

DECEMBER 21, 2016

1

UL 489G

**Outline of Investigation for Molded-Case Circuit Breakers, Molded-Case
Switches, and Circuit-Breaker Enclosures, 650 – 1000 Volts AC and 650 –
1500 Volts DC**

Issue No. 1

December 21, 2016

Summary of Topics

This First issue of the Outline of Investigation for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, 650 – 1000 Volts AC and 650 – 1500 Volts DC, covers molded-case circuit breakers, molded-case switches, and circuit-breaker enclosures, rated at 650 – 1000 volts AC and 650 – 1500 volts DC, 6000 amperes or less.

UL's Outlines of Investigation are copyrighted by UL LLC. Neither a printed nor electronic copy of an Outline of Investigation should be altered in any way. All of UL's Outlines of Investigation and all copyrights, ownerships, and rights regarding those Outlines of Investigation shall remain the sole and exclusive property of UL LLC.

COPYRIGHT © 2016 UL LLC

**UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL**



Documents
Document Sharing Hub

No Text on This Page

**UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL**



Documents

Document Sharing Hub

CONTENTS

1	Scope	4
6	Construction	4
7	Tests	5
7.1.3	Overload Test	5
7.1.5	Endurance Test	7
7.1.7	Interrupting Test	9
7.1.9	Dielectric Voltage-Withstand Test	10
7.1.11	High Available Fault Current Test Sequence	10
7.2.3	Interrupting and Let-Through Measurement Test	11
8	Ratings	12
14	Construction	12
19	Performance	13

1 Scope

1.1 These requirements cover molded-case circuit breakers, molded-case switches, and circuit-breaker enclosures, rated at 650 – 1000 volts AC and 650 – 1500 volts DC, 6000 amperes or less. This Outline is intended to be used with the Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures, UL 489. Only the sections that are modified from UL 489 are included in this Outline, all other Sections apply as written in UL 489.

6 Construction

Section 6 of UL 489 is modified as follows:

Table 6.1.6.1.1
Minimum spacings in millimeters^{e,f,g}

Voltage between parts	At terminals				Other than at terminals					
	Between terminals of opposite polarity		Between terminals and any grounded metal ^a		Between uninsulated live parts of opposite polarity ^b		Between uninsulated live parts and any ground metal ^a			
	A		B		C		D ^c		E ^d	
	Through air	Over surface	Through air	Over surface	Through air	Over surface	Through air	Over surface	Through air	Over surface
0 – 130	12.7	19.1	12.7	12.7	6.4	9.5	12.7	12.7	6.4	9.5
131 – 300	19.1	31.8	12.7	12.7	6.4	9.5	12.7	12.7	6.4	9.5
301 – 600	25.4	50.8	12.7	25.4	9.5	12.7	12.7	25.4	9.5	12.7
650 – 1000	25.4	50.8	12.7	25.4	9.5	12.7	12.7	25.4	9.5	12.7

^a The spacing to the enclosure or mounting means shall be permitted to be reduced if an acceptable liner of insulating material, not less than 0.8 mm (1/32 inch) thick, is used to provide the required spacing through air.

^b Not applicable for spacings between parts of opposite polarity on a control circuit printed wiring board with conformal coating. See Table 6.1.6.2.1 and Printed Circuit and Wiring Board Assembly, 6.1.6.2.

^c If indentation or deformation of the overall enclosure or circuit breaker mounting means could reduce spacings to less than those indicated in Column E.

^d If indentation or deformation of the overall enclosure or circuit breaker mounting means would not affect spacings.

^e An isolated dead metal part (such as a screw head or a washer) interposed between uninsulated live parts of opposite polarity or between an uninsulated live part and a grounded dead metal part is considered to reduce the spacing by an amount equal to the dimension of the interposed part along the path of measurement.

^f In measuring an over surface spacing, any slot, groove, or the like, 0.33 mm (0.013 inch) wide or less in the contour of insulating material shall be disregarded.

^g In measuring spacings, an air spacing of 0.33 mm (0.013 inch) or less between a live part and an insulating surface shall be disregarded, and the live part considered in contact with the insulating material.

mm	0.8	6.4	9.5	12.7	19.1	25.4	31.8	50.8
inches	1/32	1/4	3/8	1/2	3/4	1	1-1/4	2

Table 6.1.6.2.1
Minimum opposite polarity spacings on printed-wiring
assemblies with conformal coatings^a

Voltage between parts	Power available	Minimum spacings	
		mm	Inch
0 – 600	Unlimited	0.8	(1/32)
650 – 1000	Unlimited	1.6	(1/16)
1001 – 1500 ^c	Unlimited	2.4	(1/8)
0 – 30	Limited ^b	0.4	(1/64)
^a Minimum spacing between live parts of opposite polarity. Spacing between live parts and dead metal shall comply with Table 6.1.6.1.1. ^b See 6.1.6.3.1 and 6.1.6.3.2. ^c Volts dc.			

7 Tests

Section 7 of UL 489 is modified as follows:

7.1.3 Overload Test