



UL 61800-5-1

STANDARD FOR SAFETY

Adjustable Speed Electrical Power
Drive Systems – Part 5-1: Safety
Requirements – Electrical, Thermal and
Energy

UL Standard for Safety for Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal and Energy, UL 61800-5-1

First Edition, Dated June 8, 2012

Summary of Topics

This revision of ANSI/UL 61800-5-1 dated February 11, 2021 includes the following changes:

- Typo Corrections in [Table 4.3.5.3.1DV.3](#)***
- Editorial Correction in Clause [4.1](#) to Align with IEC Text***

Please note that the national difference document incorporates all of the U.S. national differences for UL 61800-5-1. UL 61800-5-1 is based on IEC 61800-5-1, second edition (published July 2007).

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The revised requirements are substantially in accordance with Proposal (s) on this subject dated September 25, 2020 and November 20, 2020.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of UL.

UL provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if UL or an authorized UL representative has been advised of the possibility of such damage. In no event shall UL's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

Users of the electronic versions of UL's Standards for Safety agree to defend, indemnify, and hold UL harmless from and against any loss, expense, liability, damage, claim, or judgment (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

No Text on This Page

JUNE 8, 2012
(Title Page Reprinted: February 11, 2021)



ANSI/UL 61800-5-1-2021

1

UL 61800-5-1

**Standard for Adjustable Speed Electrical Power Drive Systems – Part 5-1:
Safety Requirements – Electrical, Thermal and Energy**

First Edition

June 8, 2012

This ANSI/UL Standard for Safety consists of the First Edition including revisions through February 11, 2021.

The most recent designation of ANSI/UL 61800-5-1 as an American National Standard (ANSI) occurred on February 11, 2021. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

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

UL's Standards for Safety are copyrighted by UL. Neither a printed nor electronic copy of a Standard should be altered in any way. All of UL's Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of UL.

COPYRIGHT © 2021 UNDERWRITERS LABORATORIES INC.

No Text on This Page

CONTENTS

Preface (UL)	7
NATIONAL DIFFERENCES	9
FOREWORD	11
1 Scope	15
1DV.1 Modification to add the following:	15
1DV.2 Modification to add the following:	15
1DV.3 Modification to add the following:	15
2 Normative references	16
2DV Modification to add the following:	19
3 Terms and definitions.....	19
Table 1DV Modification to add the following terms to Table 1 :	20
3.1ADV Addition:.....	20
3.6ADV Addition:.....	20
3.6BDV Addition:.....	21
3.6CDV Addition:.....	21
3.6DDV Addition:.....	21
3.6EDV Addition:.....	21
3.6FDV Addition:	21
3.11ADV Addition:	22
3.12ADV Addition:	22
3.13DV Modification:	22
3.14ADV Addition:	22
3.15ADV Addition:	22
3.15BDV Addition:	23
3.17ADV Addition:	23
3.18DV Modification:	23
3.18ADV Addition:	23
3.18BDV-3.18ADV Addition:.....	23
3.19ADV Addition:	24
3.20ADV Addition:	24
3.32ADV Addition:	25
3.36ADV Addition:	26
3.36BDV Addition:	26
3.36CDV Addition:.....	26
3.36DDV Addition:.....	26
3.37ADV Addition:	26
3.40DV Addition:	27
3.40ADV Addition:	27
3.41DV Addition:	27
4 Protection against electric shock, thermal, and energy hazards	29
4.1 General	29
4.1DV.1 Modification to add the following:	30
4.1DV.2 Modification to add the following:	30
4.1DV.3 Modification to add the following:	30
4.2 Fault conditions	31
4.2DV.1 Modification to add the following:	31
4.2DV.2 Modification to add the following:	31
4.2DV.3 Modification to add the following:	32
4.3 Protection against electric shock.....	32
4.4 Protection against thermal hazards	95

4.5 Protection against energy hazards	105
4.6 Protection against environmental stresses	106
4.6DV Modification:	106
4.7DV Addition:	106
4.8DV Addition:	107
4.9DV Addition:	107
4.10DV Addition:	107
4.11DV Addition:	108
4.12DV Addition:	108
4.13DV Addition:	108
4.14DV Addition:	109
4.15DV Addition:	112
4.16DV Addition:	115
5 Test requirements	116
5.1 General	116
5.2 Test specifications	120
5.2DV Addition:	120
6 Information and marking requirements	179
6.1 General	179
6.1DV Modification	180
Table 28DV Modification to replace Table 28 with the following:	182
6.2 Information for selection	186
6.2DV.1 Modification to add the following:	186
6.2DV.2 Modification to add the following:	187
6.2DV.3 Modification to add the following:	188
6.2DV.4 Modification to add the following:	188
6.3 Information for INSTALLATION and commissioning	188
6.4 Information for use	200
6.5 Information for maintenance	204
6.5DV Modification to add the following:	204

Annex A (informative) Examples of protection in case of direct contact

A.1 General	207
A.2 Protection by means of DVC A	207
A.3 Protection by means of PROTECTIVE IMPEDANCE	207
A.4 Protection by using limited voltages	208

Annex B (informative) Examples of overvoltage category reduction

B.1 General	209
B.2 Insulation to the surroundings (see 4.3.6.2)	209
B.2.1 Circuits connected directly to the supply mains (see 4.3.6.2.2)	209
B.2.2 Circuits not connected directly to the supply mains (see 4.3.6.2.3)	213
B.2.3 Insulation between circuits (see 4.3.6.2.4)	214
B.3 FUNCTIONAL INSULATION (see 4.3.6.3)	214
B.3DV Modify to correct:	214
B.4 Further examples	215

Annex C (normative) Measurement of clearance and creepage distances

C.1 Measurement	216
C.1DV Modification to add requirements for clamped joints:	216
C.2 Relationship of measurement to pollution degree	216
C.3 Examples	217

Annex D (informative) Altitude correction for clearances**Annex E (informative) Clearance and creepage distance determination for frequencies greater than 30 kHz**

E.1	Clearance.....	225
E.2	Creepage distance.....	226

Annex F (informative) Cross-sections of round conductors**Annex G (informative) Guidelines for RCD compatibility**

G.1	Selection of RCD type.....	229
G.2	Fault current waveforms.....	230

Annex H (informative) Symbols referred to in this part of IEC 61800**Bibliography****Annex DVA (normative) Normative References and Component Standards**

DVA	Addition of new annex DVA as follows:.....	236
-----	--	-----

Annex DVB (normative) IEC to USA Standard References

DVB	Addition of new annex DVB as follows:.....	240
-----	--	-----

Annex DVC (normative) Isolated Secondary Circuits and Circuits Supplied by Battery

DVC	Addition of new annex DVC as follows:	243
-----	---	-----

Annex DVD (normative) Enclosures for use with Industrial Control Equipment

DVD	Addition of new annex DVD as follows:	255
-----	---	-----

Annex DVE (normative) Motor Current Tables

DVE	Addition of new annex DVE as follows:.....	268
-----	--	-----

Annex DVF (normative) Clearances and Creepage Distances (Spacing) Tables

DVF	Addition of new annex DVF as follows:	270
-----	---	-----

Annex DVG (normative) Modular Drive Systems

Annex DVG	Addition of new annex DVG as follows:.....	275
-----------	--	-----

Annex DVH (normative) CDM/BDM for Multiple Motor Applications

Annex DVH Addition of new Annex DVH as follows:.....	291
--	-----