

Hubbell Power Systems

27 kV Individual Phase Reclosers and Beckwith Controller
Simulated Surge Arrestor Operation Test: IEEE C37.60/IEC
62271-111:2019



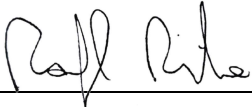
REPORT OF PERFORMANCE

CLIENT/MANUFACTURER	Hubbell Power Systems 353 Powerville Road, Boonton, NJ USA 07005
TEST OBJECT	<u>Recloser</u> Manufacturer: Hubbell Power Systems Type: Individual Phase Recloser Rated Voltage: 27 kV _{rms} BIL: 150 kV Rated Current: 800 A Interrupting Current: 16 kA Serial Number: HPR1223120020, HPR1223120043, HPR1223120045 <u>Recloser Controller</u> Manufacturer: Beckwith Electric Part Number: M-7679-V6L1ML6ELW2C0000-0 Serial Number: 8558 <u>Junction Box</u> Manufacturer: Hubbell Power Systems Drawing No.: RF-108414-D
TESTED BY	Powertech Labs Inc. 12388 - 88 th Ave, Surrey, BC Canada V3W 7R7 www.powertechlabs.com
DATE RECEIVED	2025-01-20
TEST DATE(S)	2025-02-03 to 2025-02-05
TEST SPECIFICATION	IEEE C37.60/IEC 62271-111:2019, Clause 7.111.2
TEST RESULT	PASS

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1 INTRODUCTION

At the request of Hubbell Power Systems, three 27 kV individual phase reclosers, manufactured by Hubbell Power Systems, and controller, manufactured by Beckwith Electric, were subjected to Simulated Surge Arrester Operation (SSAO) tests in accordance with IEEE C37.60/IEC 62271-111:2019. This report summarizes the results of the tests performed.

2 TEST OBJECT INFORMATION

The test assembly consisted of three individual phase reclosers, a control unit, and a junction box used to interface between the two components. The test objects were identified based on the nameplate information as follows:

Recloser

Manufacturer:	Hubbell Power Systems
Type:	Individual Phase Recloser
Rated Voltage:	27 kV _{rms}
Rated Current:	800 A _{rms} continuous, 16 kA _{rms} interrupting
BIL:	150 kV
Serial No.:	HPR1223120020, HPR1223120043, HPR1223120045
Condition:	New

Recloser Controller

Manufacturer:	Beckwith Electric
Part Number:	M-7679-V6L1ML6ELW2C0000-0
Serial Number:	8558
Condition:	New

Junction Box

Manufacturer:	Hubbell Power Systems
Drawing No.:	RF-108414-D

3 GENERAL INFORMATION

3.1 Purpose

The purpose of the test was to verify if the test object complies with the requirements of the standard.

3.2 Witnesses

Name	Company
Kaushil Patel	Hubbell Power Systems
Hung Tu	Hubbell Utility Solutions/Beckwith Electric

3.3 Tests Performed

Test Standards/Specifications

IEEE C37.60-2019	Clause 7.111.2 – Simulated surge arrester operation test
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4 SIMULATED SURGE ARRESTER OPERATION TEST

General Information:

Standard IEEE C37.60/IEC 62271-111:2019, Clause 7.111.2
 Test Date 2025-02-03 to 2025-02-05
 Test Leader Gaurav Patel

Environmental Conditions:

Ambient temperature: 8.5 – 10.4 °C
 Barometric Pressure: 749.2 – 760.6 mmHg
 Relative Humidity: 24.1 – 31.9 %

Test Conditions:

The test was in accordance with the test set-up requirements outlined in section 7.111.2.2 of the test standard. The controller was energized and operational during the tests with settings as follows:

- a) Value of trip point (pick up setting) not to exceed the rated load current of the device;
- b) Reclosers set for the maximum number of operations to lock-out;
- c) Other settings for normal operation consistent with a) and b) above.

The junction box was connected at the mid-span of the control cable such that the control cable remained parallel to the #12 AWG ground wire for as long as practicably possible. The junction box was bonded to the frame of the recloser. The frames of the individual phases were bonded together using #12 AWG wire.

The surges were applied using the following test levels and configurations:

Test Voltage: 105 to 135 kV_{peak}
 Surge Current: 5.4 to 6.6 kA_{peak}
 Surge Voltage time to flashover: 0.7 to 1.7 μs
 Surge Current rate of rise: 5 to 10 kA/μs (over the initial 2 kA rise)

Configuration	Switch	HV Applied	Conditions
A	Open	Source Terminals	15 positive and 15 negative surges
B	Closed	Source Terminals	15 positive and 15 negative surges
C	Closed	Load Terminals	15 positive and 15 negative surges
D	Open	Properly Rated Transformer	15 positive and 15 negative surges
E	Closed	Properly Rated Transformer	15 positive and 15 negative surges

Requirements:

During the application of surges, the control shall neither close the recloser/FI from an open position nor open (trip) the recloser/FI from a closed position. No change of state shall occur or be reported.

Following the tests, the recloser/FI and control apparatus shall be capable of performing all normal functions without impairment. The following verifications shall be made following the test if supported by the controller:

- Communicate with an external computer;
- Open and close the recloser;
- Upload event(s) or oscillography captured;
- Receive a program download;
- Receive a firmware download
- Perform the rated maximum number of sequence operations at any convenient pick-up level.

Evaluation:

No change of state of the recloser occurred during the application of the surges, and the controller successfully performed all the above verifications at the conclusion of the test.

Result:

PASS

Note: The rate of rise of the surge current exceeded the 10 kA/μs limit in certain configurations. However, since this condition represents a more severe testing scenario for the objects under evaluation, the test results remain valid.

APPENDIX A EXAMPLE SSAO WAVEFORMS

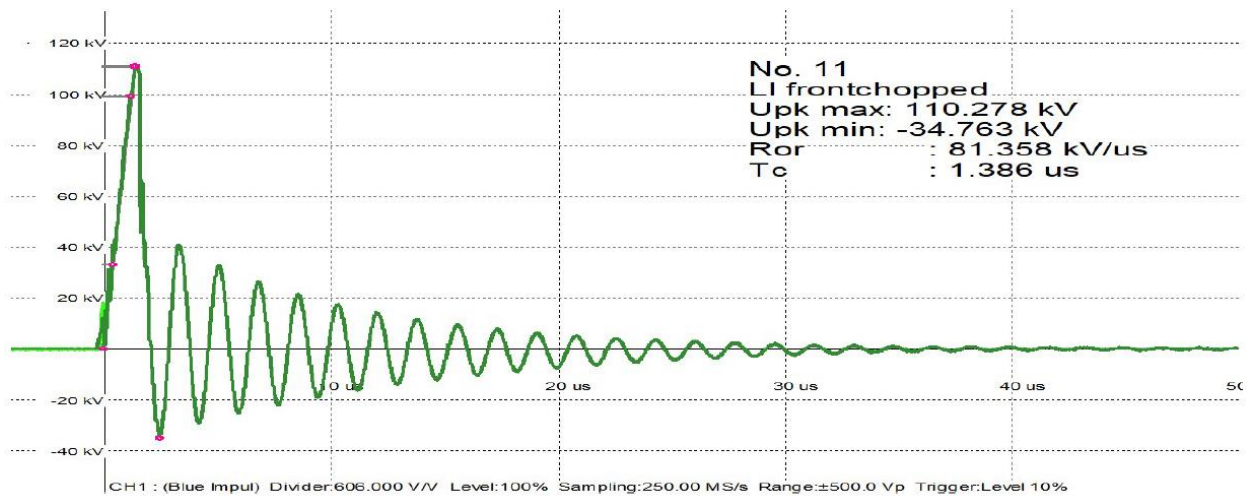


Figure 1. Example positive surge voltage waveform

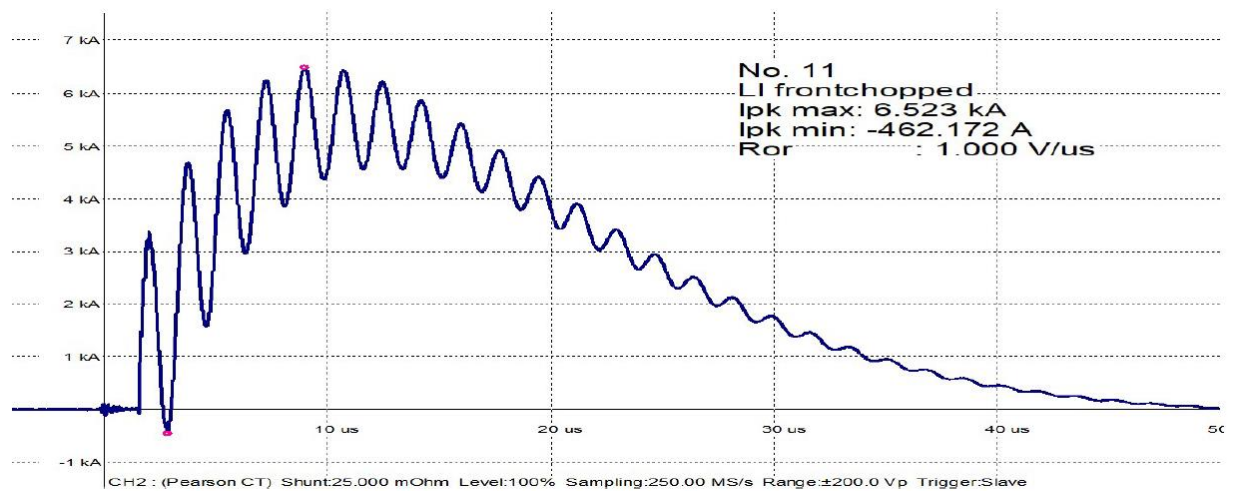


Figure 2. Example positive surge current waveform

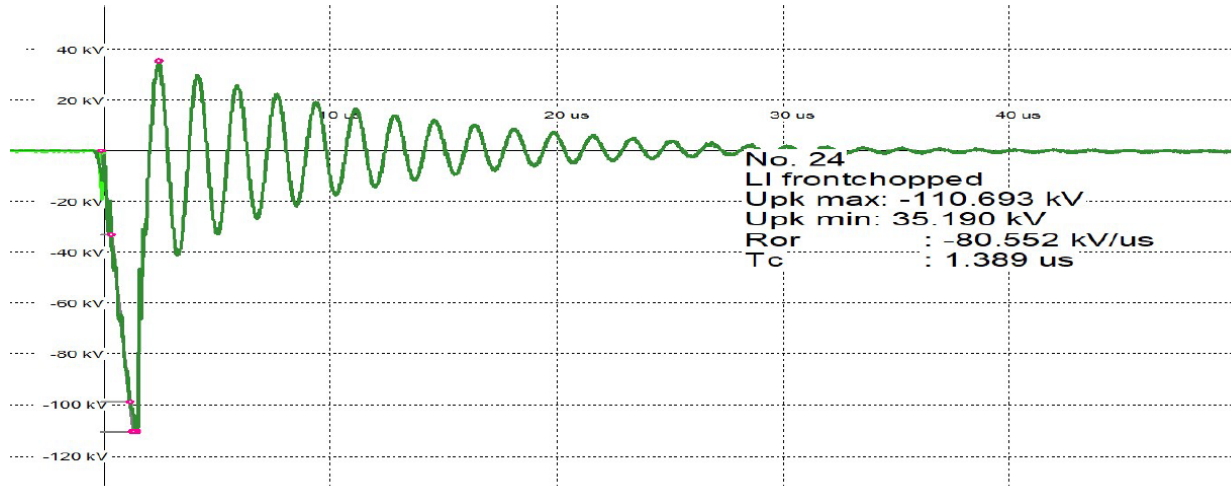


Figure 3. Example negative surge voltage waveform

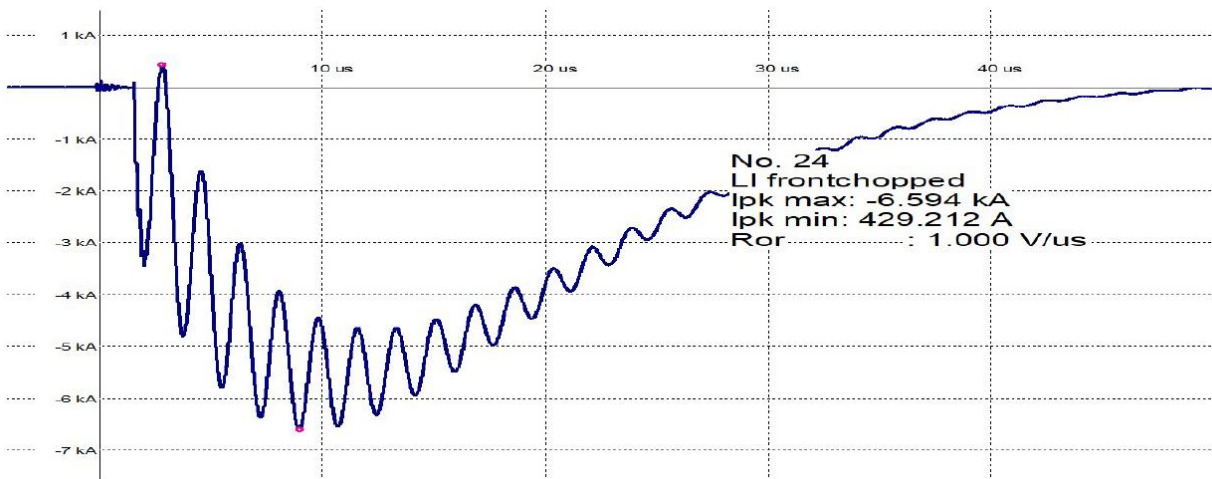


Figure 4. Example negative surge current waveform

APPENDIX B MANUFACTURER'S DRAWINGS

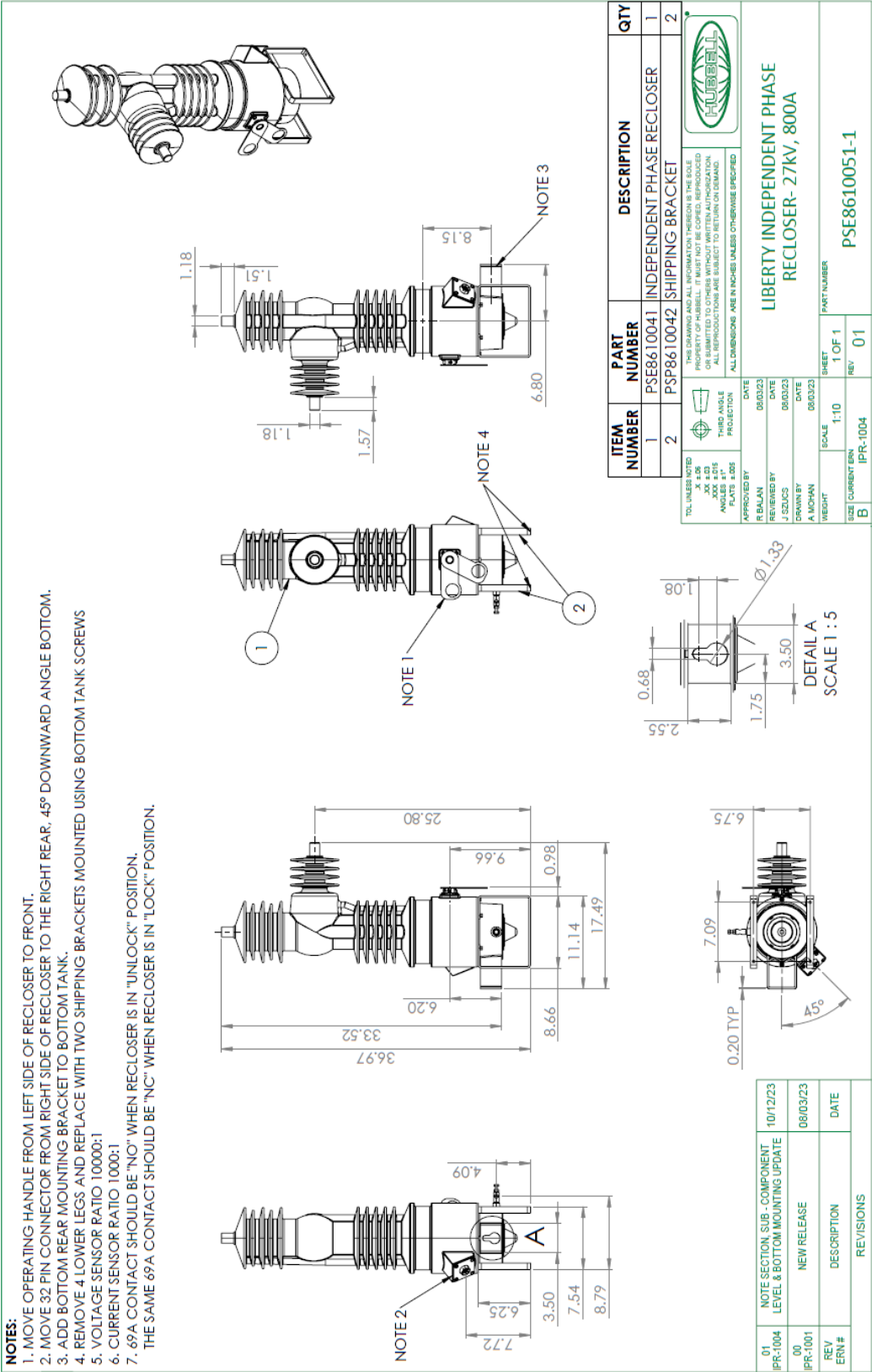


Figure 5. Recloser drawing

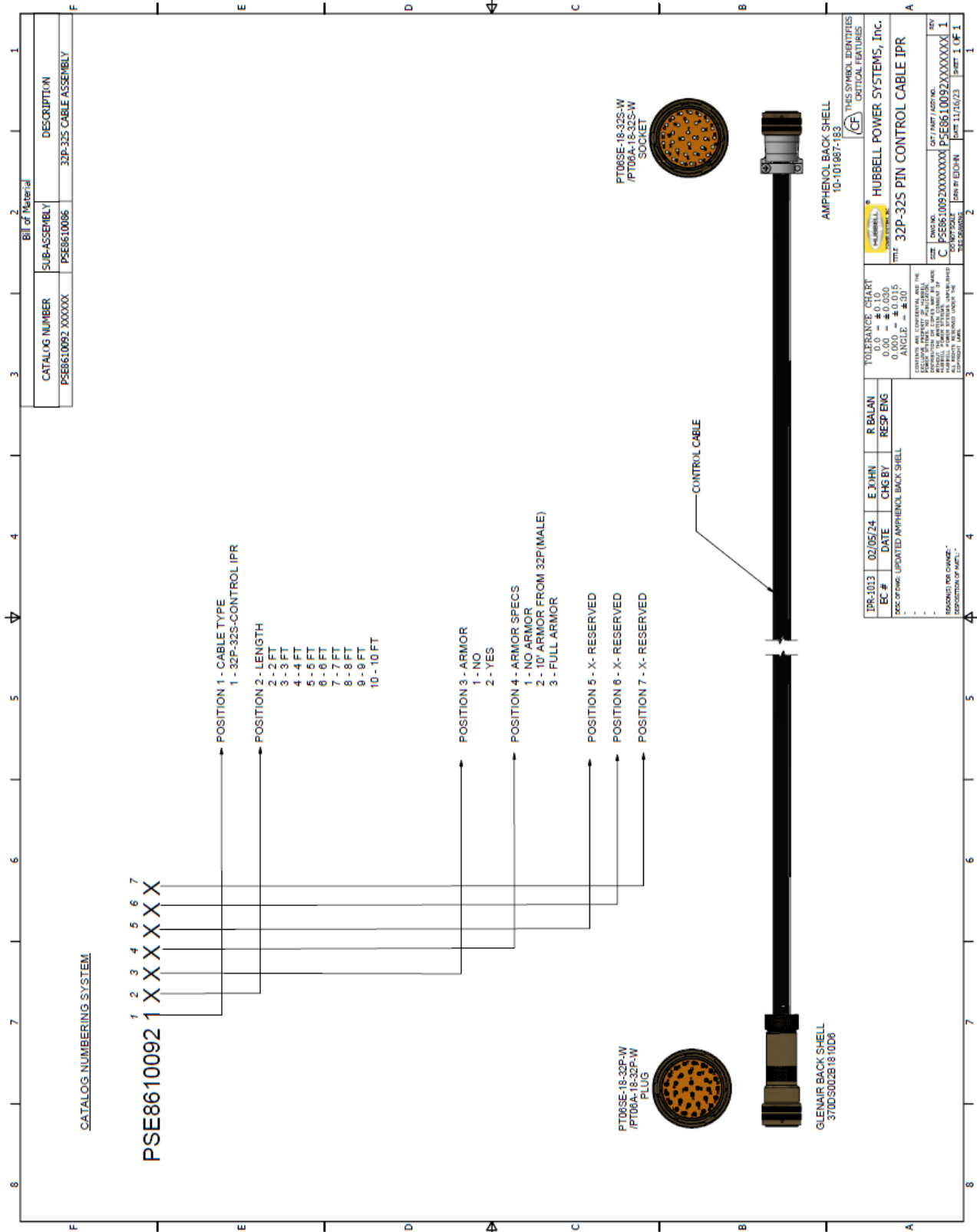
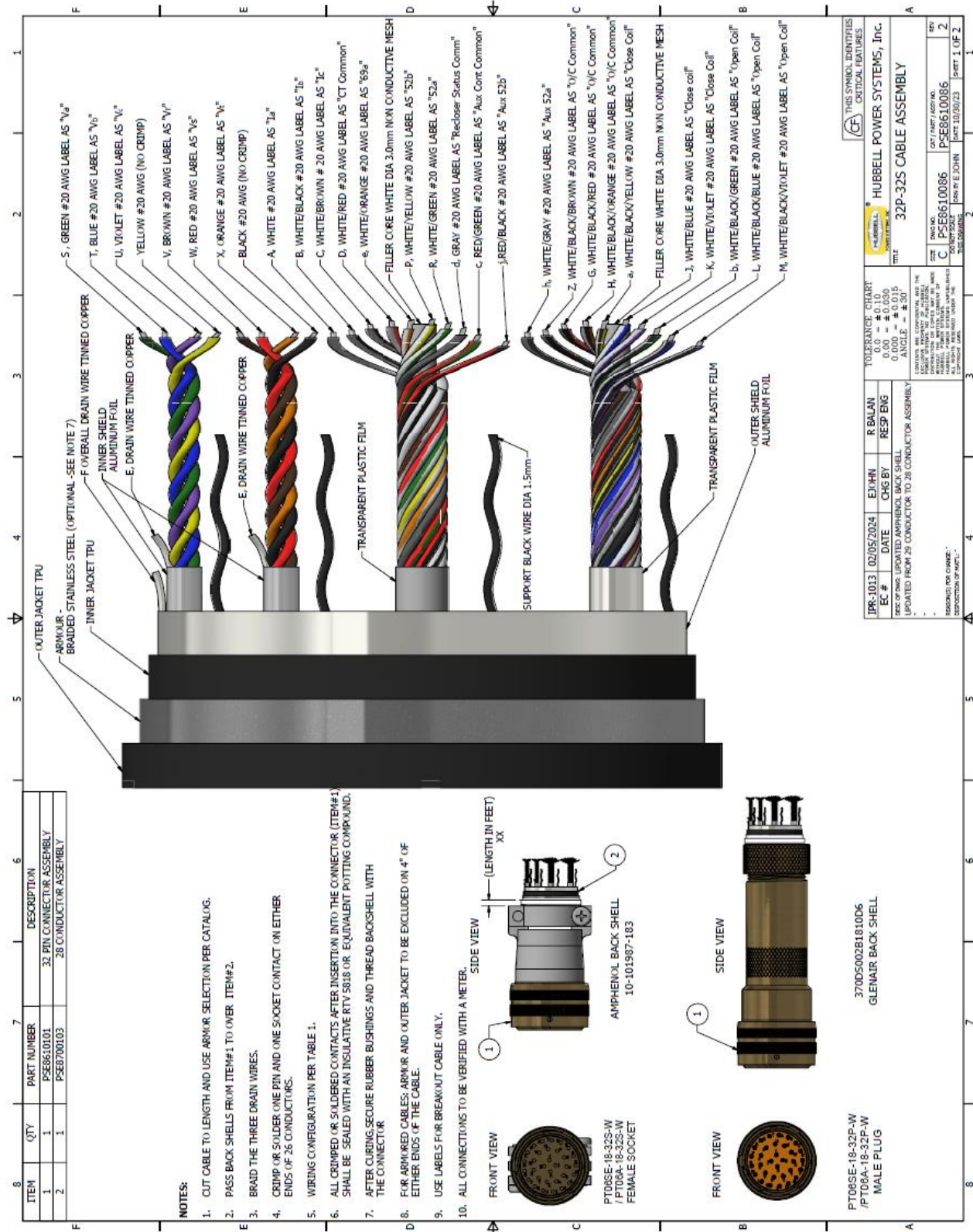


Figure 6. Control cable drawing



APPENDIX C PHOTOGRAPHS OF THE TEST OBJECT AND SETUP

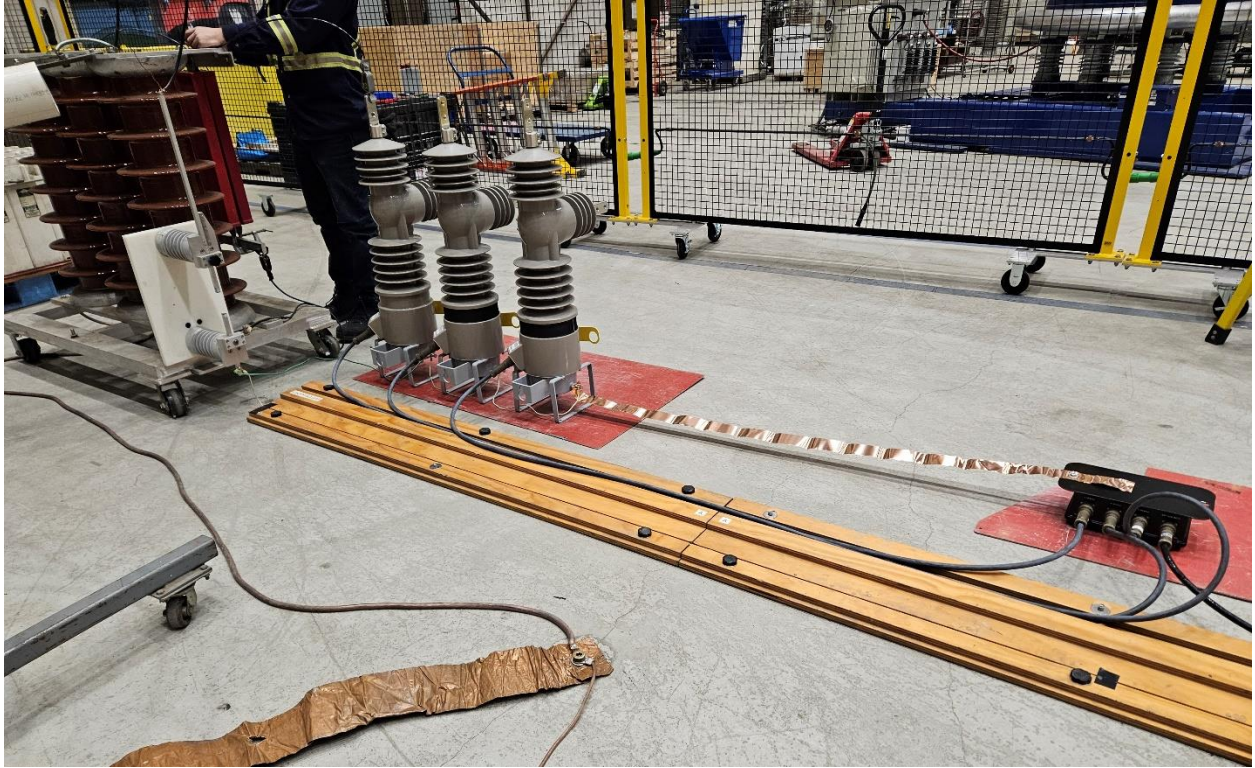


Figure 9. SSAO test setup. Configuration A or B



Figure 10. SSAO test setup. Configuration A or B

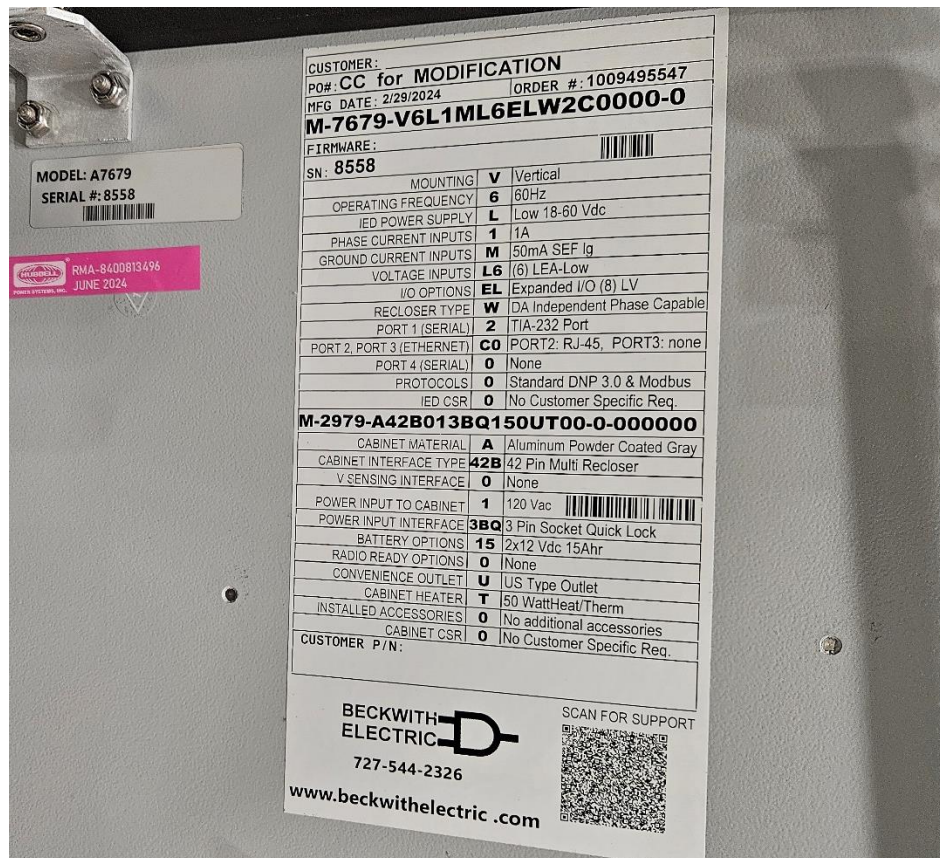


Figure 11. Controller nameplate

APPENDIX D EQUIPMENT CALIBRATION

Description	Manufacturer	Model	Powertech ID	Calibration Due
Impulse Analyzer System	Haefely	HiAS 744	34780	Jan. 30, 2030
Impulse Voltage Divider	Interworld	R-450	HV10442	Jan. 30, 2030
Current Transformer	Pearson Electronics	3025	H10056	Oct. 29, 2025