STANDARDS UPDATE NOTICE (SUN)
ISSUED: June 19, 2018

STANDARD INFORMATION

This SUN establishes the Continuing Certification approach to Automatic Electrical Controls

Standard Number: UL 60730-1
Standard Name: Automatic Electrical Controls – Part 1: General Requirements
Standard Edition and Issue Date: 5th Edition Dated August 3, 2016
Date of Revision: May 21, 2014 and August 3, 2016
Date of Previous Revision of Standard: November 13, 2013

EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

Effective Date: **No action is required for currently certified products to maintain certification.**

This SUN is being presented to assist users of the standard to appreciate the significance of the changes made to the standard that will apply should the product described be modified after October 19, 2018.

IMPACT, OVERVIEW, AND ACTION REQUIRED

Impact Statement: After October 19, 2018, existing certifications to UL 60730-1 can remain unless a change is made to the product design. **NOTE:** Effective immediately, this revised standard will be exclusively used for evaluation of new products unless the Applicant requests in writing that current requirements be used along with their understanding that their listings will be withdrawn on Effective Date noted above, unless the product is found to comply with new/revised requirements.

After October 19, 2018

- All new listing must be evaluated to UL 60730-1 4th or 5th Edition.
- Existing listings may remain to previous versions of UL 60730-1 unless:
  - A design change is made to the product that requires a certification decision or
  - A new/revised requirement in future may require action to be taken

After October 23, 2023

- All new listing must be evaluated to UL 60730-1 5th Edition.
- Existing listings may remain to previous versions of UL 60730-1 unless:
  - A design change is made to the product that requires a certification decision or
  - A new/revised requirement in future may require action to be taken

Overview of Changes:

Changes from UL 60730-1 4th edition dated November 23, 2013 to UL 60730-1 4th edition dated May 21, 2014:

- Revised requirement for components placed across the output of switching devices in safety controls
- Provided additional details regarding gaskets
- Controls classified as Type 1.M or 2.M are subjected to the aging test
- Added manufacturing and production tests to address electrical and functional safety concerns during manufacturing

Changes from UL 60730-1 4th edition dated May 21, 2014 to UL 60730-1 5th edition dated August 3, 2016:

- Modification of the title and scope
- Revisions to Clause H.26 based on changes in technology, applications, and to improve consistency and layout
- Modification to Table H.12 to align with CISPR 22
- Revisions to Annex J to correlate the fault modes of thermistors and to exempt thermistors used in conjunction with type 1 controls in SELV low power circuits from the tests specified in Annex J
- New requirements covering battery-powered controls, and the use of batteries in controls
- Revision addressing the exclusion of relay faults
- New/updated requirements in Clause 24, for switch mode power supplies
- Revisions covering the allowance of screwless-type clamping units complying with IEC 60999-1
- New requirements addressing remotely actuated control functions
- Addition of a new/updated leakage current diagram to align the Annex E diagram with the diagram in IEC 6099
- updated requirements for temperature sensing controls
- Some DV deleted, at the same time some new DV added

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

If the applicable requirements noted in the table are not described in your report(s), these requirements will need to be confirmed as met and added to your report(s) such as markings, instructions, test results, etc. (as required).

Client Action Required:

Information – To assist our Engineer with review of your Listing Reports, please submit technical information in response to the new/revised paragraphs noted in the attached or explain why these new/revised requirements do not apply to your product (s).

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 <u>underlined</u> and deletions are shown ~~lined out~~ below.
		The following changes reflect the UL 60730-1 May 14, 2014 revision:
1	Info	**Scope and normative references**
1.1.1DV.2		This national difference is being added to allow the evaluation of controls used in commercial and industrial applications where no other standard is available that adequately covers the safety aspects of the product.
8	Info	**Protection against electric shock**
8.1	Info	**General requirements**
8.1.3DV		Referenced UL 746C – Standard for Polymeric Materials to maintain present practice.
10	Info	**Terminals and TERMINATIONS**
10.1	Info	**Terminals and TERMINATIONS for external copper conductors**
10.1.1DV.2		Revised to reflect current practices and requirements for field wiring.
10.1.14DV.1.1		Deleted “two full threads” to align with requirements in other wiring connector standards such as UL 486 and UL 1059.
11	Info	**Constructional requirements**
11.3	Info	**ACTUATION and OPERATION**
11.3.5	Info	**Contacts – General**
11.3.5.1DV		Revised requirement for components placed across the output of switching devices in safety controls to accommodate innovative designs while instituting the principles of functional safety.
11.13	Info	**Protective controls and components of protective control systems**
11.13.1DV		Added clarity to 11.13.1 and to address the reliability of circuits/components used in operating controls that are being relied upon to perform a function, failure of which could lead to a hazardous condition.
12	Info	**Moisture and dust resistance**
12.1	Info	**Protection against ingress of water and dust**
12.1.6.3DV		Provided additional details regarding the method, test parameters and compliance criteria for gaskets
13	Info	**Electric strength and insulation resistance**
13.2	Info	**Electric strength**
13.2.3		Added the DC equivalent of the test potential referenced in the electric strength test for DC applications.

17	Info	**Endurance**
17.6	Info	**Ageing test**
17.6.2DV		Controls classified as Type 1.M or 2.M are subjected to the aging test for the declared number of hours representing normal operation/condition in the field prior to being subjected to the sequence of tests under the Endurance test.
24	Info	**Components**
24.2.1DV.3.2		Added clarity to the requirement for SMPS – abnormal test by adding the term "DC" link.
Annex H	Info	**Requirements for ELECTRONIC CONTROLS**
H.26	Info	**Electromagnetic compatibility (EMC) requirements – immunity**
Table H.11		Added the full range of frequency variations since this is the only test where test levels 2 and 3 are applicable.
H.26.14	Info	**Power frequency magnetic field immunity test**
Table H.26.14.2DV		Modified to reflect the correct verbiage used in the horizontal standards – IEC 61000 series.
Annex DVC		Added manufacturer's date code requirements to reflect current practice.
Annex DVE		Added manufacturing and production tests to address electrical and functional safety concerns during manufacturing.

		The following changes reflect the issuing of UL 60730-1 5th edition dated August 2, 2016:
9	Info	**Provision for protective earthing**
9.1	Info	**General requirements**
9.1.1DV.2.3		***New clause added;*** A PELV circuit supplied from a transformer where the supply system is less than 150 V to ground may be earthed for functional reasons, and are used in applications where SELV is not required. A PELV circuit that is supplied from a transformer where the supply system exceeds 150 V to ground, the PELV circuit shall be grounded.
10	Info	**Terminals and terminations**
10.1	Info	**Terminals and terminations for external copper conductors**
10.1.8.2DV		***New clause added;*** D2 Modification to 10.1.8.2: Terminals are fitted with conductors according to the use of the terminal and in accordance with Article 400 of the National Electrical Code, NFPA 70. The wires of FIXED WIRING conductors are straightened before inserting into the terminal.
11	Info	**Constructional requirements**

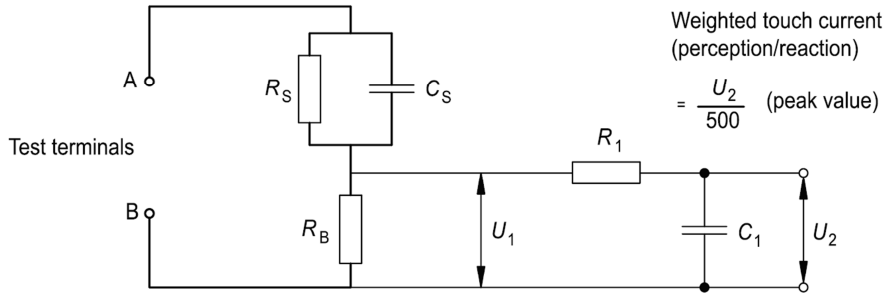
11.11	Info	**Requirements during mounting, maintenance and servicing**
11.11.1	Info	**Covers and their fixing**
11.11.1.2DV.2		***New clause added;*** Devices that allow user removal or replacement of button/coin cells shall comply with the requirements of 5.2 – 5.6 of UL 4200A. Devices with button/coin cells that are not intended to allow user removal/replacement of the cells shall comply with 5.7 of UL 4200A.
11.13	Info	**Protective controls and components of protective control systems**
11.13.4		***New section added;*** **Batteries**
11.13.4.1		CONTROLS containing batteries shall be designed to reduce the RISK of fire, explosion and chemical leaks under normal conditions and after a single FAULT in the CONTROL. For USER-replaceable batteries, the design shall reduce the likelihood of reverse polarity installation if this would create a HAZARD.
11.13.4.2		Battery circuits designed for a total battery capacity > 1 000 mAh shall be designed so that: – the output characteristics of a battery charging circuit are compatible with its rechargeable battery (see Annex V); and – for non-rechargeable batteries, discharging at a rate exceeding the battery manufacturer's recommendations, and unintentional charging, are prevented; and – for rechargeable batteries (see Annex V), charging and discharging at a rate exceeding the battery manufacturer's recommendations, and reversed charging, are prevented; and – replaceable batteries shall either: • have contacts that cannot be shorted with the test finger (Figure 2); or • be inherently protected to avoid creating a HAZARD within the meaning of the standard. NOTE: Reversed charging of a rechargeable battery occurs when the polarity of the charging circuit is reversed, aiding the discharge of the battery.
11.13.4.3		If a battery with a capacity > 1 000 mAh contains liquid or gel electrolyte, a battery tray shall be provided that is capable of retaining any liquid that could leak as a result of internal pressure build-up in the battery. The requirement to provide a battery tray does not apply if the construction of the battery is such that leakage of the electrolyte from the battery is unlikely. NOTE: An example of a battery construction where leakage of the electrolyte is considered to be unlikely is the sealed CELL valve-regulated type.

11.13.4.3.1	If battery tray is required, its capacity shall be at least equal to the volume of electrolyte of all the CELLS of the battery, or the volume of a single CELL if the design of the battery is such that simultaneous leakage from multiple CELLS is unlikely. NOTE: If several CELLS (for example, the six CELLS in a 12 V lead-acid battery) are in a single casing, its fracture could lead to a greater volume of leakage than from a single CELL.
11.13.4.4	Compliance with 11.13.4.1 to 11.13.4.3.1 is checked by inspection and by evaluation of the data provided by the EQUIPMENT MANUFACTURER and battery manufacturer. When appropriate data is not available, compliance is checked by the test of 11.13.4.4.1 to 11.13.4.4.4 and 11.13.4.5. However, batteries that are inherently safe for the conditions given are not tested under those conditions. Consumer grade, non-rechargeable carbon-zinc or alkaline batteries are considered safe under short-circuiting conditions and therefore are not tested for discharge; nor are such batteries tested for leakage under storage conditions. The battery used for the following tests is a new non-rechargeable battery or as provided with, or recommended by the manufacturer for use with, the CONTROL.
11.13.4.4.1	Unintentional charging of a non-rechargeable battery. The battery is charged while briefly subjected to the simulation of any single component FAILURE that is likely to occur in the charging circuit and that would result in unintentional charging of the battery. To minimize testing time, the FAILURE is chosen that causes the highest charging current. The battery is then charged for a single period of 7 h with that simulated FAILURE in place.
11.13.4.4.2	Excessive discharging rate. The battery is subjected to rapid discharge by open-circuiting or short-circuiting any current-limiting or voltage-limiting components in the load circuit of the battery under test. NOTE: Some of the tests specified can be hazardous to the persons carrying them out; it is suggested that all appropriate measures to protect personnel against possible chemical or explosion HAZARDS be taken.
11.13.4.4.3	See Annex V.
11.13.4.4.4	These tests shall not result in any of the following: – chemical leaks caused by cracking, rupturing or bursting of the battery jacket, if such leakage could adversely affect required insulation; or – spillage of liquid from any pressure relief device in the battery, unless such spillage is contained by the CONTROL without RISK of damage to the insulation or HARM to the USER; or – explosion of the battery, if such explosion could result in injury to a USER; or – emission of flame or expulsion of molten metal to the outside of the CONTROL enclosure.

11.13.4.5		After completion of the tests, the equipment is subjected to the electric strength tests of 13.2.
11.13.5		***New section added;*** **Smart enabled controls**
11.13.5.1		A SMART ENABLED CONTROL shall be so designed that the external communication signals (data or power demand) do not unintentionally override the operating parameters of a TYPE 2 ACTION CONTROL nor interfere with any protective function of the CONTROL. A SMART ENABLED CONTROL is permitted to alter the operating parameters of a type 2 CONTROL within defined limits so long as the protective functions remain intact.
11.13.5.2		A SMART ENABLED CONTROL that integrates operating and protective functions shall be evaluated as a PROTECTIVE CONTROL.
11.13.5.3		Any transmitter or communication module that is external to the CONTROL and acts as the interface between the CONTROL and the telecommunication network shall comply with IEC 62151 or IEC 62368-1. Nevertheless the measures to ensure protection against electric shock in this standard (e.g. Annex T) shall be met.
11.13.5.4		Any transmitter or communication module that is part of the SMART ENABLED CONTROL shall comply with the requirements of this standard.
11.13.5.5		Compliance of 11.13.5 is checked by evaluating the CONTROL in accordance with the requirements of H.27.1 and other relevant requirements of this standard.
13	Info	**Electric strength and insulation resistance**
13.2	info	**Electric strength**
13.2.1		Compliance is checked by the following test of 13.2.2 to 13.2.4 inclusive, <u>using insulation or disconnection test voltages as shown in Table 12</u>. This test is made when specified in Clause 12 and Clause 17.
24	Info	**Components**
24.1		Transformers intended to supply power to a SELV-circuit or PELV-circuit shall be of the safety isolating type and shall comply with the relevant requirements of IEC 61558-2-6. Capacitors ~~used to provided radio interference suppression shall comply with the requirements of IEC 60384-14.~~ <u>connected between two line conductors or between a line conductor and the neutral or between HAZARDOUS LIVE PARTS and protective earth shall be in accordance with IEC 60384-14 and shall be used in accordance with its rated values.</u> Fuses shall comply with the requirements of IEC 60127-1 or IEC 60269-1, as appropriate.

24.1DV	D2 Modification of 24.1 by adding the following text after the first paragraph: Transformers shall comply with the relevant requirements of the Standard for Low Voltage Transformers – Part 1: General Requirements, UL 5085-1, and the Standard for Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers, UL 5085-3. Fuses shall comply with the requirements of the relevant standard for low-voltage fuses, UL 248-14. Other fuses are considered to be intentionally weak parts and shall be evaluated in accordance with H.27.1.1.
24.4	***New section added;*** Switch mode power supplies not covered by 24.2.1, including their peripheral circuitry, used in ELECTRONIC CONTROLS shall comply with the tests of 24.4.1 and all of the applicable requirements of this standard. NOTE: Subclause 24.4.1.11 gives the compliance criteria for the tests.
24.4.1	**Overload tests for switch mode power supplies**
24.4.1.1	Each output winding, or section of a tapped winding, is overloaded in turn, one at a time, while the other windings are kept loaded or unloaded, whichever load conditions of NORMAL USE is the least favourable.
24.4.1.2	The overload is carried out by connecting a variable resistor (or an electronic load) across the winding or the rectified output. The resistor is adjusted as quickly as possible and readjusted, if necessary, after 1 min to maintain the applicable overload. No further readjustments are then permitted.
24.4.1.3	For this test, any protective devices such as a fuse, manual reset circuit protector, thermal protector, etc. are allowed to remain in the circuit.
24.4.1.4	If overcurrent protection is provided by a current-breaking device, the overload test current is the maximum current which the overcurrent protection device is just capable of passing for 1 h. If this value cannot be derived from the specification, it is to be established by test.
24.4.1.5	If no overcurrent protection is provided, the maximum overload is the maximum power output obtainable from the power supply.
24.4.1.6	In case of voltage foldback, the overload is slowly increased to the point which causes the output voltage to drop by 5 %. The overload is then established at the point where the output voltage recovers and held for the duration of the test.
24.4.1.7	The duration of the test is to be for 1 h or until ultimate results are reached.
24.4.1.8	The maximum open-circuit voltage of each winding (directly at the winding of the transformer) and the maximum load current are measured and recorded such that the maximum output power may be determined.
24.4.1.9	The maximum open circuit voltage measurements shall be made during normal OPERATION and under single component FAILURE, see Table H.24.

24.4.1.10		For SELV applications, where the maximum open circuit voltage measured directly at the secondary of the transformer exceeds the limits specified in 2.1.5, the measurement of the maximum output voltage of each winding may be made after certain PROTECTIVE IMPEDANCES. In this case, the limits shall be in accordance with H.8.1.10.1.
24.4.1.11		Following each test (while still in a heated condition), the transformer is to be subjected to the electric strength test of 13.2.
24.4.1.12		Compliance shall be in accordance with items a), b), c), d), e) and f) of H.27.1.1.3.
24.5		***New clause added;*** Annex J is not applicable to THERMISTORS used in a circuit which meets all of the following requirements: – type 1 CONTROL as declared in Table 1, requirement 39; – connected to a SELV/PELV circuit as specified in Clause T.1; – low power circuit as specified in H.27.1.1.1; – the CONTROL or final equipment complies with Clause H.27 when the THERMISTOR is open or short circuited; – CONTROL with CLASS A CONTROL FUNCTIONS as declared in Table 1, requirement 92.
27	Info	**Abnormal operation**
27.5	Info	**Overload tests**
27.5.2		***New clause added;*** Overload tests carried out on in-line cord controls as indicated in 11.10.2 and provided with a plug and socket outlet The tests according to 27.5.1 shall be carried out. The temperature shall not exceed those indicated in Table 13.
27.5.3		For controls not covered by 27.5.2 The tests according to 27.5.1 shall be carried out at ambient temperature (20 ± 5) °C. If declared in requirement 97 of Table 1, the test will not be done for INCORPORATED CONTROLS and INTEGRATED CONTROLS. The compliance with items a) to g) of H.27.1.1.3, where applicable, is verified.

Annex E		***New annex added;*** **Circuit for measuring leakage current** A suitable circuit for measuring LEAKAGE CURRENT in accordance with H.8.1.10 is shown in Figure E.1.  R_S 1 500 Ω R_B 500 Ω C_S 0,22 µF R_1 10 000 Ω C_1 0,022 µF NOTE This figure is taken from IEC 60990:1999, Figure 4. **Figure E.1 – Circuit for measuring leakage currents**
Annex H	Info	**Requirements for electronic controls**
H.11	Info	**Constructional requirements**
H.11.2	Info	**Protection against electric shock**
H.11.2.5DV		***New clause added;*** D2 Add the following to second paragraph of H.11.2.5: The capacitor shall comply with UL 60384-14, Class Y1 and be an IECQ or similar approved component.
H.11.12	Info	**Controls using software**
H.11.12.4		***New section added;*** **Remotely actuated control functions** This section contains requirements for remotely actuated control functions (see standard for details).

H.26	Info	**Electromagnetic compatibility (EMC) requirements – Immunity**
H.26.8	Info	**Surge immunity test**
H.26.8.2		**Test values** The tests as detailed in Table H.16 shall be applied. The tests on the terminals for signal, data, CONTROL and other input lines shall only be performed if these terminals are designed to make an interconnection with cables longer than 10 m, according to the manufacturer's specifications. For PROTECTIVE CONTROLS declared according to requirement 90 of Table 1, the following additional test applies: The power supply terminals of the CONTROL are subjected to an open circuit test ~~level 4~~ voltage of 4 kV (applicable for the line-to-earth coupling mode) with a generator having a source impedance of 12 W being used, and to an open circuit test ~~level 3~~ voltage of 2 kV (applicable for the line-to-line coupling mode) with a generator having a source impedance of 2 W being used.
H.27	Info	**Abnormal operation**
H.27.1	Info	**Electronic controls – Assessment against internal faults**
H.27.1.1.3DV		***New clause added;*** D2 Add the following text to H.27.1.1.3: If an intentionally weak part becomes permanently open-circuited due to a component fault, the relevant test is repeated twice (three tests total) using new components as necessary. The subsequent tests shall be terminated in the same mode unless the tests are otherwise satisfactorily completed. NOTE 1: An intentionally weak part is a part intended to rupture under conditions of abnormal operation to prevent the occurrence of a condition which could impair compliance with this standard. Such a part may be a replaceable component, such as a resistor or a capacitor.
Annex J	Info	**Requirements for thermistor elements and controls using thermistors**
J.27		***New section added;*** **Abnormal operation**
J.27.1		Consideration of FAULT modes shall be made in accordance with Table H.24 for THERMISTORS used in PROTECTIVE CONTROLS.

Annex V	***New annex added;*** **Requirements for controls powered by secondary batteries (rechargeable)** This annex contains requirements for controls powered by batteries that can be recharged in the control (see standard for details).

	CUSTOMERS PLEASE NOTE: This Table and column “Verdict” can be used in determining how your current or future production is or will be in compliance with new/revised requirements.