

STANDARD INFORMATION

Standard: UL 347A

Standard ID: Medium Voltage Power Conversion Equipment [UL 347A:2021 Ed.2+R:05Apr2022]

Previous Standard ID: Medium Voltage Power Conversion Equipment [UL 347A:2021 Ed.2+R:01Mar2021]

EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

Effective Date: **April 5, 2024**

IMPACT, OVERVIEW, AND ACTION REQUIRED

Impact Statement: Per our accreditation, Intertek is required to review reports against the standard revisions to confirm compliance. Once compliance is confirmed, the standard reference in the report is updated to show continued compliance to the technical requirements of the standard. Reports not updated to this version by the effective date above will be withdrawn.

Overview of Changes:

- Color Coding of Grounding and Bonding Conductors
- Spacings for Printed Wiring Board
- Spacings within Gate Driver Circuit
- Revision to Breakdown of Components Requirements

Specific details of new/revise requirements are found in table below.

Current Listings Not Active? – Please immediately identify any current Listing Reports or products that are no longer active and should be removed from our records. We will do this at no charge as long as Intertek is notified in writing prior to the review of your reports.



STANDARD INFORMATION

CLAUSE	VERDICT	COMMENT
		<i>Additions to existing requirements are <u>underlined</u> and deletions are shown lined-out below.</i>
18	Info	Internal Wiring <i>New clause added;</i>
18.4		Insulated grounding and bonding conductors shall be identified by the color green with or without one or more yellow stripes throughout the entire product or shall be identified at each termination point by a green or green/yellow marking, such as green tape wrapped around the conductor. No other leads shall be so identified. This requirement does not apply to a green or green/yellow insulated conductor provided in a wiring harness, ribbon cable, or similar prefabricated wiring assembly, which is not likely to be mistaken for a grounding conductor.
18.5		Insulated conductors that are connected to the grounded side of a transformer secondary (neutral conductors) may be identified by the color white or grey or by three continuous white stripes on other than green insulation. No other conductor shall be so identified other than as described below: a) The insulation of type SIS wire used for control circuit wiring may be grey; b) When color coding of phases in a multi-phase circuit is provided at the end(s) of phase conductors, using tape or similar methods, any color other than green may be used; and c) Insulated conductors provided in a wiring harness, ribbon cable, or similar prefabricated wiring assembly, which are not likely to be mistaken for neutral conductors may have grey or white insulation.
21	Info	Spacings
21.7		Spacings for printed wiring boards used in accordance with the Standard for Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment, UL 840
21.7.1		This section applies only to circuits on printed wiring boards <u>with connection to grounded parts</u> and does not apply to spacings at field wiring terminals.
21.7.2		Other than as noted in 21.7.3, clearances and creepage distances in circuits of printed wiring boards may be evaluated in accordance with the requirements in the Standard for Insulation Coordination Including Clearance and Creepage Distances for Electrical Equipment, UL 840, as modified by 21.7.4 and 21.7.5. For circuits with working voltages above 1000 V, Table 8.1 and 9.2 of UL 840 are to be replaced by Table 21.5 and Table 21.6. <u>In circuits having serial connected components, the clearances and creepage distances are based on the potential involved across the individual component.</u>



CLAUSE	VERDICT	COMMENT
21.7.3		Clearances between an uninsulated live part and the walls of a metal enclosure, including fittings for conduit or armored cable, shall be in accordance with Table 21.3. <u>For potentials above 600V, Table 21.1 shall be used.</u> The clearances shall be determined by physical measurement.
21.7.4		In conducting evaluations in accordance with the requirements in the Standard for Insulation Coordination Including Clearance and Creepage Distances for Electrical Equipment, UL 840, the following guidelines shall be used: <u>c) Overvoltage Category IV shall apply to equipment permanently connected at the origin of an installation that is upstream of the main distribution board, or to equipment installed at the service entrance. Overvoltage Category III shall apply to equipment permanently connected in fixed installations that are downstream of, and including, the main distribution board.</u>
26	Info	Gate Drive Circuits
26.1		Gate drive circuits, <u>which may consist of multiple sub-circuits at medium voltage potential including the connection to the switching devices,</u> shall provide isolation between the gates of medium voltage solid state switching devices and low voltage control circuits. This isolation shall comply with the Dielectric Voltage Withstand Test, Section 33, and the Impulse Withstand Test, Section 36 with the potentials applied between the gate drive circuits and the low voltage control circuit. <u>This insulation may be provided by a dedicated gate drive circuit power supply.</u>
		<i>New clause added;</i>
26.4		Spacings within the gate drive circuits, including the connection to the solid state switching devices at medium voltage potential, shall be evaluated to the requirements in 26.5 – 26.10.
		<i>New clause added;</i>
26.5		A circuit analysis described in IEC 61800-5-1 clause 4.2 shall show that a failure of the insulation does not result in a hazard.
		<i>New clause added;</i>
26.6		For circuits having a serial connected component the clearances and creepage distances are based on the potential involved across the individual component.
		<i>New clause added;</i>
26.7		Minimum clearances shall comply with columns 1 and 2 of Table 26.2.



CLAUSE VERDICT COMMENT

New table added;

Minimum clearance – within gate drive circuit

Table 26.2

1		2		3		4		5		6	
Working voltage		Impulse		Minimum clearance							
				Pollution Degree							
				1		2		3			
Volts (rms or direct current)	Volts (recurring peak)	Volts		mm		mm		mm			
50	340	330		0.01		0.2		0.8			
100	530	500		0.01		0.2		0.8			
150	700	800		0.1		0.5		0.8			
300	960	1500		0.5		0.5		0.8			
600	1600	2500		1.5							
1000	2600	4000		3							
2040	3700	6000		5.5							
3080	4800	8000		8							
4870	7400	12000		14							
8240	12000	20000		25							
17500	26000	40000		60							
Interpolation is permitted.											

New clause added;

26.8

Clearances above an altitude of 2000 m must be multiplied by the factor provided in Table D.1. of IEC 61800-5-1.

New clause added;

26.9

Creepage distances may be evaluated in accordance with the requirements in Section 9 of UL 840. When the creepage distance determined is less than the clearance required, then it shall be increased to that clearance.

New clause added;

26.10

The spacings between the gate drive circuits and the low voltage control circuit shall comply with Table 21.1.

39

Info

Operation Tests

39.1

Info

General

To assess the risk of electric shock, the enclosure under test shall be in accordance with one of the following:

39.1.2

a) ~~The ground fuse shall be connected between the enclosure and earth ground, with the main input ground connection removed~~ The enclosure shall be grounded to the building following the guidelines of Table 250.122 of the National Electrical Code, NFPA 70, or the manufacturer. The source feeding the enclosure under test shall be solidly grounded; or



CLAUSE	VERDICT	COMMENT
		b) The grounding conductor shall be connected between the enclosure and the main input power terminal judged least at risk of arcing to earth ground, with the main input ground connection removed. For 3-phase controllers, the main input power terminal judged least at risk of arcing to earth ground is the L2 terminal.
39.8	Info	Acceptance criteria
39.8.1		At the conclusion of the tests in 39.2 – 39.7 the equipment shall comply with all of the following: <u>a) The ground conductor shall not have opened;</u> <u>b) Deleted</u> c) If cotton is used as specified in 39.1.4, the cotton shall not glow or flame. If cotton is not used, the controller shall comply with 39.1.4 (a), (b) and (c); d) The door or cover shall not have blown open; e) The door or cover shall be able to be opened; and f) The enclosure may become deformed, however, live parts shall not be accessible.