjustment .....	167
6.4.3	Labels, signs, symbols and signals .....	168
6.4.4	Hot surfaces .....	170
6.4.5	Control and device marking .....	170
6.5	Supplementary information .....	170
6.5.1	Maintenance .....	170
6.5.2	Capacitor discharge.....	171
6.5.3	Auto restart/bypass connection.....	171
6.5.4	Other hazards.....	171
6.5.5	<i>PECS</i> with multiple sources of supply .....	171
6.5.6	Replaceable fuses in neutral of single-phase <i>PECS</i> .....	171
Annex A	(normative) Additional information for protection against electric shock .....	173
A.1	General.....	173
A.2	Protection by means of <i>DVC As</i> .....	173
A.3	Protection by means of <i>protective impedance</i> .....	173
A.4	Protection by using limited voltages .....	174
A.5	Evaluation of the <i>working voltage</i> of circuits.....	175
A.5.1	General .....	175
A.5.2	Classification of the <i>working voltage</i> .....	175
A.5.3	<i>AC working voltage</i> .....	176
A.5.4	<i>DC working voltage</i> .....	176
A.5.5	<i>Pulsating working voltage</i> .....	177
A.6	The concept of protective means according to 4.4.....	178
A.6.1	General .....	178
A.6.2	Examples of the use of elements of protective means.....	178
Annex B	(informative) Considerations for the reduction of the <i>pollution degree</i> .....	180
B.1	General.....	180
B.2	Factors influencing the <i>pollution degree</i> .....	180
B.3	Reduction of influencing factors .....	180
Annex C	(informative) Symbols referred to in this document .....	181
C.1	Symbols used .....	181
C.2	Determination of contrast .....	182
Annex D	(normative) Evaluation of <i>clearance</i> and <i>creepage distances</i> .....	184
D.1	Measurement.....	184
D.2	Relationship of measurement to <i>pollution degree</i> .....	184
D.3	Examples.....	185
Annex E	(normative) Altitude correction for <i>clearances</i> .....	191
E.1	Correction factor for <i>clearances</i> at altitudes above 2 000 m .....	191
E.2	Test voltages for verifying <i>clearances</i> at different altitudes .....	191

Annex F (normative) <i>Clearance</i> and <i>creepage distance</i> determination for frequencies greater than 30 kHz .....	193
F.1 General influence of the frequency on the withstand characteristics.....	193
F.2 <i>Clearance</i> .....	193
F.2.1 General .....	193
F.2.2 <i>Clearance</i> for inhomogenous fields .....	194
F.2.3 <i>Clearance</i> for approximately homogenous fields .....	195
F.3 <i>Creepage distance</i> .....	196
F.4 <i>Solid insulation</i> .....	197
F.4.1 General .....	197
F.4.2 Approximately uniform field distribution without air gaps or voids.....	197
F.4.3 Other cases .....	198
Annex G (informative) Cross-sections of round conductors .....	199
Annex H (informative) Guidelines for RCD compatibility .....	200
H.1 Selection of RCD type.....	200
H.2 Fault current waveforms.....	201
Annex I (informative) Examples of <i>overvoltage category</i> reduction .....	204
I.1 General.....	204
I.2 Protection to the surroundings (see 4.4.7.2).....	204
I.2.1 Circuits connected to <i>mains supply</i> (see 4.4.7.2.3) .....	204
I.2.2 Circuits connected to the <i>non-mains supply</i> (see 4.4.7.2.4) .....	207
I.2.3 Protection between circuits (see 4.4.7.2.7) .....	207
I.3 <i>Functional insulation</i> (see 4.4.7.3) .....	208
I.4 Further examples .....	208
I.5 Circuits with multiple supplies (see 4.4.7.2.1) .....	209
Annex J (informative) Burn thresholds for touchable surfaces .....	210
J.1 General.....	210
J.2 Burn thresholds.....	210
Annex K (informative) Table of electrochemical potentials .....	214
Annex L (informative) Measuring instrument for <i>touch current</i> measurements .....	215
L.1 Measuring instrument 1.....	215
L.2 Measuring instrument 2.....	215
L.3 Measuring instrument 3.....	216
Annex M (normative) Test probes for determining access .....	217
Annex N (informative) Guidance regarding short-circuit current.....	220
N.1 General.....	220
N.2 Coordination of short-circuit current .....	221
N.2.1 General .....	221
N.2.2 <i>Conditional short-circuit current</i> ( $I_{CC}$ ) and <i>minimum required prospective short-circuit current</i> ( $I_{CP, mr}$ ) .....	221
N.2.3 <i>Short-time withstand current</i> ( $I_{CW}$ ) .....	223
N.3 Guidance for specification of short-circuit current and <i>short-circuit protective device</i> .....	224
N.3.1 General .....	224
N.3.2 Example 1: Two or more <i>PECS</i> with different ratings .....	225
N.3.3 Specification of $I_{CC}$ .....	226
N.3.4 Specification of $I_{CW}$ .....	226

N.3.5	Example 2: One <i>PECS</i> with more than one rating .....	227
N.3.6	Additional explanation on terms, definitions and specifications .....	228
N.4	Short-circuit rating and <i>single fault conditions</i> testing .....	229
N.4.1	General .....	229
N.4.2	Exemption from <i>short-time withstand current</i> testing .....	231
N.5	Guideline for short-circuit analysis .....	231
Annex O (informative)	Guidelines for determination of <i>clearance</i> and <i>creepage distances</i> .....	232
O.1	Guideline for determination of <i>clearances</i> .....	232
O.2	Guideline for determination of <i>creepage distances</i> .....	233
O.3	Minimum spacings within <i>solid insulation</i> or similar .....	233
Annex P (informative)	Protection of persons against electromagnetic fields for frequencies from 0 Hz up to 300 GHz .....	235
P.1	General influence of electromagnetic fields to persons .....	235
P.1.1	General .....	235
P.1.2	Low-frequency electric fields effects (1 Hz to 100 kHz) .....	235
P.1.3	Low-frequency magnetic fields effects (1 Hz to 100 kHz) .....	235
P.1.4	Low-frequency electric and magnetic fields effects .....	235
P.1.5	High-frequency electromagnetic fields effects (100 kHz to 300 GHz) .....	235
P.1.6	Current knowledge on low-level effects .....	236
P.1.7	Biological effects versus adverse health effects .....	236
P.1.8	Influence of EMF on passive and active medical implants .....	236
P.2	Requirements from ICNIRP LF guidelines against exposure to EMF .....	236
P.2.1	Adoption of exposure limits from ICNIRP .....	236
P.2.2	Limits of EMF exposure for transportation and storage .....	238
P.3	Protection of persons against exposure of EMF .....	238
P.3.1	General .....	238
P.3.2	EMF requirements for general public access areas .....	239
P.3.3	EMF requirements for <i>general access areas, service access areas</i> and <i>restricted access areas</i> .....	239
P.3.4	EMF requirements for transportation and storage .....	239
P.4	Electromagnetic fields (EMF) test ( <i>type test</i> ) .....	240
P.4.1	General test set up for EMF .....	240
P.4.2	EMF test ( <i>type test</i> ) .....	240
P.5	Electromagnetic fields (EMF) marking .....	240
Annex Q (informative)	Maximum disconnection times .....	241
Annex R (informative)	Risk assessment according to IEC Guide 116 .....	242
R.1	General .....	242
R.2	Risk assessment .....	242
Annex S (informative)	Guidance to product technical committees .....	244
Bibliography	.....	245

Figure 1 – Protective means for protection against electric shock considering <i>Class I equipment</i> and <i>Class II equipment</i> .....	39
Figure 2 – Protective means for protection against electric shock considering <i>Class III equipment</i> or <i>accessible circuits</i> of <i>DVC As</i> .....	40
Figure 3 – Example of a <i>PECS</i> assembly and its associated <i>protective equipotential bonding</i> .....	47

Figure 4 – Example of a <i>PECS</i> assembly and its associated <i>protective equipotential bonding</i> through direct metallic contact.....	48
Figure 5 – Time-voltage zones for <i>accessible circuits</i> of <i>DVC As</i> and <i>DVC B – DC</i> during <i>single fault conditions</i> .....	52
Figure 6 – Time-voltage zones for <i>accessible circuits</i> of <i>DVC As</i> and <i>DVC B – AC peak</i> during <i>single fault conditions</i> .....	53
Figure 7 – Time-voltage zones for conductive <i>accessible parts</i> during <i>single fault conditions</i> .....	54
Figure 8 – <i>Fire enclosure</i> bottom openings below an unenclosed or partially enclosed fire-hazardous <i>component</i> .....	81
Figure 9 – <i>Fire enclosure</i> baffle construction.....	82
Figure 10 – Example for interconnections within <i>permanently connected PECS</i> and between parts of them .....	93
Figure 11 – Example of cable as an arrangement of insulated conductors.....	94
Figure 12 – Detachable <i>mains supply</i> cords and connections.....	98
Figure 13 – Example for evaluation of wire bending space .....	101
Figure 14 – Supported and unsupported <i>enclosure</i> parts .....	103
Figure 15 – Impact test using a steel ball.....	118
Figure 16 – Voltage test procedures .....	127
Figure 17 – Partial discharge test procedure.....	129
Figure 18 – <i>Protective equipotential bonding</i> impedance test for separate <i>PECS</i> with power fed from the <i>PECS</i> with protection for the power cable .....	134
Figure 19 – <i>Protective equipotential bonding</i> impedance test for sub-assembly with <i>accessible parts</i> and with power fed from the <i>PECS</i> .....	135
Figure 20 – Electric strength test instrument .....	138
Figure 21 – Mandrel.....	139
Figure 22 – Initial position of mandrel .....	139
Figure 23 – Final position of mandrel .....	139
Figure 24 – Position of metal foil on insulating material.....	140
Figure 25 – Circuit for high-current arcing test .....	148
Figure 26 – Test fixture for hot-wire ignition test .....	150
Figure A.1 – Protection by <i>DVC As</i> with <i>enhanced protection</i> .....	173
Figure A.2 – Protection by means of <i>protective impedance</i> .....	174
Figure A.3 – Protection by using limited voltages .....	174
Figure A.4 – Typical waveform for <i>AC working voltage</i> .....	176
Figure A.5 – Typical waveform for <i>DC working voltage</i> .....	176
Figure A.6 – Typical waveform for pulsating <i>working voltage</i> .....	177
Figure D.1 – Example of measurements including a groove .....	185
Figure D.2 – Example of measurements including a groove .....	185
Figure D.3 – Example of measurements including a groove .....	185
Figure D.4 – Example of measurements including a rib.....	186
Figure D.5 – Example of measurements providing protection of type 2.....	186
Figure D.6 – Example of measurements providing protection of type 1.....	186
Figure D.7 – Example of measurements providing protection of type 1.....	187
Figure D.8 – Example of measurements providing protection of type 1.....	187
Figure D.9 – Example of measurements including a barrier (cemented joint).....	187

Figure D.10 – Example of measurements including a barrier.....	188
Figure D.11 – Example of measurements including a gap .....	188
Figure D.12 – Example of measurements including a gap .....	189
Figure D.13 – Example of measurements including an isolated conductive part .....	189
Figure D.14 – Example of measurements in inner layer of PWB .....	189
Figure D.15 – Example of measurements on <i>enclosure</i> of insulating material to a part inside.....	190
Figure F.1 – Diagram for dimensioning of <i>clearances</i> .....	194
Figure F.2 – Diagram for dimensioning of <i>creepage distances</i> .....	196
Figure F.3 – Permissible field strength for dimensioning of <i>solid insulation</i> according to Formula (F.1).....	198
Figure H.1 – Flow chart leading to selection of the RCD type upstream of a <i>PECS</i> .....	200
Figure H.2 – Symbols for marking depending on the type of RCD .....	201
Figure H.3 – Fault current waveforms in connections with <i>power electronic converter</i> devices .....	203
Figure I.1 – <i>Basic protection</i> evaluation for circuits connected to the origin of the <i>installation mains supply</i> .....	204
Figure I.2 – <i>Basic protection</i> evaluation for circuits connected to the <i>mains supply</i> .....	205
Figure I.3 – <i>Basic protection</i> evaluation for single and three phase <i>PECS</i> not <i>permanently connected</i> to the <i>mains supply</i> .....	205
Figure I.4 – <i>Basic protection</i> evaluation for circuits connected to the origin of the <i>installation mains supply</i> where internal <i>SPDs</i> are used.....	205
Figure I.5 – <i>Basic protection</i> evaluation for circuits connected to the <i>mains supply</i> where internal <i>SPDs</i> are used.....	206
Figure I.6 – Example of <i>enhanced protection</i> evaluation for circuits connected to the <i>mains supply</i> where internal <i>SPDs</i> are used .....	206
Figure I.7 – Example of <i>enhanced protection</i> evaluation for circuits connected to the <i>mains supply</i> where internal <i>SPDs</i> are used .....	206
Figure I.8 –Example of <i>enhanced protection</i> evaluation for circuits connected to the <i>mains supply</i> where internal <i>SPDs</i> are used .....	207
Figure I.9 – <i>Basic protection</i> evaluation for circuits connected to the <i>non-mains supply</i> .....	207
Figure I.10 – <i>Basic protection</i> evaluation for circuits connected to the the origin of the <i>installation non-mains supply</i> .....	207
Figure I.11 – <i>Functional insulation</i> evaluation within circuits affected by external transients.....	208
Figure I.12 – <i>Basic protection</i> evaluation for circuits connected to the <i>mains supply</i> .....	208
Figure I.13 – <i>Insulation</i> evaluation for <i>accessible circuit</i> of <i>DVC As</i> .....	208
Figure I.14 – <i>PEC</i> with <i>mains supply</i> and <i>non-mains supply</i> without galvanic isolation .....	209
Figure I.15 – Transformer (basic protected) <i>PEC</i> inverter with <i>SPD</i> and transformer to reduce impulse voltage for functional and <i>basic protection</i> .....	209
Figure J.1 – Burn threshold spread when the skin is in contact with a hot smooth surface made of bare (uncoated) metal.....	210
Figure J.2 – Rise in the burn threshold spread from Figure J.1 for metals which are coated by shellac varnish.....	211
Figure J.3 – Rise in the burn threshold spread from Figure J.1 for metals coated with the specific materials .....	211
Figure J.4 – Burn threshold spread when the skin is in contact with a hot smooth surface made of ceramics, glass and stone materials .....	212

Figure J.5 – Burn threshold spread when the skin is in contact with a hot smooth surface made of plastics .....	213
Figure L.1 – Measuring instrument 1 .....	215
Figure L.2 – Measuring instrument 2 .....	215
Figure M.1 – Sphere 50 mm probe according to IEC 61032:1997, test probe A .....	217
Figure M.2 – Jointed test finger according to IEC 61032:1997, test probe B .....	218
Figure M.3 – Test rod 2,5 mm according to IEC 61032:1997, test probe C .....	219
Figure M.4 – Sphere 12,5 mm test probe according to IEC 61032:1997, test probe 2 .....	219
Figure N.1 – Example of short-circuit current curve under specification of $I_{CC}$ .....	222
Figure N.2 – Example of tripping characteristic of a circuit breaker .....	223
Figure N.3 – Example of tripping characteristic of a current-limiting fuse .....	223
Figure N.4 – Example of short-circuit current curve under specification of $I_{CW}$ .....	224
Figure N.5 – Two PECS with different specifications .....	225
Figure N.6 – One PECS with different specification for each input <i>mains supply port</i> .....	227
Figure N.7 – Flowchart for classification of $I_{CC}$ or $I_{CW}$ .....	230
Figure O.1 – Flowchart for determination of <i>clearance</i> .....	232
Figure O.2 – Flowchart for determination of <i>creepage distance</i> .....	233
Table 1 – Alphabetical list of terms .....	20
Table 2 – Voltage limits for the <i>decisive voltage classes DVC</i> .....	42
Table 3 – Minimum protection requirements for circuit under consideration .....	43
Table 4 – <i>PE conductor</i> cross-sectional area .....	49
Table 5 – Limits for access of <i>touch current</i> .....	56
Table 6 – Definitions of <i>pollution degrees</i> .....	59
Table 7 – <i>Impulse withstand voltage</i> and <i>temporary overvoltage</i> versus <i>system voltage</i> .....	61
Table 8 – <i>Clearances</i> for <i>functional insulation</i> , <i>basic insulation</i> or <i>supplementary insulation</i> for inhomogeneous fields .....	66
Table 9 – <i>Creepage distances</i> .....	69
Table 10 – Generic materials for the direct support of uninsulated <i>live parts</i> .....	71
Table 11 – Thin sheet material thickness through <i>insulation</i> requirements .....	72
Table 12 – Flammability classes and classification standards .....	78
Table 13 – Permitted openings in <i>fire enclosure</i> bottoms .....	82
Table 14 – Maximum measured temperatures for internal materials and <i>components</i> .....	84
Table 15 – Maximum measured temperatures for <i>accessible parts</i> of the PECS .....	86
Table 16 – Limits for sources without an <i>overcurrent protective device</i> .....	87
Table 17 – Limits for power sources with an <i>overcurrent protective device</i> .....	87
Table 18 – Environmental service conditions .....	92
Table 19 – Wire bending space from terminals to <i>enclosure</i> .....	100
Table 20 – Thickness of sheet metal for <i>enclosures</i> : carbon steel or stainless steel .....	104
Table 21 – Thickness of sheet metal for <i>enclosures</i> : aluminium, copper or brass .....	105
Table 22 – Environmental conditions for tests .....	109
Table 23 – Test overview .....	110
Table 24 – Pull values for handles and manual control securement .....	120

Table 25 – Values for physical tests on strain relief of <i>enclosure</i> .....	120
Table 26 – <i>Impulse withstand voltage</i> test procedure .....	122
Table 27 – <i>Impulse withstand voltage test</i> .....	123
Table 28 – AC or DC test voltage for circuits connected directly to <i>mains supply</i> .....	125
Table 29 – AC or DC test voltage for circuits connected to <i>non-mains supply</i> without <i>temporary overvoltages</i> .....	125
Table 30 – Partial discharge test.....	129
Table 31 – Test duration for <i>protective equipotential bonding</i> test.....	136
Table 32 – AC <i>short-time withstand current</i> test, minimum <i>PECS</i> requirements .....	145
Table 33 – Environmental tests .....	153
Table 34 – Dry heat test (steady state) .....	154
Table 35 – Damp heat test (steady state).....	155
Table 36 – Vibration test.....	156
Table 37 – Salt mist test .....	156
Table 38 – Dust test.....	157
Table 39 – Sand test.....	157
Table 40 – Marking location .....	159
Table A.1 – Examples for protection against electric shock.....	179
Table C.1 – Symbols used .....	181
Table D.1 – Width of grooves by <i>pollution degree</i> .....	184
Table E.1 – Correction factor for <i>clearances</i> at altitudes between 2 000 m and 20 000 m .....	191
Table E.2 – Test voltages for verifying <i>clearances</i> at different altitudes .....	192
Table F.1 – Minimum values of <i>clearances</i> in air at atmospheric pressure for inhomogeneous field conditions .....	195
Table F.2 – Multiplication factors for <i>clearances</i> in air at atmospheric pressure for approximately homogeneous field conditions .....	195
Table F.3 – Minimum values of <i>creepage distances</i> for different frequency ranges .....	197
Table G.1 – Standard cross-sections of round conductors.....	199
Table K.1 – Table of electrochemical potentials .....	214
Table O.1 – Minimum spacings within <i>solid insulation</i> or similar.....	234
Table P.1 – Limits of EMF for general public exposure.....	237
Table P.2 – Limits of EMF for occupational exposure.....	238
Table P.3 – Limits for magnetic flux density of static magnetic fields (2013/35/EU).....	238
Table P.4 – EMF test overview .....	240
Table 41.1 – Maximum disconnection times .....	241
Table R.1 – Risk assessment.....	242

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY REQUIREMENTS FOR POWER ELECTRONIC  
CONVERTER SYSTEMS AND EQUIPMENT –****Part 1: General**

## FOREWORD

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IEC 62477-1 has been prepared by IEC technical committee 22: Power electronic systems and equipment. It is an International Standard.

This document is developed according to the intent of ISO/IEC Guide 51 and IEC Guide 116.

It has the status of a group safety publication in accordance with IEC Guide 104.

This second edition cancels and replaces the first edition published in 2012 and Amendment 1:2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) PECS emitting or receiving radio waves added in the Scope;
- b) simplification of the concept of DVC As including the voltage-time-zones;

- c) improved consistency of the concept "protection" versus "insulation" according to IEC 61140;
- d) limits for touch current updated and limits for PE conductor currents added;
- e) thin sheet of tape materials reworked and tests added;
- f) inner layers of multi-layer printed wiring boards added;
- g) mechanical hazards updated;
- h) requirements for enclosures updated;
- i) requirements for wiring and connections updated;
- j) polymeric enclosure requirements updated;
- k) requirements for components added;
- l) several test added (e.g. UV, working voltage, SPD, preconditioning);
- m) information and marking requirements updated;
- n) requirements for the contrast of symbols added;
- o) several annexes updated.

The text of this International Standard is based on the following documents:

Draft	Report on voting
22/355/FDIS	22/356/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

A list of all the parts in the IEC 62477 series, published under the general title *Safety requirements for power electronic converter systems and equipment*, can be found on the IEC website.

In this document, terms in *italic* are defined in Clause 3.

NOTE Due to the requirement in ISO/IEC Directive Part 2, the defined term is in singular. In this document, also the plural is in *italic*.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## INTRODUCTION

This document relates to products that include *power electronic converters*, with a rated *system voltage* not exceeding 1 000 V AC or 1 500 V DC. It specifies requirements to reduce risks of fire, electric shock, thermal, energy and mechanical hazards, except functional safety as defined in IEC 61508 (all parts). The objectives of this document are to establish a common terminology and basis for the safety requirements of products that contain *power electronic converters* across several IEC technical committees.

During the update of the document, feedback from technical committees which used the IEC 62477-1 as reference document has been taken into consideration.

Modifications have been made to 4.4.2 and Annex A considering the safe to touch voltage *DVC As* under normal operating conditions and *single fault conditions*. On request from TCs using this document as a reference document, the determination of *DVC As* has been simplified. The determination of *DVC As* in IEC 62477-1:2012 and IEC 62477-1:2012/AMD1:2016 was developed based on IEC TS 60479-1:2005<sup>1</sup> and IEC TR 60479-5:2007 and in details taking different environmental condition, size of body contact area and body reaction into consideration. This change also included time-voltage zones in Annex A for relevant body reactions, environmental conditions and contact area.

NOTE See IEC 60479-1:2018 for further information about effects of current on human beings and livestock.

This document follows the simplified concepts of the basic safety standard IEC 61140:2016, 5.2.6, considering two situations in Table 2 of this document:

- a) dry and large contact areas;
- b) all other cases.

For the temporary increase of voltage during *single fault conditions*, it was decided to use the more simplified approach to limit the voltage to the maximum voltage of *DVC B* which is also used by other committees.

This document has been developed with the intention

- to be used as a reference document for product committees inside TC 22 in the development of product standards for *power electronic converter systems* and equipment,
- to replace IEC 62103<sup>2</sup> as a product family standard providing minimum requirements for safety aspects of *power electronic converter systems* and equipment in apparatus for which no product standard exists, and

NOTE The scope of IEC 62103 contains reliability and electromagnetic compatibility aspects, which are not covered by this document.

- to be used as a reference document for product committees outside TC 22 in the development of product standards of *power electronic converter systems* and equipment intended renewable energy sources. TC 82, TC 88, TC 105 and TC 114, in particular, have been identified as relevant technical committees at the time of publication.

Technical committees using this document should carefully consider the relevance of each paragraph in this document for the product under consideration and reference, add, replace or modify requirement as relevant. Product specific topics not covered by this document are in the responsibility of the technical committees using this document as reference document.

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<sup>1</sup> This publication has been withdrawn.

<sup>2</sup> This publication has been withdrawn.

This group safety standard will not take precedence over any product specific standard according to IEC Guide 104. IEC Guide 104 provides information about the responsibility of product committees to use group safety standards for the development of their own product standards.