STANDARDS UPDATE NOTICE (SUN)
ISSUED: March 3, 2022

STANDARD INFORMATION

Standard: UL 61800-5-1
Standard ID: Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal and Energy [UL 61800-5-1:2012 Ed.1+R:11Jun2018]
Previous Standard ID: Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal and Energy [UL 61800-5-1:2012 Ed.1+R:24Feb2017]

EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

Effective Date: **November 20, 2022**

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.

Overview of Changes:

- Additional requirements for thermistors
- CDM/BDM controlling multiple motors
- Slash and Straight Voltage Ratings for Drives with a 3 Phase Input
- Revision to the requirements for signal words
- Dust test requirement for equipment rated other than Type 1, 2, 3R, and 3RX
- Revision to the requirements for across-the-line capacitors

Specific details of new/revised 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 – Please immediately identify any current Listing Reports or products that are no longer active and should be removed from our records.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
		Additions to existing requirements are underlined and deletions are shown ~~lined out~~ below.
4	Info	**Protection against electric shock, thermal, and energy hazards**
4.3	Info	**Protection against electric shock**
4.3.6	Info	**Insulation**
4.3.6.1	Info	**General**
4.3.6.1.4DV.2		***New clause added;*** PDS/CDM/BDM intended for connection to TN corner earthed systems shall be investigated for a STRAIGHT VOLTAGE RATING according to 6.2DV.2.1.5(a).
4.3.6.1.4DV.3		***New clause added;*** PDS/CDM/BDM intended for connection only to TN non-corner earthed systems, TN high-leg delta earthed systems, or IT systems shall be investigated for a SLASH VOLTAGE RATING according to 6.2DV.2.1.5(b).
4.3.6.2	Info	**Insulation to the surroundings**
4.3.6.1.1DV.2		***New clause added;*** The system voltage for Table 7 and Table 8 shall be according to the higher value given by the following: a) The largest rated voltage for equipment rated in accordance with 6.2DV.2.1.5(a); and b) The largest lower rated voltage for equipment rated in accordance with 6.2DV.2.1.5(b).
4.3.6.2.1DV.1		***New clause added;*** For evaluating the clearances and creepage distances between uninsulated LIVE PARTS and the surface on which the equipment is mounted, the mounting surface is evaluated as part of an enclosure, unless any deformation of the enclosure will not reduce the clearances and creepage distances between the mounting surface and any uninsulated LIVE PART.
4.14DV.1.2		~~An across-line capacitor shall be rated for the voltage (square root of 2 times the input value) and the temperature rating of the circuit involved and it shall comply with the AC or DC Voltage Test5.2.3.2.~~ A capacitor bridging functional insulation shall comply with Clause 4.14DV.1.7

CLAUSE	VERDICT	COMMENT
		or comply with the requirements of the Standard For Fixed Capacitors for Use in Electronic Equipment – Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains, UL 60384-14, be used within its voltage and temperature rating, and be of any Class X or Y which has a peak impulse voltage rating greater than or equal to the required impulse voltage according to Clauses 4.3.6.1 – 4.3.6.3 for the circuit the capacitor is bridging. In the case of more than one capacitor in series bridging functional insulation, voltage division shall be considered for both the working voltage and impulse voltage ratings.
4.14DV.1.7		***New clause added;*** A capacitor bridging functional insulation not in compliance with 4.14DV.1.2 shall be used within its voltage and temperature rating and be subjected to the analysis, and when necessary test, described in Clause 4.2.
4.14DV.1.8		***New clause added;*** A capacitor bridging basic insulation shall comply with the requirements of the Standard For Fixed Capacitors for Use in Electronic Equipment – Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains, UL 60384-14, be used within its voltage and temperature rating, and be any Class Y capacitor which has a peak impulse voltage rating greater than or equal to the required impulse voltage according to Clauses 4.3.6.1 – 4.3.6.3. Alternately, the capacitor may be a Class X capacitor, comply with the requirements of the Standard For Fixed Capacitors for Use in Electronic Equipment – Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains, UL 60384-14, be used within its temperature rating, and be any Class X capacitor which has a working voltage rating equal to 1.36 times the working voltage across the capacitor and peak impulse voltage rating greater than or equal to the required impulse voltage according to Clauses 4.3.6.1 – 4.3.6.3. In the case of both Y and X capacitors, if more than one capacitor is in series bridging basic insulation, voltage division shall be considered for both the working voltage and impulse voltage ratings.
4.14DV.1.9		***New clause added;*** Capacitors bridging functional and basic insulation in a center-connected network, see Figure 4.14DV.1.
4.14DV.1.9.1		***New clause added;*** Capacitors designated C1 and C2 in Figure 4.14DV.1 shall be used within their marked temperature ratings.
4.14DV.1.9.2		***New clause added;*** Capacitors designated C1 in Figure 4.14DV.1 shall be in compliance with one of the following with regard to the rated working voltage:

CLAUSE	VERDICT	COMMENT
		a) Any Class X capacitor with a rated voltage greater than or equal to 1.36 times the phase to earth working voltage; or b) Any Class Y capacitor with a rated voltage greater than or equal to the phase to earth working voltage; or c) Any Class X capacitor with a rated voltage greater than or equal to phase to earth working voltage used with a C2 capacitor in compliance with 4.14DV.1.9.4 (a) or (b); or d) Any Class X capacitor with a rated voltage greater than or equal to phase to earth working voltage and subjected to the analysis of Clause 4.2 with regard to a component failure from phase to earth; or e) Any capacitor subjected to the analysis of Clause 4.2 with regard to a component failure from phase to phase and used with a C2 capacitor in compliance with 4.14DV.1.9.4 (a) or (b); or f) Any capacitor subjected to the analysis of Clause 4.2 with regard to a component failure from phase to phase and phase to earth. Class X and Class Y capacitors as referenced above are capacitors that shall be in compliance with the requirements of the Standard For Fixed Capacitors for Use in Electronic Equipment – Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains, UL 60384-14.
4.14DV.1.9.3		***New clause added;*** Capacitors designated C1 in Figure 4.14DV.1 shall be in compliance with one of the following with regard to the rated impulse voltage: a) Any Class X or Y capacitor with a rated impulse voltage greater than or equal to the larger of: 1/2 the required phase to phase impulse voltage, or the required phase to earth impulse voltage times C2/(C1 + C2), where C1 and C2 are the capacitance of capacitors C1 and C2 respectively; or b) Any Class X or Y capacitor with a rated impulse voltage greater than or equal to 1/2 the required phase to phase impulse voltage and used with a C2 capacitor in compliance with 4.14DV.1.9.5 (a) or (b); or c) Class X or Y capacitor with a rated impulse voltage greater than or equal to 1/2 the required phase to phase impulse voltage and subjected to the analysis of Clause 4.2 with regard to a component failure from phase to earth; or d) Any Class X or Y capacitor with a rated impulse voltage greater than or equal to the required phase to earth impulse voltage times C2/(C1 + C2), where C1 and C2 are the capacitance of capacitors C1 and C2 respectively, and subjected to the analysis of Clause 4.2 with regard to a component failure from phase to phase; or e) Any capacitor subjected to the analysis of Clause 4.2 with respect to a component failure from phase to phase and used with a C2 capacitor in compliance with 4.14DV.1.9.5 a) or b); or

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		f) Any capacitor subjected to the analysis of Clause 4.2 with respect to a component failure from phase to phase and phase to earth. Class X and Class Y capacitors as referenced above are capacitors that shall be in compliance with the requirements of the Standard For Fixed Capacitors for Use in Electronic Equipment – Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains, UL 60384-14; and the required phase to phase and phase to earth impulse voltage is according to 4.3.6.1 – 4.3.6.3.
4.14DV.1.9.4		***New clause added;*** Capacitors designated C2 in Figure 4.14DV.1 shall be in compliance with one of the following with regard to the rated working voltage: a) Any Class Y capacitor with a rated voltage greater than or equal to the phase to earth working voltage when used with a C1 capacitor in compliance with 4.14DV.1.9.2 (c) or (e); or b) Any Class X capacitor with a rated voltage greater than or equal to 1.36 times the phase to earth working voltage when used with a C1 capacitor in compliance with 4.14DV.1.9.2 (c) or (e); or c) Any Class X or Y capacitor with any rated voltage. when used with C1 capacitors in compliance with 4.14DV.1.9.2 (a), (b), (d), or (f); or Class X and Class Y capacitors as referenced above are capacitors that shall be in compliance with the requirements of the Standard For Fixed Capacitors for Use in Electronic Equipment – Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains, UL 60384-14.
4.14DV.1.15		***New clause added;*** A capacitor bridging two adjacent circuits shall comply with the requirements of the Standard For Fixed Capacitors for Use in Electronic Equipment – Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains, UL 60384-14, be used within its temperature rating, and be any Class X or Y capacitor with a rated impulse voltage greater than or equal to the required impulse voltage according to Clauses 4.3.6.1 – 4.3.6.3. A Class Y capacitor shall be rated for the working voltage it bridges, a Class X capacitor shall be equal to 1.36 x the working voltage it bridges. Where two identical capacitors are connected in series, the rated voltage shall be greater than or equal to one-half the working voltage across the capacitor series (or 1.36 times half the working voltage for X capacitors), and the rated impulse voltage

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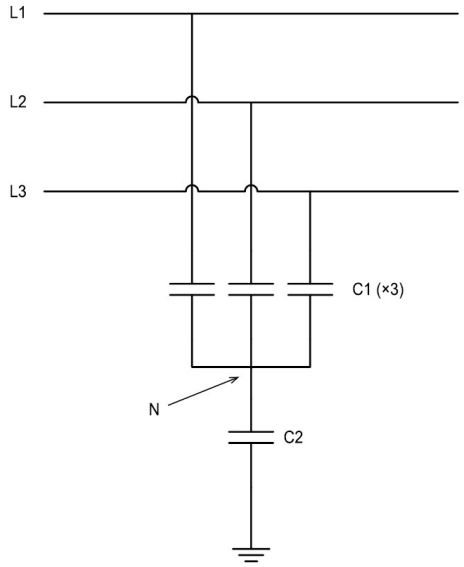
		shall be greater than or equal to one-half the required impulse voltage according to 4.3.6.1 – 4.3.6.3 across the capacitor series.
Figure 4.14DV.1		***New figure added;*** **Capacitors in a center-connected network** 
5	Info	**Test requirements**
5.1	Info	**General**
5.1.4DV		***New clause added;*** D2 Modification to replace 5.1.4 with the following: The manufacturer shall rate the CDM/BDM/PDS for its acceptable earthing systems according to 4.3.6.1.4DV.2 and 4.3.6.1.4DV.3. Where the earthing system may be a factor in test results, the individual test requirements will address the worst-case (most stressful) earthing system to be used for the test.
5.2	Info	**Test specifications**
5.2.2	Info	**Mechanical tests**
5.2.2.1DV		***New clause added;*** The test voltage between phases, as required by 5.2DV.1, shall be the maximum of (a) and (b): a) The largest rated voltage for equipment rated in accordance with 6.2DV.2.1.5(a); and b) The largest higher rated voltage for equipment rated in accordance with 6.2DV.2.1.5(b).
5.2.2.1DV.2		The source used for test shall an earthing system according to the following:

CLAUSE	VERDICT	COMMENT
		a) For BDM/DCM/PDS intended for connection to systems according to 4.3.6.1.4DV.2, the source shall have a measured r.m.s working voltage from phase to earth equal to or greater than the STRAIGHT VOLTAGE RATING, or the measured working voltage from phase to earth may be lower than the STRAIGHT VOLTAGE RATING when all measured working voltages, both rms and peak, from circuits isolated from earth to earth or a circuit referenced to earth (i.e. PELV) are multiplied by the following factor: (STRAIGHT VOLTAGE RATING) / (Phase to earth measured r.m.s working voltage) b) For BDCM/CDM/PDS intended for connection only to systems according to 4.3.6.1.4DV.3, the source shall have a measured r.m.s. working voltage from phase to earth equal to or greater than the rated phase to earth voltage.
5.2.2.2DV.2		***New clause added;*** The PDS/CDM/BDM, and the wire mesh cage (if used), shall be connected to earth. The conductor shall have a maximum length of 4 ft (1,2 m) and be sized in accordance with 4.3.5.4DV.1. For conductors sized 6 AWG (13,3 mm2) or smaller shall be solid wire.
5.2.2.2DV.3		***New clause added;*** The source used for test shall have an earthing system according to the following: a) For PDS/CDM/BDM intended for connection to systems according to 4.3.6.1.4DV.2, the source shall have a measured r.m.s working voltage from phase to earth equal to or greater than the STRAIGHT VOLTAGE RATING, or the measured working voltage from phase to earth may be lower than the STRAIGHT VOLTAGE RATING if the earth connection of the PDS/CDM/BDM, and the wire mesh cage (if used), are connected to the supply circuit pole least at risk of arcing to ground. b) For BDCM/CDM/PDS intended for connection only to systems according to 4.3.6.1.4DV.3, the source shall have a measured r.m.s. working voltage from phase to earth equal to or greater than the rated phase to earth voltage.
5.2.3	Info	**Electrical tests**
5.2.3.6	Info	**Short-circuit test and Breakdown of components test (TYPE TESTS)**
5.2.3.6DV .1.4.1		A drive having short circuit ratings in excess of the levels specified in Table 4.3.9DV.1 shall comply with the requirements of Section 5.2.3.6.2.1DV.5, Short Circuit Test – High Fault Currents, with the following modifications: a) The 5.2.3.6.2 reference in 5.2.3.6.2.1DV.5.5 is amended by 5.2.3.6DV.1.3; and

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		b) The maximum current rating of the branch-circuit protective device(s) shall be selected according to 5.2.3.6DV.1.1.3. The type of the branch-circuit protective device(s) shall comply with 5.2.3.6DV.1.1.3.
5.2.3.4DV .1.5.1		A drive having short circuit ratings at the standard available levels specified in Table 4.3.9DV.1 shall be tested in accordance with 5.2.3.6.4, Breakdown of Components Test, with the following additional requirements: b) The drive shall be connected in series with branch-circuit protective devices selected according to 5.2.3.6DV.1.1.3. c) The drive shall be tested with 4 feet (1,2 m) of wire, or less, attached to each input terminal and output terminal (if required). For enclosed drives, the input wiring and output wiring (if required) is then to be routed through 10 – 12 inch (250 – 305 mm) lengths of conduit installed on the enclosure with the ends of the conduit plugged with surgical cotton. For an open type drive controller, a wire mesh cage that is 1,5 times the size of the controller is usable to simulate the intended enclosure. The wire mesh cage must be grounded per (a). d) The input and output wiring shall be according to 5.2.3.6DV.1.1.4. e) The drive shall be tested on a circuit that is calibrated as described in 5.2.3.6.2.1DV.3, Calibration of Test Circuits. The available short circuit current of the test circuit shall be the standard fault current value according to Table 4.3.9DV.1.
5.2.3.6.2DV .2.1.4		***New clause added;*** The PDS/CDM/BDM, and the wire mesh cage (if used), shall be connected to earth. The conductor shall have a maximum length of 4 ft (1,2 m) and be sized in accordance with 4.3.5.4DV.1. For conductors sized 6 AWG (13,3 mm2) or smaller shall be solid wire.
5.2.3.6.2DV .2.1.5		***New clause added;*** The source used for test shall have an earthing system according to the following: a) For PDS/CDM/BDM intended for connection to systems according to 4.3.6.1.4DV.2, the source shall have a measured r.m.s working voltage from phase to earth equal to or greater than the STRAIGHT VOLTAGE RATING, or the measured working voltage from phase to earth may be lower than the STRAIGHT VOLTAGE RATING if the earth connection of the PDS/CDM/BDM, and the wire mesh cage (if used), are connected to the supply circuit pole least at risk of arcing to ground. b) For BDCM/CDM/PDS intended for connection only to systems according to 4.3.6.1.4DV.3, the source shall have a measured r.m.s. working voltage from phase to earth equal to or greater than the rated phase to earth voltage. If the source is a three phase, four wire, center earthed system (TN), the test circuit shall also be able to deliver not less than 90% of the rated high fault current into a single-phase

CLAUSE	VERDICT	COMMENT
		short circuit between each phase and "S". The single-phase power factor shall comply with 5.2.3.6.2.1DV.3.
5.2.4	Info	**Abnormal operation tests**
5.2.4.1DV.2		***New clause added;*** The test voltage between phases, as required by 5.2DV.1, shall be the maximum of (a) and (b): a) The largest rated voltage for equipment rated in accordance with 6.2DV.2.1.5(a); and b) The largest higher rated voltage for equipment rated in accordance with 6.2DV.2.1.5(b).
5.2.4.1DV.3		***New clause added;*** The source used for test shall have an earthing system according to the following: a) For PDS/CDM/BDM intended for connection to systems according to 4.3.6.1.4DV.2, the source shall have a measured r.m.s working voltage from phase to earth equal to or greater than the STRAIGHT VOLTAGE RATING, or the measured working voltage from phase to earth may be lower than the STRAIGHT VOLTAGE RATING if the earth connection of the PDS/CDM/BDM, and the wire mesh cage (if used), are connected to the supply circuit pole least at risk of arcing to ground. b) For PDS/CDM/BDM intended for connection only to systems according to 4.3.6.1.4DV.3, the source shall have a measured r.m.s. working voltage from phase to earth equal to or greater than the rated phase to earth voltage.
6	Info	**Information and marking requirements**
6.2DV.2.1.5		***New clause added;*** PDS/CDM/BDM shall have one or more of the following input voltage ratings: a) Straight voltage rating – The rating shall be the line-to-line voltage, for example, 460 or 480 volts. b) Slash voltage rating – The rating shall have two values, the line-to-line voltage and the line-to-ground voltage, for example, 460Y/267 or 480Y/277 volts.
6.2DV.1.6		***New clause added;*** The type of electrical supply system (e.g. TN or IT) to which the PDS/CDM/BDM may be connected to is not information required to be included with the PDS/CDM/BDM.
6.3	Info	**Information for INSTALLATION and commissioning**

CLAUSE	VERDICT	COMMENT
6.3.6	Info	**Connections**
6.3.6.6DV.2		The marking required for enclosures that are intended for field assembly of the bonding means in accordance with 4.3.5.3.1DV.2.1.3 shall: a) Be located where visible during INSTALLATION, such as inside the cover; and b) Consist of the word ~~"CAUTION"~~ "WARNING" and the following or the equivalent, "Bonding between conduit connections is not automatic and must be provided as a part of the installation"; or the word ~~"CAUTION"~~ "WARNING" and the following or equivalent, "Nonmetallic enclosure does not provide grounding between conduit connection. Use grounding bushings and jumper wires."
6.4	Info	**Information for use**
6.4.3	Info	**Labels, signs and signals**
6.4.3.1DV.0		***New clause added;*** A marking on the product or in the instruction manual that is intended to inform the user of a risk of injury to persons or property damage shall comply with Section 6.4.3.1 in addition to 6.4.3.1DV.1 – 6.4.3.1DV.10.
6.4.3.1DV.5		***New clause added;*** The Standard for Product Safety Signs and Labels, NEMA Z535.4 provides additional information with respect to markings, symbols, and color coding.
6.4.3.1DV.9		***New clause added;*** Unless specified otherwise in individual marking requirements, when deciding which signal word to use, the following definitions apply: DANGER – Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury WARNING – Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury Caution – Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. Notice – Indicates a potentially hazardous situation which, if not avoided, could result in property damage or other situation not related to personal injury.
6.4.3.1DV.10		***New clause added;*** The signal word "NOTICE" shall not be used when a risk of personal injury is involved.
6.5	Info	**Information for maintenance**
6.5DV.1		When more than one disconnect switch is required to disconnect all power within a control assembly or compartment, the assembly or compartment shall be marked with the word ~~"CAUTION"~~ "WARNING" and the following or the

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		equivalent, “Risk of Electric Shock – More than one disconnect switch is required to de-energize the equipment before servicing.”
6.5.2DV		The marking shall be located where clearly visible to the user prior to accessing the charged circuit. The marking shall include the following: ~~“CAUTION~~ “WARNING – Risk of Electric Shock,” followed by instructions to discharge the specific capacitor or indicating the time required for the capacitor to discharge to a level below 50 V DC.
Annex DVD	Info	**Enclosures for use with Industrial Control Equipment**
DVD.2	Info	**Construction**
DVD.2.1	Info	**General**
DVD.2.1.3	Info	**ENVIRONMENTAL RATING RELATED TO ENCLOSURE PERFORM**
DVD.2.1.3.3		A ~~Type 12~~ enclosure with an environmental rating other than Type 1, 2, or 3R may employ ~~filtered~~ ventilation openings if it complies with the requirements for it’s type rating (s) ~~Type 12 enclosures~~ for non-ventilated enclosures in the Standard for Enclosures for Electrical Equipment, Environmental Considerations, UL 50E, with the exception that water tests cannot be used in lieu of dust tests when testing the ventilation openings.
Annex DVG		***New annex added;*** **Modular Drive Systems** The requirements in this section are applicable only to MODULAR DRIVE SYSTEMS consisting of a single converter and two or more INVERTER SECTIONS, where each single inverter is intended to control a single motor (see standard for details).
Annex DVH		***New annex added;*** **CDM/BDM for Multiple Motor Applications** The requirements in this section are applicable only to CDM/BDM intended to control multiple motors (see standard for details).