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1

UL 891A

Outline of Investigation for Switchboards Rated 601 - 1000 V

Issue Number: 1

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Summary of Topics

This first issue of the Outline of Investigation for Switchboards Rated 601 - 1000 V, UL 891A applies to switchboards nominally rated between 601 and 1000 V for use on circuits having available short-circuit currents of not more than 200 000 A, and intended for use in accordance with the National Electrical Code (NEC), ANSI/NFPA 70.

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CONTENTS

INTRODUCTION

1 Scope	4
2 Components	4
2.1 References	4
2.2 Undated References	4
2.3 Components	4
3 Definitions	5
4 Units of Measurement	5
5 Electrical Characteristics of Assemblies	5
6 Information to be Given Regarding the Assembly	5
7 Service Conditions	6
8 Design and Construction	6
9 Test Specifications	7
10 Tables	7
11 Figures	8

SUPPLEMENT SA - Use of Components Not UL Listed or Recognized

Appendix A – Standards for Components

Appendix B – Standards Referenced in the Trinational Switchboard Standard

Appendix C – Markings Required to be Translated and Suggested French Translations

Appendix D – Example of Series Short-Circuit Current Rating Marking

Appendix E – Example of Terminal Torque Marking

Appendix F – Short-Circuit Test at Reduced Voltage

Appendix G – Maximum 100 000 Ampere Short-Circuit Current Rating Without Short-Circuit Test

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INTRODUCTION

1 Scope

1.1 This Standard applies to switchboards nominally rated between 601 and 1000 V for use on circuits having available short-circuit currents of not more than 200 000 A, and intended for use in accordance with the National Electrical Code, ANSI/NFPA 70.

2 Components

2.1 References

2.1.1 This Outline includes references to requirements in the Standard for Switchboards, UL 891. All references noting "UL 891" are to the 11th Edition of that Standard, dated July 26, 2005, with the latest Revision Date of October 31, 2012. Additionally, UL 891 is a tri-national Standard, whereas this Outline is for US application only. References to requirements for Canada (C22.2 No. 244-05) or Mexico (NMX-J-118/2-ANCE-2006) do not apply.

2.1.2 Where references are made that indicate UL 891 "applies with modification", the clauses provided in this Outline are numbered to match the corresponding requirement in UL 891. These clauses replace the corresponding clauses in UL 891.

2.2 Undated References

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

2.3 Components

2.3.1 Except as indicated in 2.3.2, a component of a product covered by this Outline of Investigation shall comply with the requirements for that component.

2.3.2 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 Outline; or
- b) Is superseded by a requirement in this Outline.

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

2.3.4 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.

3 Definitions

Section 3 of UL 891 applies without modification.

4 Units of Measurement

Section 4 of UL 891 applies without modification.

5 Electrical Characteristics of Assemblies

Section 5 of UL 891 applies with the following modification:

5.2.1 The voltage rating of a switchboard section or interior shall be nominally rated at 1000 V or less and is the voltage range for which the assembly has been evaluated.

6 Information to be Given Regarding the Assembly

Section 6 of UL 891 applies with the following modification:

6.3.4.3.1 To provide for system performance testing, each ground fault relay or apparatus incorporating a ground fault relay or its functions intended for protection of a solidly grounded wye service shall be provided with information sheets describing system testing instructions, and with a test form. The form shall include a space for the date the test was performed and the results, and shall state that the form should be retained by those in charge of the building's electrical installation in order to be available to the authority having jurisdiction. The instructions shall include the following items and shall basically prescribe only that information necessary to perform the tests. The instructions shall be separate and apart from any more elaborate test detail that the manufacturer may wish to provide. The instructions shall specify that:

- a) The interconnected system shall be investigated in accordance with the switchboard manufacturer's detailed instructions, and that this investigation is to be undertaken by qualified personnel.
- b) The location of the sensors around the bus of the circuit to be protected shall be determined. This can be done visually, with knowledge of which bus is involved.
- c) The grounding points of the system shall be verified to determine that ground paths do not exist that would bypass the sensors. The use of high-voltage testers and resistance bridges may be suggested.
- d) The installed system is to be tested for correct response by the application of full scale current into the equipment to duplicate a ground fault condition, or by equivalent means such as by a simulated fault current generated by:
 - 1) a coil around the sensors or
 - 2) a separate test winding in the sensors.

7 Service Conditions

Section 7 of UL 891 applies without modification.

8 Design and Construction

Section 8 of UL 891 applies with the following modifications:

8.1.13.1 A switchboard section or interior marked for use as service equipment for 3-phase, 4-wire, solidly grounded wye-connected services rated in excess of 150 V to ground, but not exceeding 1000 V phase-to-phase, shall be provided with ground fault protection for each service disconnecting means rated 1000 A or more. The ground fault sensing and relaying equipment provided shall operate to cause the service disconnecting means to open all ungrounded conductors of the faulted circuit. The maximum setting of the ground fault protection shall be 1 200 A and a maximum time delay shall be 1 second for ground fault currents equal to or greater than 3 000 A.

8.1.15.1 Except for the following, equipment shall not be connected to the supply side of the service disconnecting means:

- a) meters nominally rated not in excess of 1000 V located in the switchboard;
- b) instrument transformers (current and potential), high-impedance shunts, Type 1 surge-protective devices, and load management devices;
- c) control circuits of power operable service disconnecting means, if suitable overcurrent protection and disconnecting means are provided, see 8.1.11.1.1;
- d) Ground-fault protection systems or surge-protective devices, if suitable overcurrent protection and disconnecting means are provided, see 8.1.11.1.1; and
- e) taps used to supply load management devices, circuits for stand-by power systems, fire pumps, and fire and sprinkler alarms.

8.4.8.1 High-impedance grounded neutral systems may be used on 3-phase alternating current systems rated 480 V or 1000 V (wye or delta). Provision for line to neutral loads shall not be provided.

8.5.1.5 A fuse or circuit breaker pole shall be provided for the protection of each ungrounded conductor except as follows:

- a) taps used to supply load management devices, circuits for stand-by power systems, fire pumps, and fire and sprinkler alarms;
- b) through or splice bus or wire;
- c) in a Class 2 circuit;
- d) for copper wire smaller than 16 AWG (1.3 mm²) if the wire is treated as an arcing part in the application of 8.2.1.3.1 and 8.8.1.8.5;
- e) for high-impedance shunt circuits, lightning arresters, Type 1 surge protective devices, and instrument transformers (current) installed on the supply side of the service disconnecting means;

- f) for meters nominally rated not in excess of 1000 V that do not include potential coils; and
- g) as stated in 8.6.6.8.1.2.

8.8.1.7.2 A bus bar or uninsulated live part, other than a pressure wire connector as mentioned in 8.1.16.6, shall be secured so that ordinary vibration will not loosen the securing means and shall be prevented from turning or shifting in position if any spacings less than half those shown in Table 6 would result from such turning or shifting. A bus bar provided with one or more insulators that must be removed when a branch circuit unit is installed shall be prevented from any turning that would result in spacings less than one-half those specified in Table 6 with all insulators in place, or that would result in spacings less than 3.2 mm (1/8 in) for a voltage up to 250 V, or 6.4 mm (1/4 in) for a voltage between 251 to 1000 V, with any insulators omitted.

9 Test Specifications

Section 9 of UL 891 applies without modification.

10 Tables

Section 10 of UL 891 applies with the following modifications:

Table 6
Minimum spacings
(8.1.3.5, 8.1.16.1, 8.1.16.2, 8.1.16.6, 8.1.16.7, 8.1.16.8, 8.1.16.11, 8.1.16.14, 8.1.17.5, 8.4.6.1.2, 8.7.1.2.1, 8.8.1.4.4, 8.8.1.7.2, 8.8.1.7.3, 8.8.2.3.5, 9.2.3.1.1, 9.2.4.5.1)

Voltage involved		Minimum spacing between live parts of opposite polarity				Minimum spacing through air and over surface between live parts and grounded metal	
Greater than	Maximum	Through air		Over surface			
		mm	(in)	mm	(in)		
0	130	12.5	1/2	19.0	3/4	12.5	1/2
130	250	19	3/4	31	1-1/4	12.5	1/2
250	600	25	1	50	2	25 ^a	1 ^a
601	1000	25	1	50	2	25 ^a	1 ^a
^a A through air spacing of not less than 12.5 mm (1/2 in) may be used: 1) At a circuit breaker or a switch, other than a snap switch; 2) Between uninsulated live parts of a meter mounting base and grounded metal; and 3) Between grounded metal and the neutral of a 3-phase, 4-wire switchboard.							
NOTE 1 – Exceptions to these minimum spacings are covered in 8.1.16.2 – 8.1.16.6 and Table 7.							
NOTE 2 – The SI units are minimum values and are not a direct conversion from the corresponding values in inches.							

Table 7
Instrument or control circuit spacings
(8.1.16.2, 8.1.16.3, 8.1.16.6, 8.1.16.7, 8.1.16.8, 8.1.17.5, 8.7.1.2.1 and Table 6)

Voltage involved		Minimum spacings					
		Between uninsulated live parts of opposite polarity and between an uninsulated live part and an exposed or uninsulated metal part other than the enclosure				Between uninsulated live parts and the walls of a metal enclosure, including fittings for conduit or armored cable	
More than	Maximum	Through air ^a		Over surface		Shortest distance	
		mm	(in)	mm	(in)	mm	(in)
0	150	3.2	1/8	6.4	1/4	12.5	1/2
150	300	6.4	1/4	9.5	3/8	12.5	1/2
300	600	9.5	3/8	12.5	1/2	12.5	1/2
601	1000	9.5	3/8	12.5	1/2	12.5	1/2

^a The spacing between wiring terminals of opposite polarity shall not be less than 6.4 mm (1/4 in) in any case if the terminals are in the same plane. A metal piece attached to the enclosure shall be considered to be a part of the enclosure for the purpose of this footnote if deformation of the enclosure is likely to reduce the spacing between the metal piece and a live part.

11 Figures

Section 11 of UL 891 applies without modification.