

Part 21 (PAR)

Event # 51915

Rep Org: ELECTROSWITCH	Notification Date / Time: 05/10/2016 15:59 (EDT)
Supplier: ELECTROSWITCH	Event Date / Time: 05/10/2016 (EDT)
	Last Modification: 10/21/2016
Region: 1	Docket #: 99900833
City: WEYMOUTH	Agreement State: Yes
County:	License #:
State: MA	
NRC Notified by: LARRY FRIEDMAN	Notifications: ART BURRITT R1DO
HQ Ops Officer: BETHANY CECERE	JAMIE HEISSERER R2DO
Emergency Class: NON EMERGENCY	ERIC DUNCAN R3DO
10 CFR Section:	VIVIAN CAMPBELL R4DO
21.21(d)(3)(i) DEFECTS AND NONCOMPLIANCE	PART 21/50.55 REACTORS EMAIL

PART 21 REPORTING OF DEFECTS AND NONCOMPLIANCE

The following is a synopsis of information received via fax:

"Various Electros witch products - Series 24 Instrument & Control (Part #24XX, 24XXX, 243XX, 74XXX), Series 24 LOR (part #78XX), Series 24 LOR/ER (part #78XX), Series 24 CSR (part #88XX), Series 24 LSR (part #92XX), Series 31 Instrument & Control (part #31XXX, 65XXX, 75XXX), Series 31 TR/LSR (part #93XX), Series 20 Cam (part #20KB, 20KD, 20LB, 20LD, 20MB, 20MD, 20MF, 20MG, 20PF, 20PG, 20PH, 20PJ, 20PL, 20PY), Series 20 Module (part #10XXX, 17XXX, 18XXX, 19XXX, 29XXX, 30XXX, 32XXX,38XXX,40XXX, 60XXX, 61XXX, 62XXX, 63XXX) [have a potential deviation (departure from the technical requirements included in the procure document)]

"It was determined on May 10, 2016 that Electros witch does not have the capability to perform the evaluation to determine if a defect, which could create a substantial safety hazard, exists.

"Any Electros witch product that has a part number listed above and was sold as a Safety-Related Class 1E product [may contain the deviation].

The two nonconformance issues are:

"Initial Product Qualification Tests for Dielectric Withstanding Voltage, Insulation Resistance and Contact Resistance as defined in Electros witch's ESC-STD-1000 Rev. 3 dated 9/3/1984 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment for Nuclear Power Generating Stations was found to be in contradiction to IEEE C37.90-1978 Relays and Relay Systems Associated with Electric Power Apparatus.

JE19
NRR

"Electroswitch did not procure materials, parts, equipment and/or services from an Appendix B supplier nor were applicable Commercial Grade Surveys, Source Inspections and Material Analyses performed for the following materials:

- Precious metal blade overlay material
- Red metal blade material
- Precious metal overlay thickness of switch blade material
- Molding compound of switch insulators (terminal decks and barriers)
- Carbon steel for securing rods
- Solenoids
- Relays
- Services (test labs) pertaining to product qualification

Electroswitch is attempting to determine which NRC licensees are potentially affected.

"The following personnel may be contacted regarding this notification:

Larry Friedman
Quality Assurance Manager
781-607-3309

Ed Reszenski
Engineering Manager
781-607-3341"

*** UPDATE FROM LARRY FRIEDMAN TO DONALD NORWOOD AT 1656 EDT ON 5/11/2016 ***

The following information was received via fax:

Below is the list of utilities (and plants where specified) which were notified of Electroswitch's decision to end the Appendix B Quality Assurance Program:

- Ameren Energy
- Dominion Energy
- Duke Energy
- Energy Northwest
- Entergy Nuclear (Waterford 3 Nuclear)
- Entergy Nuclear (Pilgrim Power Plant)
- Entergy Nuclear (Indian Point Energy)
- Xcel Energy (Monticello Nuclear)
- MPR Associates for FPL
- Nebraska Public Power (Cooper Nuclear)
- Nextera (Point Beach Nuclear)
- Xcel Energy (Prairie Island Gen)
- Southern Power (Hatch)

Southern Power (Vogtle)

TVA

TVA (Watts Bar Nuclear)

Wolf Creek Nuclear

Notified R1DO (Burritt), R2DO (Heisserer), R3DO (Duncan) and R4DO (Campbell) and via E-mail Part 21/50.55 Reactors Group.

*** UPDATE FROM LARRY FRIEDMAN TO DONG HWA PARK AT 1617 EDT ON 8/25/2016 ***

The following information was received via fax:

"Electroswitch is formally requesting a thirty (30) day extension to complete the evaluation by Sept. 24, 2016 in order to provide detailed answers to the questions and provide any needed updates to the Part 21 notification report."

Notified R1DO (Dimitriadis), R2DO (Michel), R3DO (Cameron) and R4DO (Kellar) and Part 21/50.55 Reactors Group via E-mail.

*** UPDATE FROM LARRY FRIEDMAN TO JOHN SHOEMAKER AT 1349 EDT ON 10/21/2016 ***

The following information was received via fax:

"Subject: Response to questions about Electroswitch's response to the U.S. Nuclear Regulatory Commission Inspection Report NO. 99900833/2016-201 and Notice of Nonconformance (Letter from Terry W. Jackson, Branch Chief dated August 5, 2016."

Notified R1DO (Cahill), R2DO (Masters), R3DO (Orth) and R4DO (Kramer) and Part 21/50.55 Reactors Group via E-mail.



180 King Avenue
Weymouth, MA 02188
Phone: 781-335-5200
Fax: 781-331-3798

Date: October 21, 2016

Attention: **NRC Operations Center**

of Pages: 44 (including cover)

Company: U. S. Nuclear Regulatory Commission

Fax #: 301-816-5151

From: Larry Friedman
Quality Assurance Manager

Phone: 781-607-3309

Attached is the response to questions about Electroswitch's response to the U.S. Nuclear Regulatory Commission Inspection Report NO. 99900833/2016-201 and Notice of Nonconformance (Letter from Terry W. Jackson, Branch Chief, dated August 5, 2016



ELECTROSWITCH • SWITCHES & RELAYS
UNIT OF ELECTRO SWITCH CORP.

180 King Avenue • Weymouth, MA 02188 • Phone 781-335-5200 • Fax 781-335-4253

October 20, 2016

U. S. Nuclear Regulatory Commission
NRC Operations Center
Facsimile # 301-816-5151

Subject: Response to questions about Electros witch's response to the U.S. Nuclear Regulatory Commission Inspection Report NO. 99900833/2016-201 and Notice of Nonconformance (Letter from Terry W. Jackson, Branch Chief, dated August 5, 2016

Reference: 10 CFR Part21 Reporting of Defects and Noncompliance - Vendor Inspection of Electros witch Corporation Docket #99900833 (Event #51915)

To Whom It May Concern:

Below are the questions and Electros witch's responses:

Question #1: Your documents that correspond to NON 99900833/2016-201-01 show differing test numbers on the product tags that do not seem to match the original test reports. Four of the six samples are tagged from being from Test 2392-XX, but are tied to differing numbered reports:

- a. Series 24 I&C - tag 2392-21 with report 2983-2
- b. Series 24 LOR - tag 2393-21 with report 2983-3
- c. Series 24 LOR/ER - tag 2392-5 with report 2983-3
- d. Series CSR and LSR - tag 2983-1 with report 2983-3
- e. Series 21 I&C - tag 2392-7 with report 2392-6A
- f. Series 20 CAM and 20M - tag 2392-12 with report 2970-2

Please clarify or provide documentation that supports or correlates the test specimens to their corresponding test reports.

Response #1: The test reports and test tag numbers identified above have a parent/child connection. The test report covers the family of products whereas the test tag number is associated with that specific model. Attachment A shows the various switch models which were tested as part of the product family.

Question #2: Your documents that correspond to NON 99900833/2016-201-01 seems to be missing Series 31 TR/LSR in Appendix B of your documents. Please provide the supporting documentation for Series 31 TR/LSR.

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Response #2: The Series 31 TR/LSR test report #8629-1 dated June 24, 2016 had been inadvertently been omitted from CAR #16-010 (NRC Finding) revised 9-8-16. Attachment B is the revised CAR, which includes the Series 31 RTR/LSR test report 8629-1 dated June 24, 2016.

Question #3: Your documents that correspond to NON 99900833/2016-201-01 shows Series 20 CAM test documentation with a test specimen date code in 1977 (code 7740), but the picture in the tag shows 12/7/1978. Please verify this information is correct and corresponds to the correct documentation. If correct, please explain why they differ.

Response #3: The test specimen date code in 1977 (code 7740) on the Series 20 CAM product is correct. It is the date (year/week) when the switch was built. The tag on the switch represents the date that the switch had begun its suite of tests. There were lags from when the switch was built and when it had been tested. Because the (parent) test report covered a number of switches, the time from when the switch was built and tested had been lengthy.

Question #4: Your documents that correspond to NON 99900833/2016-201-01 have test specimen date codes around 1977 or early 1980s. The reports are all from the late 1984, 1985 timeframe. Please expound on the significant time gap between specimens and reports. Also, please verify which IEEE standards were used on the test specimens and which IEEE standards are referenced in the reports and ensure the required IEEE documents, either via license purchase orders or via your certificate of conformance, were all met.

Response #4: The test specimen date codes were between 1977 and the early 1980's. Because the (parent) test report covered a number of switches, the time from when the test specimen switches were built and subsequently tested had taken a very long time, in some cases, up to 6 years.

The IEEE standards, to which the switches were tested to conform, are identified in each of the test reports (refer to Attachment A).

Question #5: Your documents that correspond to NON 99900833/2016-201-02 have not addressed the services that were listed in the NON that were used to support the qualification testing that was done. The NRC report listed three commercial testing services used without supporting documentation: Acton Environmental Testing Corp. (radiation aging), Arnold Greene Testing Lab (radiation aging), and ASL (seismic). Please summarize the supporting documentation, verification, and/or justification for acceptance of the services used at the time of qualification testing. We are particularly interested in the evidence that establishes that the services had the capability and traceability to support the qualification testing of Electroswitch's control switches and relays to ensure intended safety function performance at end of life and following a design basis event. Additionally, are there other commercial services that were used to support original qualification testing that were not evaluated?

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Response #5: There was a Supplier Quality System Questionnaire sent to and received from Acton Environmental Test Corp., who had performed the radiation aging tests. They noted that their procedures were based on MIL-Q-9858A, MIL-STD-45662 and 10CFR50 App. B. Acton Environmental Test Corp. was purchased by NTS Huntsville, who is an A2LA accredited lab.

There is no supporting documentation such as Commercial Grade Surveys, Vendor visits or Supplier Quality Questionnaires for Arnold Green Testing Lab, who had performed the radiation aging tests. Their test reports do have the ACIL (American Council of Independent Laboratories) seal on them.

Because these services were provided back in the 1977-1985 timeframes, there is nothing further that can be done. Additionally, Electroswitch does not know what the safety function of the product is.

Question #6: Your documents corresponding to NON 99900833/2016-201-02 do not address the failure to adequately dedicate or verify acceptability of past components that have been shipped. Rather, it explains reliance on historical performance of a commercial vendor (commonly described as commercial-grade dedication method 4 acceptance), which the NRC has explained its usage and acceptability in Generic Letter 89-02. Your response detailing periodic Class II testing and Statistical Process Control is what the NRC understood during the inspection and is insufficient in terms of meeting 10 CFR 50 Appendix B requirements. Please provide any additional evaluation you have completed on safety-related product that has been shipped and how the inadequate dedication/verification of material/chemical composition and dimensions/thickness cited in the finding would not prevent products from performing their intended safety function in a reliable manner and under all potential operating conditions.

Response #6: Other than the periodic Class II testing and Statistical Process Control that was seen during the NRC vendor inspection, there is no other evaluations or activities to provide. Electroswitch does not know what the safety function of the product is. Based upon the historical performance data of the products manufactured and sold since the product qualification, Electroswitch can state that product has met the design specifications.

Question #7: Your documents corresponding to NON 99900833/2016-201-02 do not mention your use of various commercial suppliers for small sub-components used in some safety related components, such as commercial solenoids and relays, which were not dedicated or verified. Please provide any additional evaluation you have completed on safety-related solenoids and relays would not prevent products from performing their safety function in a reliable manner and under all potential operating conditions.

Response #7: Other than the periodic Class II testing and Statistical Process Control that was seen during the NRC vendor inspection, there is no other evaluations or activities to provide. Electroswitch does not know what the safety function of the product is. Based upon the



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historical performance data of the products manufactured and sold since the product qualification, Electros witch can state that product has met the design specifications.

Please sign below, acknowledging receipt of this request, and return a copy to the attention of Larry Friedman, Quality Assurance Manager, at the above address or fax to 781-335-4253 within 10 working days after receipt.

Sincerely,
ELECTROSWITCH

Larry Friedman
Quality Assurance Manager

Please let us know if ANY of your mailing information changes – name of recipient, name of company/facility, address, etc. Mark the changes on this acknowledgement form and send to us by mail to the address above or by FAX to 781-335-4253.

RECEIVED: _____

DATE: _____



ELECTROSWITCH

Report No. 2983-2

QUALIFICATION INSPECTION
 OF
 SERIES 24
 INSTRUMENT AND CONTROL SWITCHES
 TO
 ESC-STD-1006 REV. 3

Attachment A

APPROVALS

	PROCEDURE	DATE	REPORT	DATE
Prepared by:	<i>[Signature]</i>	10/15/84	<i>[Signature]</i>	10/15/84
Approved by:	<i>[Signature]</i>	10/15/84	<i>[Signature]</i>	10/15/84
Test Lab	<i>[Signature]</i>	10/15/84	<i>[Signature]</i>	10/15/84
Applications Eng.	<i>[Signature]</i>	10/15/84	<i>[Signature]</i>	10/15/84
Project Eng.				
Quality Control	<i>[Signature]</i>	10/15/84	<i>[Signature]</i>	10/15/84
Validated by:				
DCASMA	<i>[Signature]</i>		<i>[Signature]</i>	
Boston Rep.				
Released by:	<i>[Signature]</i>	10/15/84	<i>[Signature]</i>	10/15/84



ELECTRO SWITCH CORP.
Weymouth, Massachusetts 02188.

ENGINEERING TEST REPORT

REPORT NO. 2983-2
PAGE 3 OF 11
DATE: OCT 15 1984
PREPARED BY: [Signature]
APPROVED BY: [Signature]

ADMINISTRATIVE DATA

Purpose

The purpose of these tests is to determine the ability of the series 24 Instrument and Control Switches to conform to the qualification requirements of ANSI/IEEE 323-1983 and IEEE Std 344-1975 while the product is manufactured in accordance with ANSI/ASME NQA-1-1983. This is accomplished by subjecting the switches to the Qualification Inspection requirements of Electro Switch Technical Publication ESC-Std-1000 Rev. 3 dated 9/3/84.

The testing consists of four parts:

1. Establishing the baseline by initial tests and measurements.
2. Performing unusual ambient tests including contact temperature rise, elevated temperature, and elevated humidity.
3. Aging the product to a simulated forty year life by subjecting the product to accelerated radiation and electromechanical aging followed by seismic testing.
4. Final operational testing and inspections to verify that the product did not deteriorate from the baseline beyond accepted parameters or tolerances.

Summary of Results

The results of the tests indicate that the series 24 switches do conform to the Qualification Inspection requirements of ESC-Std-1000 Rev. 3 and thereby meet the qualification requirements of ANSI/IEEE 323-1983 and IEEE Std 344-1975 and the quality assurance requirements of ANSI/ASME NQA-1-1983 (which includes, by reference, the NRC regulation 10CFR50 Appendix B).

A summary of the results is published on page 5. Complete test results follow.

Specifications

- ANSI/IEEE 323-1983 Qualifying Class 1E Equipment for Nuclear Power Generating Stations.
- IEEE Std 344-1975 IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.
- ANSI/ASME NQA-1-1983 Quality Assurance Program Requirements for Nuclear Power Plants.
- ESC-Std-1000 Rev. 3 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment Requirements for Nuclear Power Generating Stations.



ELECTRO SWITCH CORP.
Weymouth, Massachusetts 02188.

ENGINEERING TEST REPORT

REPORT NO. 2983-2
PAGE 4 OF 11
DATE: OCT 15 1984
PREPARED BY [Signature]
APPROVED BY [Signature]

ADMINISTRATIVE DATA (Continued)

Manufacturer

Electro Switch Corp.
180 King Avenue, Weymouth, Massachusetts 02188

Material

seven samples of series JE instrument and control switch in accordance
with 15, 500, 1000 hrs. testing normal production processes and tools. The
specification is:

<u>QUANTITY</u>	<u>SAMPLE NUMBER</u>	<u>SIZE</u>	<u>CATALOG NUMBER</u>
1	10111		242104 24670 24118

Test Laboratories

Electro Switch Corp.
180 King Avenue, Weymouth, Massachusetts 02188

Acton Environmental Testing Corp.
Acton, Massachusetts 01720

Arnold Greene Testing Laboratories, Inc.
Natick, Massachusetts 01760

Attachment A



ELECTROSWITCH

Report No. **1000**

QUALIFICATION INSPECTION

OF

SERIES 24LOR, LOR/ER, and LSR

AUXILIARY RELAYS and LOCK-OUT RELAYS

TO

ESC-STD-1000 Rev. 3

Attachment A

APPROVALS

	PROCEDURE	DATE	REPORT	DATE
Prepared by:	<i>[Signature]</i>	1/11/85	<i>[Signature]</i>	1/11/85
Approved by:	<i>[Signature]</i>	1/11/85	<i>[Signature]</i>	1/11/85
Test Lab	<i>[Signature]</i>	1/11/85	<i>[Signature]</i>	1/11/85
Applications Eng.	<i>[Signature]</i>	1/11/85	<i>[Signature]</i>	1/11/85
Project Eng.	—	—	—	—
Quality Control	<i>[Signature]</i>	1/11/85	<i>[Signature]</i>	1/11/85
Validated by:	—	—	—	—
DCASMA	—	—	—	—
Boston Rep.	—	—	—	—
Released by:	<i>[Signature]</i>	1/11/85	<i>[Signature]</i>	1/11/85



ELECTRO SWITCH CORP.
Weymouth, Massachusetts 02188.

ENGINEERING TEST REPORT

REPORT NO. 2983-3
PAGE 3 OF 10
DATE: JAN 11 1985
PREPARED BY: [Signature]
APPROVED BY: [Signature]

ADMINISTRATIVE DATA

Purpose

The purpose of these tests is to determine the ability of the series 24 LOR, LOR/ER, and LSR Auxiliary Relays and Lock-out Relays to conform to the qualification requirements of ANSI/IEEE 323-1983 and IEEE Std 344-1975 while the product is manufactured in accordance with ANSI/ASME NQA-1-1983. This is accomplished by subjecting the switches to the Qualification Inspection requirements of Electro Switch Technical Publication ESC-Std-1000 Rev. 3 dated 01/83 which conforms to ANSI/IEEE Std 323-1983, ANSI/IEEE Std 344-1975, and ANSI/ASME NQA-1-1983.

The testing consists of four parts:

1. Establishing the baseline by initial test and measurements.
2. Performing unusual ambient tests including contact temperature rise, elevated temperature, and elevated humidity.
3. Aging the product to a simulated forty year life by subjecting the product to accelerated radiation and electromechanical aging followed by seismic testing.
4. Final operational testing and inspections to verify that the product did not deteriorate from the baseline beyond accepted parameters or tolerances.

Summary of Results

The results of the tests indicate that the series 24 relays do conform to the Qualification Inspection requirements of ESC-Std-1000 Rev. 3 and thereby meet the qualification requirements of ANSI/IEEE 323-1983 and IEEE Std 344-1975 and the quality assurance requirements of ANSI/ASME NQA-1-1983 (which includes, by reference, the NRC regulation 10CFR50 Appendix B).

A summary of the results is published on page 5. Complete test results follow.

Specifications

- ANSI/IEEE 323-1983 Qualifying Class 1E Equipment for Nuclear Power Generating Stations.
- IEEE Std 344-1975 IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.
- ANSI/ASME NQA-1-1983 Quality Assurance Program Requirements for Nuclear Power Plants.
- ESC-Std-1000 Rev. 3 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment Requirements for Nuclear Power Generating Stations.



ELECTRO SWITCH CORP.
Weymouth, Massachusetts 02188.

ENGINEERING TEST REPORT

REPORT NO. 2983-3

PAGE 4 OF 10

DATE: JAN 11 1985

PREPARED BY [Signature]

APPROVED BY [Signature]

ADMINISTRATIVE DATA (Continued)

Specifications (continued)

ANSI/IEEE C37.90-1978 Relays and Relay Systems Associated with Electric Power Apparatus

ANSI/IEEE C37.98-1978 IEEE Standard Seismic Testing of Relays

ANSI/IEEE C37.105-19XX Standard for Qualifying Class 1E Protective Relays and Auxiliaries for Nuclear Power Generating Stations

Manufacturer

Electro Switch Corp.
180 King Avenue, Weymouth, Massachusetts 02188

Material

Twelve samples of 1000A 240V, 1000A 240V Auxiliary Relays and 1000A 240V Relays in accordance with IEEE C37.90-1978, IEEE C37.98-1978 and IEEE C37.105-19XX.

<u>QUANTITY</u>	<u>SAMPLE NO.</u>	<u>TESTS</u>	<u>CATALOG NUMBER</u>
1	1000A 240V	IEEE C37.90-1978	78120
		IEEE C37.98-1978	82120
		IEEE C37.105-19XX	92120

Test Laboratories

Electro Switch Corp.
180 King Avenue, Weymouth, Massachusetts 02188

Acton Environmental Testing Corp.
Acton, Massachusetts 01720

Neutron Products, Inc.
Dickerson, MD 20753

Attachment A



ELECTROSWITCH

REV A

Report No. 2392-BA

QUALIFICATION INSPECTION OF
SERIES 31 LATCHING SWITCH RELAYS
AND
SERIES 31 DETENT ACTION SWITCHES
INSTRUMENT AND CONTROL SWITCHES TO
ESC-STD-1000 (REV 1)

Attachment A

APPROVALS

	PROCEDURE	DATE	REPORT	DATE
Prepared by:	<i>[Signature]</i>	12/19/84	<i>[Signature]</i>	12/19/84
Approved by: Test Lab	<i>[Signature]</i>	12/19/84	<i>[Signature]</i>	12/19/84
Applications Eng.	<i>J. Royce</i>	12/19/84	<i>J. Royce</i>	12/19/84
Project Eng.	-	-	-	-
Quality Control	<i>[Signature]</i>	12/19/84	<i>[Signature]</i>	12/19/84
Validated by: DCASMA Boston Rep.	-	-	-	-
Released by:	<i>[Signature]</i>	12/19/84	<i>[Signature]</i>	12/19/84



ELECTRO SWITCH CORP.
Weymouth, Massachusetts 02188.

ENGINEERING TEST REPORT

REPORT NO. 2392-6A (Rev. A)

PAGE 3 OF 11

DATE: MAR 20 1987

PREPARED BY *[Signature]*

APPROVED BY *[Signature]*

ADMINISTRATIVE DATA

Purpose

The purpose of these tests is to determine the ability of the series 31LSR and series 31 detent action switches to conform to the qualification requirements of ANSI/IEEE 323-1974 and IEEE Std 344-1975 while the product is manufactured in accordance with ANSI/ASME NQA-1-1983. This is accomplished by subjecting the switches to the Qualification Inspection requirements of Electro Switch Technical Publication ESC-Std-1000 Rev. 1 dated 2/15/78.

The testing consists of four parts:

1. Establishing the baseline by initial tests and measurements.
2. Performing unusual ambient tests including contact temperature rise, elevated temperature, and elevated humidity.
3. Aging the product to a simulated forty year life by subjecting the product to accelerated radiation and electromechanical aging followed by seismic testing.
4. Final operational testing and inspections to verify that the product did not deteriorate from the baseline beyond accepted parameters or tolerances.

Summary of Results

The results of the tests indicate that the series 31LSR and series 31 detent action switches do conform to the Qualification Inspection requirements of ESC-Std-1000 Rev. 1 and thereby meet the qualification requirements of ANSI/IEEE 323-1974 and IEEE Std 344-1975 and the quality assurance requirements of ANSI/ASME NQA-1-1983 (which includes, by reference, the NRC regulation 10CFR50 Appendix B).

A summary of the results is published on page 5. Complete test results follow.

Specifications

- ANSI/IEEE 323-1974 Qualifying Class 1E Equipment for Nuclear Power Generating Stations.
- IEEE Std 344-1975 IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.
- ANSI/ASME NQA-1-1983 Quality Assurance Program Requirements for Nuclear Power Plants.
- ESC-Std-1000 Rev. 1 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment Requirements for Nuclear Power Generating Stations.



ELECTRO SWITCH CORP.
Weymouth, Massachusetts 02188.

ENGINEERING TEST REPORT

REPORT NO. 2392-6A (Rev. A)

PAGE 4 of 11

DATE: MAR 20 1987

PREPARED BY [Signature]

APPROVED BY [Signature]

ADMINISTRATIVE DATA (Continued)

Manufacturer

Electro Switch Corp.
180 King Avenue, Weymouth, Massachusetts 02188

Material

Twelve samples of series 311 SR and series 31 latent bolt fasteners in accordance with the 1980 Rev. 1.000 form of the test procedures and tests. The series are:

<u>QUANTITY</u>	<u>SAMPLE NUMBER</u>	<u>DATE</u>	<u>CATALOG NUMBER</u>
1	311 SR	3/20/87	311 SR

Test Laboratories

Electro Switch Corp.
180 King Avenue, Weymouth, Massachusetts 02188

Acton Environmental Testing Corp.
Acton, Massachusetts 01720

Arnold Greene Testing Laboratories, Inc.
Natick, Massachusetts 01760

Attachment A



ELECTROSWITCH

Report No. 2970-2

QUALIFICATION INSPECTION
 OF
 SERIES 20
 INSTRUMENT AND CONTROL SWITCHES
 TO
 ESC-STD-1009 REV. 3

Attachment A

APPROVALS

	PROCEDURE	DATE	REPORT	DATE
Prepared by:	<i>[Signature]</i>	12/12/84	<i>[Signature]</i>	12/12/84
Approved by:	<i>[Signature]</i>	12/12/84	<i>[Signature]</i>	12/12/84
Test Lab				
Applications Eng.	<i>JF Royce</i>	12/12/84	<i>JF Royce</i>	12/12/84
Project Eng.				
Quality Control	<i>[Signature]</i>	12/12/84	<i>[Signature]</i>	12/12/84
Validated by:				
DCASMA				
Boston Rep.				
Released by:	<i>[Signature]</i>	12/12/84	<i>[Signature]</i>	12/12/84



ELECTRO SWITCH CORP.
Weymouth, Massachusetts 02188.

ENGINEERING TEST REPORT

REPORT NO. 2970-2
PAGE 3 OF 11
DATE: DEC 12 1984
PREPARED BY [Signature]
APPROVED BY [Signature]

ADMINISTRATIVE DATA

Purpose

The purpose of these tests is to determine the ability of the series 20 Instrument and Control Switches to ~~perform to the qualification requirements of ANSI/IEEE 323-1983 and IEEE Std 344-1975~~ while the product is manufactured in accordance with ANSI/ASME NQA-1-1983. This is accomplished by subjecting the switches to the Qualification Inspection requirements of Electro Switch Technical Publication ESC-Std-1000 Rev. 3 dated 9/3/84.

The testing consists of four parts:

1. Establishing the baseline by initial tests and measurements.
2. Performing unusual ambient tests including contact temperature rise, elevated temperature, and elevated humidity.
3. Aging the product to a simulated forty year life by subjecting the product to accelerated oxidation and electromechanical aging followed by seismic testing.
4. Final operational testing and inspections to verify that the product did not deteriorate from the baseline beyond accepted parameters or tolerances.

Summary of Results

The results of the tests indicate that the series 20 Instrument and Control switches do conform to the Qualification Inspection requirements of ESC-Std-1000 Rev. 3 and thereby meet the qualification requirements of ANSI/IEEE 323-1983 and IEEE Std 344-1975 and the quality assurance requirements of ANSI/ASME NQA-1-1983 (which includes, by reference, the NRC regulation 10CFR50 Appendix B).

A summary of the results is published on page 5. Complete test results follow.

Specifications

- ANSI/IEEE 323-1983 Qualifying Class 1E Equipment for Nuclear Power Generating Stations.
- IEEE Std 344-1975 IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.
- ANSI/ASME NQA-1-1983 Quality Assurance Program Requirements for Nuclear Power Plants.
- ESC-Std-1000 Rev. 3 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications, including Class 1E Equipment Requirements for Nuclear Power Generating Stations.



ELECTRO SWITCH CORP.
Weymouth, Massachusetts 02188.

ENGINEERING TEST REPORT

REPORT NO. 2970-2
PAGE 4 OF 11
DATE: DEC 12 1984
PREPARED BY [Signature]
APPROVED BY [Signature]

ADMINISTRATIVE DATA (Continued)

Manufacturer

Electro Switch Corp.
180 King Avenue, Weymouth, Massachusetts 02188

Material

Several samples of various 20 Insulators and Connectors were tested in accordance with the IEEE 1000 Rev. 2 using the following procedures and codes. The results are:

<u>QUANTITY</u>	<u>SAMPLE NUMBERS</u>	<u>CATALOG NUMBERS</u>
1	12210	2052-11244
	12211	2052-11244
	12212	2052-11244
	12213	2052-11244
	12214	2052-11244
	12215	2052-11244
	12216	2052-11244
	12217	2052-11244
	12218	2052-11244
	12219	2052-11244
	12220	2052-11244
	12221	2052-11244
	12222	2052-11244
	12223	2052-11244
	12224	2052-11244
	12225	2052-11244
	12226	2052-11244
	12227	2052-11244
	12228	2052-11244
	12229	2052-11244
	12230	2052-11244
	12231	2052-11244
	12232	2052-11244
	12233	2052-11244
	12234	2052-11244
	12235	2052-11244
	12236	2052-11244
	12237	2052-11244
	12238	2052-11244
	12239	2052-11244
	12240	2052-11244
	12241	2052-11244
	12242	2052-11244
	12243	2052-11244
	12244	2052-11244
	12245	2052-11244
	12246	2052-11244
	12247	2052-11244
	12248	2052-11244
	12249	2052-11244
	12250	2052-11244
	12251	2052-11244
	12252	2052-11244
	12253	2052-11244
	12254	2052-11244
	12255	2052-11244
	12256	2052-11244
	12257	2052-11244
	12258	2052-11244
	12259	2052-11244
	12260	2052-11244
	12261	2052-11244
	12262	2052-11244
	12263	2052-11244
	12264	2052-11244
	12265	2052-11244
	12266	2052-11244
	12267	2052-11244
	12268	2052-11244
	12269	2052-11244
	12270	2052-11244
	12271	2052-11244
	12272	2052-11244
	12273	2052-11244
	12274	2052-11244
	12275	2052-11244
	12276	2052-11244
	12277	2052-11244
	12278	2052-11244
	12279	2052-11244
	12280	2052-11244
	12281	2052-11244
	12282	2052-11244
	12283	2052-11244
	12284	2052-11244
	12285	2052-11244
	12286	2052-11244
	12287	2052-11244
	12288	2052-11244
	12289	2052-11244
	12290	2052-11244
	12291	2052-11244
	12292	2052-11244
	12293	2052-11244
	12294	2052-11244
	12295	2052-11244
	12296	2052-11244
	12297	2052-11244
	12298	2052-11244
	12299	2052-11244

Test Laboratories

Electro Switch Corp.
180 King Avenue, Weymouth, Massachusetts 02188

Acton Environmental Testing Corp.
Acton, Massachusetts 01720

Arnold Grege Testing Laboratories, Inc.
Natick, Massachusetts 01760

Attachment A

Electroswitch	NON CONFORMANCE REPORT	Rev: J	Document no: NONCON-1 CAR #16-010
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Attachment B

REVISIONS

DATE: 4/28/16	REF. #: NRC Vendor Inspection Docket #99900833	INITIATED BY: Larry Friedman
ITEM: Criterion III of 10CFR50 Appendix B		
NONCONFORMANCE: Compliance to Criterion III - Design Control		AREA: Design

DESCRIPTION OF NON CONFORMANCE:

Criterion III, Design Control, of 10CFR50 Appendix B in part states "Measures shall be established to assure that applicable regulatory requirements and the design basis, as defined in § 50.2 and as specified in the license application, for those structures, systems, and components to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions. These measures shall include provisions to assure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled."

Electroswitch's ESC-STD-1000 Rev. 3 dated 9/3/1984 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment for Nuclear Power Generating Stations states the following:

1. Dielectric Withstanding Voltage - 2200VRMS, 60Hz for one minute with a maximum of 100 microamps leakage initially and 600VRMS, 60Hz for one minute with a maximum of 100 milliamps after aging.
 - a. This is contrary to contrary to IEEE C37.90-1978 Relays and Relay Systems Associated with Electric Power Apparatus.
2. Insulation Resistance - 100 megohms minimum at 500VDC for one minute and 50 megohms minimum at 500VDC for one minute after endurance and aging.
 - a. This is contrary to paragraph 3.8 of ESC-STD-1000 Rev. 3 dated 9/3/1984, which states 100 megohms minimum.
3. Contact Resistance - 10 milliohms maximum at rated current and 10 milliohms at 100 milliamps after endurance.
 - a. This is contrary to paragraph 3.9 of ESC-STD-1000 Rev. 3 dated 9/3/1984, which states 10 milliohms maximum at rated current.

* All blocks to be completed and legible - no pencil

Electroswitch	NON CONFORMANCE REPORT	Rev: J	Document no: NONCON-1 CAR #16-010
Attachment B			

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IMMEDIATE DISPOSITION/SHORT TERM FIX: (DUE WITHIN 10 WORKING DAYS OF FINDING)

1. Reviewed the product qualification test reports for the nine families to determine which products fell into the same findings. See Appendix A for matrix showing before and after parameters used. Completion date: 5/17/16
2. The actual products used for the initial product qualification testing were retrieved from storage. The three tests using the before aging parameters have been completed. The actual results are documented in Electroswitch Test Reports (see Appendix B):
 - a. All products passed the Dielectric Withstanding Voltage test at the 2200VRMS 60HZ for 1 minute.
 - b. All products passed the Insulation Resistance Test 100 megaohm minimum at 500VDC.
 - c. All products passed the Contact Resistance test at the rated current.

RESPONDED DATE: 6/24/16 DISPOSITIONED BY:
Larry Friedman

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WHAT CAUSED THE NONCONFORMANCE? (ROOT CAUSE):

When the Dielectric Withstanding Voltage, Insulation Resistance and Contact Resistance after aging test parameters in ESC-STD-1000 standard was specified, Electroswitch did not take into consideration that the lower specifications would not simulate the operation of the product at end of life and a design basis event (DBE).

SIGNATURE: LARRY FRIEDMAN

ACTIONS TO PREVENT RECURRENCE (CORRECTIVE ACTION):

1. Internal review of ESC-STD-1000 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment for Nuclear Power Generating Stations document, specifically, the after aging test parameters for Dielectric Withstanding Voltage, Insulation Resistance and Contact Resistance has been conducted.
2. Engineering revised the ESC-STD-100 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment for Nuclear Power Generating Stations document. The new revision 7 has the before and after aging test parameters for Dielectric Withstanding Voltage, Insulation resistance and Contact Resistance the same.

Preventive Action Report Reference # (Where Applicable):

ASSIGNED TO: • Ed Reszenski DUE DATE: 8/24/16

SIGNATURE AT COMPLETION: ED RESZENSKI DATE: 7/1/16

* All blocks to be completed and legible – no pencil

Electroswitch	NON CONFORMANCE REPORT	Rev: J	Document no: NONCON-1 CAR #16-010
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Attachment B

CLOSE OUT DETAILS (REVIEW EFFECTIVENESS OF ACTIONS TAKEN):

1. Quality has conducted and documented the results of the Dielectric Withstanding Voltage, Insulation Resistance and Contact Resistance tests using the same parameters as before aging.
2. Quality reviewed and verified that the ESC-STD-1000 standard Rev. 7 that the before and after aging test parameters for Dielectric Withstanding Voltage, Insulation resistance and Contact Resistance are the same.

4.6.3 Dielectric withstanding voltage (see 3.7). The product shall be tested in accordance with ANSI/IEEE C37.90-1989 (paragraph 8). The following details shall apply:

- (a) Unless otherwise specified (see 3.1 and 6.2.2), the test voltage shall be 2200VRMS, 60Hz, alternating current (AC), ~~except after elevated humidity testing (see 3.11) the test voltage shall be 1000VRMS, 60Hz~~ after oil aging test, the test voltage shall be 600VRMS, 60Hz.

a.

4.6.4 Insulation resistance (see 3.8). The product shall be tested in accordance with this standard. Insulation resistance measurements shall be made on an apparatus suitable for the characteristic to be measured such as a megohm bridge, megohmmeter, insulation resistance test set, or other suitable apparatus. The following details shall apply:

- (a) The test potential shall be 100 megohms minimum at 500VDC ±10%.

b.

4.6.5 Contact resistance (see 3.9). The product shall be tested in accordance with this standard. Contact resistance values between two contacting surfaces are influenced by such factors as the resistivities of the surface materials, contact pressure, area, shape, condition of surfaces (including relative cleanliness, smoothness, and hardness), current, open circuit voltage appearing at the contacts during interruption of current, temperature, and thermal conductivity of leads. The resistance of the contacts shall be measured using voltmeter-ammeter method. The following detail shall apply:

- (b) The maximum allowable measurement error shall be 5%.
- (c) The test leads shall be connected by a method suitable for the product terminals.
- (d) The test current shall be at rated current, ~~except 100 milliamperes (mA) may be used after endurance (see 3.14).~~

c.

SIGNATURE: LARRY FRIEDMAN

DATE: 7/1/16

COMMENTS:

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Electroswitch	NON CONFORMANCE REPORT	Rev: J	Document no: NONCON-1 CAR #16-010
Attachment B			

Appendix A:

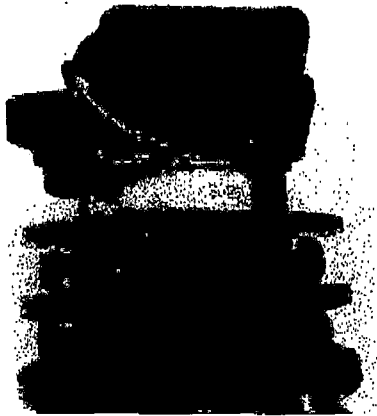
Initial Product Qualification									
Switch Family	Part Number	Test Report #	Test Date	Test Parameters (before aging)			Test Parameters (after aging)		
				Dielectric Withstanding Voltage	Insulation Resistance	Contact Resistance (at rated current)	Dielectric Withstanding Voltage	Insulation Resistance	Contact Resistance
Series 24 Instruments & Control	24XX / 242XX / 243XX / 244XX	2983-2	10/19/1984	2200VRMS, 60HZ for 1 Min	100 megohms min. at 500VDC	10 milliohms max. 20A			
Series 24 LDR	24XX	2982-2	1/21/1985	2200VRMS, 60HZ for 1 Min	100 megohms min. at 500VDC	10 milliohms max. 20A			
Series 24 (DRIVE)	24XX	2985-0	1/11/1985	2200VRMS, 60HZ for 1 Min	100 megohms min. at 500VDC	10 milliohms max. 20A			
Series 24 (SH)	24XX	2985-3	1/11/1985	2200VRMS, 60HZ for 1 Min	100 megohms min. at 500VDC	10 milliohms max. 20A			
Series 24 LSR	24XX	2988-2	1/22/1985	2200VRMS, 60HZ for 1 Min	100 megohms min. at 500VDC	10 milliohms max. 20A			
Series 24 Components & Control	242XX / 243XX / 244XX / 245XX	2352-04	12/10/1984	2200VRMS, 60HZ for 1 Min	100 megohms min. at 500VDC	10 milliohms max. 20A			
Series 61 TR/LSR	61XX / 70XX / 70LB / 70LP / 70MB / 70MP / 70NH / 70NG / 70PJ / 70PS / 70PH / 70PI / 70PL / 70PY	2970-2	12/14/1984	2200VRMS, 60HZ for 1 Min	100 megohms min. at 500VDC	10 milliohms max. 20A			
Series 70M	70XX / 70XX / 70XX / 70XX / 70XX / 70XX	2970-2A	1/24/1985	2200VRMS, 60HZ for 1 Min	100 megohms min. at 500VDC	10 milliohms max. 20A			

* All blocks to be completed and legible -- no pencil

 <p>ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTROSWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188</p>	<h1 style="text-align: center;">Attachment B</h1> <p style="text-align: center;">ENGINEERING TEST REPORT</p>	<p>REPORT NO. 624-1 PAGE 4 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN</p>
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MATERIAL

Original Series 24 Instrument and Control switch part #24208B date code 8026, which was used for the initial product qualification test and documented in Test Report 2983-2 dated 10/5/1984.

PURPOSE

To address the nonconformance:

Initial Product Qualification Test for Dielectric Withstanding Voltage, Insulation Resistance and Contact Resistance as defined in Electroswitch's ESC-STD-1000 Rev. 3 dated 9/3/1984 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment for Nuclear Power Generating Stations was found to be in contradiction to IEEE C37.90-1978 Relays and Relay Systems Associated with Electric Power Apparatus.

REFERENCES


- (a) ESC-STD-1000 (Rev 3) Para. 4.5.2 and 4.6
- (b) ANSI/IEEE C37.90.1978

PROCEDURE


The sequence of tests as detailed in ESC-STD-1000 (Rev 3) Table I was Dielectric Withstanding Voltage, Insulation Resistance and Contact Resistance.

RESULTS

1. Passed the Dielectric Withstanding Voltage test at the 2200VRMS 60HZ for 1 minute.
2. Passed the Insulation Resistance Test 100 megaohm minimum at 500VDC.
3. Passed the Contact Resistance test at the rated current of 20A.


 ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTRO SWITCH CASE 180 King Avenue Weymouth, Massachusetts 02188	<h1>Attachment B</h1> <p>ENGINEERING TEST REPORT</p>	REPORT NUMBER: 624-1 PAGE 2 of 4 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN
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DATE STARTED: 6/7/16	TEST: Dielectric Withstanding Voltage	ORDER NUMBER: Not applicable	
DATE COMPLETED: 6/7/16	TEST SPEC: ESC-STD-1000 (Rev. 3) para. 4.6.3		
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY: DM	
HUMIDITY: 49%			
REQUIREMENT: When tested as specified , product shall withstand 2200 V RMS, 60Hz (AC) for 1 minute without arcing, breakdown of insulation, or damage and there shall be no leakage current greater than 100 microamperes.			
AFTER AGING			
	Deck	TEST A	TEST B
	1	10	11
	2	10	11
	3	10	10
	4	10	10
	5	10	11
	6	10	10
	7	10	10
	8	10	10
NOTES: 1 Values are maximum found in microamperes.			
2 Test voltage applied between:			
Test A- Open Circuit contacts			
Test B- Closed contacts and non current carrying parts.			


 <p>ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTROSWITCH CORP.</p> <p>180 King Avenue Weymouth, Massachusetts 02188</p>	<h1 style="margin:0;">Attachment B</h1> <p>ENGINEERING TEST REPORT</p>	<p>REPORT No. 624-1 PAGE 3 of 4 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN</p>
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DATE STARTED: 6/14/16	TEST: Insulation Resistance	ORDER NUMBER: Not applicable	
DATE COMPLETED: 6/14/16	TEST SPEC: ESC-STD 1000 (Rev 3) para. 4.6.4		
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY: DM	
HUMIDITY: 49%			
REQUIREMENT: When the product is tested as specified at 500VDC + 10% for 1 minute, the insulation resistance shall be greater than 100 megohms.			
AFTER AGING			
	Deck	TEST A	TEST B
	1	>550	>550
	2	>550	>550
	3	>550	>550
		>550	>550
		>550	>550
	6	>550	>550
	7	>550	>550
	8	>550	>550
NOTES: 1 Values are maximum found in megohms (K=1,000)			
2 Test voltage applied between:			
Test A- Open Circuit contacts			
Test B- Closed contacts and non-current carrying parts.			

Appendix B to CAR #16-010

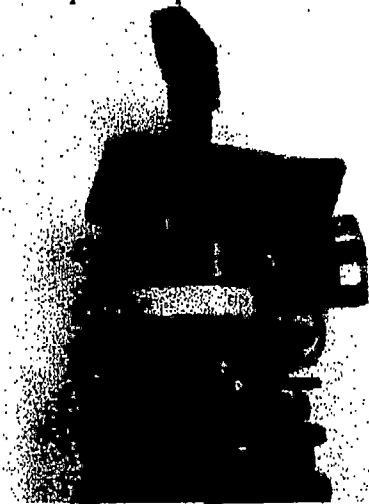
 ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTRO SWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188	<h1>Attachment B</h1>	REPORT NO. 624-1 PAGE 4 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN
	ENGINEERING TEST REPORT	

DATE STARTED: 6/16/15	TEST: Contact Resistance	ORDER NUMBER: Not applicable
DATE COMPLETED: 6/16/16	TEST SPEC: ESC-STD-1000 (Rev. 3) para. 4.6.5	
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY:
HUMIDITY: 49%		DM
REQUIREMENT: When the product is tested as specified, the contact resistance shall not exceed 10 milliohms at rated current of 20A. The products shall be operated once prior to taking measurements to cleanse the contact.		
	Sample	CONTACT CIRCUIT:
		MAXIMUM OF READING
	1	1-12 5.89
		21-22 4.30
		31-32 8.74
		41-42 1.51
		51-52 3.05
		61-62 8.43
		71-72 2.90
		81-82 2.14
NOTES: 1. Values are the average of five measurements in milliohms		

 <p>ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTRO SWITCH CORP.</p> <p>180 King Avenue Weymouth, Massachusetts 02188</p>	<h1>Attachment B</h1> <p>ENGINEERING TEST REPORT</p>	<p>REPORT NO. 8625-1 PAGE 03 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN</p>
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MATERIAL

Original Series 24 Lockout Relay switch part #7810D date code 8151, which was used for the initial product qualification test and documented in Test Report 2983-3 dated 1/11/1985



PURPOSE

To address the nonconformance:

Initial Product Qualification Test for Insulation Resistance and Contact Resistance as defined in Electroswitch's ESC-STD-1000 Rev. 3 dated 9/3/1984 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment for Nuclear Power Generating Stations was found to be in contradiction to IEEE C37.90-1978 Relays and Relay Systems Associated with Electric Power Apparatus.

REFERENCES


- (a) ESC-STD-1000 (Rev 3) Para. 4.5.2 and 4.6
- (b) ANSI/IEEE C37.90.1978

PROCEDURE

The sequence of tests as detailed in ESC-STD-1000 (Rev 3) Table I was Insulation Resistance and Contact Resistance.


RESULTS

1. Passed the Dielectric Withstanding Voltage test at 2200VRMS 60HZ for 1 minute during original test.
2. Passed the Insulation Resistance Test 100 megaohm minimum at 500VDC.
3. Passed the Contact Resistance test at the rated current of 20A.

 ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTRO SWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02158	<h1>Attachment B</h1> <p>ENGINEERING TEST REPORT</p>	REPORT NO. 8625-1
		PAGE 2 of 3 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN

DATE STARTED: 6/14/16	TEST: Insulation Resistance	ORDER NUMBER: Not applicable
DATE COMPLETED: 6/14/16	TEST SPEC: ESC-STD 1000 (Rev 3) para. 4.6.4	
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY: DM
HUMIDITY: 49%		
REQUIREMENT: When the product is tested as specified at 500VDC +/- 10% for 1 minute, the insulation resistance shall be greater than 100 megohms.		
AFTER AGING		
	Deck	TEST A
	1	>550
	2	>550
	3	>550
		>550
		>550
	6	>550
	7	>550
	8	>550
NOTES: 1 Values are maximum found in megohms (K=1,000)		
2 Test voltage applied between:		
Test A- Open Circuit contacts Test B- Closed contacts and non-current carrying parts.		

Appendix B to CAR #16-070

 ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTRO SWITCH CO. INC.	<h1 style="text-align: center;">Attachment B</h1> <h2 style="text-align: center;">ENGINEERING TEST REPORT</h2>	REPORT NO. 8625-1 PAGE 3 OF 3 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN
180 King Avenue Weymouth, Massachusetts 02188		


DATE STARTED: 6/16/15	TEST: Contact Resistance	ORDER NUMBER: Not applicable
DATE COMPLETED: 6/16/16	TEST SPEC: ESC-STD-1000 (Rev. 3) para. 4.6.5	
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY: DM
HUMIDITY: 49%		

REQUIREMENT:

When the product is tested as specified, the contact resistance shall not exceed 10 milliohms at rated current of 20A. The products shall be operated once prior to taking measurements to clean the contact.

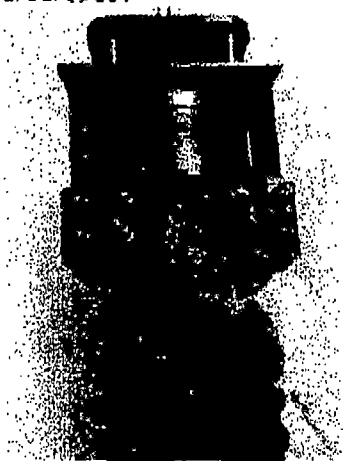
Sample	CONTACT CIRCUIT	MAXIMUM OF READING
1	1-15	4.22
	22-28	2.33
	32-38	2.51
	42-48	3.11
	52-58	2.58
	62-68	2.33
	72-78	2.83
	82-88	4.75
	92-98	3.11
	102-108	2.38

NOTES: 1. Values are the average of five measurements in milliohms

 <p>ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTRO SWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188</p>	<h1>Attachment B</h1> <p>ENGINEERING TEST REPORT</p>	<p>REPORT NO. 626-1 PAGE 3 of 3 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN</p>
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MATERIAL

Original Series 24 Lockout Relay Electric Reset switch part #7828DD date code 7733, which was used for the initial product qualification test and documented in Test Report 2983-3 dated 1/11/1985.

PURPOSE

To address the nonconformance:

Initial Product Qualification Tests for Insulation Resistance and Contact Resistance as defined in Electroswitch's ESC-STD-1000 Rev. 3 dated 9/3/1984 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment for Nuclear Power Generating Stations was found to be in contradiction to IEEE C37.90-1978 Relays and Relay Systems Associated with Electric Power Apparatus.

REFERENCES


- (a) ESC-STD-1000 (Rev 3) Para. 4.5.2 and 4.6
- (b) ANSI/IEEE C37.90.1978

PROCEDURE

The sequence of tests as detailed in ESC-STD-1000 (Rev 3) Table I was Resistance and Contact Resistance.


RESULTS

1. **Passed** the Dielectric Withstanding Voltage test at 2200VRMS 60HZ for 1 minute during **original test**.
2. **Passed** the Insulation Resistance Test 100 megaohm minimum at 500VDC.
3. **Passed** the Contact Resistance test at the rated current of 20A.

 ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTRO SWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188	<h1>Attachment B</h1>		REPORT NO. 626-1 PAGE 3 OF 3 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN
	ENGINEERING TEST REPORT		


DATE STARTED: 6/14/16	TEST: Insulation Resistance	ORDER NUMBER: Not applicable
DATE COMPLETED: 6/14/16	TEST SPEC: ESC-STD 1000 (Rev 3) para. 4.6.4	
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY: DM
HUMIDITY: 49%		
REQUIREMENT: When the product is tested as specified at 500VDC +- 10% for 1 minute, the insulation resistance shall be greater than 100 megohms.		
AFTER AGING		
	Deck	TEST A
		TEST B
	1	>550
	2	>550
	3	>550
		>550
		>550
	6	>550
	7	>550
	8	>550
NOTES: 1 Values are maximum found in megohms (K=1,000) 2 Test voltage applied between: Test A- Open Circuit contacts Test B- Closed contacts and non-current carrying parts.		

Appendix B to CAR #16-010

 ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTRO SWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188	<h1>Attachment B</h1> ENGINEERING TEST REPORT	REPORT NO. 626-1
		PAGE 3 of 3 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN

DATE STARTED: 6/16/15	TEST: Contact Resistance	ORDER NUMBER: Not Applicable																											
DATE COMPLETED: 6/16/16	TEST SPEC: ESC-STD-1000 (Rev. 3) para. 4.6.5																												
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY:																											
HUMIDITY: 49%		DM																											
REQUIREMENT: When the product is tested as specified, the contact resistance shall not exceed 10 milliohms at rated current of 20A. The products shall be operated once prior to taking measurements to clean the contact.																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Sample</th> <th style="width: 40%;">CONTACT CIRCUIT</th> <th style="width: 45%;">MAXIMUM OF READING</th> </tr> </thead> <tbody> <tr><td>1</td><td>1-18</td><td>1.88</td></tr> <tr><td></td><td>22-28</td><td>2.99</td></tr> <tr><td></td><td>32-38</td><td>3.63</td></tr> <tr><td></td><td>42-48</td><td>1.42</td></tr> <tr><td></td><td>52-58</td><td>1.19</td></tr> <tr><td></td><td>62-68</td><td>2.29</td></tr> <tr><td></td><td>72-78</td><td>2.75</td></tr> <tr><td></td><td>82-88</td><td>2.36</td></tr> </tbody> </table>			Sample	CONTACT CIRCUIT	MAXIMUM OF READING	1	1-18	1.88		22-28	2.99		32-38	3.63		42-48	1.42		52-58	1.19		62-68	2.29		72-78	2.75		82-88	2.36
Sample	CONTACT CIRCUIT	MAXIMUM OF READING																											
1	1-18	1.88																											
	22-28	2.99																											
	32-38	3.63																											
	42-48	1.42																											
	52-58	1.19																											
	62-68	2.29																											
	72-78	2.75																											
	82-88	2.36																											
NOTES: 1. Values are the average of five measurements in milliohms																													

Appendix B to CAR #16-010

 <p>ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTRO SWITCH CORP.</p> <p>180 King Avenue Weymouth, Massachusetts 02188</p>	<h1>Attachment B</h1> <p>ENGINEERING TEST REPORT</p>	<p>REPORT NO. 8627-1 PAGE 3 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN</p>
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MATERIAL

Original Series 24 Latching Switch Relay part #9210DD date code 8135, which was used for the initial product qualification test and documented in Test Report 2983-3 dated 1/11/1985

NOTE: Series 24 Control Switch Relay was qualified by similarity.

PURPOSE

To address the nonconformance:

Initial Product Qualification test for Insulation Resistance and Contact Resistance as defined in Electroswitch's ESC-STD-1000 Rev. 3 dated 9/3/1984 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment for Nuclear Power Generating Stations was found to be in contradiction to IEEE C37.90-1978 Relays and Relay Systems Associated with Electric Power Apparatus.

REFERENCES


- (a) ESC-STD-1000 (Rev 3) Para. 4.5.2 and 4.6
- (b) ANSI/IEEE C37.90.1978

PROCEDURE

The sequence of tests as detailed in ESC-STD-1000 (Rev 3) Table I was Insulation Resistance and Contact Resistance.


RESULTS

1. **Passed** the Dielectric Withstanding Voltage test at 2200VRMS 60HZ for 1 minute during **original test**.
2. **Passed** the Insulation Resistance Test 100 megaohm minimum at 500VDC.
3. **Passed** the Contact Resistance test at the rated current of 20A.

 ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTRO SWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188	<h1>Attachment B</h1> <p>ENGINEERING TEST REPORT</p>	REPORT NO. B627-1 PAGE 2 of 3 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN
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DATE STARTED: 6/14/16	TEST: Insulation Resistance	ORDER NUMBER: No applicable
DATE COMPLETED: 6/14/16	TEST SPEC: ESC-STD 1000 (Rev 3) para. 4.6.4	
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY:
HUMIDITY: 49%		DM
REQUIREMENT: When the product is tested as specified at 500VDC + 10% for 1 minute, the insulation resistance shall be greater than 100 megohms.		
AFTER AGING		
	Deck	TEST A TEST B
	1	>550 >550
	2	> 550 >550
	3	> 550 >550
	4	>550 >550
	5	>550 >550
	6	>550 >550
	7	>550 >550
	8	> 550 >550
NOTES: 1 Values are maximum found in megohms (K=1,000)		
2 Test voltage applied between:		
Test A- Open Circuit contacts		
Test B- Closed contacts and non-current carrying parts.		

Appendix B to CAR #16-010


 ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTROSWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188	<h1>Attachment B</h1> ENGINEERING TEST REPORT	REPORT NO. 8627-1 PAGE 3 of 3 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN

DATE STARTED: 6/16/15	TEST: Contact Resistance	ORDER NUMBER: Not applicable
DATE COMPLETED: 6/16/16	TEST SPEC: ESC-STD-1000 (Rev. 3) para. 4.6.5	
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY: DM
HUMIDITY: 49%		

REQUIREMENT:
 When the product is tested as specified, the contact resistance shall not exceed 10 milliohms at rated current of 20A. The products shall be operated once prior to taking measurements to clean the contact.

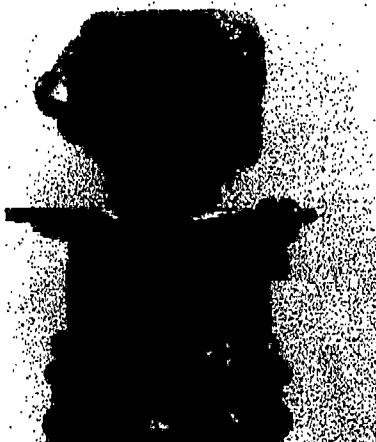
Sample	CONTACT CIRCUIT	MAXIMUM OF READING
1	1-13	1.60
	21-23	1.39
	31-33	1.76
	41-43	1.10
	51-53	1.30
	61-63	1.27
	71-73	1.47
	81-83	1.24
	91-93	1.45
	101-103	1.25

NOTES: 1. Values are the average of five measurements in milliohms

 <p>ELECTROSWITCH SWITCHES & DEVICES UNIT OF ELECTROSWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188</p>	<h1>Attachment B</h1> <p>ENGINEERING TEST REPORT</p>	<p>REPORT NO. 628-1 PAGE 3 of 3 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN</p>
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MATERIAL

Original Series 31 Instrument and Control switch part #31310B date code 77XX, which was used for the initial product qualification test and documented in Test Report 2392-6A dated 12/19/1984.

PURPOSE

To address the nonconformance:

Initial Product Qualification tests for Dielectric Withstanding Voltage and Insulation Resistance as defined in Electroswitch's ESC-STD-1000 Rev. 3 dated 9/3/1984 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment for Nuclear Power Generating Stations was found to be in contradiction to IEEE C37.90-1978 Relays and Relay Systems Associated with Electric Power Apparatus.

REFERENCES


- (a) ESC-STD-1000 (Rev 3) Para. 4.5.2 and 4.6
- (b) ANSI/IEEE C37.90.1978

PROCEDURE

The sequence of tests as detailed in ESC-STD-1000 (Rev 3) Table I was Dielectric Withstanding Voltage and Insulation Resistance.

RESULTS

1. **Passed** the Dielectric Withstanding Voltage test at the 2200VRMS 60HZ for 1 minute.
2. **Passed** the Insulation Resistance Test 100 megaohm minimum at 500VDC.
3. **Passed** the Contact Resistance Test at the rated current of 10A during original test.

 ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTRO SWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188	<h1>Attachment B</h1> ENGINEERING TEST REPORT	REPORT NO. 628-1 PAGE 2 of 3 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN

DATE STARTED: 6/7/16	TEST: Dielectric Withstanding Voltage	ORDER NUMBER: Not applicable
DATE COMPLETED: 6/7/16	TEST SPEC: ESC-STD-1000 (Rev. 3) para. 4.6.3	
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY:
HUMIDITY: 49%		DM

REQUIREMENT: When tested as specified, product shall withstand 2500 VRMS, 60Hz (AC) for 1 minute without arcing, breakdown of insulation, or damage and there shall be no leakage current greater than 100 microamperes.

AFTER AGING


Deck	TEST A	TEST B
1	10	11
2	10	11
3	11	11
4	11	11
5	11	11
6	10	12
7	10	12
8	10	11
9	11	12
10	10	11

NOTES: 1 Values are maximum found in microamperes.


2 Test voltage applied between:

Test A- Open Circuit contacts

Test B- Closed contacts and non current carrying parts.

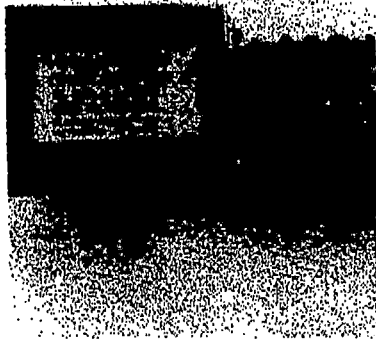
 ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTROSWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188	<h1>Attachment B</h1> <h2>ENGINEERING TEST REPORT</h2>	REPORT NO. 628-1 PAGE 3 OF 3 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN
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DATE STARTED: 6/14/16	TEST: Insulation Resistance	ORDER NUMBER: Not applicable
DATE COMPLETED: 6/14/16	TEST SPEC: ESC-STD 1000 (Rev 3) para. 4.6.4	
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY:
HUMIDITY: 49%		DM
REQUIREMENT: When the product is tested as specified at 500VDC + 10% for 1 minute, the insulation resistance shall be greater than 100 megohms.		
AFTER AGING		
	Deck	TEST A TEST B
	1	>550 >550
	2	>550 >550
	3	>550 >550
		>550 >550
		>550 >550
	6	>550 >550
	7	>550 >550
	8	>550 >550
NOTES: 1 Values are maximum found in megohms (K=1,000)		
2 Test voltage applied between:		
Test A- Open Circuit contacts		
Test B- Closed contacts and non-current carrying parts.		

 <p>ELECTROSWITCH • SWITCHES & RELAYS UNIT OF ELECTROSWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188</p>	<h1>Attachment B</h1> <p>ENGINEERING TEST REPORT</p>	<p>REPORT NO. 629-1 PAGE 03 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN</p>
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MATERIAL

Original Series 31 Latching Relay switch part #9308DB date code 7801, which was used for the initial product qualification test and documented in Test Report 2392-6A dated 12/19/1984.



PURPOSE

To address the nonconformance:

Initial Product Qualification Tests for Dielectric Withstanding Voltage and Insulation Resistance as defined in Electroswitch's ESC-STD-1000 Rev. 3 dated 9/3/1984 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment for Nuclear Power Generating Stations was found to be in contradiction to IEEE C37.90-1978 Relays and Relay Systems Associated with Electric Power Apparatus.

REFERENCES


- (a) ESC-STD-1000 (Rev 3) Para. 4.5.2 and 4.6
- (b) ANSI/ IEEE C37.90.1978

PROCEDURE


The sequence of tests as detailed in ESC-STD-1000 (Rev 3) Table I was Dielectric Withstanding Voltage and Insulation Resistance.

RESULTS


1. **Passed** the Dielectric Withstanding Voltage test at the 2200VRMS 60HZ for 1 minute.
2. **Passed** the Insulation Resistance Test 100 megaohm minimum at 500VDC.
3. **Passed** the Contact Resistance Test at the rated current of 10A during original test.

 <p>ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTROSWITCH CORP.</p> <p>180 King Avenue Weymouth, Massachusetts 02188</p>	<h1 style="margin: 0;">Attachment B</h1> <p>ENGINEERING TEST REPORT</p>	<p>REPORT NO. 629-1 PAGE 2 OF 3 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN</p>
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DATE STARTED: 6/7/16	TEST: Dielectric Withstanding Voltage	ORDER NUMBER: Not applicable	
DATE COMPLETED: 6/7/16	TEST SPEC: ESC-STD-1000 (Rev. 3) para. 4.6.3		
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY: DM	
HUMIDITY: 49%			
REQUIREMENT: When tested as specified , product shall withstand 2200 VRMS, 60Hz (AC) for 1 minute without arcing, breakdown of insulation, or damage and there shall be no leakage current greater than 100 microamperes.			
AFTER AGING			
	Deck	TEST A	TEST B
	1	11	10
	2	9	11
	3	9	10
	4	10	10
	5	10	11
	6	10	11
	7	10	12
	8	10	10
NOTES: 1 Values are maximum found in microamperes.			
2 Test voltage applied between:			
Test A- Open Circuit contacts			
Test B- Closed contacts and non current carrying parts.			

 <p>ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTRO SWITCH CORP.</p> <p>180 King Avenue Weymouth, Massachusetts 02188</p>	<h1 style="margin:0;">Attachment B</h1> <p>ENGINEERING TEST REPORT</p>	<p>REPORT NO. 629-1 PAGE 3 of 3 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN</p>
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DATE STARTED: 6/14/16	TEST: Insulation Resistance	ORDER NUMBER: Not applicable
DATE COMPLETED: 6/14/16	TEST SPEC: ESC-STD 1000 (Rev 3) para. 4.6.4	
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY: DM
HUMIDITY: 49%		
REQUIREMENT: When the product is tested as specified at 500VDC +- 10% for 1 minute, the insulation resistance shall be greater than 100 megohms.		
AFTER AGING		
	Deck	TEST A
	TEST B	
1	>550	>550
2	> 550	>550
3	> 550	>550
4	>550	>550
5	>550	>550
6	>550	>550
7	>550	>550
8	> 550	>550
NOTES: 1 Values are maximum found in megohms (K=1,000)		
2 Test voltage applied between:		
Test A- Open Circuit contacts		
Test B- Closed contacts and non-current carrying parts.		

 <p>ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTRO SWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188</p>	<h1>Attachment B</h1> <p>ENGINEERING TEST REPORT</p>	<p>REPORT NO. 630-1 PAGE 04 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN</p>
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MATERIAL

Original Series 20 CAM switch part #20PHD-57 date code 7740, which was used for the initial product qualification test and documented in Test Report 2970-2 dated 12/12/1984.

NOTE: Series 20M switch part #80162-33-4 was qualified by similarity in Test Report 2970-2A dated 1/24/1985, because a Series 20 CAM switch is part of the Series 20M module.



PURPOSE

To address the nonconformance:

Initial Product Qualification tests for Dielectric Withstanding Voltage, Insulation Resistance and Contact Resistance as defined in Electroswitch's ESC-STD-1000 Rev. 3 dated 9/3/1984 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment for Nuclear Power Generating Stations was found to be in contradiction to IEEE C37.90-1978 Relays and Relay Systems Associated with Electric Power Apparatus.

REFERENCES


- (a) ESC-STD-1000 (Rev 3) Para. 4.5.2 and 4.6
- (b) ANSI/IEEE C37.90.1978

PROCEDURE

The sequence of tests as detailed in ESC-STD-1000 (Rev 3) Table I was Dielectric Withstanding Voltage, Insulation Resistance and Contact Resistance.

RESULTS

1. **Passed** the Dielectric Withstanding Voltage test at the 2200VRMS 60HZ for 1 minute.
2. **Passed** the Insulation Resistance Test 100 megaohm minimum at 500VDC.
3. **Passed** the Contact Resistance test at the rated current of 20A.

 ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTROSWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188	<h1>Attachment B</h1> <h2>ENGINEERING TEST REPORT</h2>	REPORT NO. 630-1 PAGE 4 of 4 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN
		(Empty space for additional report information)

DATE STARTED: 6/7/16	TEST: Dielectric Withstanding Voltage	ORDER NUMBER: Not applicable
DATE COMPLETED: 6/7/16	TEST SPEC: ESC-STD-1000 (Rev. 3) para. 4.6.3	
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY:
HUMIDITY: 49%		DM

REQUIREMENT: When tested as specified, product shall withstand 100 VRMS, 60Hz (AC) for 1 minute without arcing, breakdown of insulation, or damage and there shall be no leakage current greater than 100 microamperes.

AFTER AGING

Deck	TEST A	TEST B
1	10	11
2	10	11
3	10	10
4	10	10
5	10	11
6	10	10
7	10	10
8	10	10


NOTES: 1 Values are maximum found in microamperes.

2 Test voltage applied between:

Test A- Open Circuit contacts

Test B- Closed contacts and non current carrying parts.

Appendix B to CAR #16-010

 ELECTROSWITCH SWITCHES & REPAIRS UNIT OF ELECTRO SWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188	<h1>Attachment B</h1> <p>ENGINEERING TEST REPORT</p>	REPORT NO. 630-1 PAGE 4 of 4 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN
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DATE STARTED: 6/14/16	TEST: Insulation Resistance	ORDER NUMBER: Not applicable
DATE COMPLETED: 6/14/16	TEST SPEC: ESC-STD 1000 (Rev 3) para. 4.6.4	
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY:
HUMIDITY: 49%		DM

REQUIREMENT: When the product is tested as specified at 500VDC + 10% for 1 minute, the insulation resistance shall be greater than 100 megohms.

AFTER RIDDING


Deck	TEST A	TEST B
1	>550	>550
2	> 550	>550
3	> 550	>550
4	>550	>550
5	>550	>550
6	>550	>550
7	>550	>550
8	> 550	>550

NOTES: 1 Values are maximum found in megohms (K=1,000)

2 Test voltage applied between:

Test A- Open Circuit contacts

Test B- Closed contacts and non-current carrying parts.

 ELECTROSWITCH SWITCHES & RELAYS UNIT OF ELECTROSWITCH CORP. 180 King Avenue Weymouth, Massachusetts 02188	<h1>Attachment B</h1> ENGINEERING TEST REPORT	REPORT NO. 530-1 PAGE 4 OF 4 DATE: JUNE 24, 2016 PREPARED BY: DAN MENARD APPROVED BY: LARRY FRIEDMAN
		(This area is blank in the original image)

DATE STARTED: 6/16/15	TEST: Contact Resistance	ORDER NUMBER: Not Applicable																											
DATE COMPLETED: 6/16/16	TEST SPEC: ESC-STD-1000 (Rev. 3) para. 4.6.5																												
TEMPERATURE: 23.7C	SAMPLE NO/DESCRIPTION: Original sample	TEST CONDUCTED BY:																											
HUMIDITY: 49%		DM																											
REQUIREMENT: When the product is tested as specified, the contact resistance shall not exceed 10 milliohms at rated current of 20A. The products shall be operated once prior to taking measurements to clean the contact.																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Sample</th> <th style="width: 40%;">CONTACT CIRCUIT</th> <th style="width: 45%;">MAXIMUM OF READING</th> </tr> </thead> <tbody> <tr><td>1</td><td>1-17</td><td>5.89</td></tr> <tr><td></td><td>21-22</td><td>4.30</td></tr> <tr><td></td><td>31-32</td><td>8.74</td></tr> <tr><td></td><td>41-42</td><td>1.51</td></tr> <tr><td></td><td>51-52</td><td>3.05</td></tr> <tr><td></td><td>61-62</td><td>8.43</td></tr> <tr><td></td><td>71-72</td><td>2.90</td></tr> <tr><td></td><td>81-82</td><td>2.14</td></tr> </tbody> </table>			Sample	CONTACT CIRCUIT	MAXIMUM OF READING	1	1-17	5.89		21-22	4.30		31-32	8.74		41-42	1.51		51-52	3.05		61-62	8.43		71-72	2.90		81-82	2.14
Sample	CONTACT CIRCUIT	MAXIMUM OF READING																											
1	1-17	5.89																											
	21-22	4.30																											
	31-32	8.74																											
	41-42	1.51																											
	51-52	3.05																											
	61-62	8.43																											
	71-72	2.90																											
	81-82	2.14																											
NOTES: 1. Values are the average of five measurements in milliohms																													

Appendix B to CAR #16-010