UL 508

STANDARD FOR SAFETY

Industrial Control Equipment

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UL Standard for Safety for Industrial Control Equipment, UL 508

Nineteenth Edition, Dated October 28, 2024

Summary of Topics

This new Nineteenth Edition of ANSI/UL 508 dated October 28, 2024 includes the following changes in requirements:

– Revisions to Address Changes to UL 869A; Section 133.

– Clarification of Ambient for Tests; 44.3 and 44.4.

– Remove Exception to 72.5 for Definite Purpose Motor Controllers.

– Move Pressure Test to General Section 71 and Table 102.1.

– Remove Programmable Controllers from UL 508; 1.3, 1.12, 37.1, Table 77.1, and Index.

– Correction to Section 50; 50.2, Table 50.1, 73.41, and Table 77.1.

– Correction to UL 50 References; 7.3.1, 7.4.7, 7.5.2, 7.15.3, 7.15.14, 8.2.1, 9.2 – 9.4, 9.7, 9.8, 12.1, 12.2, 12.18, A2.4, A2.5, and A2.7.

– Editorial Update to Remove Standard for Components Appendix; 4.1, and Section 5.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated August 11, 2023, June 7, 2024, and September 20, 2024.

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The Department of Defense (DoD) has adopted UL 508 on June 5, 1989. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Comments or proposals for revisions on any part of the Standard may be submitted to ULSE at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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CONTENTS

INTRODUCTION

1 Scope 13
2 Glossary 14
3 Units of Measurement 17
4 Components 17
5 Referenced Publications 17
6 Installation and Operation Instructions 19

PART I – ALL EQUIPMENT

ENCLOSURE CONSTRUCTION

7 Frames and Enclosure 19
7.1 General 19
7.2 Cast metal 20
7.3 Sheet metal 20
7.4 Doors and covers 24
7.5 Polymeric 27
7.6 Bonding 29
7.7 Resistance measurement 31
7.8 Openings in enclosure 31
7.9 Ventilating openings 32
7.10 Barriers used with ventilation openings 33
7.11 Forced ventilation 34
7.12 Observation windows 34
7.13 Transformer or autotransformer 34
7.14 Motor controller wire bending space 34
7.15 Specific enclosures 35
7.16 Components for use on specific enclosures 37
7.17 Accessibility of live parts 38
8 Protection Against Corrosion 41
8.1 General 41
8.2 Outdoor enclosures 41

ENCLOSURE PERFORMANCE

9 General 41
10 Securement of Snap-On Cover Test 42

INSTRUCTIONS AND MARKINGS PERTAINING TO ENCLOSURES

11 Permanence of Marking 43
12 Details 43

DEVICE CONSTRUCTION

13 General 44
14 Protection Against Corrosion 44
15 Provisions for Mounting 44
16 Insulating Material 45

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

17 Means for Switching 46
18 Live Parts 47
19 Protective Devices 47
19.1 General 47
19.2 Protection of internal primary and secondary control circuit conductors 48
19.3 Protection of control circuit transformer 49
19.4 Low-voltage protection 50
19.5 Phase loss protection 51
19.6 Phase-reversal protection 51
20 Capacitors 51
21 Fuseholders 51
22 Internal Wiring 51
22.1 General 51
22.2 Routing of internal wiring 52
22.3 Clamps and guides 52
22.4 Flexing of internal wiring 52
22.5 Additional insulation 52
22.6 Splices and connections 52
22.7 Splice insulation 53
23 External Interconnections 53
23.1 Open equipment 53
23.2 Enclosed equipment 53
23.3 Interconnecting cords and cables 53
24 Transformers 53
25 Blower Motors 54
26 Supply Connections 54
26.1 General 54
26.2 Permanently connected equipment 54
26.3 Tapped holes for conduit 54
26.4 Knockouts 54
26.5 Size of wiring terminals and leads 55
26.6 Evaluation of pressure wire connectors 55
26.7 Evaluation of quick connect terminals 56
26.8 Evaluation of wire binding screws 57
26.9 Evaluation of field wiring leads 57
26.10 Evaluation of spring type terminations 57
26.11 Cord-connected equipment 57
27 Cord-Connected Programming and Diagnostic Units 60
28 Coil Windings 60
29 Risk of Electric Shock 60
30 Risk of Fire 60
31 Lithium Cells and Batteries 61
32 Non-Lithium Battery Circuits 61
32.1 General 61
32.2 Primary non-rechargeable 61
32.3 Secondary rechargeable/non-rechargeable 62
33 Isolated Secondary Circuits 62
33.1 General 62
33.2 Class 2 circuit requirements 65
33.3 Limited voltage/current circuit requirements 65
33.4 Limited voltage circuit requirements 66
33.5 Isolated power supply circuit requirements 66
33.6 Limited energy circuit requirements 67
33.7 Limiting impedance circuit requirements 67
33.8 Limited power source circuit requirements 68
34 Limited Voltage Primary Circuit 68

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

35 Separation of Circuits 69
36 Isolation Devices 69
37 Spacings 70
38 Insulating Barriers 76
39 Clamped Insulating Joints in Lieu of Spacings 77
40 Clearance and Creepage Distances 78
41 Protection of Service Personnel 79
42 Grounding 80
42.1 General 80
42.2 Internal insulated bonding, grounding, and grounded circuit conductors 82
42.3 Transformer secondary grounding 82
42.4 Switches intended for mounting in a flush-device box and suitable for lighting control 82
43 Accessories 83

DEVICE PERFORMANCE

44 General 83
45 Temperature Test 85
46 Overvoltage and Undervoltage Test 93
47 Overload Test 93
48 Endurance Test 101
49 Endurance Test for Relays for Television Applications 103
50 Calibration Test 103
51 Dielectric Voltage-Withstand Test 104
51.1 General 104
51.2 Coils 105
51.3 Secondary circuits 106
52 Short Circuit Test – General 106
52.1 General 106
52.2 Enclosure 108
52.3 Sample preparation 108
53 Standard Fault Current Circuits 109
53.1 Protective devices 109
53.2 Sample selection for overload relay 111
53.3 Parameters 112
54 High-Available Fault Current Circuits (Optional) 115
54.1 General 115
54.2 Sample selection 116
54.3 Procedure 117
55 Group Installation (Optional) 118
55.1 General 118
55.2 Sample selection 119
55.3 Group installation for standard fault circuit ratings 119
55.4 Group installation for high capacity short circuit ratings 119
56 Standard and High Fault Acceptance Criteria 120
57 Calibration of Test Circuits 120
57.1 Circuit characteristics 120
57.2 Alternating-current circuits 121
57.3 Direct current circuits 124
57.4 Instrumentation for test currents above 10,000 amperes 126
57.5 Calibration characteristics for protective device 127
58 Transient-Voltage-Surge Suppression Test 130
59 Accelerated Aging Test 131
60 Breakdown of Components Test 131
61 Strain Relief Test 131
62 Push-Back Relief Test 132

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

63 Wire Flexing 132
64 Printed Wiring Board Abnormal Operation Test 132
65 Secondary Circuits Test 133
65.1 General 133
65.2 Limited voltage/current secondary test 133
65.3 Limited energy secondary test 134
65.4 Isolated power supply capacity test 134
65.5 Limited voltage secondary test 134
65.6 Limiting impedance test 134
66 Leakage Current Test 135
67 Switches Intended for Mounting in a Flush-Device Box and Suitable for Lighting Control 138
68 Protection Against Contact with Live Parts of Door Mounted Components Test 140
69 Electronic Fluorescent Ballasts, CFLs, and LED Drivers 140
70 Terminal Assembly Test 144
71 Pressure Tests 145
71.1 General 145
71.2 Parts contained in an enclosure 145
71.3 Parts not contained in an enclosure 145

DEVICE RATING

72 Details 146

MARKING

73 General 148
74 Wiring Terminal Markings 153
75 Cautionary Markings 155

INSTRUCTIONS AND MARKINGS PERTAINING TO ACCESSORIES

76 Details 156
77 Marking Location 157

MANUFACTURING AND PRODUCTION TESTS

78 Production-Line Dielectric Voltage-Withstand Test 161
79 Production-Line Grounding-Continuity Test 162
80 Production-Line Polarization-Continuity Test – Cord and Plug Connected Equipment 162

PART V – REDUCED-VOLTAGE STARTERS

CONSTRUCTION

81 General 163

PERFORMANCE

82 Operation Test 163
83 Duty Cycle Test 163

RATINGS

84 Details 164

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

MARKING

85 Details 165

PART VI – SOLID-STATE AC MOTOR CONTROLLERS

CONSTRUCTION

86 General 165

PERFORMANCE

87 General 166
88 Temperature Test 167
89 Dielectric Voltage-Withstand Test 167
90 Overvoltage and Undervoltage Test 167
91 Overload Test 167
92 Endurance Test 167
93 Short Circuit Test 168
93.1 Evaluation of short circuit test 168
93.2 Selection of samples 168
93.3 Test procedure 168
93.4 Test circuit 169
94 Breakdown of Components Test 169
95 Operation Tests 169
95.1 General 169
95.2 Controller overload 169
95.3 Single phasing 170
95.4 Inoperative blower motor 170
95.5 Clogged filter 170
95.6 Current limiting control 170

RATING

96 Details 170

MARKING

97 Details 170

PART VII – FLOAT- AND PRESSURE-OPERATED SWITCHES

GENERAL

98 Glossary 171

CONSTRUCTION

99 General 171
100 Supply Connections – Permanently-Connected Devices 171
101 Supply Connections – Cord- and Plug-Connected Devices 172

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

PERFORMANCE

102 General 172
103 Overload Test 173
104 Endurance Test 173
105 Hub and Nipple Tests 174
105.1 General 174
105.2 Pullout 174
105.3 Bending 174
105.4 Torque 174
106 Float Switch Tests 174
106.1 General 174
106.2 Immersion 175
106.3 Dielectric voltage-withstand 175
106.4 Tensile strength and ultimate elongation 176
106.5 Insulation resistance test 176

RATING

107 Details 177

MARKING

108 Details 177

PART VIII – SEMICONDUCTOR RELAYS AND SWITCHES

CONSTRUCTION

109 General 178

PERFORMANCE

110 General 178
111 Temperature Test 179
112 Overvoltage and Undervoltage Test 179
113 Overload Test 179
114 Endurance Test 179
115 Dielectric Voltage-Withstand Test 180
116 Breakdown of Components Test 180

RATING

117 Details 180

MARKING

118 General 180

PART IX – MERCURY TUBE SWITCHES

CONSTRUCTION

119 General 180

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

PERFORMANCE

120 General 180
121 Overvoltage and Undervoltage Test 181
122 Short Circuit Test 181

RATING

123 Details 182

MARKING

124 Details 182

PART X – AUXILIARY DEVICES

CONSTRUCTION

125 General 182

PERFORMANCE

126 General 183
127 Temperature Test 184
128 Overvoltage and Undervoltage Test 185
129 Overload Test 185
130 Endurance Test 186

RATING

131 Details 186

MARKING

132 Details 189

PART XIV – SERVICE EQUIPMENT

133 General 189

PART XV – LAMP DIMMERS

CONSTRUCTION

134 General 190

PERFORMANCE

135 General 191
136 Temperature Test 191
137 Operation Test 192
138 Abnormal Operation Test 192
139 D-C Offset Test 192

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RATING

140 Details 192

MARKING

141 Details 192

PART XVI – MISCELLANEOUS DEVICES

CONSTRUCTION

142 General 193

PERFORMANCE

143 General 193
144 Input Test 194
145 Temperature Test 194
146 Normal Operation Test 195
147 Abnormal Operation Test 195
148 Burnout Test 195
149 Inoperative Blower Motor Test 195

RATING

150 Details 196

MARKING

151 Details 196

PART XVIII – PROXIMITY SWITCHES

GENERAL

152 Details 196
153 Glossary 196

CONSTRUCTION

154 General 197

PERFORMANCE

155 General 197
156 Lasers, Ultraviolet and Infrared Emissions 197
157 Power-Supply Cord Tests 197
157.1 General 197
157.2 Tensile strength and elongation tests 198
157.3 Oven conditioning 198
157.4 Oil conditioning 198
157.5 Ultraviolet light (UV) conditioning 199
157.6 Cold bend test 199

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

158 Cable Gland Connector Tests 199
158.1 General 199
158.2 Oven conditioning (rubber composition) 199
158.3 Oven conditioning (thermoplastic composition) 199
158.4 Flexing test 199
158.5 Strain relief test 199
159 Strain Relief Test 200
160 Tests for Environmental Type Enclosures 200

RATING

161 Details 200

MARKING

162 Details 200

ANNEX A (normative) – INDUSTRIAL CONTROL EQUIPMENT FOR MARINE USE

A1 Scope 202
A2 Enclosure 202
A3 Current-Carrying Parts 202
A4 Autotransformer Starters 203
A5 Heater Circuits 203
A6 Insulating Materials 203
A7 Overcurrent Devices 203
A8 Temperature Rating 203
A9 Marking 203

INDEX

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INTRODUCTION

1 Scope

1.1 These requirements cover industrial control devices, and devices accessory thereto, for starting, stopping, regulating, controlling, or protecting electric motors. These requirements also cover industrial control devices or systems that store or process information and are provided with an output motor control function(s). This equipment is for use in ordinary locations in accordance with the National Electrical Code, NFPA 70. These requirements do not include requirements for the evaluation of equipment intended for use in functional safety applications.

1.2 These requirements cover devices rated 1500 volts or less. Industrial control equipment covered by these requirements is intended for use in an ambient temperature of 0 – 40 °C (32 – 104 °F) unless specifically indicated for use in other conditions.

1.3 Examples of industrial control devices described in 1.1 are:

a) Solid-state starters and controllers.

b) Pushbutton stations, including selector switches and pilot lights.

c) Control circuit switches and relays.

d) Float, flow, pressure, and vacuum-operated switches.

e) Resistors and rheostats.

f) Proximity switches.

g) Time-delay relays and switches.

h) Resistors and rheostats intended for industrial heating and lighting, including those for motor generator fields.

i) Control devices intended for industrial heating and lighting.

j) Solid-state time-delay relays.

k) Numerical control systems.

l) Lighting dimmer systems and controls.

m) Mercury-tube switches.

n) Solid-state logic controllers.

o) Industrial microprocessor/computer systems.

p) Variable voltage autotransformer.

q) Motor starting autotransformer.

1.4 Industrial control panels are covered by the requirements in the Standard for Industrial Control Panels, UL 508A.

1.5 Fire pump controllers are covered by the requirements in the Standard for Fire Pump Controllers, UL 218.

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1.6 An adjustable-speed drive and accessories or modules for use with an adjustable-speed drive are covered by the Standard for Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal, and Energy, UL 61800-5-1.

1.7 Equipment intended for use in hazardous locations as defined by the National Electrical Code, NFPA 70, are covered by the Standard for Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations, UL 1203.

1.8 Devices that regulate temperature and/or control refrigeration equipment are covered by the Standard for Temperature-Indicating and -Regulating Equipment, UL 873, and other applicable standards. Compliance with the Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1, and/or the applicable Part 2 standard from the UL 60730 series fulfills these requirements.

1.9 Electrical instruments are covered by the Standard for Electrical Analog Instruments– Panel Board Types, UL 1437.

1.10 Products consisting of interlocked controllers and similar assemblies, intended to transfer power to a common load or output between multiple inputs or sources, are covered by the Standard for Transfer Switch Equipment, UL 1008.

1.11 Magnetic motor controllers, manual motor controllers, combination motor controllers, and overload relays are covered by the Standard for Low-Voltage Switchgear and Controlgear – Part 4-1: Contactors and Motor-Starters – Electromechanical Contactors and Motor-Starters, UL 60947-4-1.

1.12 Programmable controllers are covered by the Standard for Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-201: Particular Requirements for Control Equipment, UL 61010-2-201.

2 Glossary

2.1 For the purpose of this Standard, the following definitions apply.

2.2 AMBIENT TEMPERATURE – The temperature of the air medium into which the heat of the equipment is dissipated. See 45.12.

2.3 AMBIENT TEMPERATURE RATING – A rating assigned to equipment that refers to the maximum ambient temperature of the room or space outside of the device enclosure or intended enclosure. See 45.13.

2.4 CLOSED-OPEN OPERATION – An operation of closing the test device on the circuit. The letters "CO" signify this operation.

2.5 COMBINATION CONTROLLER – An open or enclosed device containing both a magnetic or solid-state controller and a disconnecting means. The controller may or may not contain overload protection, short circuit protection, or both. Where an individual controller is enclosed, it includes an external means for operating the disconnecting means.

2.6 COMBINATION MOTOR CONTROLLER – A controller intended for motor service that provides a disconnecting means, branch circuit (short-circuit and ground fault) protection, motor controller, and motor overload protection. In addition, where an individual controller is enclosed, it includes means for locking the disconnecting device in the "OFF" position.

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2.7 COMPONENT FOR GROUP INSTALLATION – A motor control, overload relay, or other switching device evaluated for use in group installation. See 2.18.

2.8 CONTACTOR – A two-state (ON-OFF) device for repeatedly establishing and interrupting an electric power circuit. Interruption is obtained by introducing a gap or a very large impedance.

2.9 CONTROL CIRCUIT – A circuit that carries the electric signals directing the performance of a controller, but which does not carry the main power circuit (see IEEE Standards Dictionary of Electrical and Electronic Terms). A control circuit is generally limited to 15 amperes.

2.10 CONTROLLER – A device or group of devices that serves to govern, in some predetermined manner, the electric power delivered to the apparatus to which it is connected.

2.11 COVER – An unhinged portion of an enclosure that covers an opening.

2.12 DOOR – A hinged portion of an enclosure that covers an opening.

2.13 END-OF-LINE ENCLOSURE – An enclosure that is intended to be connected at the end of a run of conduit.

2.14 FEEDER CIRCUIT – The conductors and circuitry on the supply side of the branch circuit overcurrent protective device.

2.15 FUNCTIONAL SAFETY – Part of the overall safety of equipment or systems that depends on the correct functioning of the process, equipment, and/or safety-related control system to prevent potentially-hazardous conditions from arising or provide mitigation to reduce the severity of the hazard.

2.16 GENERAL PURPOSE RATING – This term is synonymous with "General Use Rating."

2.17 GENERAL USE RATING – A rating expressed in volts and amperes assigned to a device that is intended to control:

a) A load with a continuous or inrush ampere rating not exceeding the ampere rating of the device;

b) If AC rated, a load that has a power factor of 0.75 to 0.80 (inductive); and

c) If DC rated, a load that is resistive (noninductive).

2.18 GROUP INSTALLATION – A motor branch circuit for two or more motors, or one or more motors with other loads and protected by a circuit breaker or a single set of fuses.

2.19 ISOLATED SECONDARY CIRCUIT – A circuit derived from an isolating source (such as a transformer, optical isolator, limiting impedance or electro-mechanical relay) and having no direct connection back to the primary circuit (other than through the grounding means). A secondary circuit that has a direct connection back to the primary circuit is considered part of the primary circuit.

2.20 MANUAL CONTROLLER – A hand-operated switching device whose contacts are controlled by the position of a mechanical actuator.

2.21 MANUAL CONTROLLER WITH INSTANTANEOUS TRIP – A manual controller provided with an instantaneous trip element for short circuit protection only and optionally provided with an overload relay.

2.22 MOTOR CONTROL DEVICE – Any product or equipment rated in horsepower and/or full load-locked rotor current capable of interrupting the maximum operating overload current of a motor of the

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same horsepower or full load-locked rotor current rating as the product or equipment at the rated voltage. Such devices may include, but is not limited to, contactors, controllers, starters, and switches.

2.23 NON-COMBINATION MOTOR CONTROLLERS – Motor control devices of the non-combination type are for use with separate protective devices, such as fuses or inverse-time circuit breakers, installed in the supply side of the motor control device.

2.24 OPEN OPERATION – An operation of closing the circuit on the test device. The letter "O" signifies this operation.

2.25 PILOT DUTY – The rating assigned to a relay or switch that controls the coil of another relay or switch.

2.26 POLE LEAST LIKELY TO STRIKE GROUND – A pole that is referenced to ground or by virtue of its position or potential or both relative to other poles of the device to be less likely than any other to strike ground. In a three pole device, this pole would usually be the middle pole. It is possible for several poles to be equally least likely to strike to ground. In this case any may be used for the test.

2.27 POLLUTION DEGREE 1 – No pollution or only dry, nonconductive pollution occurs. The pollution has no influence.

2.28 POLLUTION DEGREE 2 – Normally, only nonconductive pollution occurs; however, temporary conductivity caused by condensation may be expected.

2.29 POLLUTION DEGREE 3 – Conductive pollution occurs, or dry, nonconductive pollution occurs that becomes conductive due to condensation that is expected.

2.30 POWER CIRCUIT – Conductors and components of branch and feeder circuits.

2.31 PRIMARY CIRCUIT – A circuit in which the wiring and components are conductively connected to the branch circuit.

2.32 RECOVERY VOLTAGE – The voltage impressed upon the equipment under test after a circuit is cleared.

2.33 SELF-PROTECTED – A qualifying term applied to a controller that contains coordinated overload and short circuit protection. A self-protected controller is evaluated as a complete unit whether comprised of a single or multiple components. Coordinated protection is able to be inherent or obtained by correct selection of components or accessory parts in accordance with the manufacturer’s instructions.

2.34 STARTER – A form of controller that includes the switching means necessary to start and stop the connected load in combination with suitable overload protection.

2.35 SURROUNDING AIR TEMPERATURE RATING – A rating assigned to open type equipment that refers to the maximum ambient temperature of air immediately surrounding the equipment inside of the ultimate enclosure. See 45.13.

2.36 SWITCH – A device for opening and closing, and for changing the connections of a circuit. A switch is understood to be manually-operated, unless otherwise stated.

2.37 TRANSIENT SUPPRESSIVE DEVICE – A component or assembly that limits the transient voltage such as an overvoltage protective device, a transformer with isolated windings, or a damping impedance suitably located.

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3 Units of Measurement

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

4 Components

4.1 Except as indicated in 4.2, a component of a product covered by this Standard shall comply with the requirements for that component.

4.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this Standard; or

b) Is superseded by a requirement in this Standard.

4.3 A component shall be used in accordance with its rating established for the intended conditions of use.

4.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

5 Referenced Publications

5.1 Any undated reference to a code or standard appearing in the requirements of this Standard shall be interpreted as referring to the latest edition of that code or standard.

5.2 The following publications are referenced in this Standard:

ANSI C82.11, *Lamp Ballasts – High-Frequency Fluorescent Lamp Ballasts*

ANSI C82.14, *Lamp Ballasts – Low-Frequency Square Wave Electronic Ballasts*

ASTM E230, *Standard Specification and Temperature-Electromotive Force (EMF) Tables for Standardized Thermocouples*

IEC 60584-2, *Standard for Thermocouples Part 2: Tolerances*

IEEE 4, *Techniques for High-Voltage Testing*

IEEE C37.09, *Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis*

JIS C 1602, *Standard for Tolerances*

NEMA 410, *Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts*

NEMA ICS2, *Controllers, Contactors and Overload Relays Rated 600 V*

NEMA ICS5, *Control Circuit and Pilot Devices*

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NEMA WD6, *Wiring Devices – Dimensional Requirements*

NFPA 70, *National Electrical Code*

NFPA 79, *Electrical Standard for Industrial Machinery*

UL 50, *Enclosures for Electrical Equipment, Non-Environmental Considerations*

UL 50E, *Enclosures for Electrical Equipment, Environmental Considerations*

UL 62, *Flexible Cords and Cables*

UL 94, *Flammability of Plastic Materials for Parts in Devices and Appliances*

UL 248 Series, *Low-Voltage Fuses*

UL 310, *Electrical Quick-Connect Terminals*

UL 486A-486B, *Wire Connectors*

UL 486E, *Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors*

UL 489, *Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures*

UL 514B, *Conduit, Tubing, and Cable Fittings*

UL 746A, *Polymeric Materials – Short Term Property Evaluations*

UL 746B, *Polymeric Materials – Long Term Property Evaluations*

UL 746C, *Polymeric Materials for Use in Electrical Equipment Evaluations*

UL 746D, *Polymeric Materials – Fabricated Parts*

UL 796, *Printed Wiring Boards*

UL 840, *Insulation Coordination Including Clearance and Creepage Distances for Electrical Equipment*

UL 845, *Motor Control Centers*

UL 869A, *Reference Standard for Service Equipment*

UL 1059, *Terminal Blocks*

UL 1097, *Double Insulation Systems for Use in Electrical Equipment*

UL 1310, *Class 2 Power Units*

UL 1446, *Systems of Insulating Materials – General*

UL 1557, *Electrically Isolated Semiconductor Devices*

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UL 1577, *Optical Isolators*

UL 1581, *Electrical Wires, Cables, and Flexible Cords*

UL 1642, *Lithium Batteries*

UL 1973, *Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications*

UL 2054, *Household and Commercial Batteries*

UL 2111, *Overheating Protection for Motors*

UL 2237, *Outline of Investigation for Multi-Point Interconnection Power Cable Assemblies for Industrial Machinery*

UL 2238, *Cable Assemblies and Fittings for Industrial Control and Signal Distribution*

UL 5085-1, *Low Voltage Transformers – Part 1: General Requirements*

UL 5085-2, *Low Voltage Transformers – Part 2: General Purpose Transformers*

UL 5085-3, *Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers*

UL 60086-4, *Primary Batteries – Part 4: Safety of Lithium Batteries*

UL 60384-14, *Fixed Capacitors for Use in Electronic Equipment – Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains*

UL 60950-1, *Information Technology Equipment – Safety – Part 1: General Requirements*

USCG Title 46, *Electrical Engineering Regulations*

6 Installation and Operation Instructions

6.1 Literature intended to accompany a product, such as installation, rating, operation, and user-maintenance instructions or manuals shall be reviewed in the investigation of the product if the safe use of the product is dependent on the instructions. Since the literature is to be reviewed in the examination and test of the product, a draft copy of the literature may be used instead of a printed copy.

PART I – ALL EQUIPMENT

ENCLOSURE CONSTRUCTION

7 Frames and Enclosure

7.1 General

7.1.1 An enclosure of industrial control equipment shall be constructed and assembled so that it will have the strength and rigidity necessary to resist the abuses to which it is likely to be subjected, without total or partial collapse resulting in a risk of fire, electric shock, or injury to persons due to reduction of spacings, loosening or displacement of parts, or other serious defects.

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