

## STANDARD INFORMATION

**Standard:** UL 60947-4-2 / CSA C22.2 No. 60947-4-2

**Standard ID:**

Low-Voltage Switchgear and Controlgear - Part 4-2: Contactors and Motor-Starters - Ac Semiconductor Motor Controllers and Starters [UL 60947-4-2:2022 Ed.2]

Low-Voltage Switchgear and Controlgear - Part 4-2: Contactors and Motor-Starters - Ac Semiconductor Motor Controllers and Starters [CSA C22.2#60947-4-2:2022 Ed.2]

**Previous Standard ID:**

Low-Voltage Switchgear and Controlgear - Part 4-2: Contactors and Motor-Starters - Ac Semiconductor Motor Controllers and Starters [UL 60947-4-2:2014 Ed.1]

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## EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

**Effective Date:** **September 1, 2025**

## 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 Reports not updated to this version by the effective date above will be withdrawn.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:**

- Marking of electronic relays without thermal memory
- Marking of tripping time at 0 °C ambient or below
- New test requirements for limits of operation of time-delay overload relays
- Damp heat, salt mist, vibration and shock tests
- New classes of overload current withstand time
- Short-circuit test in the smallest enclosure
- Update of the routine and sampling tests

Specific details of new/revisted 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 – Please immediately identify any current Listing Reports or products that are no longer active and should be removed from our records.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 <del>lined-out</del> below.</i>
5	Info	<b>Characteristics of a.c. semiconductor motor controllers and starters</b>
5.7	Info	<b>Characteristics of relays and releases (overload relays)</b>
		<b>Characteristic values</b>
5.7.3		b) Overload relay: – nature of the relay: thermal, electronic or electronic without thermal memory; <u>electronic relay without thermal memory shall be marked;</u> – nature of the reset: manual or automatic, <u>– tripping time of overload relays class 10A where higher than 2 min at 0 °C or below (see 8.2.1.5.1.1.1, item c).</u>
		<b><i>New clause added;</i></b>
5.7.3DV		Modification of 5.7.3 by replacing the fifth dashed item of Item b) with the following:  – Installation instructions for overload relays without thermal memory shall indicate that thermal memory is not provided. Marking of the symbol <del>Thm</del> is optional.
6	Info	<b>Product information</b>
		<b><i>New clause added;</i></b>
6.1DV.1		Delete Items c) and m):  These Items do not apply.
		<b><i>New clause added;</i></b>
6.1DV.2		Marking of Items h), i), r), and s) is optional.
		<b><i>New clause added;</i></b>
6.1DV.3		Marking of Item j) is optional except when evaluating creepage and clearance distances per subclause 7.1.4 of CSA C22.2 No. 60947-1/UL 60947-1.
		<b><i>New clause added;</i></b>
6.1DV.4		Marking of Item k) is optional and may be in addition to the required enclosure Type ratings according to 7.1.12DV of CSA C22.2 No. 60947-1/UL 60947-1.



CLAUSE	VERDICT	COMMENT
6.1DV.5		<b><i>New clause added;</i></b> l) is only required if the pollution degree is other than pollution degree 3.
8	Info	<b>Constructional and performance requirements</b>
8.1	Info	<b>Constructional requirements</b>
8.1.2	Info	<b>Materials</b>
		<b><i>New clause added;</i></b>
8.1.2.2		<b>Glow wire testing</b>  Subclause 7.1.2.2 of IEC 60947-1:2007 applies with the following addition.
8.1.4	Info	<b>Clearances and creepage distances</b>  Subclause 7.1.4 of IEC 60947-1:2007 applies with the following note.
		<b><i>New clause added;</i></b>
8.1.4DV		Creepage and clearance distances at field wiring terminals that do not preclude the possibility of stray strands shall be evaluated in accordance with Annex DVD. Where the design of the field wiring terminals is such that it precludes the possibility of reduced spacing due to stray strands or improper wiring installation, subclause 7.1.4 of CSA C22.2 No. 60947-1/UL 60947-1 shall apply. Creepage and clearance at other than field wiring terminals shall be evaluated in accordance with Annex DVD or subclause 7.1.4 of CSA C22.2 No. 60947-1/UL 60947-1.
		<b><i>New clause added;</i></b>
8.1.11		<b>Enclosures for equipment</b>  Subclause 7.1.11 of IEC 60947-1:2007 applies.
		<b><i>New clause added;</i></b>
8.1.13		<b>Conduit pull-out, torque and bending with metallic conduits</b>  Subclause 7.1.13 of IEC 60947-1:2007 applies.



CLAUSE	VERDICT	COMMENT
8.2	Info	<b>Performance requirements</b>
8.2.1	Info	<b>Operating conditions</b>
8.2.1.5	Info	<b>Limits of operation of current sensing relays and releases</b>
8.2.1.5.1	Info	<b>Relays and releases in starters</b>
8.2.1.5.1.1	Info	<b>Limits of operation of time-delay overload relays when all poles are energized</b>
		<i><b>New clause added;</b></i>
8.2.1.5.1.1.1 DV		Modification of 8.2.1.5.1.1.1 by adding the following to Item b):  For non-compensated overload relays, the manufacturer may declare a trip level higher than that in Table 5, Column B, for ambient temperatures from 20 °C to 40 °C. In this case, the test value at 20 °C shall be that declared by the manufacturer.
		<i><b>New clause added;</b></i>
8.2.1.5.1.1.1 DV.2		Overload relays may alternatively be energized at 200 % of the rated tripping current, starting from a cold state. Tripping shall occur in 8 minutes or less.
		<i><b>New clause added;</b></i>
8.2.1.5.1.1.1 DV.3		e) At D times the current setting, tripping shall occur within the maximum time limits given in Table 4 for the appropriate trip class, starting from the cold state. The minimum values given in Table 4 are informative only.
8.3	Info	<b>EMC requirements</b>
		It is widely accepted that the achievement of electromagnetic compatibility between different items of electrical and electronic apparatus is a desirable objective. Indeed, in many countries, mandatory requirements for EMC exist.
8.3.1		The requirements specified in the following subclauses are included to permit the achievement of electromagnetic compatibility for controllers and starters. All relevant immunity and emission requirements are covered, and additional tests are not required or necessary. EMC performance is not guaranteed in the event that the controller or starter is subject to electronic component failure. These conditions are not considered, and do not form part of the test requirements.
		All phenomena, whether emission or immunity, are considered individually: the limits given are for conditions which are not considered to have cumulative effects. For EMC test, the minimum system to be considered is the controller or starter interconnected with a motor and cables. The tests are to be conducted as follows:  <u>For immunity tests, the complete duty cycle of the Soft starter is to be considered, including the starting time and the stopping time.</u>  <u>For emission limit tests, only the steady state condition is to be considered.</u>



CLAUSE	VERDICT	COMMENT
		These clauses do not describe or affect the safety requirements for a controller or starter such as protection against electric shocks, insulation co-ordination, and related dielectric tests, unsafe operation, or unsafe consequence of a failure.
		<b><i>New clause added;</i></b>
8.3.2		Subclause 7.3.3.2 of IEC 60947-1:2007 applies according to the relevant set of environmental conditions defined in 7.3.1 of IEC 60947-1:2007. The relevant set of environmental condition must be stated in the information to be given with the equipment.
		<b><i>New clause added;</i></b>
8.3.2.1		Subclause 7.3.3.2.2 of IEC 60947-1:2007 applies with the following addition:  Because no significant harmonic emissions are produced in the FULL-ON state, tests are not required on those controllers or starters which run only in the FULL-ON state or which are by-passed by a mechanical switching device after completing a start, for example, Forms 2 and 3 and certain Form 1 controllers or starters.
9	Info	<b>Tests</b>
9.1	Info	<b>Kinds of tests</b>
9.1.5	Info	<b>Special tests</b>
		<b><i>New clause added;</i></b>
9.1.5.2		<b>Special tests – damp heat, salt mist, vibration and shock</b>  For these special tests, Annex Q of IEC 60947-1:2007 applies. The conditions of application are under consideration.
9.3	Info	<b>Compliance with performance requirements</b>
9.3.1	Info	<b>Test sequences</b>
		<b><i>New clause added;</i></b>
9.3.1DV		Solid state motor controllers with a reduced voltage starting feature shall also be subjected to the tests in Annex DVE.



CLAUSE	VERDICT	COMMENT
		<b>General test conditions</b>
		Subclause 8.3.2 of IEC 60947-1:2007 applies with the following addition.
		<u>Except for devices specifically rated for only one frequency, tests performed at 50 Hz cover 60 Hz applications and vice-versa.</u>
9.3.2		<u>The selection of samples to be tested for a series of devices with the same fundamental design and without a significant difference in construction shall be based on engineering judgement.</u>
		Unless otherwise specified in the relevant test clause, the clamping torque for connections shall be that specified by the manufacturer or, if not specified, the torque given in Table 4 of IEC 60947-1:2007.
		In the case where several heat sinks are specified, the one which has the higher thermal resistance shall be used.
		True r.m.s. voltage and current measuring means shall be used.
9.3.3	Info	<b>Performance under no load, normal load, and overload conditions</b>
9.3.3.3	Info	<b>Temperature rise</b>
		<b>Temperature rise of the main circuit</b>
9.3.3.3.4		<u>Subclause 8.3.3.3.4 of IEC 60947-1:2007 applies with the exception that a single phase test shall be conducted with all poles in the main circuit loaded at their individual maximum rated currents and as stated in 8.2.2.4, and with the following additions:</u>
		For semiconductor switching devices connected in the main circuit (see 8.2.2.4), temperature sensing means shall be attached to the outer surface of the case of the semiconductor switching device that is most likely to produce the highest temperature rise during this test. The final case temperature, $C_f$ , and the final ambient temperature, $A_f$ , shall be recorded for use in the test of 9.3.3.6.2.



CLAUSE	VERDICT	COMMENT
9.3.4	Info	<b>Performance under short-circuit conditions</b>
9.3.4.1	Info	<b>General conditions for short-circuit tests</b> <i>New clause added;</i> <b>General requirements for short-circuit tests</b>  The general requirements of 8.3.4.1.1 of IEC 60947-1:2007 apply with the following modification.
9.3.4.1.1		The enclosure shall be in accordance with the manufacturer specifications. In case of multiple enclosure options are provided, the enclosure with the smallest volume shall be taken.  If devices tested in free air may also be used in enclosures, they shall be additionally tested in the smallest of such enclosures stated by the manufacturer. For devices tested only in free air, information shall be provided to indicate as not suitable for use in an individual enclosure.
9.3.4.1.1DV		<i>New clause added;</i> For type 1 co-ordination, open equipment shall be tested in an enclosure sized in accordance with 8.3.2.1DV of CSA C22.2 No. 60947-1/UL 60947-1 and constructed in accordance with 7.1.12DV of CSA C22.2 No. 60947-1/UL 60947-1.
9.3.4.1.6DV		<i>New clause added;</i> For type “1” co-ordination, the wire size shall be determined in accordance with CSA C22.2 No. 60947-1/UL 60947-1, Clause 7.1.8.2DV. For motor control devices rated more than 149 kW (200 horsepower) or with equivalent operational currents per CSA C22.2 No. 60947-4-1/UL 60947-4-1, Annex G, Table G.1, the line and load connections may be made with bus bars equivalent in cross-sectional area to the wires specified.
9.3.4.3 DV.1.5		<i>New clause added;</i> For a semiconductor motor control device intended to be used with fuses, the protective devices used for the test shall be selected as follows:  a) When the fuse size is 600 A or less, tests shall be conducted with Class RK5 fuses; or other than Class RK5 fuses if the equipment is marked in accordance with 6.2DV.2.2 f). Testing with Class RK5 fuses is considered representative of tests using Class CC, G, H, K, J, RK1, or T fuses. Class H or K fuses shall not be used for motor-branch-circuit protection with a semiconductor motor control device rated more than 37 kW/50 horsepower per CSA C22.2 No. 60947-4-1/UL 60947-4-1, Annex G, Table G.1. b) When the fuse size exceeds 600 A, tests shall be conducted with Class L fuses.



CLAUSE	VERDICT	COMMENT
		The circuit shall be adjusted to the prospective test current corresponding to the rated operational current $I_e$ according to Table 9.3.4.3DV.3.1.
9.3.4.3 DV.3.1		<p>The semiconductor contactor or starter and the associated SCPD shall then be connected in the circuit. The following sequence of operations shall be performed:</p> <p>a) One breaking operation (“O”) shall be performed with the semiconductors in the conducting mode prior to the test. For devices with an integral bypass, this test shall be performed with the bypass device open.</p> <p>b) For devices with an integral bypass, one breaking operation of the SCPD shall be performed with the semiconductors bypassed and the bypass contacts closed.</p>
		<b><i>New clause added;</i></b>
9.3.4.3.1 DV.2.1		Circuit breakers – The circuit breaker used for the test shall be selected from commercially available units of the molded case type having essentially the same characteristics with respect to peak let-through current and a clearing $I^2t$ without current limiting features, unless specific circuit breakers are marked for use with the controller.
9.3.5	Info	<b>EMC tests</b>
9.3.5.1	Info	<b>EMC emission tests</b>
		<b><i>New clause added;</i></b>
9.3.5.1.1		<p><b>Condition for the emission tests</b></p> <p>All emission tests shall be performed under steady-state conditions.</p> <p>Emission measurements during the starting time with the existing measuring equipment are under consideration.</p>
9.3.5.2	Info	<b>EMC immunity tests</b>
		<b><i>New clause added;</i></b>
		<b>Radio-frequency electromagnetic field</b>
9.3.5.2.2		<p>For conducted immunity tests, 8.4.1.2.6 of IEC 60947-1:2007 applies with the following addition.</p> <ul style="list-style-type: none"> <li>• The performance criterion 1 of Table 15 applies.</li> </ul> <p>For radiated radio-frequency electromagnetic field immunity tests, 8.4.1.2.3 of IEC 60947-1:2007 applies with the following addition.</p> <ul style="list-style-type: none"> <li>• The performance criterion 1 of Table 15 applies.</li> </ul>





CLAUSE	VERDICT	COMMENT
		<b><i>New clause added;</i></b>
		<b>Voltage dips and short-time interruptions</b>
9.3.5.2.6		Subclause 8.4.1.2.8 of IEC 60947-1:2007 applies with the performance criterion 3 of Table 15 except for 0,5 cycle and 1 cycle for which the performance criterion 2 of Table 15 applies
9.3.6	Info	<b>Routine and sampling tests</b>
		<b>Operation and operating limits</b>
		The 2 following tests shall be made.
		1) Functionality shall be verified by a blocking and commutating capability test according to Table 12. Two operating cycles are required, one at 85 % $U_e$ with 85 % $U_s$ , and one at 110 % $U_e$ with 110 % $U_s$ . <u>No loss of functionality as specified by the manufacturer is permitted.</u>
9.3.6.2		<u>2) It shall be verified that the equipment operates according to the requirements of 8.2.1.5.</u>
		Tests shall be made to verify the calibration of relays. In the case of a time-delay overload relay, this may be a single test with all poles equally energized at a multiple of the current setting, to check that the tripping time conforms (within tolerances) to the curves supplied by the manufacturer. For under-current relays, stall relays and jam relays, tests shall be carried out to verify the proper operation of these relays (see 8.2.1.5.3, 8.2.1.5.4 and 8.2.1.5.5).
		<b><i>New annex added;</i></b>
		<b>Combination motor controllers</b>
Annex DVC		This annex covers the requirements for combination motor controllers employing semiconductor motor controllers and starters. Unless otherwise indicated, the requirements in the main body of the standard also apply to these devices.
		See standard for details.