

TEST REPORT NO.: 701001-S1
DATE TESTED: 1-12-00
SHEET 1 OF 2

MASTER TEST FILE: 67
PROJECT: C02395
TEST REQUEST No: 7-004-00

Item Tested: C710-112PB Type C Cutouts (15KV, 100amp, 10KAIC asym) having fuse holder tubes lined with synthetic arc quenching material.

Type of Test: High current interruption.

Tested for: Hubbell Power Systems, Centralia, MO

Applicable Standards: ANSI/IEEE C37.41 1994 Section 6.6.2

Equipment:

1. High current test generator
2. Current transformers (C.T.s) (3-3-021, 3-4-007, 3-4-008)
3. Voltage divider (3-3-045)
4. HI-Tech IQ300 digital recorder (3-3-055)
5. Honeywell model 8M37 recorder (3-3-009)
6. Precision shunt, 0.1 ohm (3-3-018)

The numbers in parenthesis are instrument control numbers. Refer to the record of performance for instrument details.¹

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(Current interruption)



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- * All samples were new and in excellent condition when tested, except as otherwise noted in the "Item Tested:" section above.

Tested by: H. George, Sr. Test Tech.
Witnessed by: B. Rinehart & G. Judy
Report by: R. Brown, Principal Engineer 1/29/01
Form EF0638, 09/13/99

Approved by:
Laboratory Mgr: Clayton C. King 2/13/01
Engineering Mgr: L. R. Bend 2/13/01

Date:

TEST REPORT NO.: 701001-S1
DATE TESTED: 1-12-00
SHEET 2 OF 2

MASTER TEST FILE: 67
PROJECT: C02395
TEST REQUEST No: 7-004-00

Procedure: The samples were tested by placing on a cutout test fixture. After the test circuit was set up, excitation was applied to the generator. When the correct output voltage was reached the test was initiated by the high current closing switch. The station breaker was used as a back up to interrupt the current flow if the cutout did not operate properly. The test current was measured by a current transformer (C.T.) which supplied current to a precision 0.1 ohm shunt. The voltage across the shunt was recorded using a Hi-Tech IQ-300 digital recorder and the readings converted mathematically to current.

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS ASYM	SYM	CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
CM	7.5	5,047	3,536	0	4			Current measurement, X/R=8.8
1	15	10,094	7,072	0	½	1	6K	SI
2	"	"	"	90	½	"	"	SI
3	"	"	"	140	½	"	"	SI
4	"	"	"	0	½	2	100T	SI
5	"	"	"	90	1 ½	"	"	SI
6	"	"	"	140	1 ½	"	"	SI
CM	7.5	3,880	2,786	0	4 ½	-	-	Current measurement, X/R=8.0
7	15	7,760	5,572	0	½	3	6K	SI
8	"	"	"	90	½	"	"	SI
9	"	"	"	140	½	"	"	SI
10	"	"	"	0	1	4	100T	SI
11	"	"	"	90	2 ½	"	"	SI
12	"	"	"	140	1 ½	"	"	SI
CM	15	2,111	1,485	0	3 ½	-	-	Current measurement, X/R=8.8
1-13-00								
13	15	"	"	90	½	5	6K	SI
14	"	"	"	90	22	"	100T	SI
CM	15	486	446	0	5 ½	-	-	Current measurement, X/R=2.4
15	"	"	"	R	1	6	6K	SI
16	"	"	"	R	1	"	"	SI
CM	15	-	23.7	0	8	-	-	Current measurement, X/R=1.07
17	"	"	"	R	66	6	6K	SI
18	"	"	"	R	81	"	"	SI

Notes:

CM denotes current measurement.
R denotes random close.
SI denotes satisfactory interruption.

Conclusion: The C710-112PB Type C cutout with fuse holder tubes lined with synthetic arc quenching material meets the requirements for short circuit interruption according to ANSI/IEEE C37.41.

Application: This report applies to all Type C cutouts having fuse holder tubes lined with synthetic arc quenching material and which have the same voltage, continuous current and interrupting current rating as the item tested.

TEST REPORT NO.: 708900-S1
DATE TESTED: 9/27/00
SHEET 1 OF 3

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-089-00

Item Tested: C710-114PB Type C Cutouts (15kV, 100amp, 16kA IC asym.) having fuse holder tubes lined with synthetic arc quenching material.

Type of Test: High current interruption.

Tested for: Hubbell Power Systems, Centralia, MO

Applicable Standards: ANSI C37.41 1994 Section 6.6.2

Equipment:

1. High current test generator
2. Current transformer (C.T.) 10000/5 ratio (3-3-021), 800/5 ratio (3-3-0090, 100/5 ratio (3-3-007)
3. Voltage divider (3-3-045)
4. HI-Tech IQ300 digital recorder (3-3-055)
5. Precision shunt, 0.1 ohm (3-3-018)

The numbers in parenthesis are instrument control numbers. Refer to the record of performance for instrument details.¹

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(Current interruption)



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Tested by: H. George, Sr. Test Tech.
Witnessed by: B. Rinehart & G. Judy
Report by: R. Brown, Principal Engineer 12/5/00
Form EF0638, 09/13/99

Approved by: _____ **Date:** _____
Laboratory Mgr: Clayton C King 2-12-01
Engineering Mgr: L. R. R. 2-13-01



F. GANO CHANCE
RESEARCH LABORATORY
Centralia, MO

TEST REPORT NO.: 708900-S1
DATE TESTED: 9/27/00
SHEET 2 OF 3

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-089-00

Procedure: The cutout was tested by placing on a cutout test fixture. After the test circuit was set up, excitation was applied to the generator. When the correct output voltage was reached the test was initiated by the high current closing switch. The station breaker was used as a back up to interrupt the current flow if the fuse link did not operate properly. The test current was measured by a current transformer (C.T.) which supplied current to a precision 0.1 ohm shunt. The voltage across the shunt was recorded using a Hi-Tech IQ-300 digital recorder and the readings converted mathematically to current.

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS		CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
CM	15	16,168	10,608	0	5 ½			Current measurement, X/R=13
1	"	"	"	0	½	15A	6K	SI
2	"	"	"	90	½	"	"	SI
3	"	"	"	140	½	"	"	SI
4	"	"	"	0	1	15B	100T	SI
5	"	"	"	90	1	"	"	SI
6	"	"	"	140	1 ½	"	"	SI
CM	15	12,448	8,204	0	5 ½			Current measurement, X/R=12.3
7	"	"	"	0	½	15C	6K	SI
8	"	"	"	90	½	"	"	SI
9	"	"	"	140	½	"	"	SI
10	"	"	"	0	½	15D	100T	SI
11	"	"	"	90	½	"	"	SI
12	"	"	"	140	1	"	"	SI



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Centralia, MO

TEST REPORT NO.: 708900-S1
DATE TESTED: 9/27/00
SHEET 3 OF 3

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-089-00

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS ASYM	TEST CURRENT-AMPS SYM	CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
10-10-00								
CM	7.5	2,117	1,386	0	3	-	-	Current measurement, X/R=13
13	15	4,234	2,722	90	1/2	15E	6K	SI
14	"	"	"	90	6 1/2	"	100T	SI
CM	15	509	458	0	7 1/2	-	-	Current measurement, X/R=2.7
15	"	"	"	R	1/2	15F	6K	SI
16	"	"	"	R	1/2	"	"	SI
10-11-00								
CM	15	-	19	R	8 1/2	15F	-	Current measurement, X/R= 0.95
17	"	-	"	R	84	"	6K	SI
18	"	-	"	R	81	"	"	SI

Notes:

CM denotes current measurement.

R denotes random closing.

SI denotes satisfactory interruption.

Conclusions: The C710-114PB Type C Cutout with fuse holder tubes lined with a synthetic arc quenching material meets the requirements for short circuit interruption according to ANSI/IEEE C37.41.

Application: This report applies to all Type C cutouts having fuse holder tubes lined with synthetic arc quenching material and which have the same voltage, continuous current and interrupting current rating as the item tested.

TEST REPORT NO.: 709700-S1
DATE TESTED: 11-9-00
SHEET 1 OF 3

MASTER TEST FILE: 7-67
PROJECT: 1355
TEST REQUEST No: 7-097-00

Item Tested: C710-143PB Type C Cutouts (15kV, 200amp, 12kA IC asym.) having fuse holder tubes lined with synthetic arc quenching material.

Type of Test: High current interruption.

Tested for: Hubbell Power Systems, Centralia, MO

Applicable Standards: ANSI C 37.41 1994 Section 6.6.2

Equipment:

1. High current test generator
2. Current transformer (C.T.) 4000/5 ratio (3-3-025)
3. Voltage divider (3-3-045)
4. HI-Tech IQ300 digital recorder (3-3-055)
5. Precision shunt, 0.1 ohm (3-3-018)

The numbers in parenthesis are instrument control numbers. Refer to the record of performance for instrument details.¹

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Tested by: H. George, Sr. Test Tech.
Witnessed by: B. Rinehart & G. Judy
Report by: R. Brown, Principal Engineer 12/18/00
Form EF0638, 09/13/99

Approved by:
Laboratory Mgr: Clayton C. King 2-12-01
Engineering Mgr: LRBear 2/13/01

Date:



F. GANO CHANCE
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Centralia, MO

TEST REPORT NO.: 709700-S1
DATE TESTED: 11-9-00
SHEET 2 OF 3

MASTER TEST FILE: 7-67
PROJECT: 1355
TEST REQUEST No: 7-097-00

Procedure: The cutouts were tested by placing on a cutout test fixture. After the test circuit was set up, excitation was applied to the generator. When the correct output voltage was reached the test was initiated by the high current closing switch. The station breaker was used as a back up to interrupt the current flow if the fuse link did not operate properly. The test current was measured by a current transformer (C.T.) which supplied current to a precision 0.1 ohm shunt. The voltage across the shunt was recorded using a Hi-Tech IQ-300 digital recorder and the readings converted mathematically to current.

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS		CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
CM	7.5	ASYM	SYM					
		6,003	3,904	0	6 1/2	-	-	Current measurement, X/R=13.6
1	15	12,006	7,808	0	1/2	1	140K	SI
2	"	"	"	90	1	"	140K	SI
3	"	"	"	140	1	"	140K	SI
4	"	"	"	0	2 1/2	2	200T	SI
5	"	"	"	90	5	"	200T	SI
6	"	"	"	140	3 1/2	"	200T	SI
CM	7.5	4,637	3,041	0	4	-	-	Current measurement, X/R=13
11-10-00								
7	15	9,274	6,082	0	1/2	3	140K	SI
8	"	"	"	90	1 1/2	"	140K	SI
9	"	"	"	140	1	"	140K	SI
10	"	"	"	0	5 1/2	4	200T	SI
11	"	"	"	90	8	"	200T	SI
12	"	"	"	140	6 1/2	"	200T	SI



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TEST REPORT NO.: 709700-S1
DATE TESTED: 11-9-00
SHEET 3 OF 3

MASTER TEST FILE: 7-67
PROJECT: 1355
TEST REQUEST No: 7-097-00

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS		CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
CM	7.5	1,521	1,001	0	5 ½	-	-	Current measurement, X/R=12.3
13	15	3,042	2,002	90	15 ½	5	140K	Cleared.
14	"	"	"	90	14	"	200T	SI
CM	7.5	511	509	0	5	-	-	Current measurement, X/R=0.89
15	15	1,022	1,010	R	44	6	140K	SI
16	"	"	"	R	44	"	140K	SI

Notes:
CM denotes current measurement.
R denotes random closing.
SI denotes satisfactory interruption.
The 200T link used on test 14 was modified by reducing a section of the diameter of the element to allow the fuse to operate within the time limit of the circuit elements.
The current used on tests 15 & 16 (test series 5) was to keep within the time limit of the circuit elements and try to keep near 2 seconds.

Conclusions: The C710-143PB Type C Cutout with fuse holder tubes lined with synthetic arc quenching material meets the requirements for short circuit interruption according to ANSI/IEEE C37.41.

Application: This report applies to all Type C cutouts having fuse holder tubes lined with synthetic arc quenching material and which have the same voltage, continuous current and interrupting current rating as the item tested.

TEST REPORT NO.: 708400-S1
DATE TESTED: 9-13-00
SHEET 1 OF 3

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-084-00

Item Tested: C710-211PB Type C Cutouts (27kV, 100amp, 8kA IC asym.) having fuse holder tubes lined with synthetic arc quenching material.

Type of Test: High current interruption.

Tested for: Hubbell Power Systems, Centralia, MO

Applicable Standards: ANSI C37.41 1994 Section 6.6.2

Equipment:

1. High current test generator
2. Current transformer (C.T.) 10000/5 ratio (3-3-021)
3. Voltage divider (3-3-045)
4. HI-Tech IQ300 digital recorder (3-3-055)
5. Precision shunt, 0.1 ohm (3-3-018)

The numbers in parenthesis are instrument control numbers. Refer to the record of performance for instrument details.¹

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(Current interruption)



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Tested by: H. George, Sr. Test Tech.
Witnessed by: B. Rinehart & G. Judy
Report by: R. Brown, Principal Engineer 12/5/00
Form EF0638, 09/13/99

Approved by: *R. Beard* **Date:** 2/13/01
Laboratory Mgr: *Clayton C. King* 2/14/01
Engineering Mgr:



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RESEARCH LABORATORY
Centralia, MO

TEST REPORT NO.: 708400-S1
DATE TESTED: 9-13-00
SHEET 2 OF 3

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-084-00

Procedure: The cutout was tested by placing on a cutout test fixture. After the test circuit was set up, excitation was applied to the generator. When the correct output voltage was reached the test was initiated by the high current closing switch. The station breaker was used as a back up to interrupt the current flow if the fuse link did not operate properly. The test current was measured by a current transformer (C.T.) which supplied current to a precision 0.1 ohm shunt. The voltage across the shunt was recorded using a Hi-Tech IQ-300 digital recorder and the readings converted mathematically to current.

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS		CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
CM	13.5	4107	2716	0	6 ½	-	-	Current measurement, X/R=12.3
1	27	8214	5432	0	½	A1	6K	SI
2	"	"	"	90	½	"	"	SI
3	"	"	"	140	½	"	"	SI
4	"	"	"	0	1 ½	A2	100T	SI
5	"	"	"	90	2 ½	"	"	SI
6	"	"	"	140	1 ½	"	"	SI.
CM	13.5	2807	1839	0	4 ½	-	-	Current measurement, X/R=13
9-14-00								
7	27	5614	3678	0	½	A3	6K	SI
8	"	"	"	90	½	"	"	SI
9	"	"	"	140	½	"	"	SI
10	"	"	"	0	3 ½	A4	100T	SI
11	"	"	"	90	3 ½	"	"	SI
12	"	"	"	140	3 ½	"	"	SI
CM	13.5	1046	686	0	9 ½	-	-	Current measurement, X/R=13
13	27	2092	1372	90	½	A5	6K	SI
14	"	"	"	90	34	"	100T	SI



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RESEARCH LABORATORY
Centralia, MO

TEST REPORT NO.: 708400-S1
DATE TESTED: 9-13-00
SHEET 3 OF 3

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-084-00

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS		CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
CM	27	ASYM	SYM	0	8	-	-	Current calibration, X/R=3.9
15	"	"	"	R	1/2	A6	6K	SI
16	"	"	"	R	1	"	"	SI
9-15-00								
CM	27	-	20.8	R	9 1/2	-	-	Current calibration, X/R= 0.90
17	"	-	"	R	58	A6	6K	SI
18	"	-	"	R	64.2	"	"	SI

Notes:
CM denotes current measurement.
R denotes random closing.
SI denotes satisfactory interruption.

Conclusions: The C710-211PB Type C Cutout with fuse holder tubes lined with synthetic arc quenching material meets the requirements for short circuit interruption according to ANSI/IEEE C37.41.

Application: This report applies to all Type C cutouts having fuse holder tubes lined with synthetic arc quenching material and which have the same voltage, continuous current and interrupting current rating as the item tested.

TEST REPORT NO.: 709500-S1
DATE TESTED: 10/12/00
SHEET 1 OF 3

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-095-00

Item Tested: C710-213PB Type C Cutouts (27kV, 100amp, 12kA IC asym.) having fuse holder tubes lined with synthetic arc quenching material.

Type of Test: High current interruption.

Tested for: Hubbell Power Systems, Centralia, MO

Applicable Standards: ANSI C37.41 1994 Section 6.6.2

Equipment:

1. High current test generator
2. Current transformer (C.T.) 10000/5 ratio (3-3-021), 800/5 ratio (3-3-0090, 100/5 ratio (3-3-007)
3. Voltage divider (3-3-045)
4. HI-Tech IQ300 digital recorder (3-3-055)
5. Precision shunt, 0.1 ohm (3-3-018)

The numbers in parenthesis are instrument control numbers. Refer to the record of performance for instrument details.¹

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(Current interruption)



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Tested by: H. George, Sr. Test Tech.
Witnessed by: B. Rinehart & G. Judy
Report by: R. Brown, Principal Engineer 12/5/00
Form EF0638, 09/13/99

Approved by:
Laboratory Mgr: Clayton C. King 12-13-01
Engineering Mgr: LRBear 2/13/01

Date:



F. GANO CHANCE
RESEARCH LABORATORY
Centralia, MO

TEST REPORT NO.: 709500-S1
DATE TESTED: 10/12/00
SHEET 2 OF 3

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-095-00

Procedure: The cutout was tested by placing on a cutout test fixture. After the test circuit was set up, excitation was applied to the generator. When the correct output voltage was reached the test was initiated by the high current closing switch. The station breaker was used as a back up to interrupt the current flow if the fuse link did not operate properly. The test current was measured by a current transformer (C.T.) which supplied current to a precision 0.1 ohm shunt. The voltage across the shunt was recorded using a Hi-Tech IQ-300 digital recorder and the readings converted mathematically to current.

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS		CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
CM	13.5	6,192	4,031	0	3 ½	-	-	Current measurement, X/R=13.6
1	27	12,384	8,062	0	½	CB1	6K	SI
2	"	"	"	90	½	"	"	SI
3	"	"	"	140	½	"	"	SI
4	"	"	"	0	1	CB2	100T	SI
5	"	"	"	90	1 ½	"	"	SI
6	"	"	"	140	1 ½	"	"	SI
CM	13.5	4,302	2,829	0	5 ½	-	-	Current measurement, X/R=13
7	27	8,604	5,658	0	½	CB3	6K	SI
8	"	"	"	90	½	"	"	SI
9	"	"	"	140	½	"	"	SI
10	"	"	"	0	½	CB4	100T	SI
11	"	"	"	90	2	"	"	SI
12	"	"	"	140	1	"	"	SI



F. GANO CHANCE
RESEARCH LABORATORY
Centralia, MO

TEST REPORT NO.: 709500-S1
DATE TESTED: 10/12/00
SHEET 3 OF 3

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-095-00

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS		CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
ASYM			SYM					
10-13-00								
CM	13.5	1,643	1,086	0	5 ½	-	-	Current measurement, X/R=12.3
13	27	3,286	2,172	90	½	CB5	6K	SI
14	“	“	“	90	11 ½	CB5	100T	SI
CM	27	545	455	0	7 ½	-	-	Current measurement, X/R=3.9
15	“	“	“	R	1	CB6	6K	SI
16	“	“	“	R	½	“	“	SI
CM	27	-	20.4	R	8	-	-	Current measurement, X/R=0.75
17	“	-	“	R	61	CB6	6K	SI
18	“	-	“	R	56	“	“	SI

Notes:

CM denotes current measurement.

R denotes random closing.

SI denotes satisfactory interruption.

Conclusions: The C710-213PB Type C Cutout with fuse holder tubes lined with synthetic arc quenching material meets the requirements for short circuit interruption according to ANSI/IEEE C37.41.

Application: This report applies to all Type C cutouts having fuse holder tubes lined with synthetic arc quenching material and which have the same voltage, continuous current and interrupting current rating as the item tested.

TEST REPORT NO.: 709800-S1
DATE TESTED: 11-22-00
SHEET 1 OF 3

MASTER TEST FILE: 7-67
PROJECT: 1355
TEST REQUEST No: 7-098-00

Item Tested: C710-242PB Type C Cutouts (27kV, 200 amp, 10kA IC asym.) having fuse holder tubes lined with synthetic arc quenching material.

Type of Test: High current interruption.

Tested for: Hubbell Power Systems, Centralia, MO

Applicable Standards: ANSI C 37.41 1994 Section 6.6.2

Equipment:

1. High current test generator
2. Current transformer (C.T.) 4000/5 ratio (3-3-025)
3. Voltage divider (3-3-045)
4. HI-Tech IQ300 digital recorder (3-3-055)
5. Precision shunt, 0.1 ohm (3-3-018)

The numbers in parenthesis are instrument control numbers. Refer to the record of performance for instrument details.¹

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Tested by: H. George, Sr. Test Tech.
Witnessed by: B. Rinehart & G. Judy
Report by: R. Brown, Principal Engineer 12/18/00
Form EF0638, 09/13/99

Approved by:
Laboratory Mgr: Clayton C. King 2/12/01
Engineering Mgr: L. R. Beard 2/13/01

Date:



F. GANO CHANCE
RESEARCH LABORATORY
Centralia, MO

TEST REPORT NO.: 709800-S1
DATE TESTED: 11-22-00
SHEET 2 OF 3

MASTER TEST FILE: 7-67
PROJECT: 1355
TEST REQUEST No: 7-098-00

Procedure: The cutouts were tested by placing on a cutout test fixture. After the test circuit was set up, excitation was applied to the generator. When the correct output voltage was reached the test was initiated by the high current closing switch. The station breaker was used as a back up to interrupt the current flow if the fuse link did not operate properly. The test current was measured by a current transformer (C.T.) which supplied current to a precision 0.1 ohm shunt. The voltage across the shunt was recorded using a Hi-Tech IQ-300 digital recorder and the readings converted mathematically to current.

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS ASYM	TEST CURRENT-AMPS SYM	CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
11-28-00								
CM	13.5	5,107	3,366	0	7	-	-	Current measurement, X/R=12.3
1	27	10,214	6,732	0	1/2	1	140K	SI
2	"	"	"	90	1 1/2	"	"	SI
3	"	"	"	140	1	"	"	SI
4	"	"	"	0	3 1/2	2	200T	SI
5	"	"	"	90	6	"	"	SI
6	"	"	"	140	5	"	"	SI
12-5-00								
CM	13.5	3,826	2,518	0	4	-	-	Current measurement, X/R=12.3
7	27	7,652	5,036	0	1	3	140K	SI
8	"	"	"	90	2	"	"	SI
9	"	"	"	140	2	"	"	SI
10	"	"	"	0	9 1/2	4	200T	SI
11	"	"	"	90	11 1/2	"	"	SI
12	"	"	"	140	11	"	"	SI



F. GANO CHANCE
RESEARCH LABORATORY
Centralia, MO

TEST REPORT NO.: 709800-S1
DATE TESTED: 11-22-00
SHEET 3 OF 3

MASTER TEST FILE: 7-67
PROJECT: 1355
TEST REQUEST No: 7-098-00

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS		CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
ASYM	SYM							
12-6-00								
CM	13.5	1,496	973	0	4	-	-	Current measurement, X/R=13.6
13	27	2,992	1,946	90	11	5	140K	SI
14	"	"	"	90	43	"	200T	SI
CM	13.5	-	421.5	0	14 ½	-	-	Current measurement, X/R=0.9
15	27	-	843	R	33	6	140K	SI
16	"	-	"	R	39	"	"	SI

Notes:

CM denotes current measurement.

R denotes random closing.

SI denotes satisfactory interruption.

The fuse links used on tests 14, 15 and 16 were modified by reducing a section of the diameter of the element to allow the fuse to operate within the time limits of the circuit elements.

The current used on tests 15 & 16 (test series 5) was to keep within the time limit of the circuit elements and to try to keep near 2 seconds.

Conclusions: The C710-242PB Type C Cutout with fuse holder tubes lined with synthetic arc quenching material meets the requirements for short circuit interruption according to ANSI/IEEE C37.41.

Application: This report applies to all Type C cutouts having fuse holder tubes lined with synthetic arc quenching material and which have the same voltage, continuous current and interrupting current rating as the item tested.

TEST REPORT NO.: 702701-S1
DATE TESTED: 3-14-01 to 3-16-01
SHEET 1 OF 3

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-027-01

Item Tested: C710-713PB Type C Cutouts (36kV, 100amp, 10.8kA IC asym.) having fuse holder tubes lined with synthetic arc quenching material.

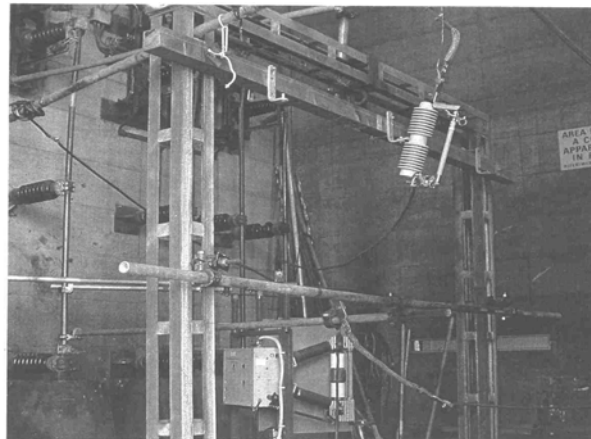
Type of Test: High current interruption.

Tested for: Hubbell Power Systems, Centralia, MO

Applicable Standards: IEC 60282-2, Interrupting tests.

Equipment: All test equipment supplied by CESI (Centro Elettrotecnico Sperimentale Italiano) laboratory in Milan, Italy.
Reference CESI test report number GPS-A1/011503

Procedure: The cutout was placed on a cutout test fixture (see below) in the CESI high current laboratory. After the test circuit was set up, excitation was applied to the generator. The correct test voltage was applied. The high current closing switch initiated the test current. The station breaker was used as a back up to interrupt the current flow if the cutout did not perform properly. The tests were performed at 50 Hz.



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- * All samples were new and in excellent condition when tested, except as otherwise noted in the "Item Tested:" section above.

Tested by: CESI Milan, Italy
Witnessed by: B. Brown
Report by: R. Brown, Principal Engineer 5/3/01
Form EF0638, 09/13/99

Approved by:
Laboratory Mgr: C. Clayton C. King 5-7-01
Engineering Mgr: R. Beale 5-7-01



F. GANO CHANCE
RESEARCH LABORATORY
Centralia, MO

TEST REPORT NO.: 702701-S1
DATE TESTED: 3-14-01 to 3-16-01
SHEET 2 OF 3

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-027-01

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS		CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
CM	36.0	11000	8050	0	3	-	-	Current measurement, X/R=7.6
1	"	"	"	8	1/2	1	6K	SI
2	"	"	"	93	1/2	"	"	SI
3	"	"	"	140	1/2	"	"	SI
4	"	"	"	8	1/2	2	100T	SI
5	"	"	"	90	1	"	"	SI
6	"	"	"	140	1 1/2	"	"	SI
CM	36.0	-	6050	0	3	-	-	Current measurement, X/R=9.95
7	"	-	"	7	1/2	3	6K	SI
8	"	-	"	92	1/2	"	"	SI
9	"	-	"	137	1/2	"	"	SI
10	"	-	"	5	1/2	4	100T	SI
11	"	-	"	90	1 1/2	"	"	SI
12	"	-	"	137	1	"	"	SI
CM	36.0	-	2000	0	3	-	-	Current measurement, X/R=9.95
13	"	-	"	90	1/2	5	6K	SI
14	"	-	"	90	11 1/2	"	100T	SI
CM	36.0	-	420	0	8	-	-	Current calibration, X/R=4.9
15	"	-	"	R	1	6	6K	SI
16	"	-	"	R	1/2	"	"	SI
CM	36.0	-	19.5	R	-	-	-	Current calibration, X/R= 0.99
17	"	-	"	R	108	6	6K	SI
18	"	-	"	R	143	"	"	SI

Notes:

CM denotes current measurement.

R denotes random closing.

SI denotes satisfactory interruption.



F. GANO CHANCE
RESEARCH LABORATORY
Centralia, MO

TEST REPORT NO.: 702701-S1
DATE TESTED: 3-14-01 to 3-16-01
SHEET 3 OF 3

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-027-01

Conclusions: The C710-713PB Type C Cutout with fuse holder tubes lined with synthetic arc quenching material meets the requirements for short circuit interruption according to IEC 60282-2.

Application: This report applies to all Type C cutouts having fuse holder tubes lined with synthetic arc quenching material and which have the same voltage, continuous current and interrupting current rating as the item tested.

TEST REPORT NO.: 709900-S1
DATE TESTED: 11-22-00
SHEET 1 OF 3

MASTER TEST FILE: 7-67
PROJECT: 1355
TEST REQUEST No: 7-099-00

Item Tested: C710-743PB Type C Cutouts (27kV, 200 amp, 12kA IC asym.) having fuse holder tubes lined with synthetic arc quenching material.

Type of Test: High current interruption.

Tested for: Hubbell Power Systems, Centralia, MO

Applicable Standards: ANSI C 37.41 1994 Section 6.6.2

Equipment:

1. High current test generator
2. Current transformer (C.T.) 4000/5 ratio (3-3-025)
3. Voltage divider (3-3-045)
4. HI-Tech IQ300 digital recorder (3-3-055)
5. Precision shunt, 0.1 ohm (3-3-018)

The numbers in parenthesis are instrument control numbers. Refer to the record of performance for instrument details.¹

This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA). These test results were made in accordance within the terms of accreditation unless otherwise specified.

(Current interruption)



Cert. No. 856.01

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Tested by: H. George, Sr. Test Tech.
Witnessed by: B. Rinehart & G. Judy
Report by: R. Brown, Principal Engineer 12/19/00
Form EF0638, 09/13/99

Approved by:
Laboratory Mgr: Clayton C. King 2/12/01
Engineering Mgr: L. R. Beard 2/13/01

Date:



F. GANO CHANCE
RESEARCH LABORATORY
Centralia, MO

TEST REPORT NO.: 709900-S1
DATE TESTED: 11-22-00
SHEET 2 OF 3

MASTER TEST FILE: 7-67
PROJECT: 1355
TEST REQUEST No: 7-099-00

Procedure: The cutouts were tested by placing on a cutout test fixture. After the test circuit was set up, excitation was applied to the generator. When the correct output voltage was reached the test was initiated by the high current closing switch. The station breaker was used as a back up to interrupt the current flow if the fuse link did not operate properly. The test current was measured by a current transformer (C.T.) which supplied current to a precision 0.1 ohm shunt. The voltage across the shunt was recorded using a Hi-Tech IQ-300 digital recorder and the readings converted mathematically to current.

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS ASYM	SYM	CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
11-27-00								
CM	13.5	6,022	3,861	0	4 1/2	-	-	Current measurement, X/R=15
1	27	12,044	7,722	0	1/2	1	140K	SI
2	"	"	"	90	1 1/2	"	"	SI
3	"	"	"	140	1	"	"	SI
4	"	"	"	0	2 1/2	2	200T	SI
5	"	"	"	90	5	"	"	SI
6	"	"	"	140	5	"	"	SI
12-5-00								
CM	13.5	4,234	2,772	0	5 1/2	-	-	Current measurement, X/R=13
12-6-00								
7	27	8,468	5,544	0	1	3	140K	SI
8	"	"	"	90	2	"	"	SI
9	"	"	"	140	1 1/2	"	"	SI
10	"	"	"	0	7 1/2	4	200T	SI
11	"	"	"	90	10	"	"	SI
12	"	"	"	140	9 1/2	"	"	SI



F. GANO CHANCE
RESEARCH LABORATORY
Centralia, MO

TEST REPORT NO.: 709900-S1
DATE TESTED: 11-22-00
SHEET 3 OF 3

MASTER TEST FILE: 7-67
PROJECT: 1355
TEST REQUEST No: 7-099-00

Results:

TEST NO	TEST VOLTS KILOVOLTS	TEST CURRENT-AMPS		CLOSING ANGLE	DURATION CYCLES	SAMPLE NO	FUSE LINK	COMMENT
CM	13.5	1,666	1,089	0	4	-	-	Current measurement, X/R=13
13	27	3,332	2,178	90	10	5	140K	SI
14	"	"	"	90	36	"	200T	SI
CM	13.5	-	421.5	0	14 ½	-	-	Current measurement, X/R=0.9
15	27	-	843	R	43	6	140K	SI
16	"	-	"	R	48	"	"	SI

Notes:

CM denotes current measurement.

R denotes random closing.

SI denotes satisfactory interruption.

The fuse links used on tests 14,15 and 16 were modified by reducing a section of the diameter of the element to allow the fuse to operate within the time limits of the circuit elements.

The current used on tests 15 & 16 (test series 5) was to keep within the time limits of the circuit elements and to try to keep near 2 seconds.

Conclusions: The C710-743PB Type C Cutout with fuse holder tubes lined with synthetic arc quenching material meets the requirements for short circuit interruption according to ANSI/IEEE C37.41.

Application: This report applies to all Type C cutouts having fuse holder tubes lined with synthetic arc quenching material and which have the same voltage, continuous current and interrupting current ratings as the item tested.

TEST REPORT NO.: 710400-S1
DATE TESTED: 1/11/00 to 2/17/00
SHEET 1 OF 1

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-104-00

Item Tested: Cutout fuse tubes lined with a synthetic arc quenching material.

Type of Test: Thermal-cycle

Tested for: Hubbell Power Systems, Centralia, MO

Applicable Standards: ANSI C37.41 1994

Equipment:

1. Calipers (6647)
2. Balance (MO6385)
3. Thermal-cycling equipment; oven (8-5-010) and freezer (8-5-005)

The numbers in parenthesis are instrument control numbers. Refer to the record of performance for instrument details.¹

Procedure: One-inch samples of fuse tubes lined with a synthetic arc quenching material were thermal-cycled according to ANSI C37.41. The samples were initially measured with calipers, weighed and the data recorded. The samples were then thermal-cycled. The thermal cycle consisted of room temperature water immersion for 1 hour followed by 2 hours at -40 °C, 2 hours at + 60 °C and then returning to ambient. The thermal cycle was repeated daily for a total of ten cycles. At the conclusion of the thermal cycling, the samples were again measured with calipers, weighed and the data recorded. The percent change in dimension and weight was then calculated and recorded. A one-inch sample of conventional organic (bone fiber) lined fuse tube was included as a control for comparison.

Results: The synthetic lined fuse tubes averaged a decrease in weight of 0.02% and an increase in ID of 0.04%. The bone fiber fuse tube decreased in weight by 0.11% and increased in ID by 0.68%.

Conclusions: Fuse tubes lined with synthetic arc quenching material exhibit less variation than bone fiber lined fuse tubes when subjected to thermal-cycle tests according to ANSI C37.41

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Tested by: J. Rickenbaugh, Quality Supervisor
Witnessed by: J. Rickenbaugh
Report by: R. Brown, Principal Engineer 12/14/00
Form EF 0638, 09/13/99

Approved by:
Laboratory Mgr: Clayton C. King 2/12/01
Engineering Mgr: L. R. Beard 5/13/01

Date:



F. GANO CHANCE
RESEARCH LABORATORY
Centralia, MO

TEST REPORT NO.: 710500-S1
DATE TESTED: 1/17/00 to 5/19/00
SHEET 1 OF 2

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-105-00

Item Tested: Cutout fuse tubes lined with a synthetic arc quenching material.

Type of Test: 24 Hour and Long Term Water Absorption

Tested for: Hubbell Power Systems, Centralia, MO

Applicable Standards: ASTM D570

Equipment: 1. Calipers (6647)
2. Balance (MO6385)

The numbers in parenthesis are instrument control numbers. Refer to the record of performance for instrument details.¹

Procedure: One-inch samples of fuse tubes lined with a synthetic arc quenching material were tested for 24 hour and long term water absorption according to ASTM D570. The samples were conditioned for 24 hours at 50 °C and allowed to cool in a desiccator. The samples were immediately weighed, measured with calipers and the data recorded. The samples were immersed in a container of distilled water for 24 hours. At the conclusion of the 24-hour period, the samples were removed from the water, wiped off with a dry cloth and immediately weighed. The samples were then replaced in the water and weighed at the end of the first week and every two weeks thereafter until the change in weight gain over a three-week period was less than 5mg. A one-inch sample of conventional organic (bone fiber) lined fuse tube was included as a control for comparison.

¹

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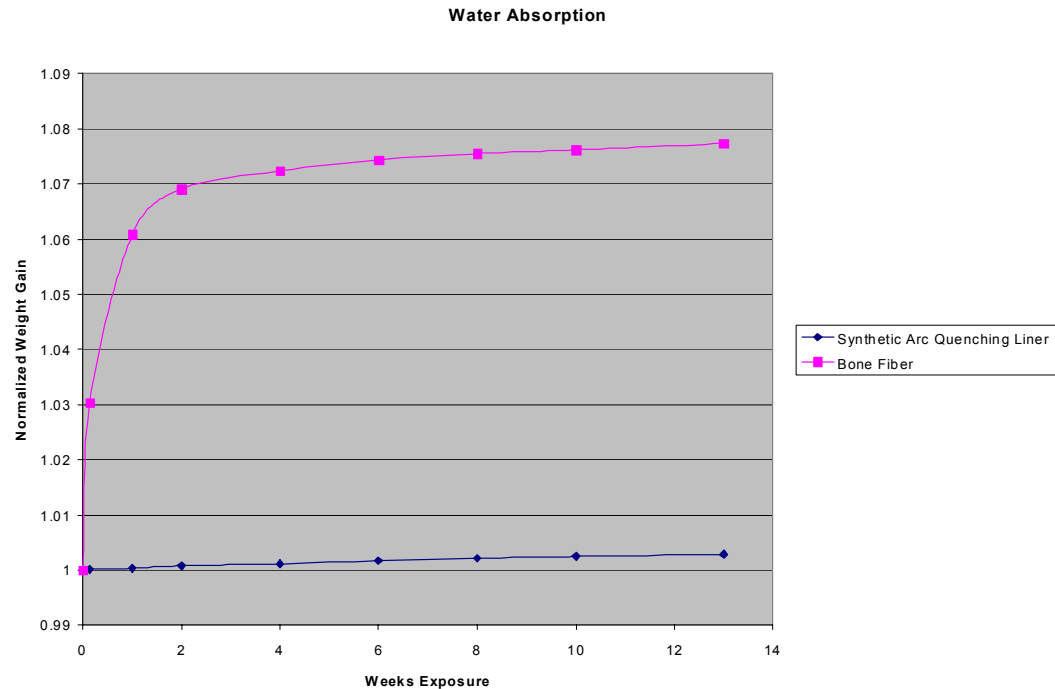
Tested by: J. Rickenbaugh, Quality Supervisor
Witnessed by: J. Rickenbaugh
Report by: R. Brown, Principal Engineer 12/14/00
Form EF0638, 09/13/99

Approved by: _____ **Date:** _____
Laboratory Mgr: Clayton C. King 2/12/01
Engineering Mgr: L. Beaudry 2/13/01

TEST REPORT NO.: 710500-S1
DATE TESTED: 1/17/00 to 5/19/00
SHEET 2 OF 2

MASTER TEST FILE: 7-67
PROJECT: C02395
TEST REQUEST NO: 7-105-00

Results: The graph below shows the normalized weight gain of the synthetic arc quenching material and bone fiber lined fuse tubes. The 24-hour gain of the fuse tubes lined with synthetic and bone fiber material is 1.0001 and 1.0304 times respectively. The long-term weight gain of the synthetic and the bone fiber fuse lined tubes is 1.0029 and 1.0773 times respectively.



Conclusions: The fuse tubes lined with synthetic arc quenching material are virtually immune to moisture absorption.