Test Report № PL-26187

The tests were performed in accordance with IEEE C37.60-2012, Sections 6.101 and 6.103

Client:	ABB Inc. 655 Century Point Lake Mary, Florida, USA		
Project №:	PL-26187	**Test Dates:**	19-21 May 2015
Tested Devices:	Three-phase vacuum reclosers, Units #1 and #2		
Manufacturer:	ABB Inc.		
Type:	OVR-3 Recloser (identified by the client)		
Voltage:	27 kV (nameplate information) 27.7 kV_{rms} (test voltage)		
Rated Currents:	1000 A_{rms} continuous, 12.5 kA_{rms} interrupting		
BIL:	125 kV		
Serial №s:	1VAL15D197OVR2 (Unit #1), 1VAL15C846OVR2 (Unit #2)		
Controller:	Schweitzer SEL-651R-2, Serial № 1150820135		
Tests performed:	Unit #1: Rated symmetrical interrupting current tests at 27.7 kV three-phase, at 12.7 kA_{rms}, 11.5 kA_{rms}, 6.70 kA_{rms} and 1.93 kA_{rms} Unit #2 • Line charging current interruption tests at 5.5 A_{rms} • Cable charging current interruption tests at 25 A_{rms} Units #1 and #2 • DC resistance tests before and after each of the tests • 60 Hz, 1 min AC withstand at 48 kV after each of the tests		
Test Witnesses:	Mr. Bob Behl Mr. Gary Haynes	ABB Inc. ABB Inc.	
Remarks:	• Identification of the tested reclosers was provided by the customer and was based on nameplate information. • No restrikes or NSDD's were observed during the tests. • The tested reclosers passed all tests performed. • As requested by the client, additional 16 operations at 12.7 kA (T100 duty) were performed on Unit #1 after completing operating duty tests.		

Tested by:

Frank for C. Morton

C. Morton, P. Eng.
Senior Engineer, High Power Lab

Reviewed by:

26 June 2015

T. Stefanski M.Sc., P. Eng.
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CONTROLLER OSCILLATORY AND FAST TRANSIENT SWC TEST REPORT

Client:	ABB Inc., 655 Century Point, Lake Mary, Florida, 32746, USA	
Test Date:	May 19-20, 2015	**Project:** PL-27128-R1
Nameplate Data: ***Recloser Controller:*** Manufacturer: Model: Serial No.: ***Three-phase Recloser:*** Manufacturer: Model: Impulse level (BIL): Rated voltage: Rated current: Serial No.:	 SEL, Inc. 651R233XBA8AE1111 1150860141 ABB OVR-Recloser 125 kV_{peak} 27.7 kV_{rms} 1,000 A_{rms} continuous 1VAL15D179 OVR2	
Test Witness:	Bob Behl – ABB Inc.	
Test Standard:	IEEE C37.60-2012, Clause 6.111.2: "Oscillatory and fast transients surge tests"	
Atmospheric Conditions:	Temperature 20 °C Relative humidity 40 % Barometric pressure 763.0 mmHg	
Test Voltage:	Oscillatory - 2.5 kV_{peak} , Fast Transient – 4 kV_{peak}	
Test Procedure:	The testing was in accordance with IEEE C37.90.1-2012. Test surges were applied to the control cable in common and transverse mode using an external coupling/decoupling network in accordance with Table 3 and 4 of IEEE C37.90.1. Signal and data circuits were tested using a capacitive clamp. The AC power supply was tested while connected to 120 Volts, 60 Hz supply for all tests.	
Test Results:	The controller and recloser operated normally following the Oscillatory and Fast Transient Tests performed in accordance with the test procedures as per the above document. The controller complied with requirements of "IEEE C37.60-2012, Clause 6.111.2".	
Remarks:	None	

Tested by:

June 17, 2015
Alex Babakov, P. Eng.
Test Engineer, High Voltage and Cable Technologies

Reviewed by:

June 17, 2015
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MINIMUM TRIPPING CURRENT TEST REPORT

Client:	ABB Inc. – 655 Century Point, Lake Mary, Florida – USA – 32746				
Test Date:	21-22 May 2015	**Project:**	PL-27128	**Report No:**	PL-27128.02.2

Nameplate Data

Model:	Recloser – ABB OVR-Recloser Controller – SEL-651R-2 Recloser Control ,
Impulse level (BIL):	125 kV_{peak}
Rated maximum voltage:	27.7 kV_{rms}
Rated current:	1000 A_{rms} continuous, 12.5 kA_{rms} interrupting
Serial No.:	Recloser – 1VAL15D179 OVR2 Controller - 1150860141

Test Witness:	Bob Behl, ABB Inc.
Test Standard:	IEC 62271-111:2012/IEEE Std. C37.60-2012, "High-voltage switchgear and controlgear – Part 111: Automatic circuit reclosers and fault interrupters for alternating current systems up to 38 kV", Clause 6.105: "Minimum tripping current tests".

Test Conditions:

Minimum Trip (Phase):	60 A_{rms}
Minimum Trip Limit:	±6 A_{rms}
Minimum Trip (Ground):	3 A_{rms}
Minimum Trip Limit:	±3 A_{rms}
Circuit Configuration:	Single-phase, all poles in series

Test Procedure:	The recloser was set for an instantaneous trip, Curve A (101), and connected to a low-voltage power source with a means of gradually increasing the current through the recloser. The current was initiated at approximately 80% of the anticipated minimum tripping current and gradually raised over approximately 10 seconds until the recloser operated, as indicated by the cessation of current. The recloser is required to meet the minimum tripping current within the greater of ±10% or $3A_{rms}$.
Test Data:	Minimum Trip Level (Phase Current): 60.35 A_{rms} Minimum Trip Level (Ground Current): 3.066 A_{rms}
Test Results:	The recloser **passed** the minimum tripping current test in accordance with the test requirements of IEC 62271-111:2012/IEEE Std. C37.60-2012, Clause 6.105.
Remarks:	None

Prepared by:
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Reviewed by:
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Date June 05 2015

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TIME-CURRENT TEST REPORT

Client:	ABB – 655 Century Point, Lake Mary - Florida – USA – 32746				
Test Date:	21-22 May 2015	**Project:**	PL-27128	**Report No:**	PL-27128.02.1

Nameplate Data	
Model:	Recloser – ABB OVR-Recloser Controller – SEL-651R-2 Recloser Control
Impulse level (BIL):	125 kV_{peak}
Rated maximum voltage:	27.7 kV_{rms}
Rated current:	1000 A_{rms} continuous, 12.5 kA_{rms} interrupting
Serial No.:	Recloser – 1VAL15D179 OVR2 Controller - 1150860141
Test Witness:	Bob Behl, ABB
Test Standard:	IEC 62271-111:2012/IEEE Std. C37.60-2012, "High-voltage switchgear and controlgear – Part 111: Automatic circuit reclosers and fault interrupters for alternating current systems up to 38 kV", Clause 6.108: "Time-current tests".
Test Conditions:	
Curve Settings Tested:	U3 (US Very Inverse - time dial 2.0) and A (Curve 101 - time dial 1.0)
Target Current Levels:	72, 120, 200, 500, 2500, 6240, 12500 A_{rms}
Pickup Current Setting:	60, 60, 67, 125, 500, 780, 833 A_{rms}
Circuit Configuration:	Single-phase, all poles in series
Test Procedure:	The recloser was subjected to short circuit current surges ranging from the minimum tripping current up to the rated symmetrical interruption current using a low voltage power source (< 20 V). The clearing time-current data was verified at a time delayed-current curve (U3) and a fast time-current curve A (101). The permissible tolerance from the curves is ±10 % of time or current, whichever is greater, and the manufacturer specified a minimum tolerance of at least ±8 ms.
Test Results:	The recloser **passed** the time-current test in accordance with the test requirements of IEC 62271-111:2012/IEEE Std. C37.60-2012, Clause 6.108. The time-current curves have been plotted in Figures 1-2 and the test data is provided in Tables 1-2
Remarks:	The recloser controller is determined to have approximately 16 ms delay associated with the trip time (opening time) and the standard time-current curves and the allowable tolerances have been adjusted accordingly. The arcing time has not been included.

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