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SUBJECT: Forwards test rept for one-time integrated emergency power & engineered safeguards functional test.

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DUKE POWER

April 30, 1997

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
Oconee Integrated Emergency Power and Engineered
Safeguards Functional Test

In a letter dated October 31, 1996, Duke Power committed to review the possibility of performing a one-time integrated emergency power and engineered safeguards functional test during the outage of all three Oconee units that was in progress at the time. In a follow-up letter dated November 21, 1996, Duke committed to the performance of a one-time integrated emergency power and ES functional test during the three unit Oconee outage.

The one-time integrated emergency power and ES functional test was performed on January 2-5, 1997. In a letter dated January 30, 1997, Duke provided the schedule for the submittal of the test report and CYME computer simulation for the one-time integrated emergency power and ES functional test. Currently, the CYME computer simulation efforts are in progress. A report containing the results of the CYME computer simulation will be submitted by December 31, 1997.

Please find attached the test report for the one-time integrated emergency power and ES functional test. Duke Power is prepared to meet with the NRC Staff to discuss the test results documented in the attached test report.

Very Truly Yours,


J. W. Hampton, Site Vice President
Oconee Nuclear Station

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Oconee Nuclear Station



Emergency Power and Engineered Safeguards Functional Test Report

Volume II

Appendix 1 - Test 1, Figures of Results

APPENDIX 1: Figures for Test 1

FIGURE	Page
Figure 4.1.1-1: Test1, Keowee Voltage and Current.....	1-2
Figure 4.1.1-2: Test1, Keowee Voltage.....	1-3
Figure 4.1.1-3: Test1, Keowee KVA.....	1-4
Figure 4.1.1-4: Test1, Keowee KW.....	1-5
Figure 4.1.1-5: Test1, Keowee Frequency and Current.....	1-6
Figure 4.1.2-1: Test1, Unit 1 MFB Voltage and Current	1-7
Figure 4.1.2-2: Test1, Unit 1 MFB KVA and KW	1-8
Figure 4.1.2-3: Test1, Unit 2 MFB Voltage and Current	1-9
Figure 4.1.2-4: Test1, Unit 2 MFB KVA and KW	1-10
Figure 4.1.2-5: Test1, Standby Bus Volts, Unit 3 MFB Current	1-11
Figure 4.1.2-6: Test1, Unit 3 MFB KVA and KW	1-12
Figure 4.1.3-1: Test1, EFW 3B Voltage and Current.....	1-13
Figure 4.1.3-2: Test1, EFW 3B KVA and KW	1-14
Figure 4.1.3-3: Test1, HPI 3B Voltages and Currents.....	1-15
Figure 4.1.3-4: Test1, HPI 3B KVA and KW	1-16
Figure 4.1.5-1: Test1, 1X5 Voltage and Current.....	1-17
Figure 4.1.5-2: Test1, 1X5 KVA and KW.....	1-18
Figure 4.1.5-3: Test1, 1X6 Voltage and Current.....	1-19
Figure 4.1.5-4: Test1, 1X6 KVA and KW.....	1-20
Figure 4.1.5-5: Test1, 3X5 Voltage and Current.....	1-21
Figure 4.1.5-6: Test1, 3X5 KVA and KW.....	1-22
Figure 4.1.5-7: Test1, 3X6 Voltage and Current.....	1-23
Figure 4.1.5-8: Test1, 3X6 KVA and KW.....	1-24
Figure 4.1.5-9: Test1, 3X8 Voltage and Current.....	1-25
Figure 4.1.5-10: Test1, 3X8 KVA and KW.....	1-26
Figure 4.1.5-11: Test1, 3X9 Voltage and Current.....	1-27
Figure 4.1.5-12: Test1, 3X9 KVA and KW.....	1-28
Figure 4.1.5-13: Test1, 3X4 Voltage and Primary Amperes.....	1-29
Figure 4.1.5-14: Test1, 3X4 Primary KVA and KW.....	1-30
Figure 4.1.6-1: Test1, 600V 3XS1 Voltage and Current.....	1-31
Figure 4.1.6-2: Test1, 600V 3XS1 KVA and KW.....	1-32
Figure 4.1.6-3: Test1, 600V 3XS2 Voltage and Current.....	1-33
Figure 4.1.6-4: Test1, 600V 3XS2 KVA and KW.....	1-34
Figure 4.1.6-5: Test1, 600V 3XS3 Voltage and Current.....	1-35
Figure 4.1.6-6: Test1, 600V 3XS3 KVA and KW.....	1-36
Figure 4.1.7-1: Test1, 208V 3XS1 Voltage and Current.....	1-37
Figure 4.1.7-2: Test1, 208V 3XS1 KVA and KW.....	1-38
Figure 4.1.7-3: Test1, 208V 3XS2 Voltage and Current.....	1-39
Figure 4.1.7-4: Test1, 208V 3XS2 KVA and KW.....	1-40
Figure 4.1.7-5: Test1, 208V 3XS3 Voltage and Current.....	1-41
Figure 4.1.7-6: Test1, 208V 3XS3 KVA and KW.....	1-42
Figure 4.1.8-1: Test1, Battery Charger 3CA Input Voltage and Current	1-43

Figure 4.1.1-1: Test1, Keowee Voltage and Current

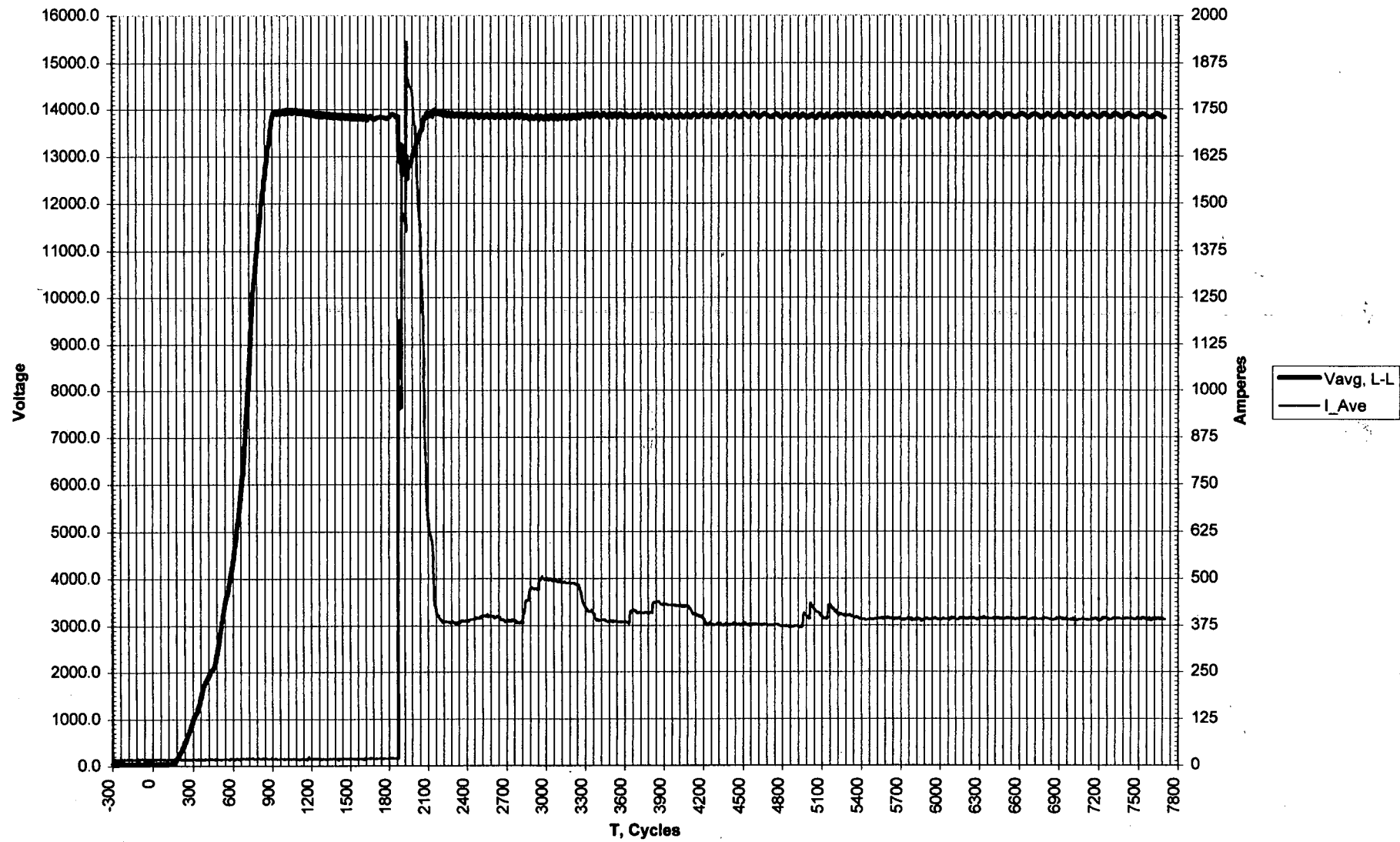


Figure 4.1.1-2: Test1, Keowee Voltage

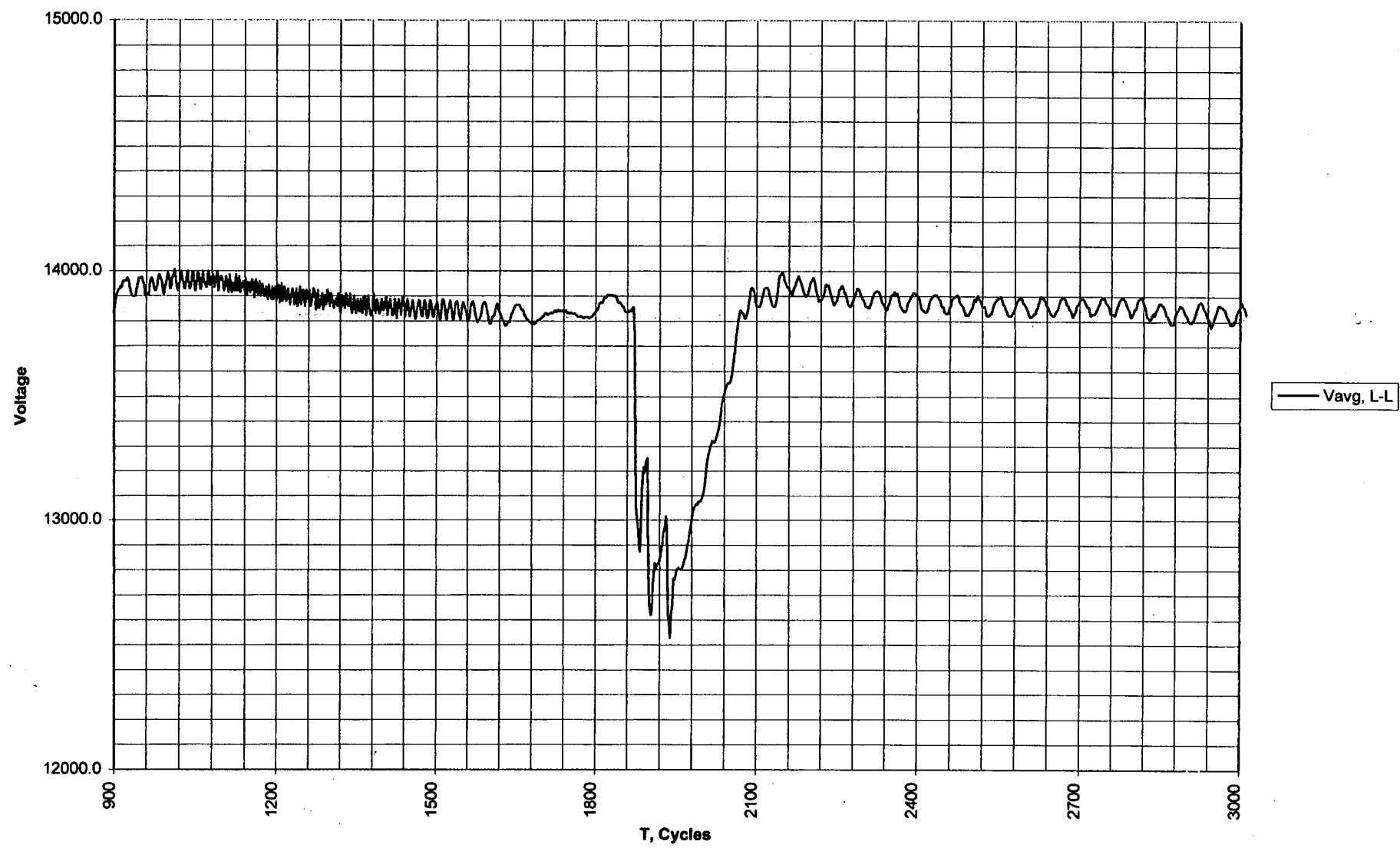


Figure 4.1.1-3: Test1, Keowee KVA

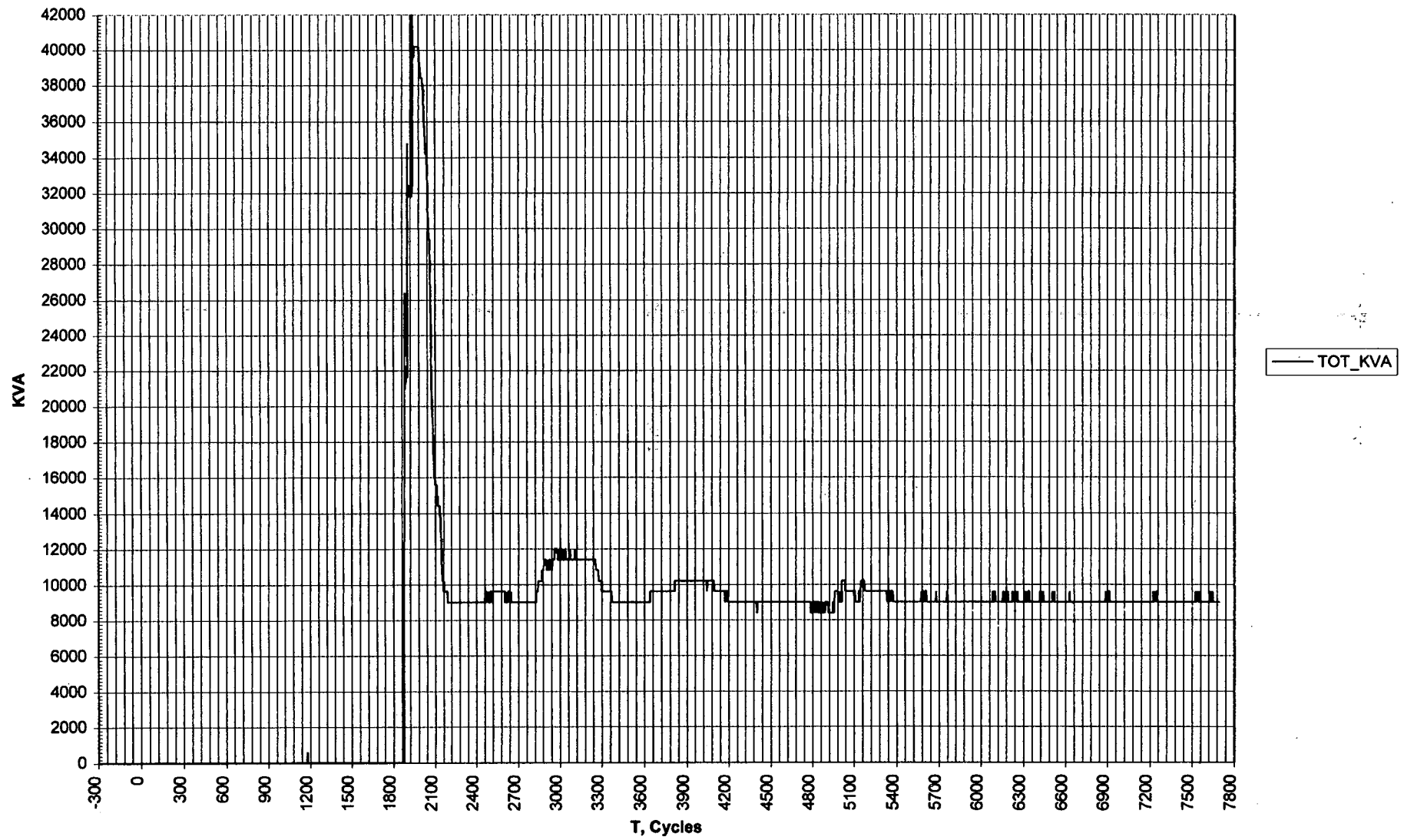


Figure 4.1.1-4: Test1, Keowee KW

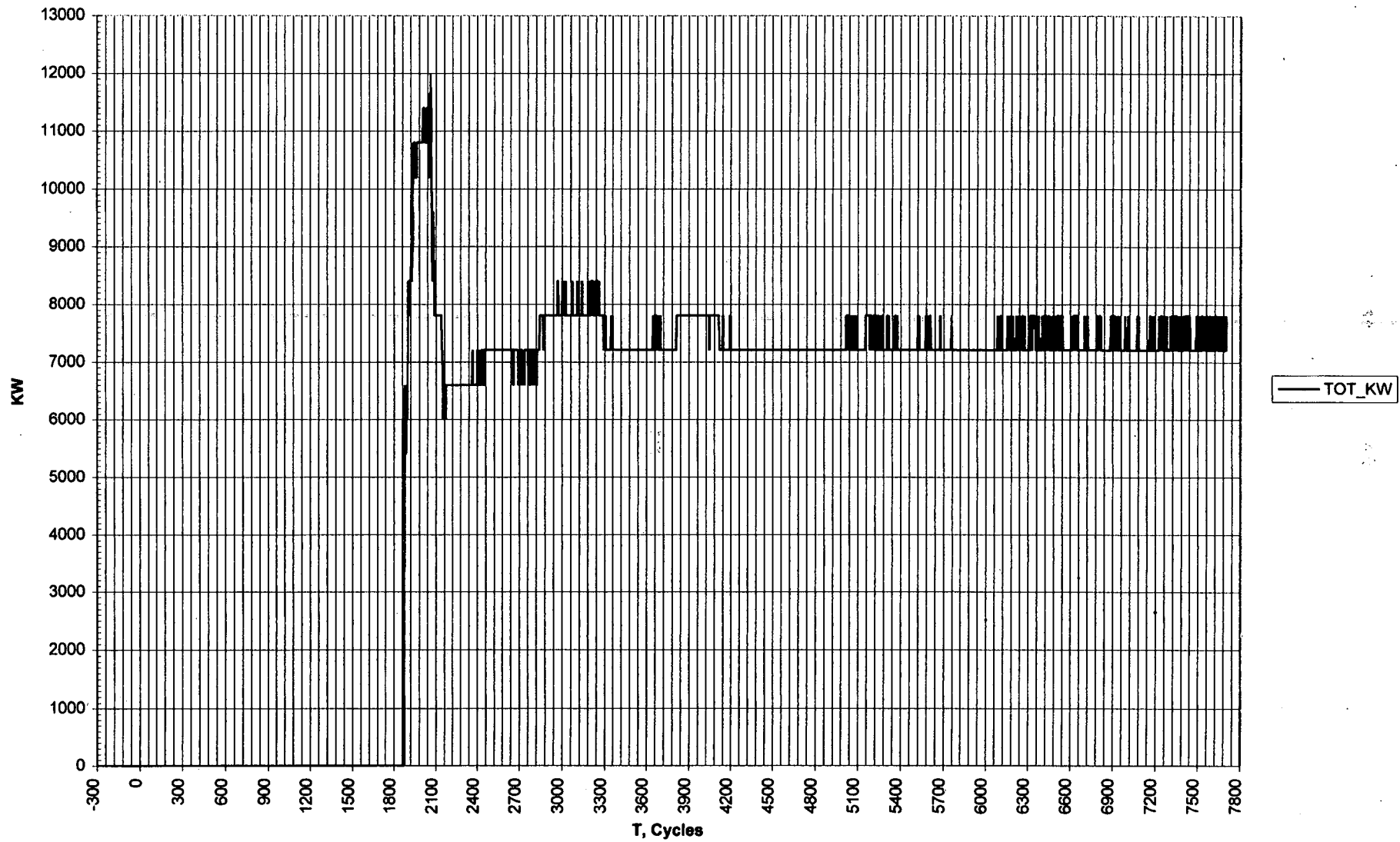


Figure 4.1.1-5: Test1, Keowee Frequency and Current

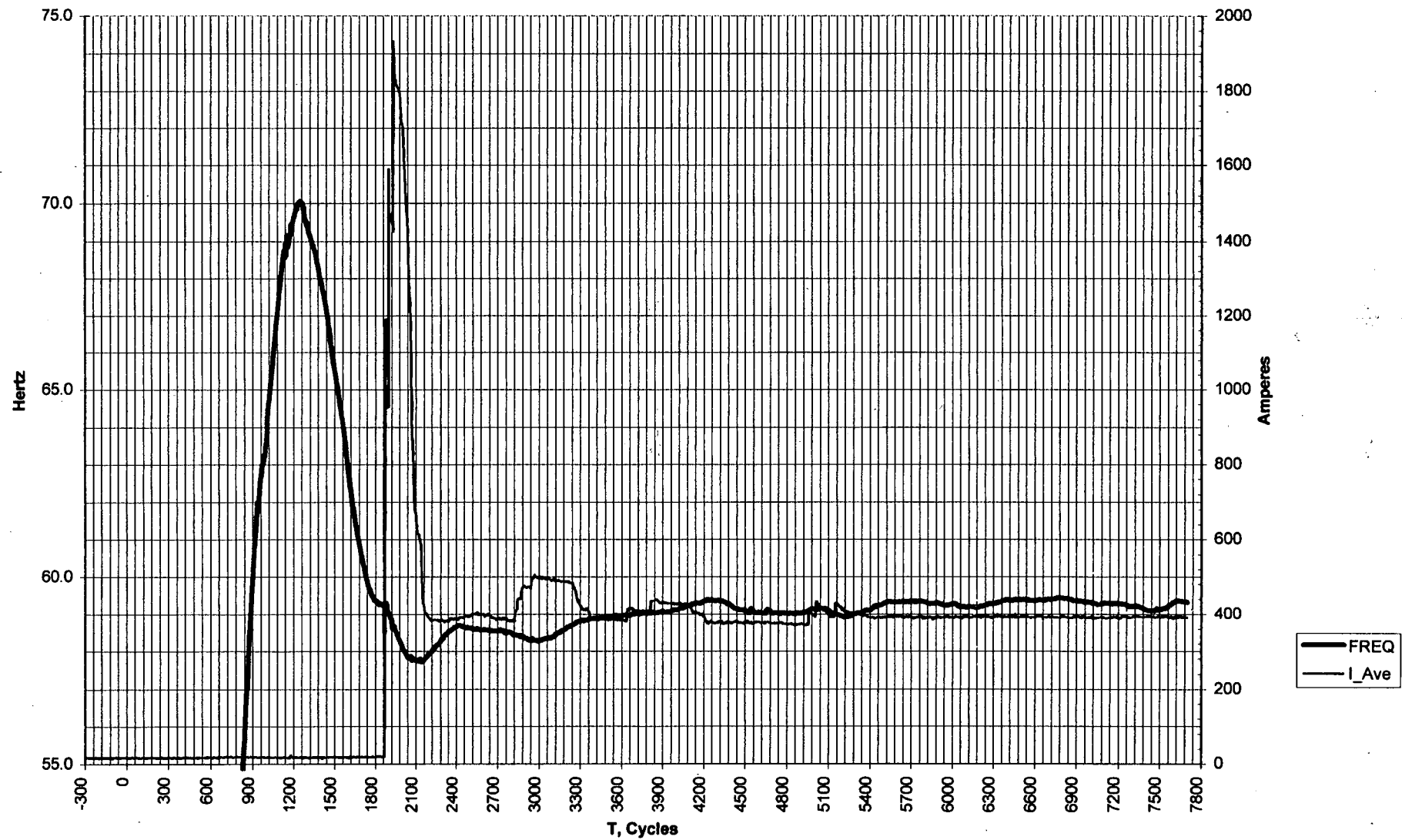


Figure 4.1.2-1: Test1, Unit 1 MFB Voltage and Current



Figure 4.1.2-2: Test1, Unit 1 MFB KVA and KW

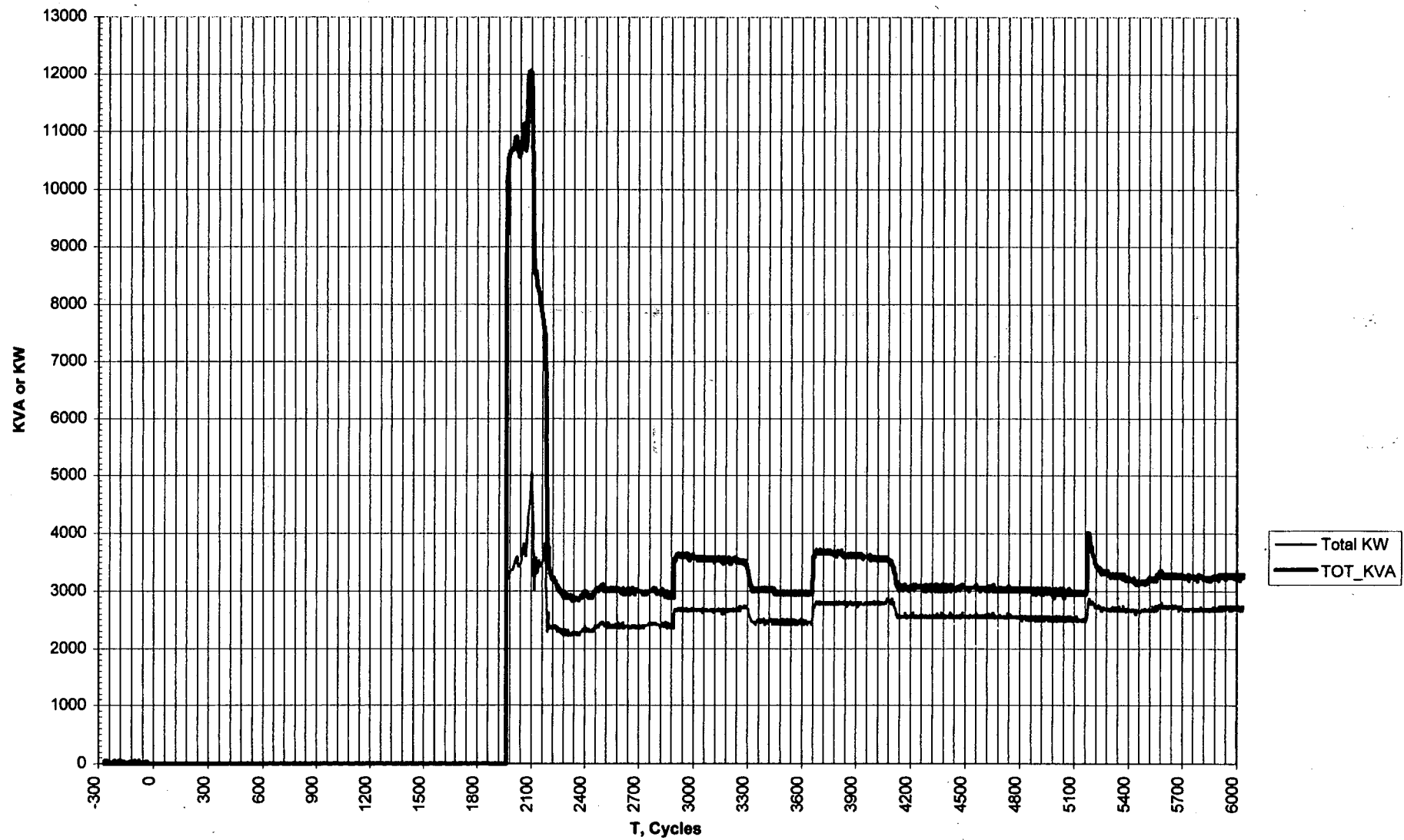


Figure 4.1.2-3: Test1, Unit 2 MFB Voltage and Current

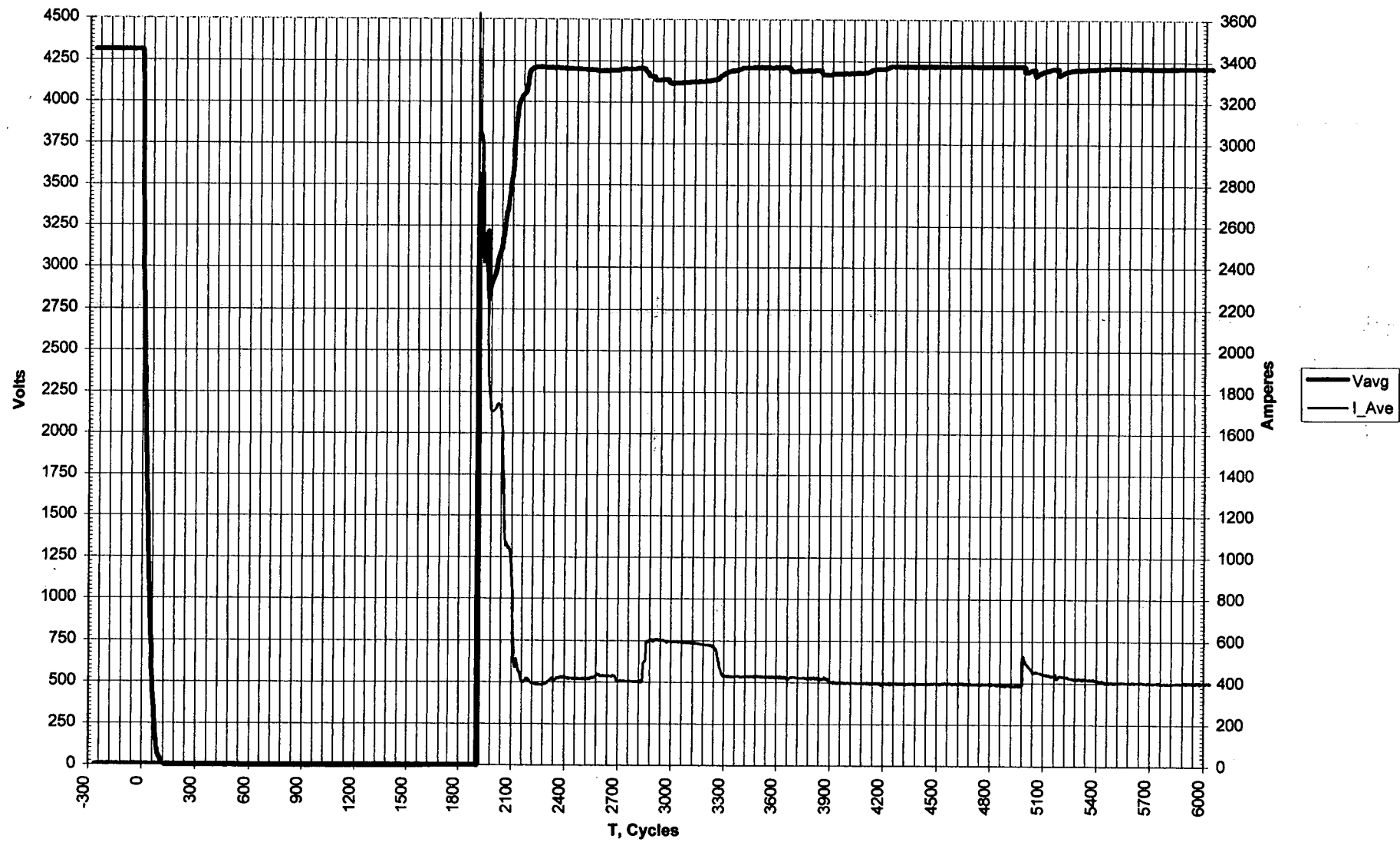


Figure 4.1.2-4: Test1, Unit 2 MFB KVA and KW

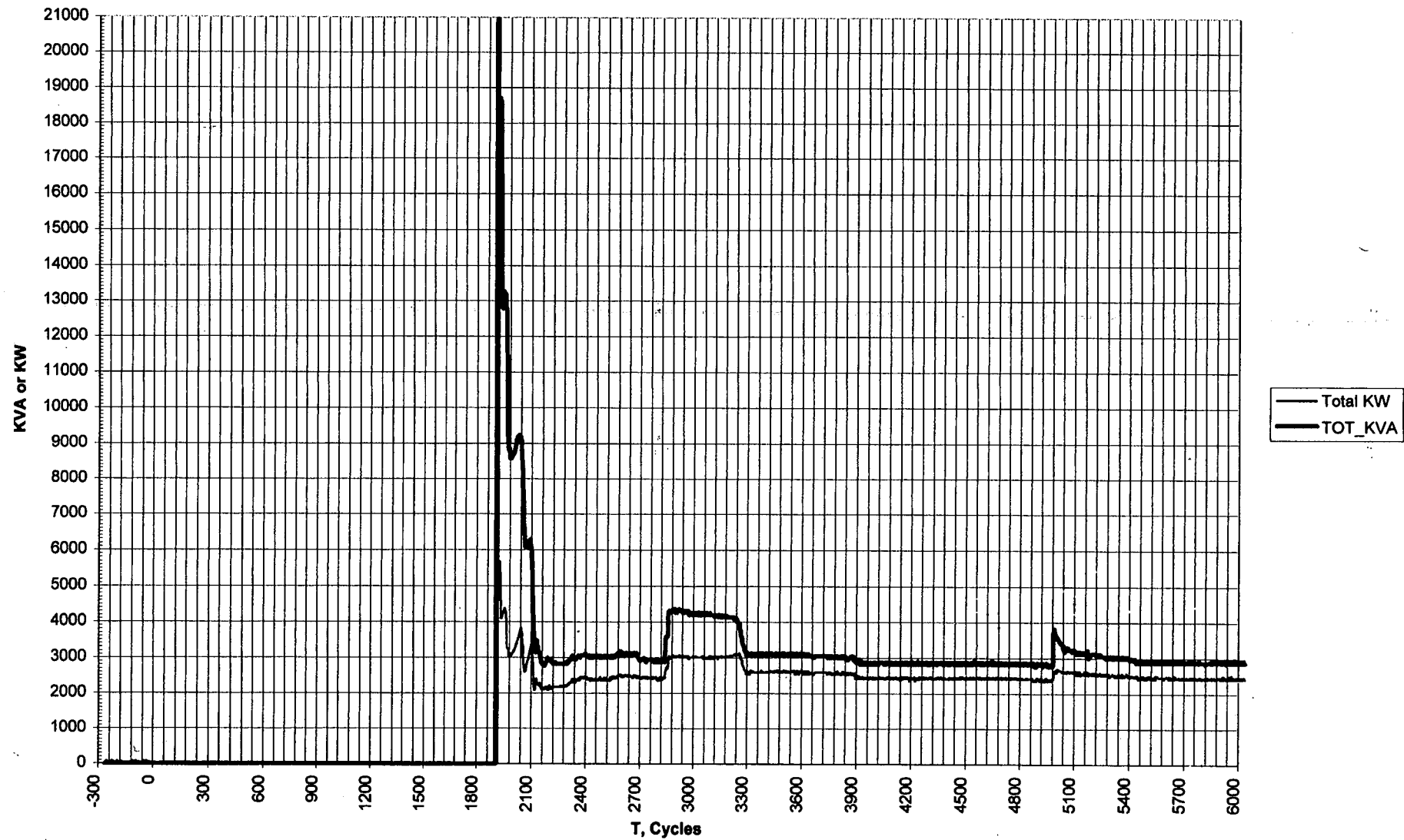


Figure 4.1.2-5: Test1, Standby Bus Volts, Unit 3 MFB Current

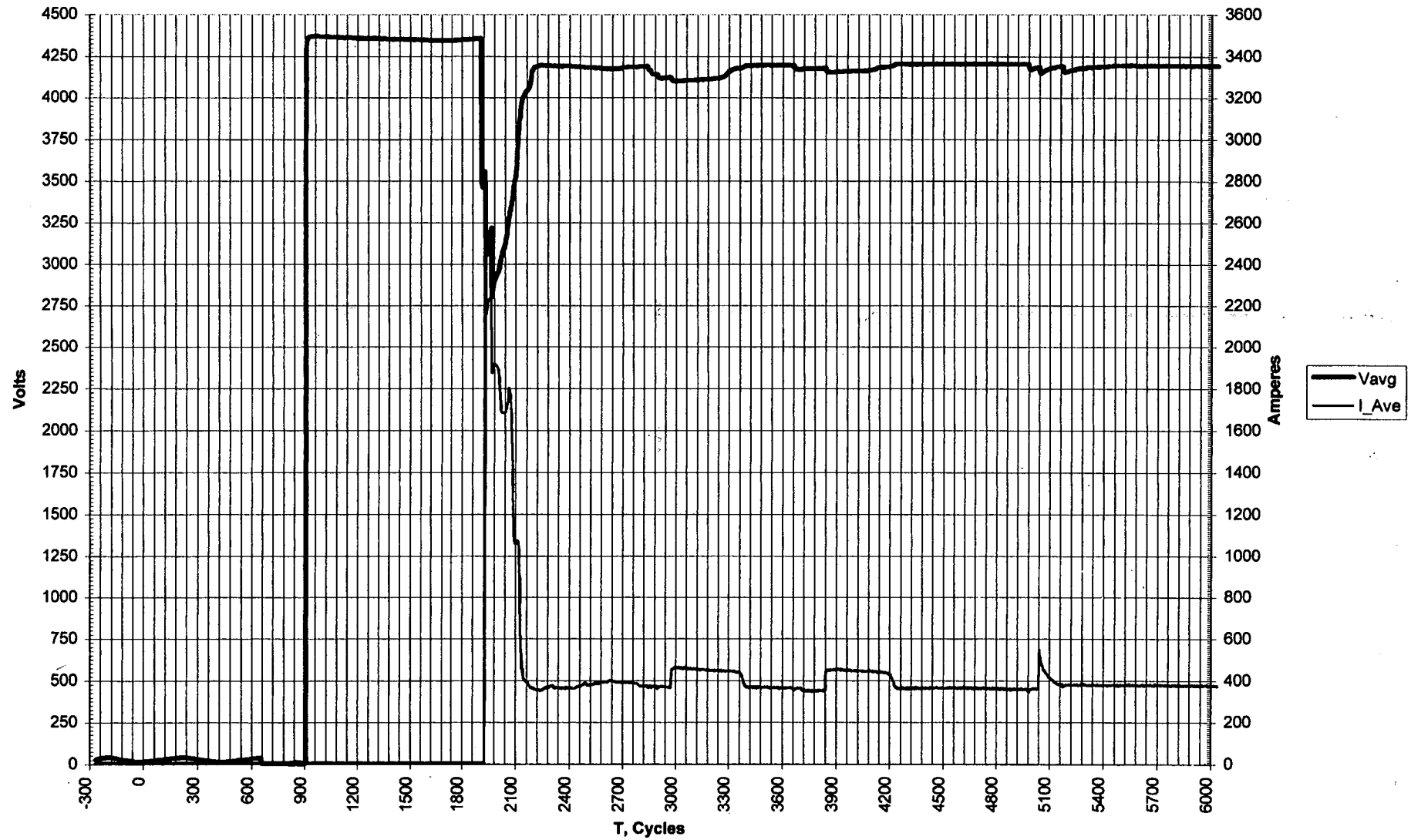


Figure 4.1.2-6: Test1, Unit 3 MFB KVA and KW

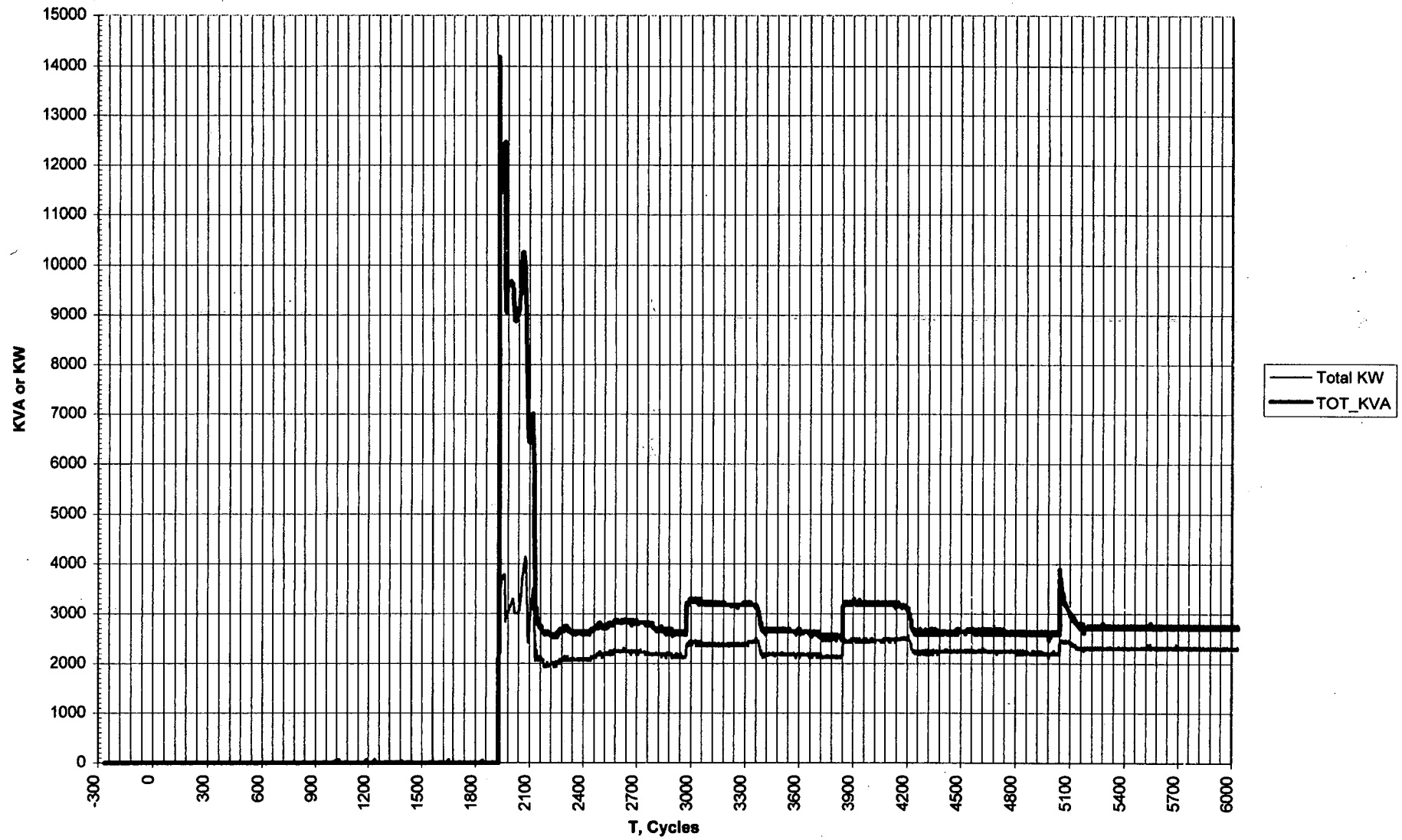


Figure 4.1.3-1: Test1, EFW 3B Voltage and Current

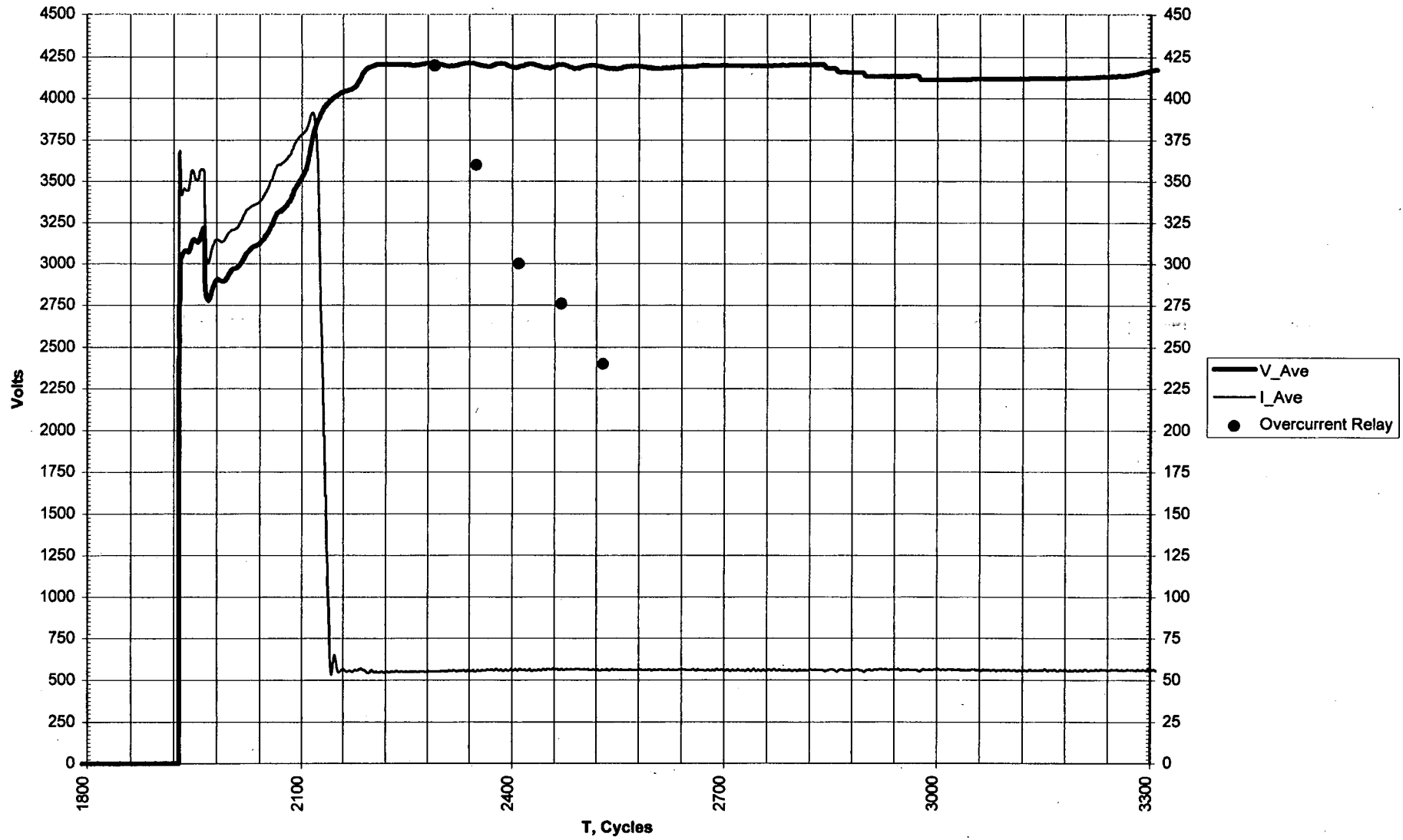


Figure 4.1.3-2: Test1, EFW 3B KVA and KW

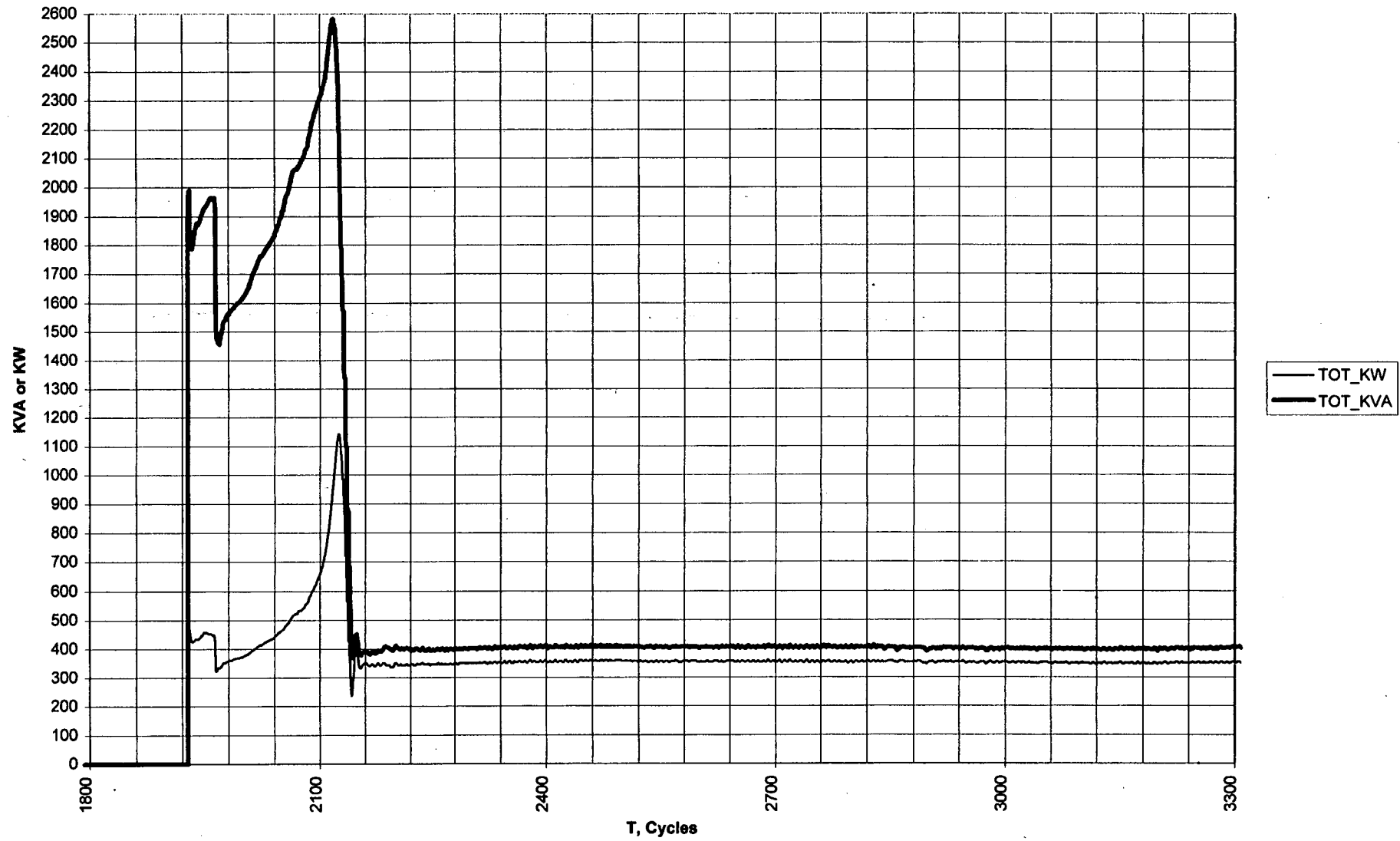


Figure 4.1.3-3: Test1, HPI 3B Voltages and Currents

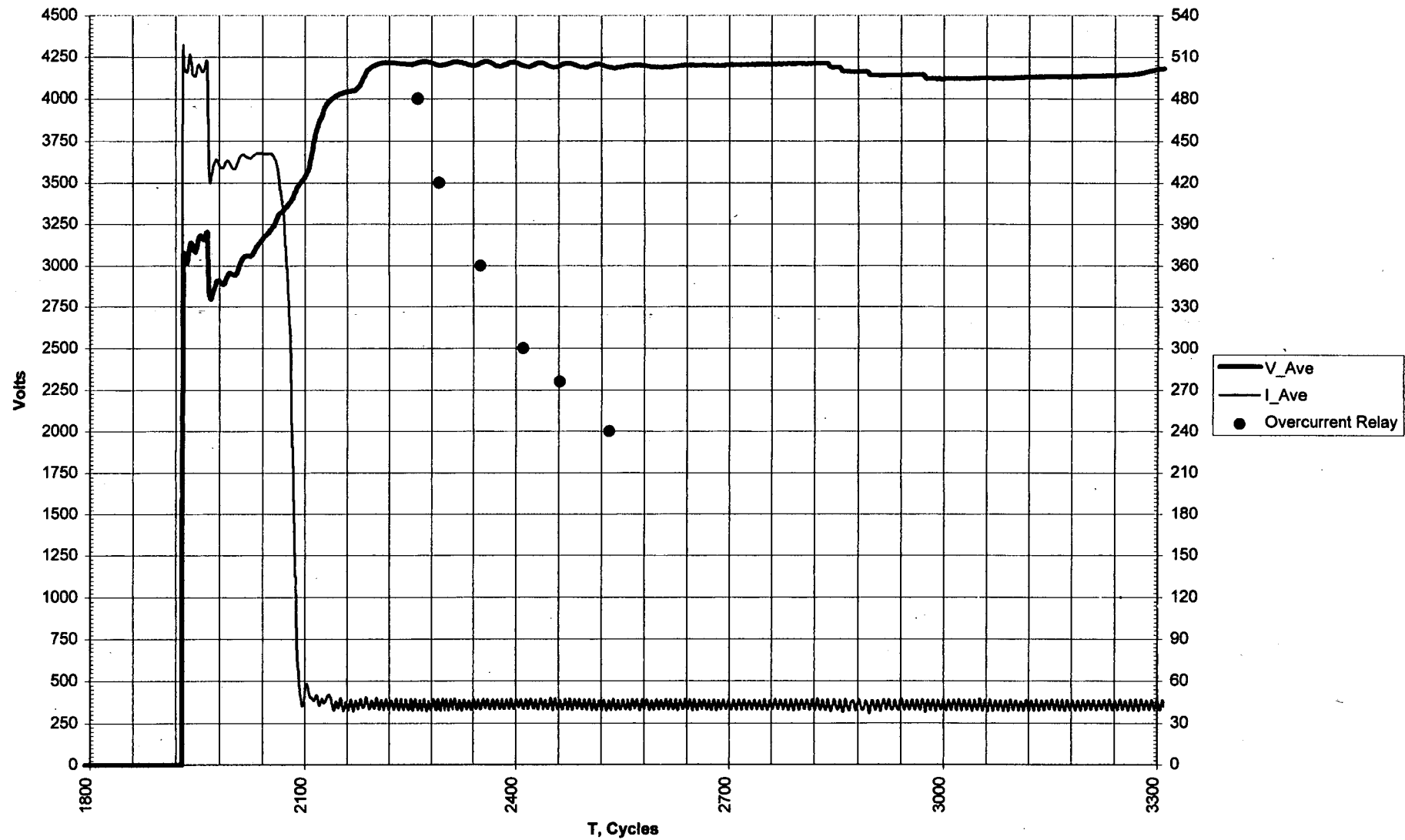


Figure 4.1.3-4: Test1, HPI 3B KVA and KW

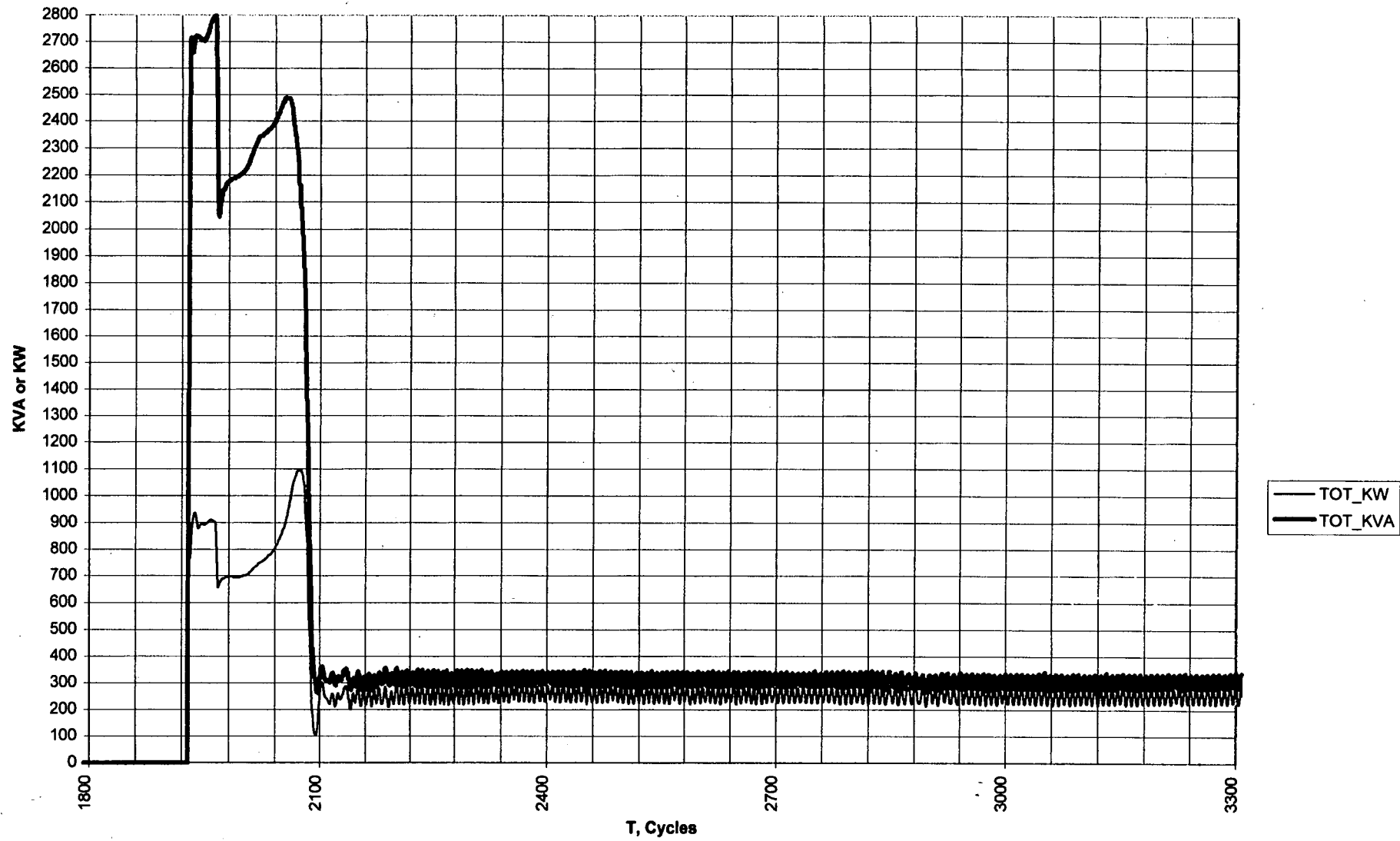


Figure 4.1.5-1: Test1, 1X5 Voltage and Current

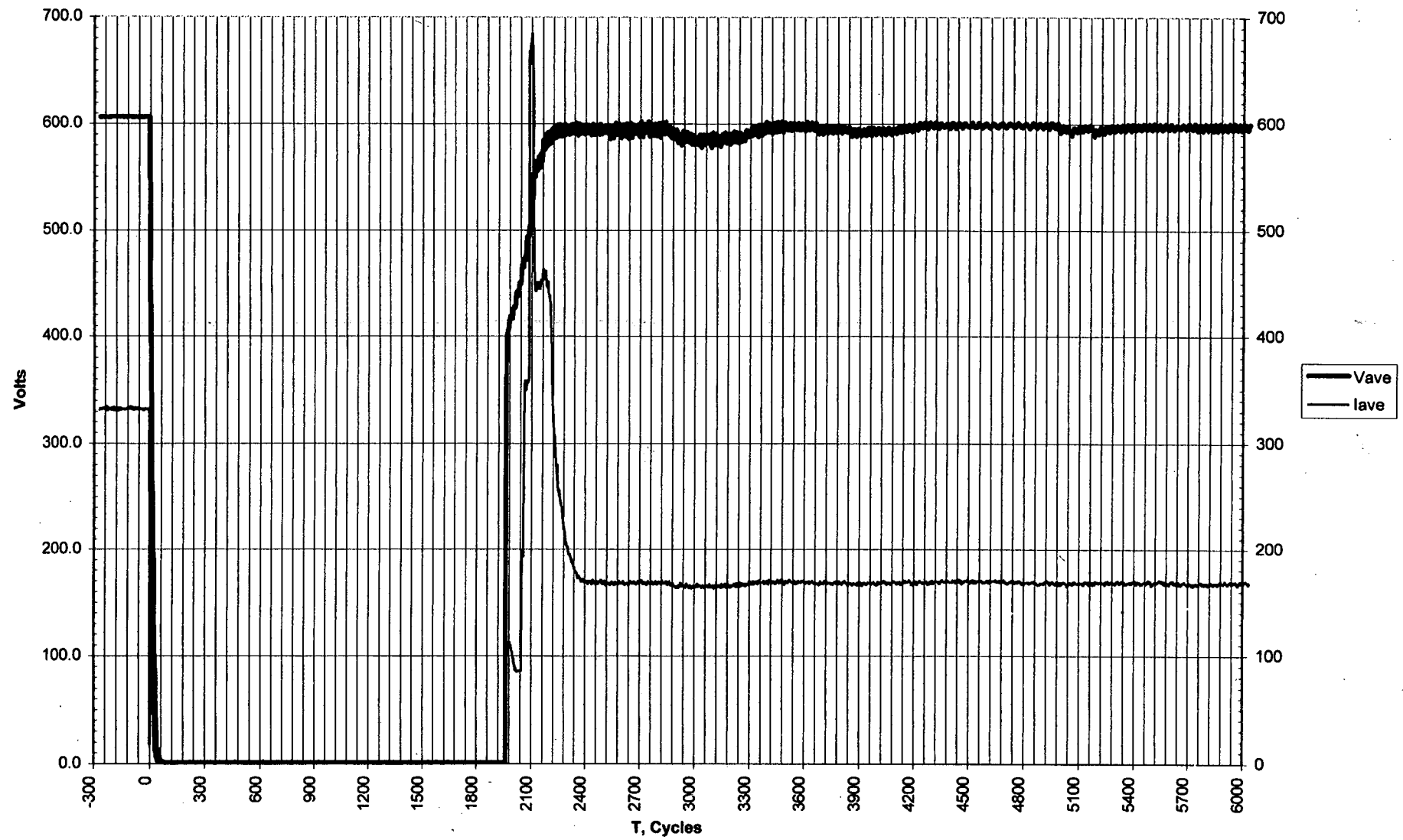


Figure 4.1.5-2: Test1, 1X5 KVA and KW

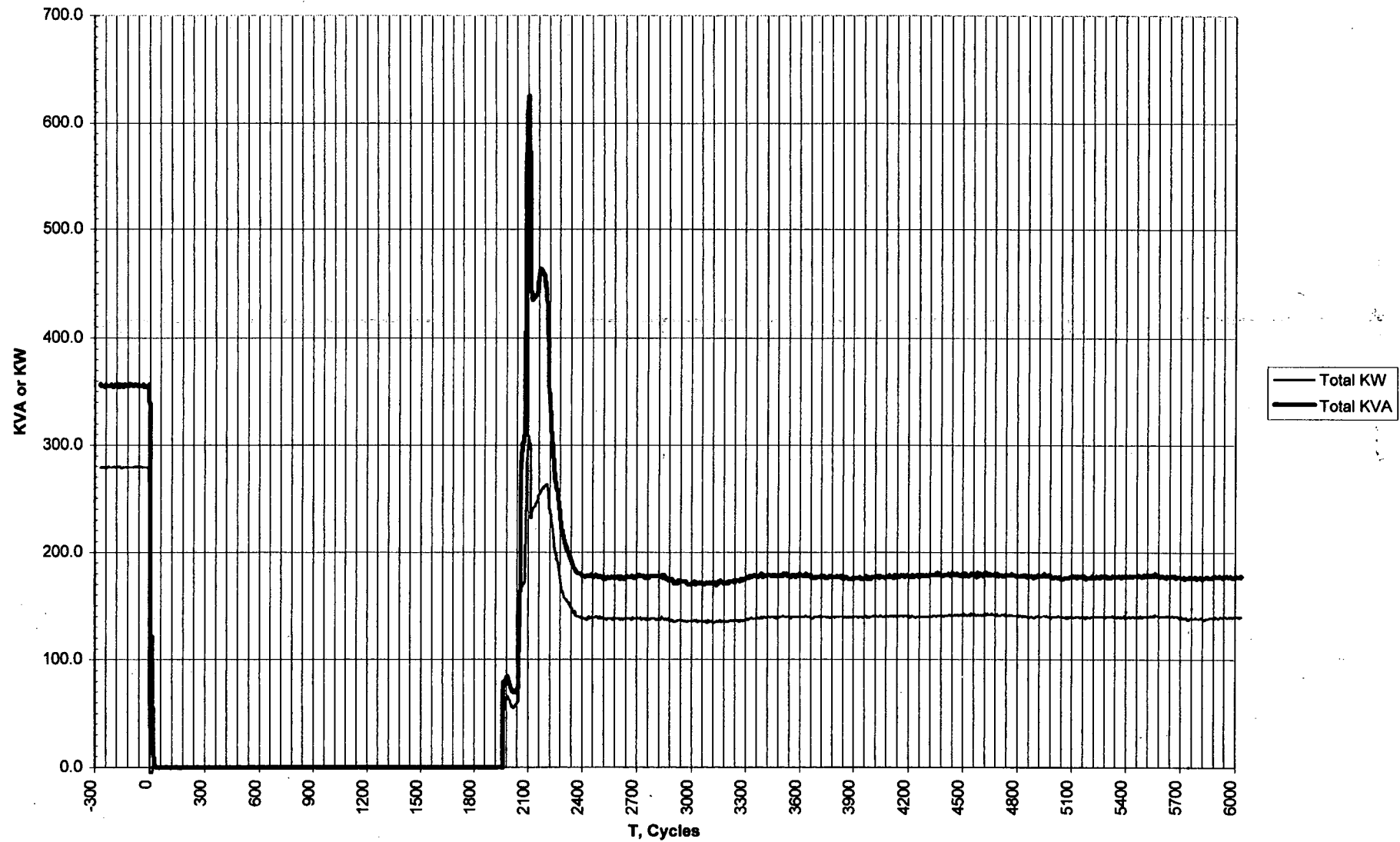


Figure 4.1.5-3: Test1, 1X6 Voltage and Current

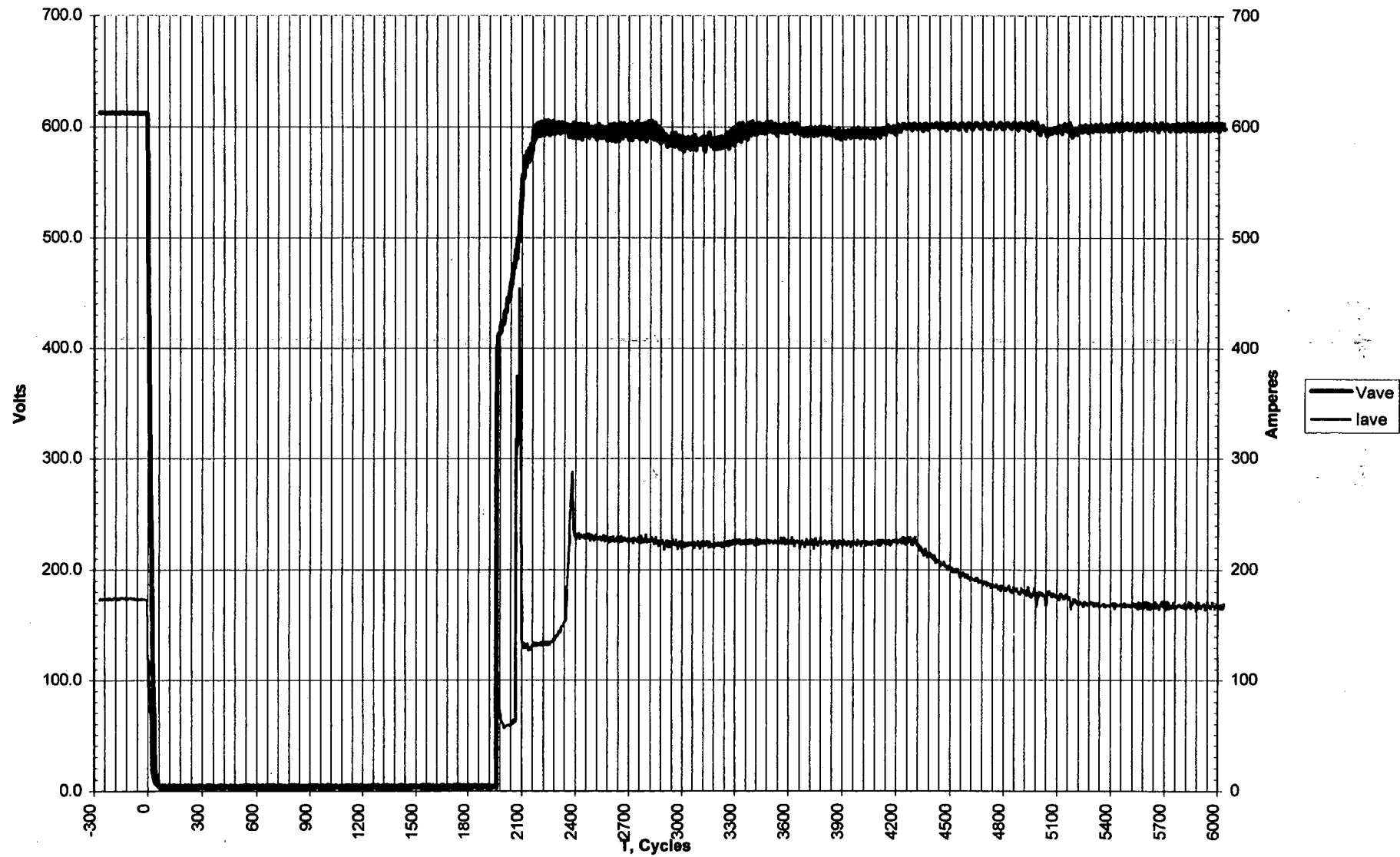


Figure 4.1.5-4: Test1, 1X6 KVA and KW

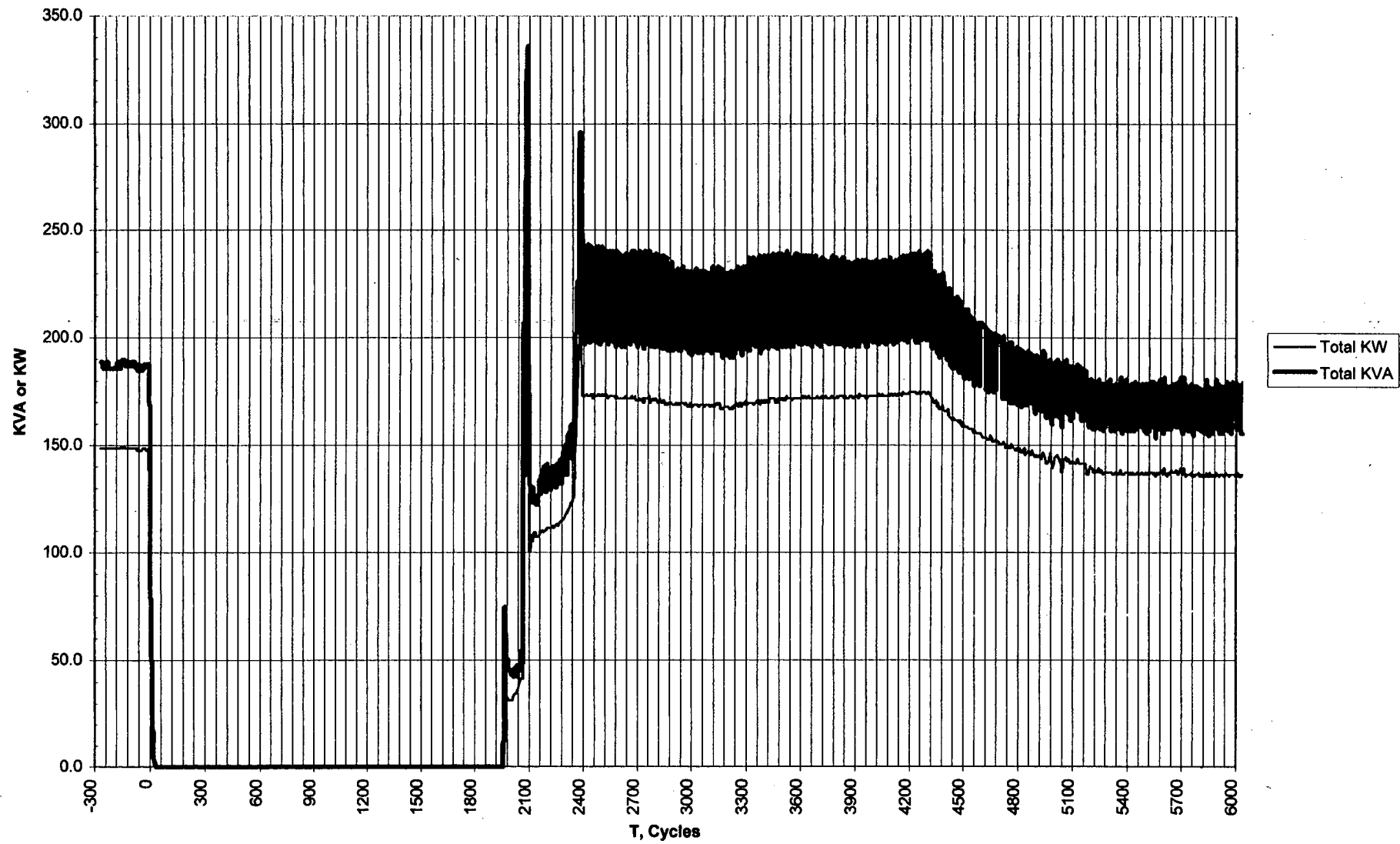


Figure 4.1.5-5: Test1, 3X5 Voltage and Current

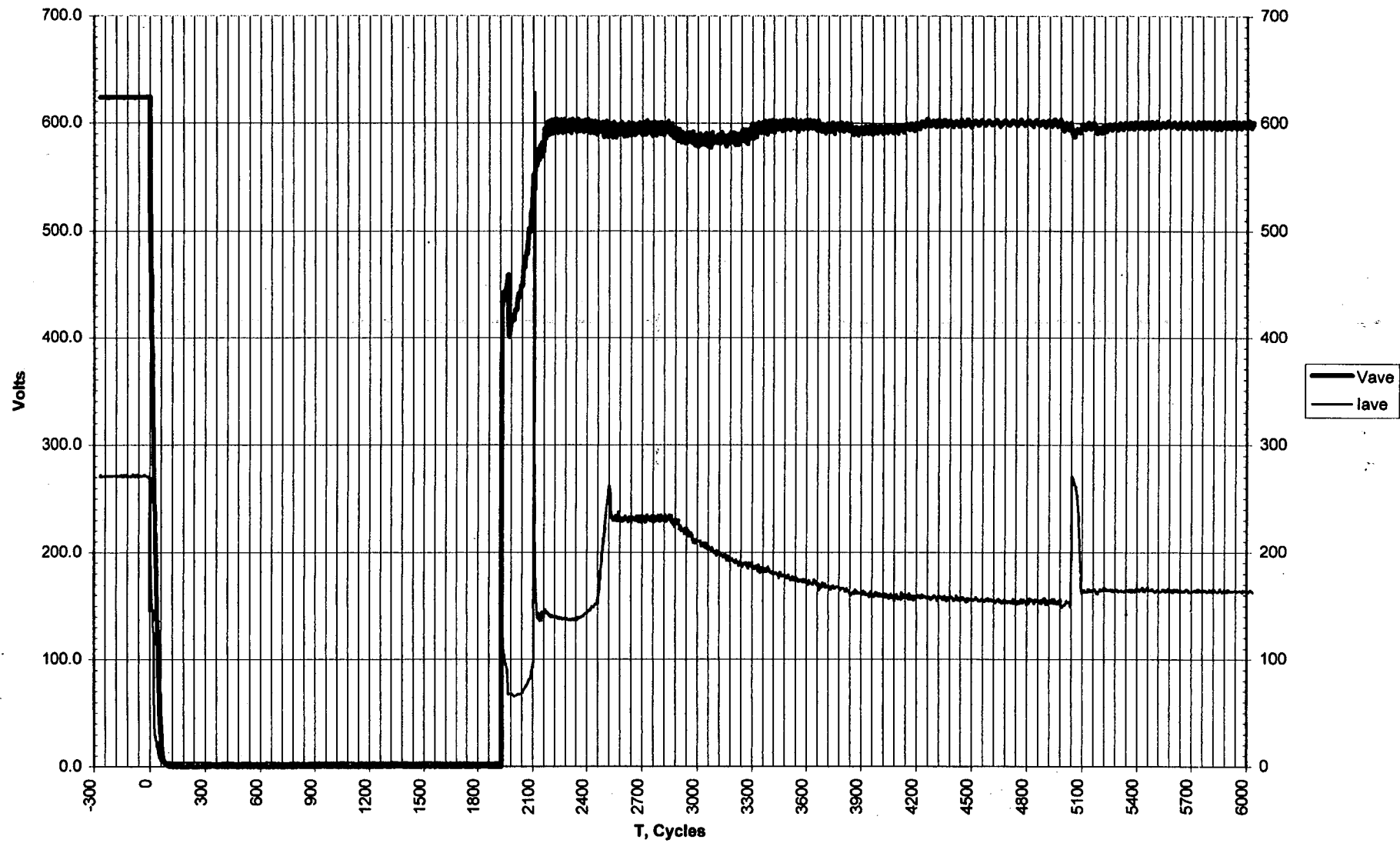


Figure 4.1.5-6: Test1, 3X5 KVA and KW

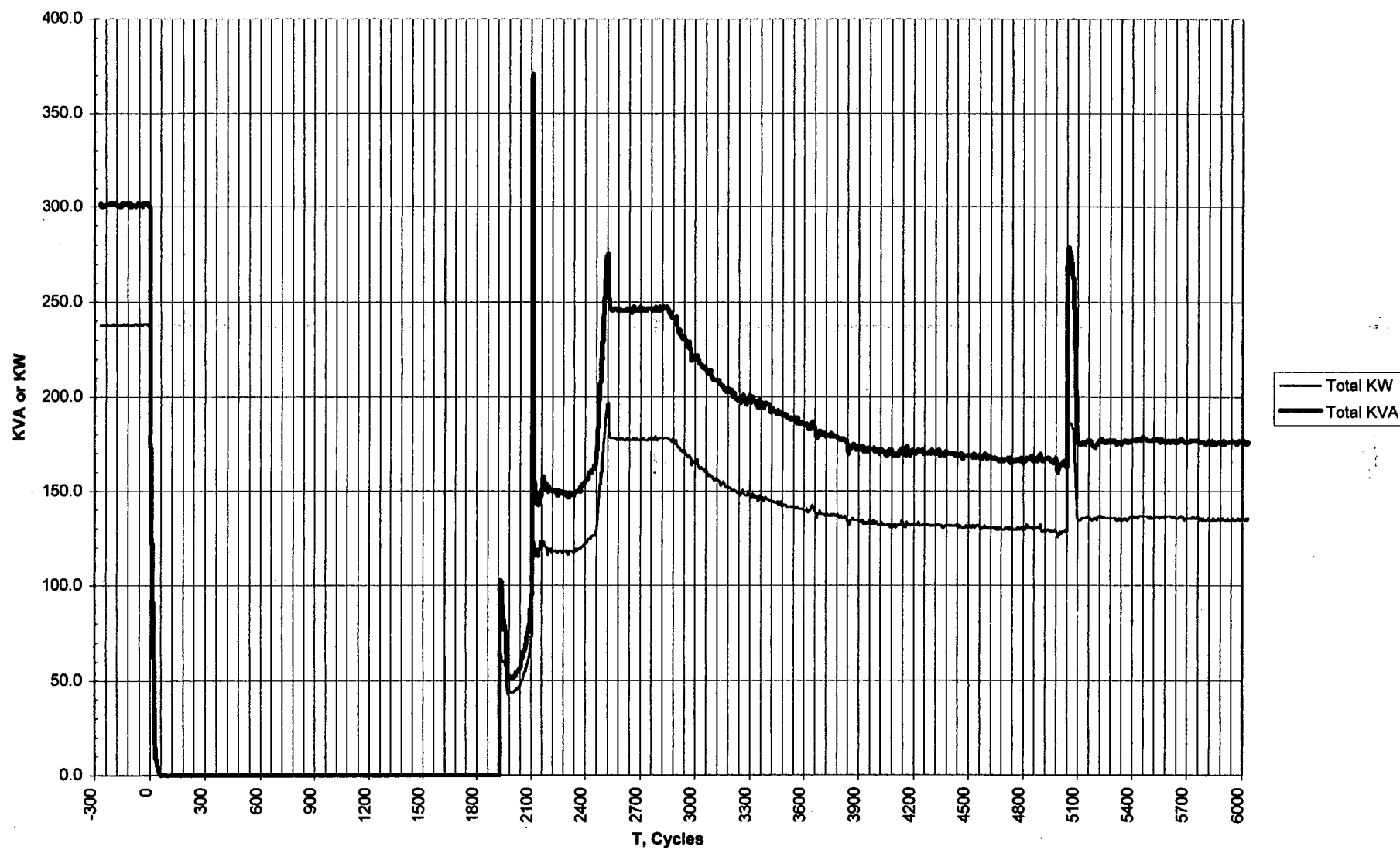


Figure 4.1.5-7: Test1, 3X6 Voltage and Current

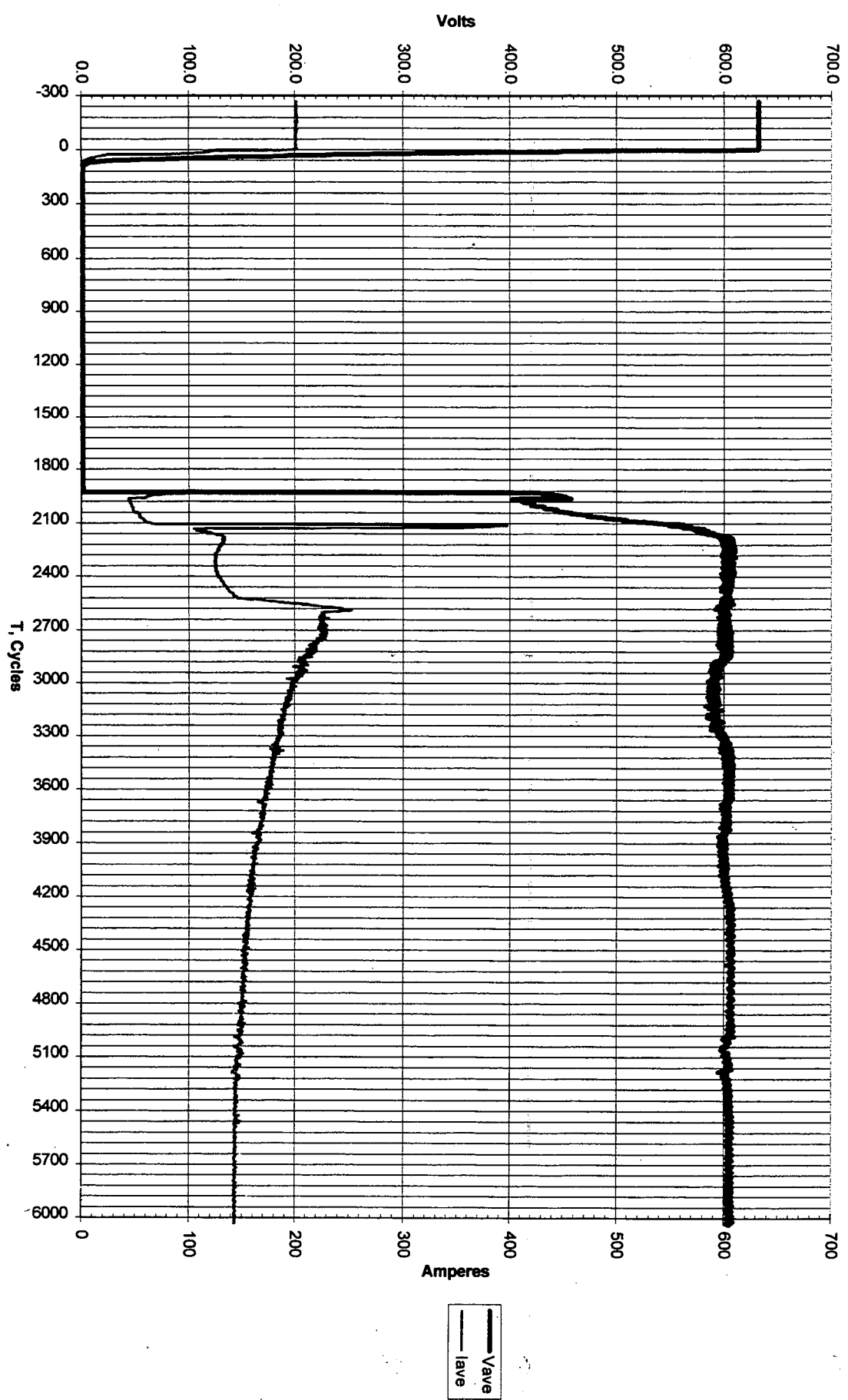


Figure 4.1.5-8: Test1, 3X6 KVA and KW

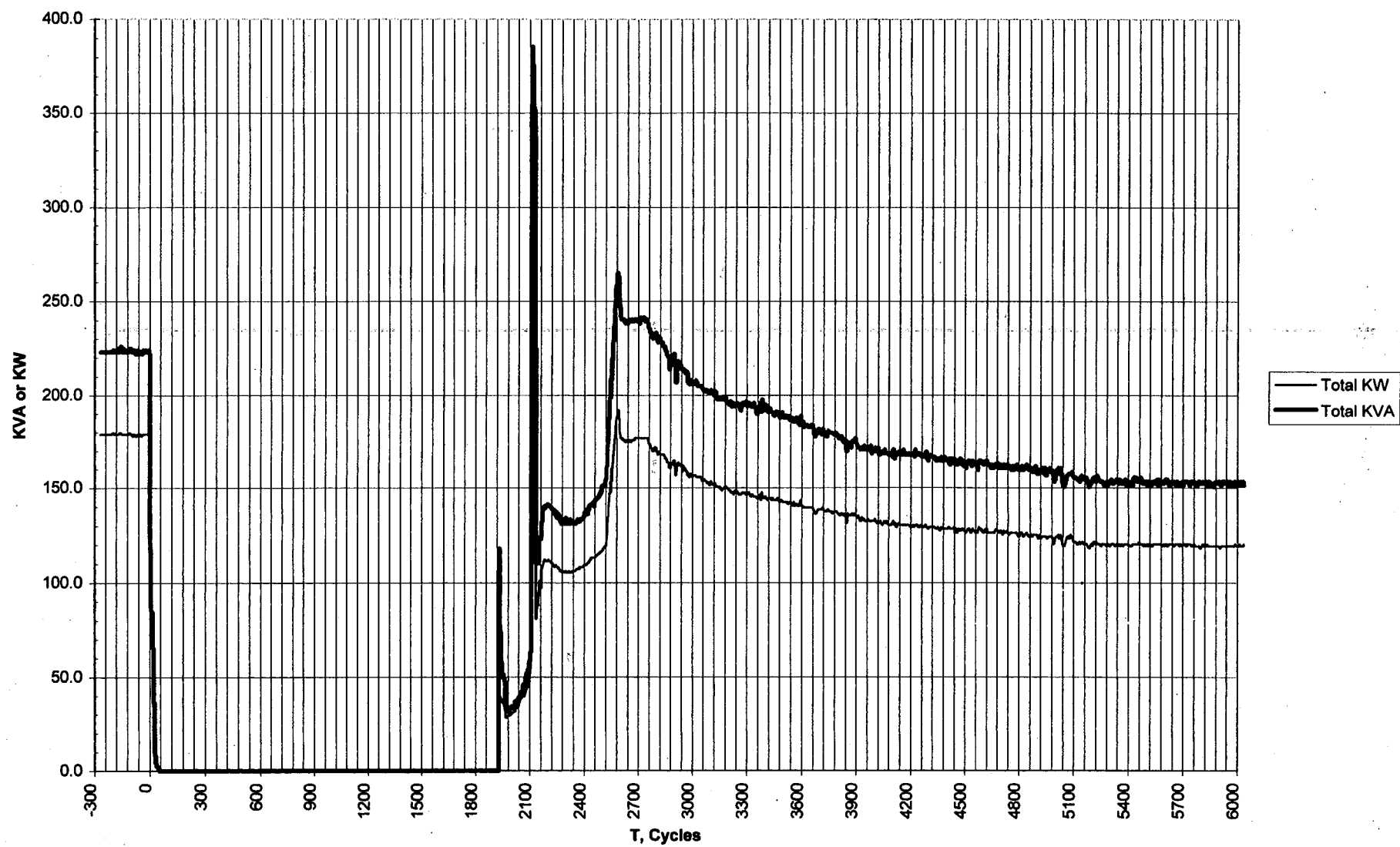


Figure 4.1.5-9: Test1, 3X8 Voltage and Current

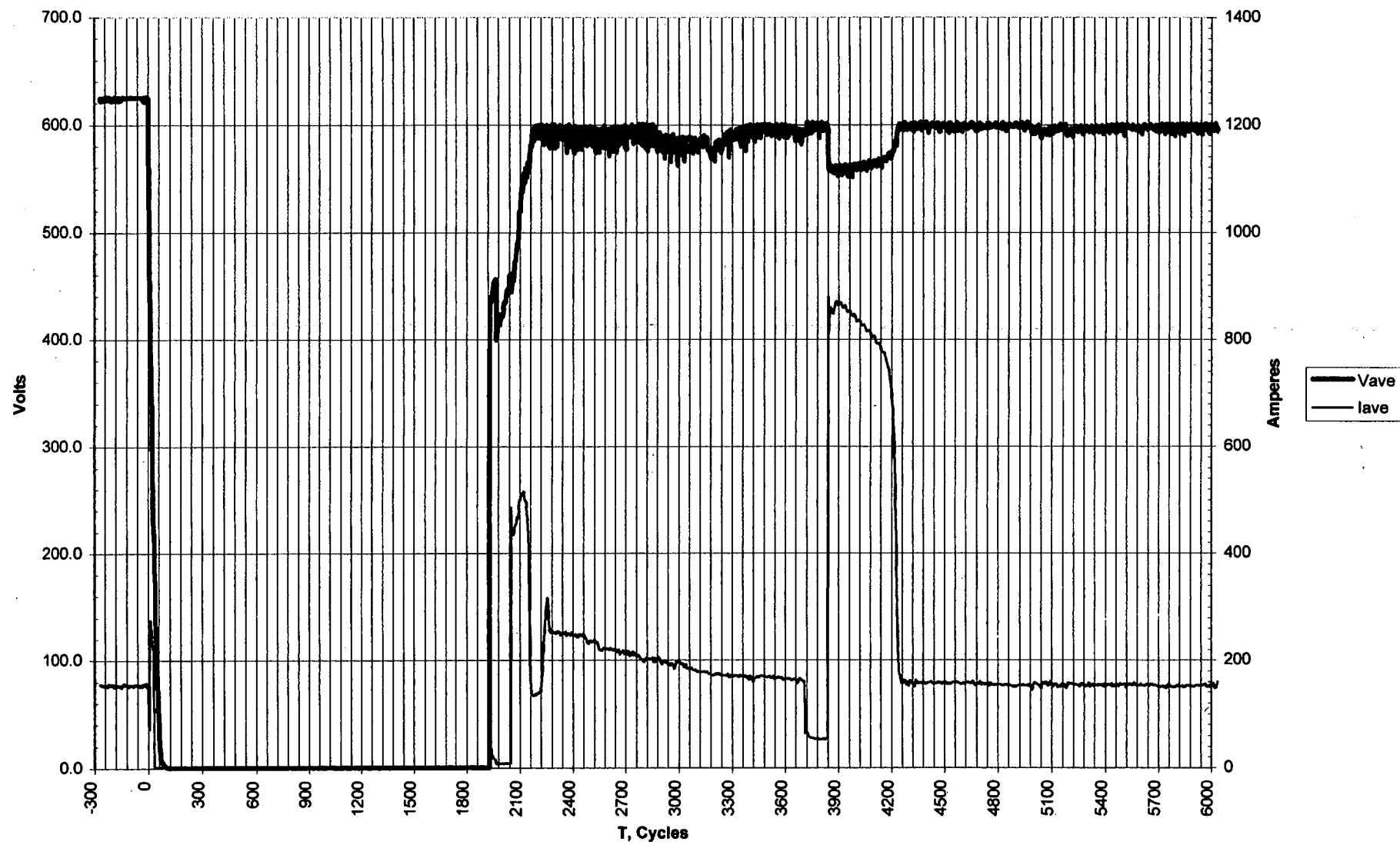


Figure 4.1.5-10: Test1, 3X8 KVA and KW

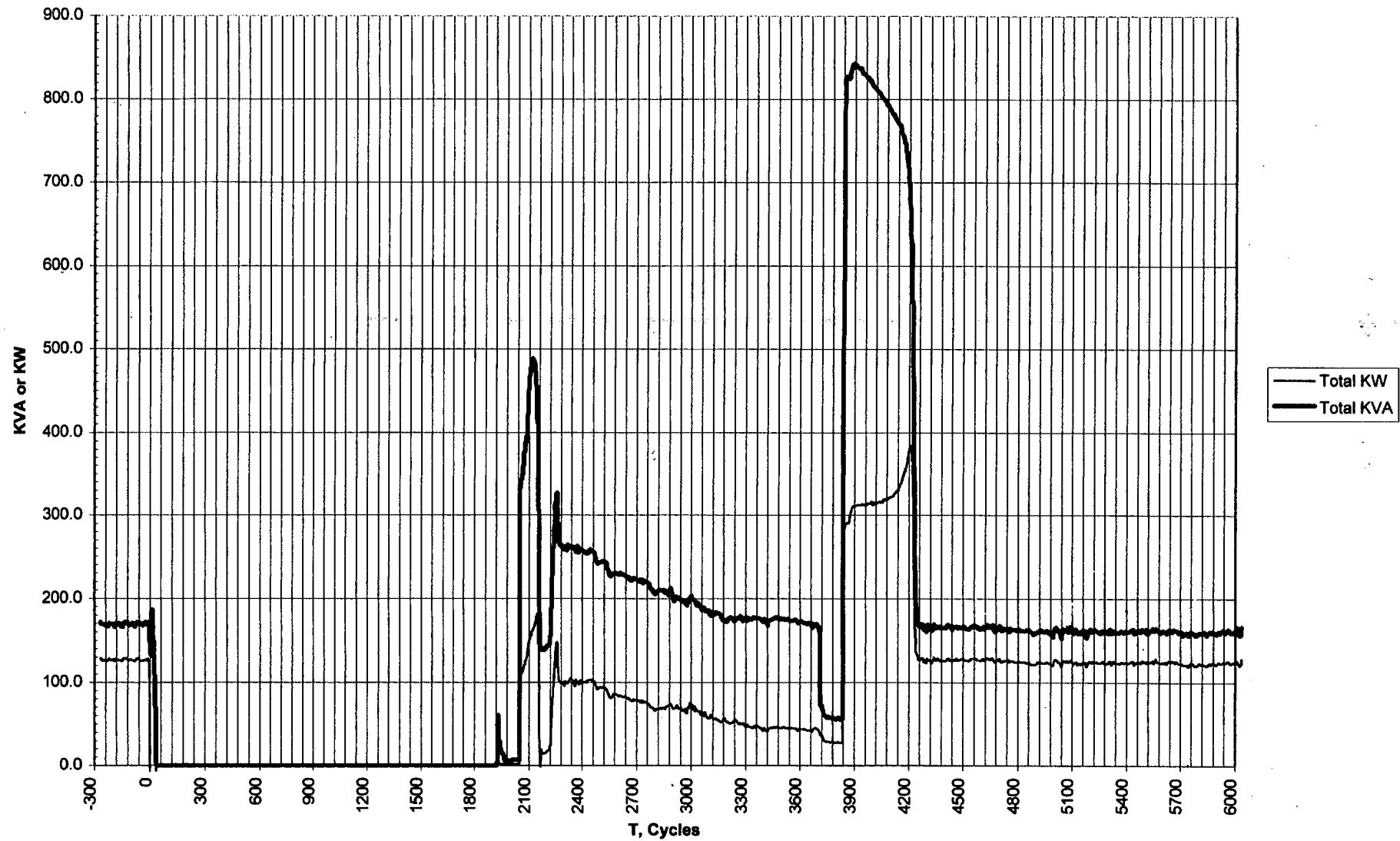


Figure 4.1.5-11: Test1, 3X9 Voltage and Current

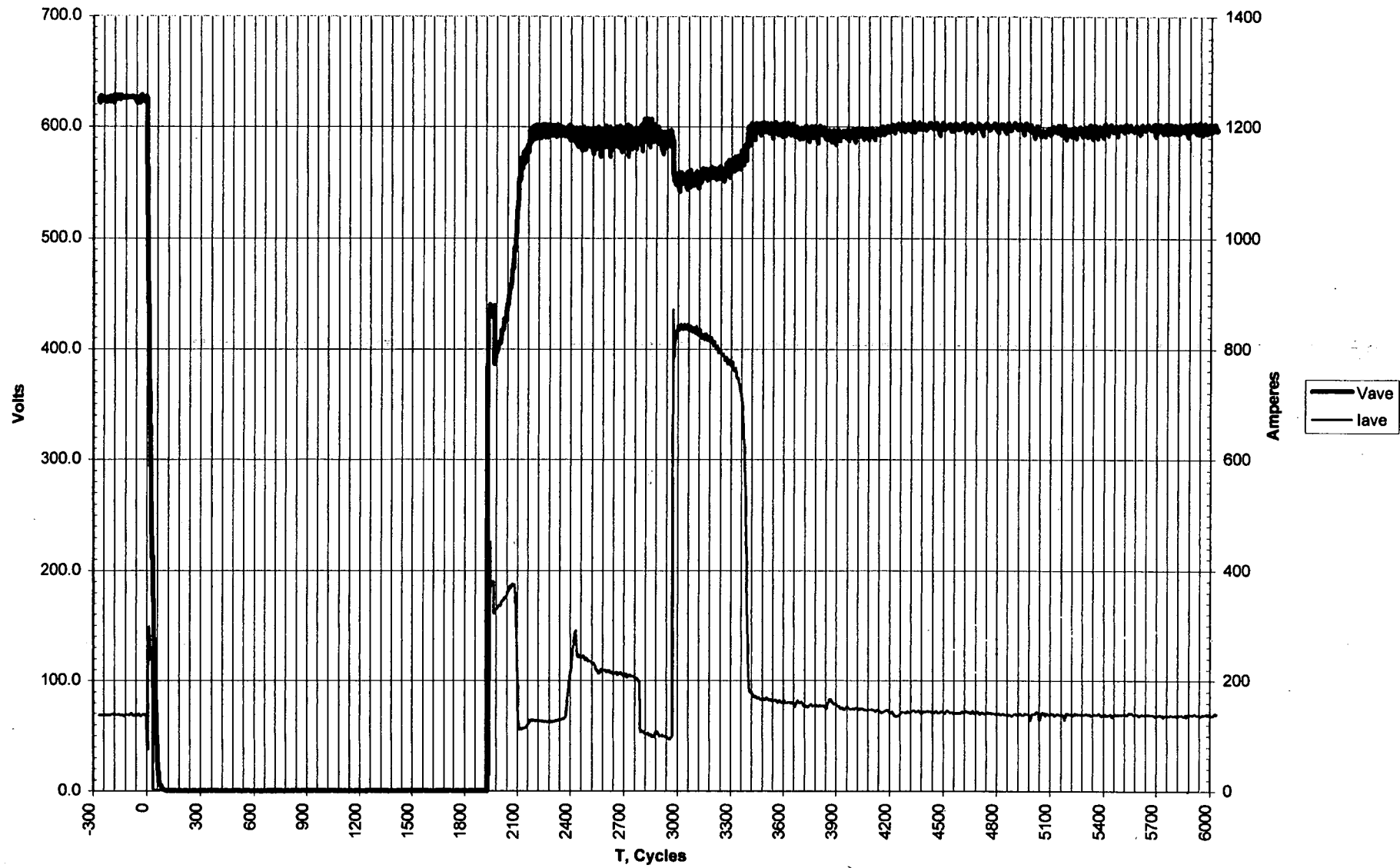


Figure 4.1.5-12: Test1, 3X9 KVA and KW

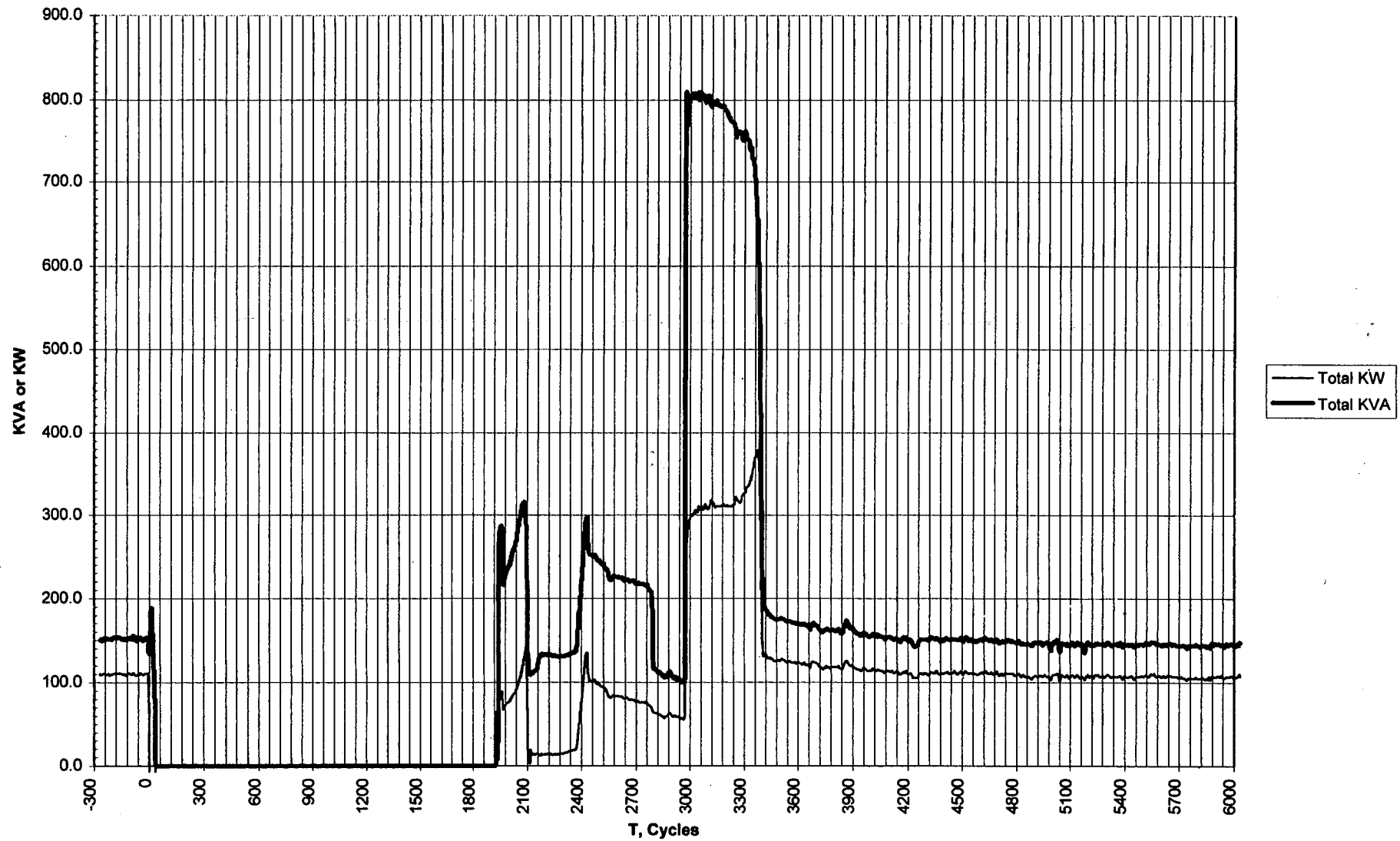


Figure 4.1.5-13: Test1, 3X4 Voltage and Primary Amperes

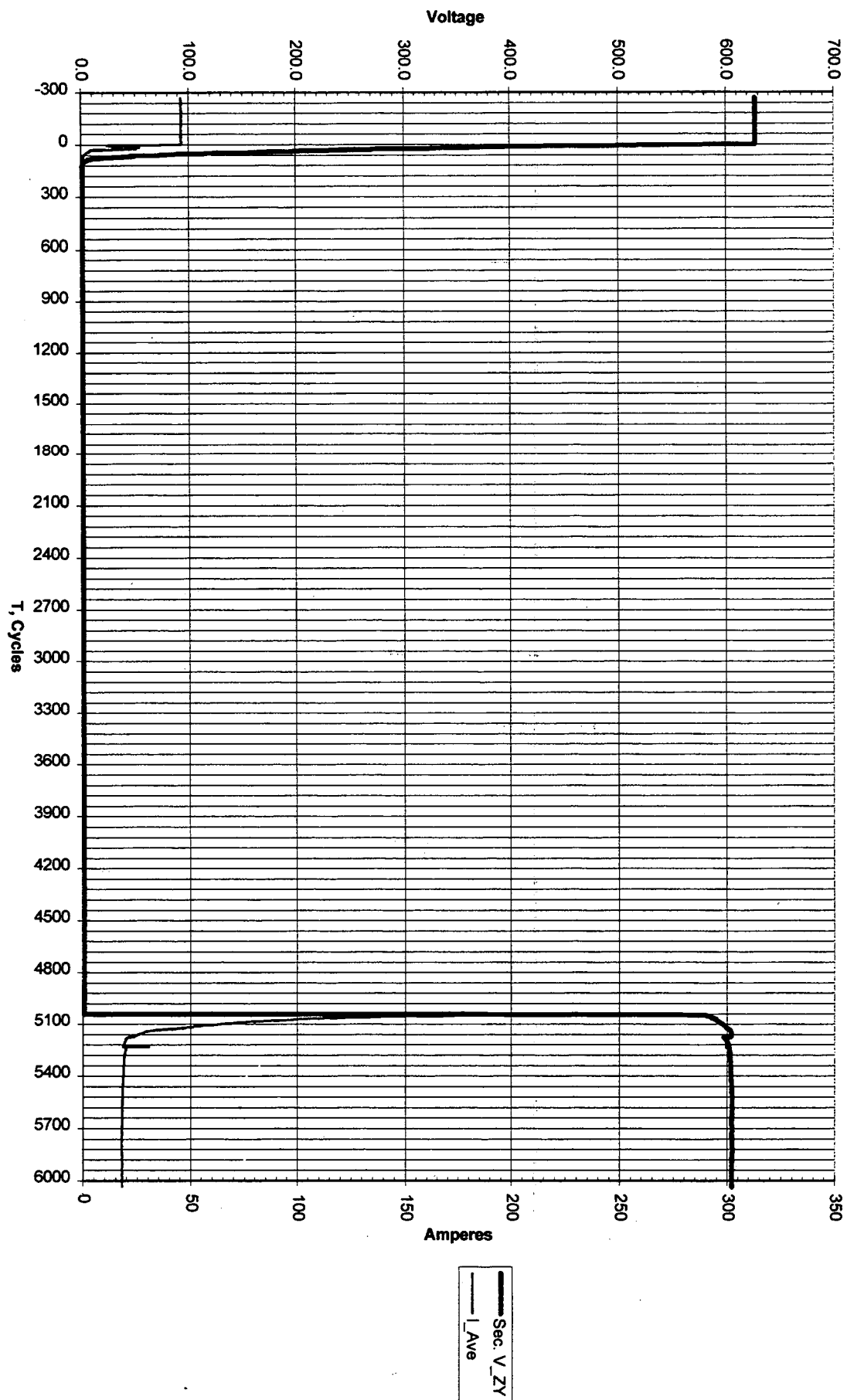


Figure 4.1.5-14: Test1, 3X4 Primary KVA and KW

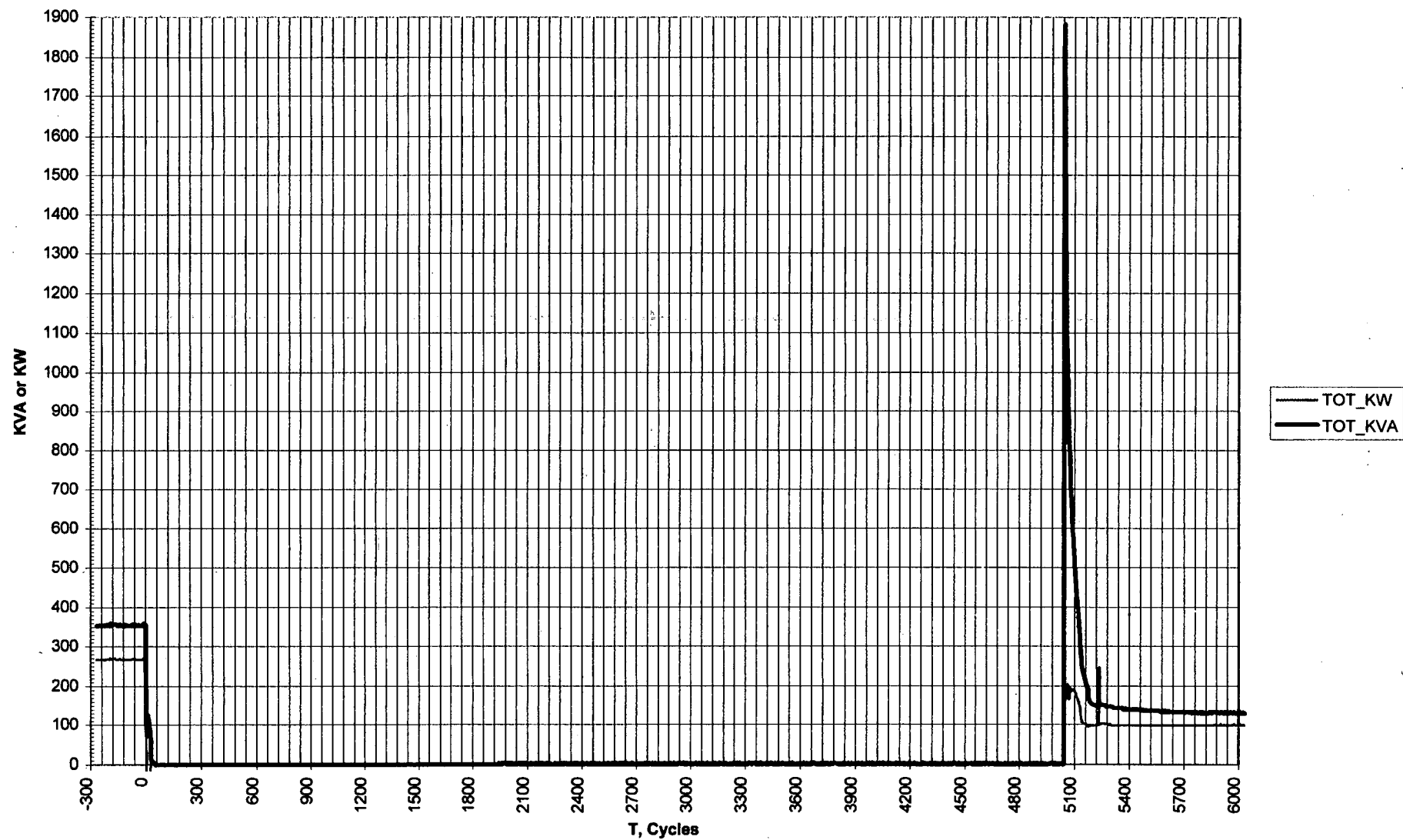


Figure 4.1.6-1: Test1, 600V 3XS1 Voltage and Current

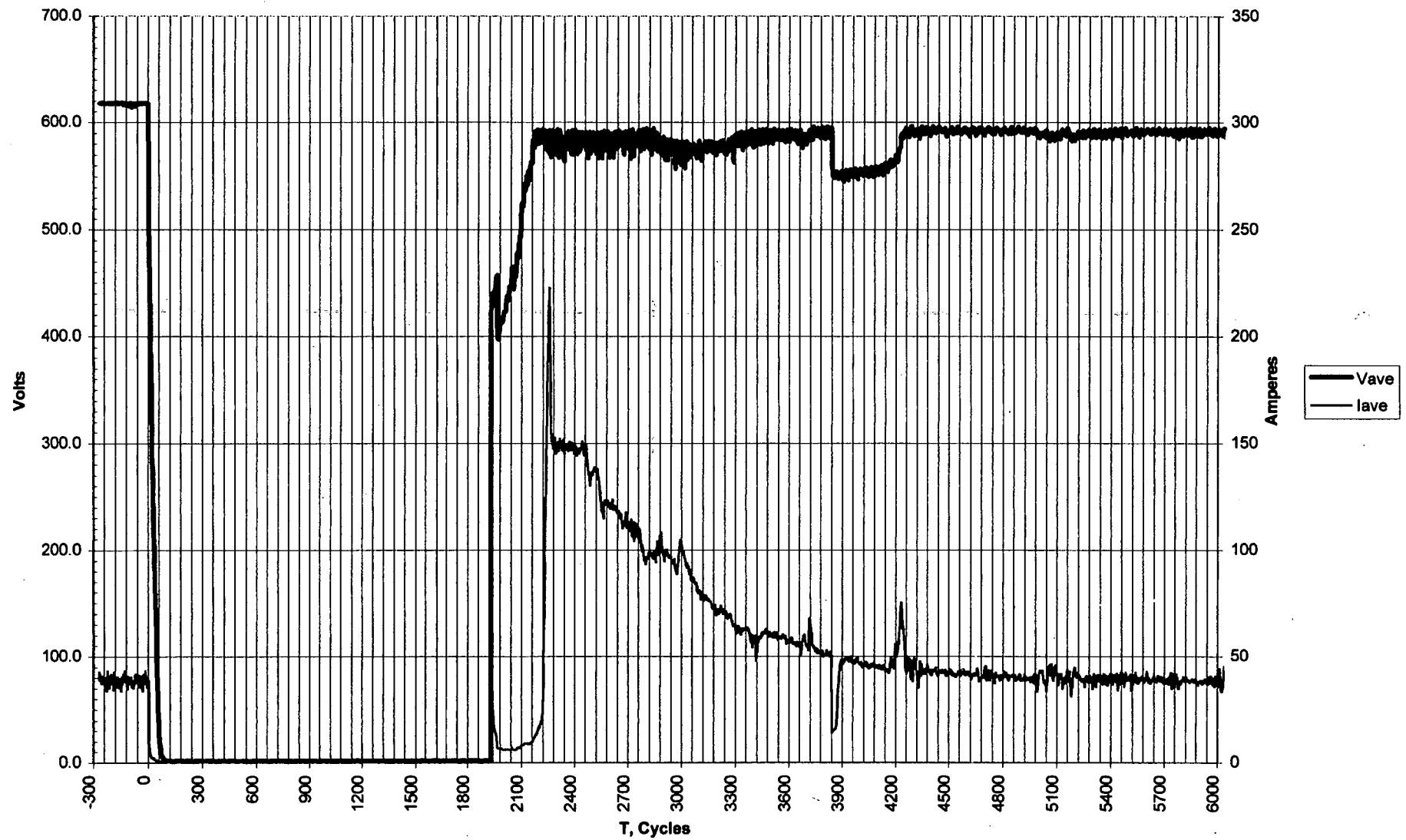


Figure 4.1.6-2: Test1, 600V 3XS1 KVA and KW

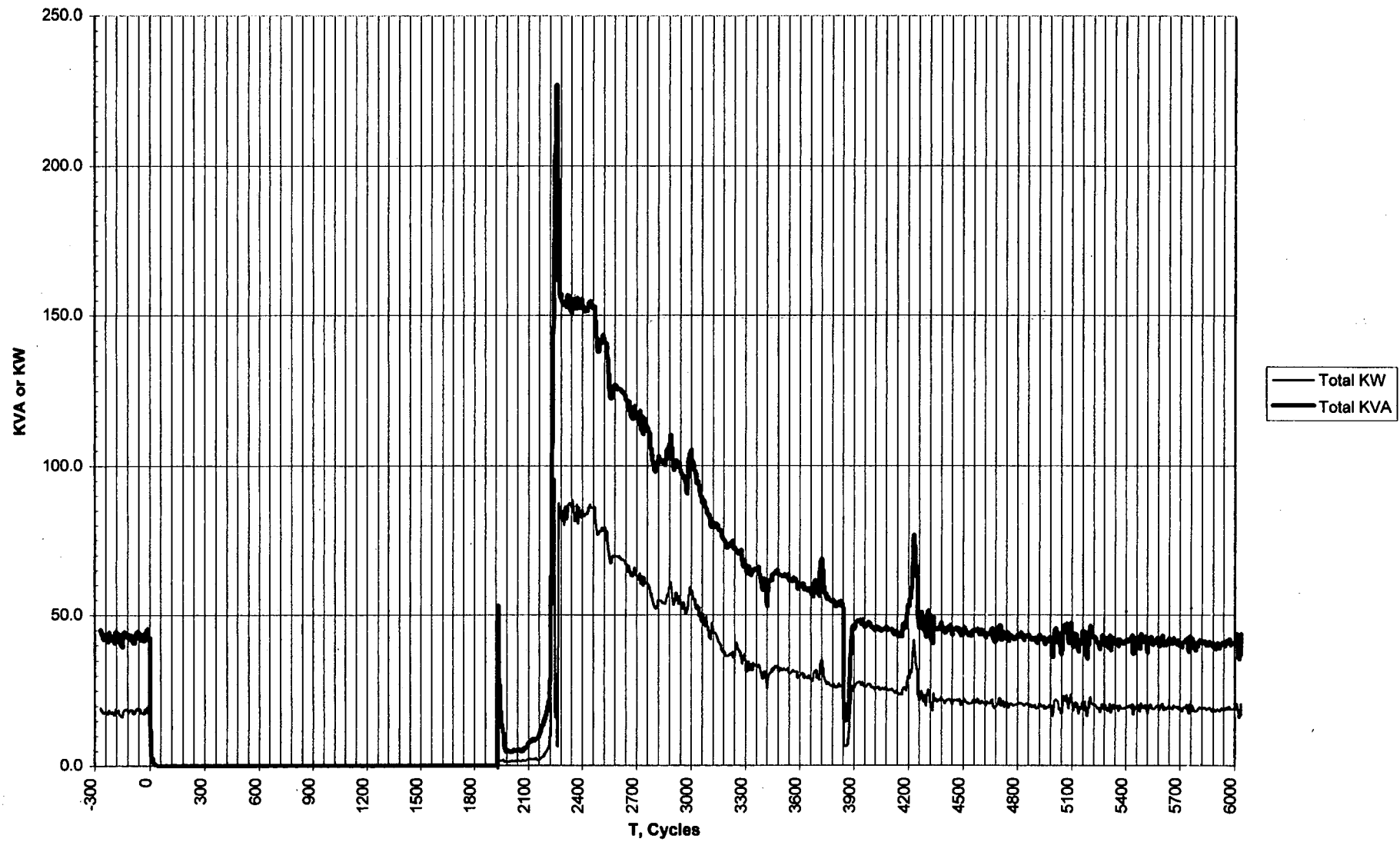


Figure 4.1.6-3: Test1, 600V 3XS2 Voltage and Current

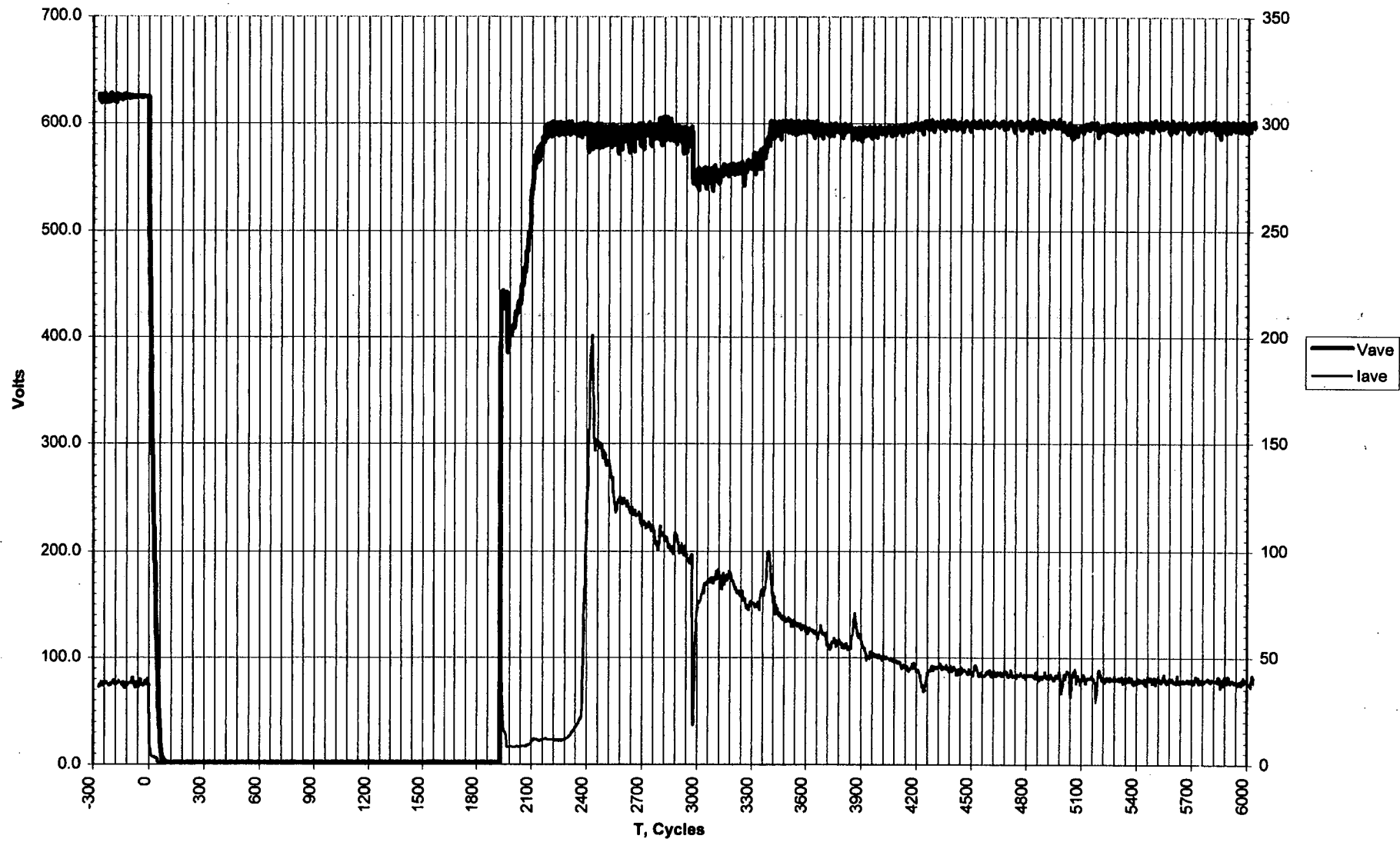


Figure 4.1.6-4: Test1, 600V 3XS2 KVA and KW

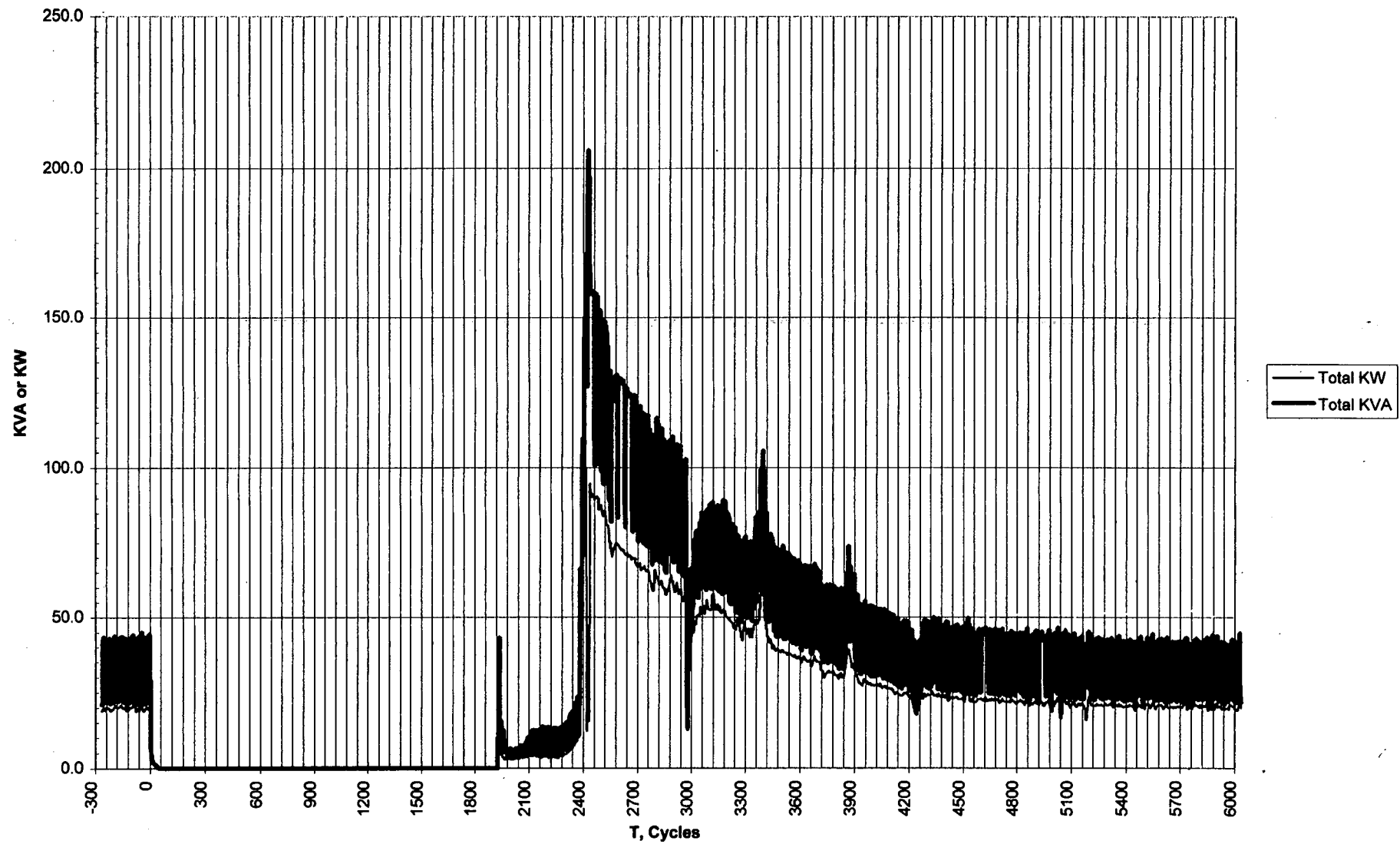


Figure 4.1.6-5: Test1, 600V 3XS3 Voltage and Current

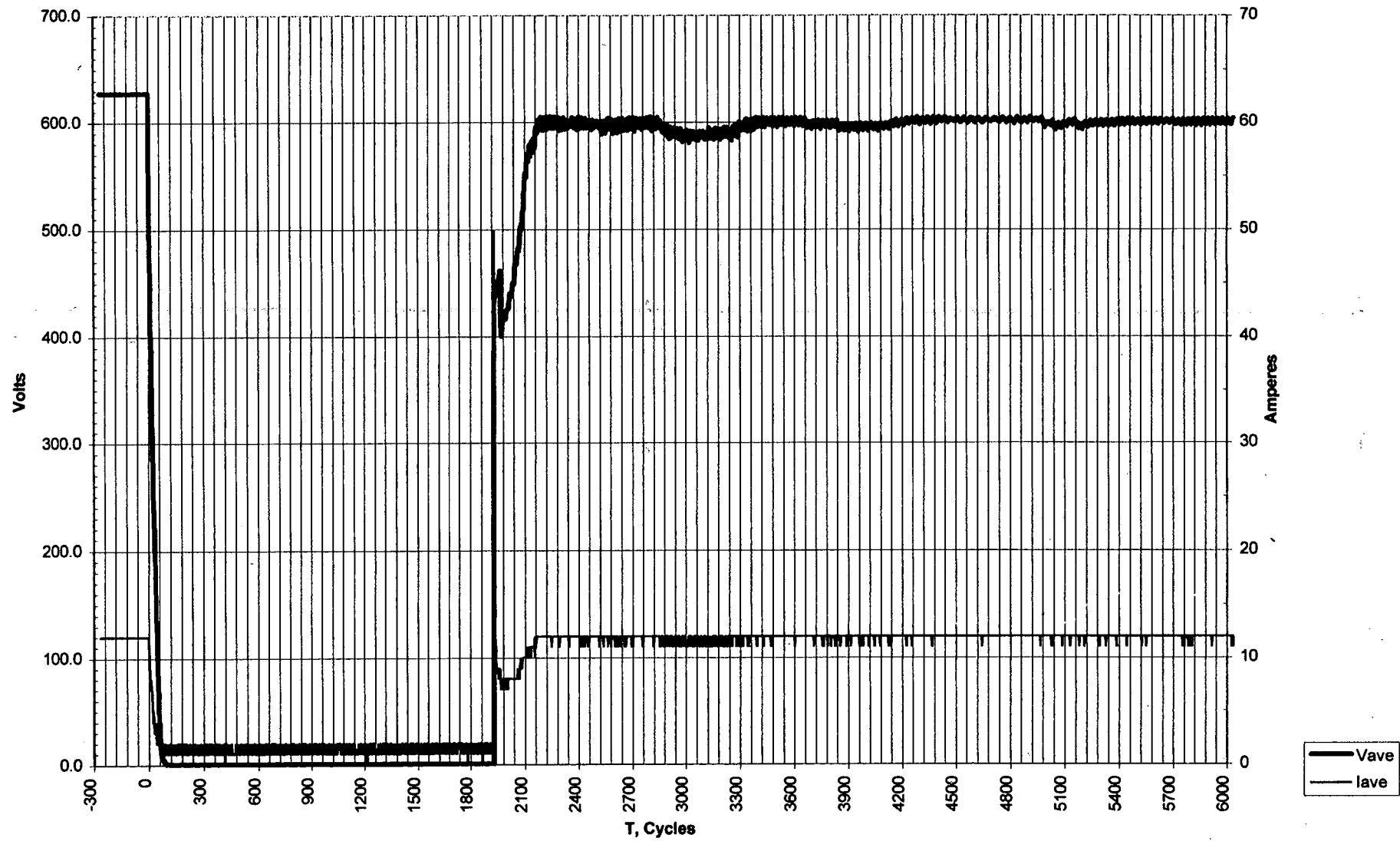


Figure 4.1.6-6: Test1, 600V 3XS3 KVA and KW

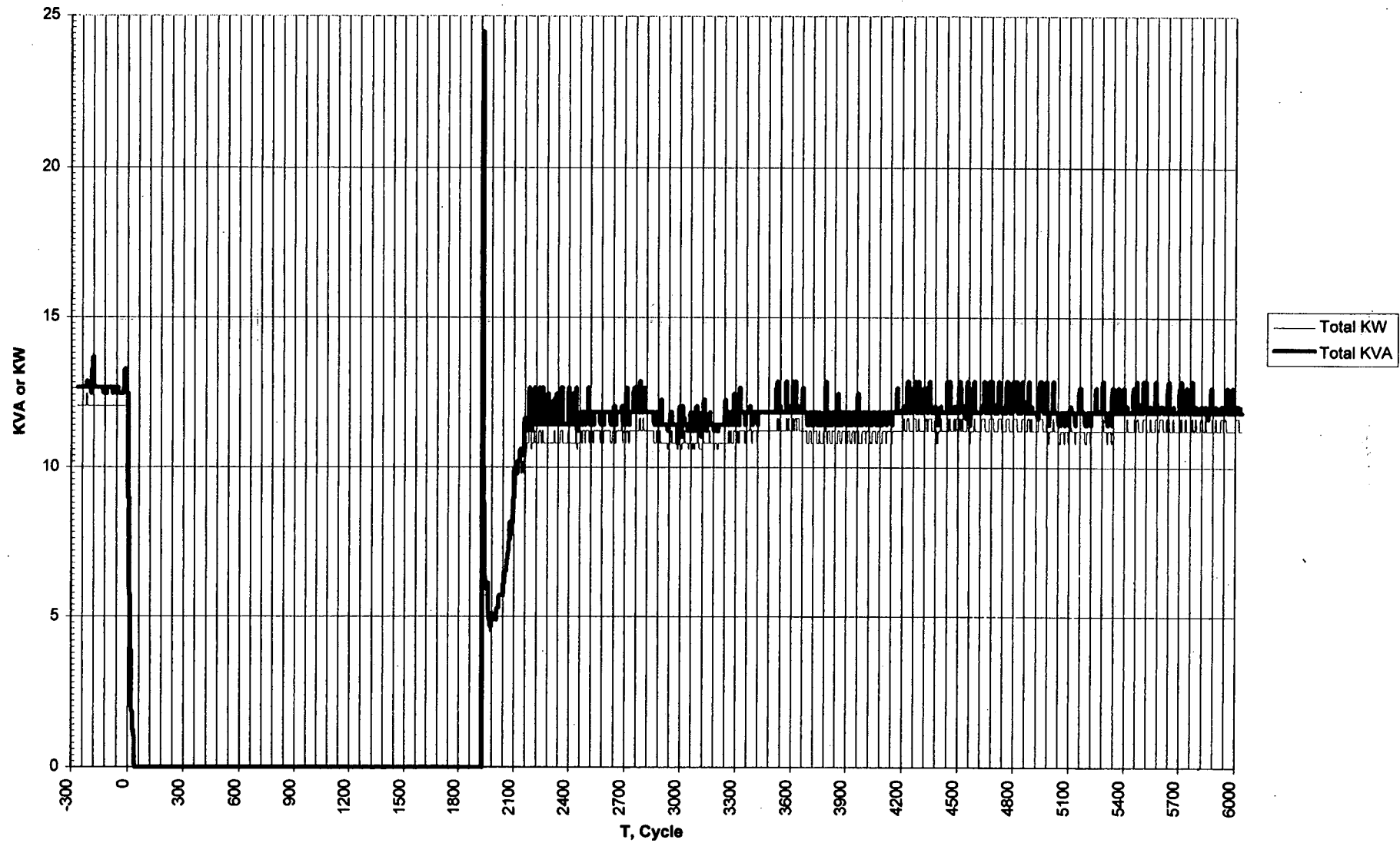


Figure 4.1.7-1: Test1, 208V 3XS1 Voltage and Current



Figure 4.1.7-2: Test1, 208V 3XS1 KVA and KW

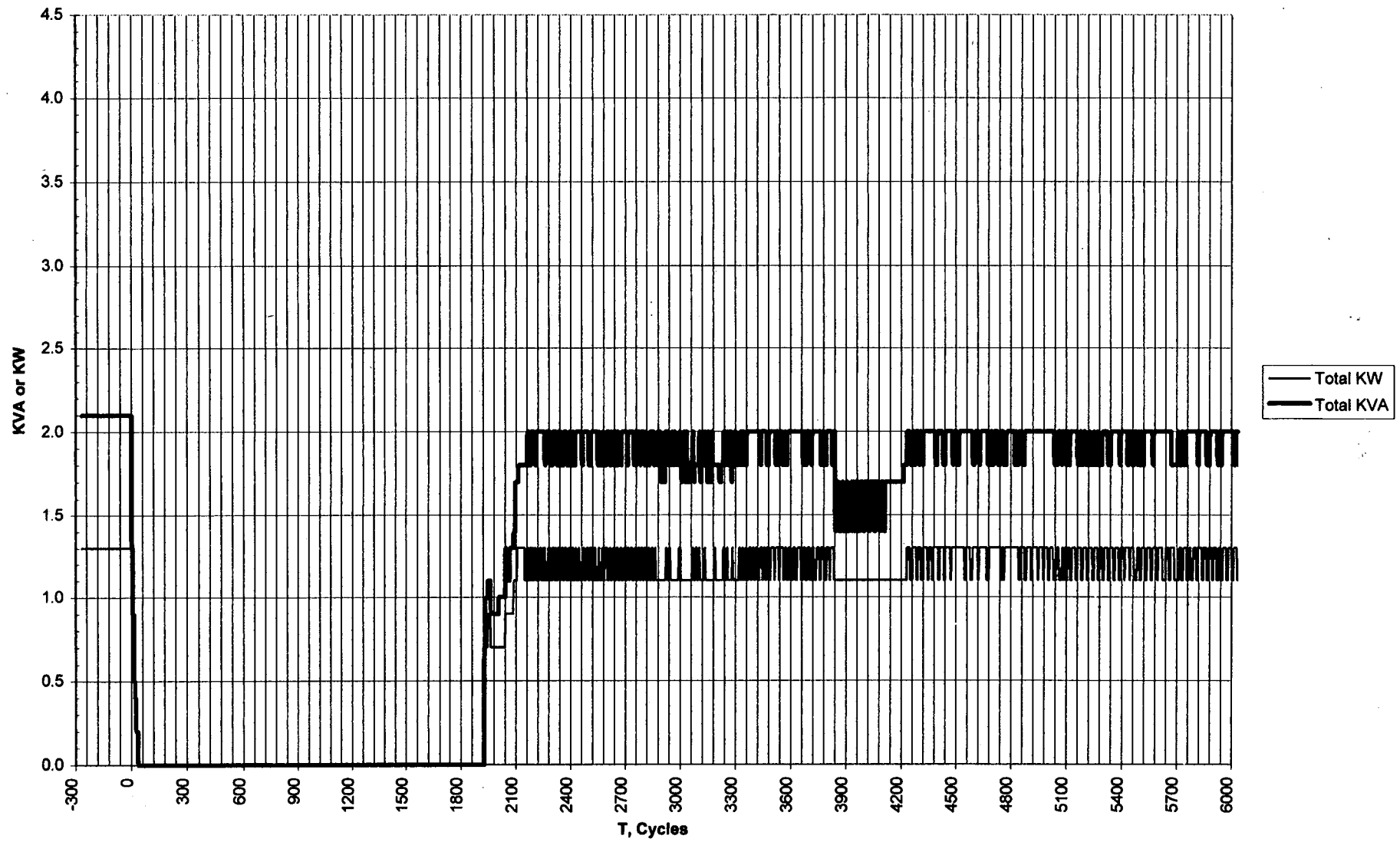


Figure 4.1.7-3: Test1, 208V 3XS2 Voltage and Current

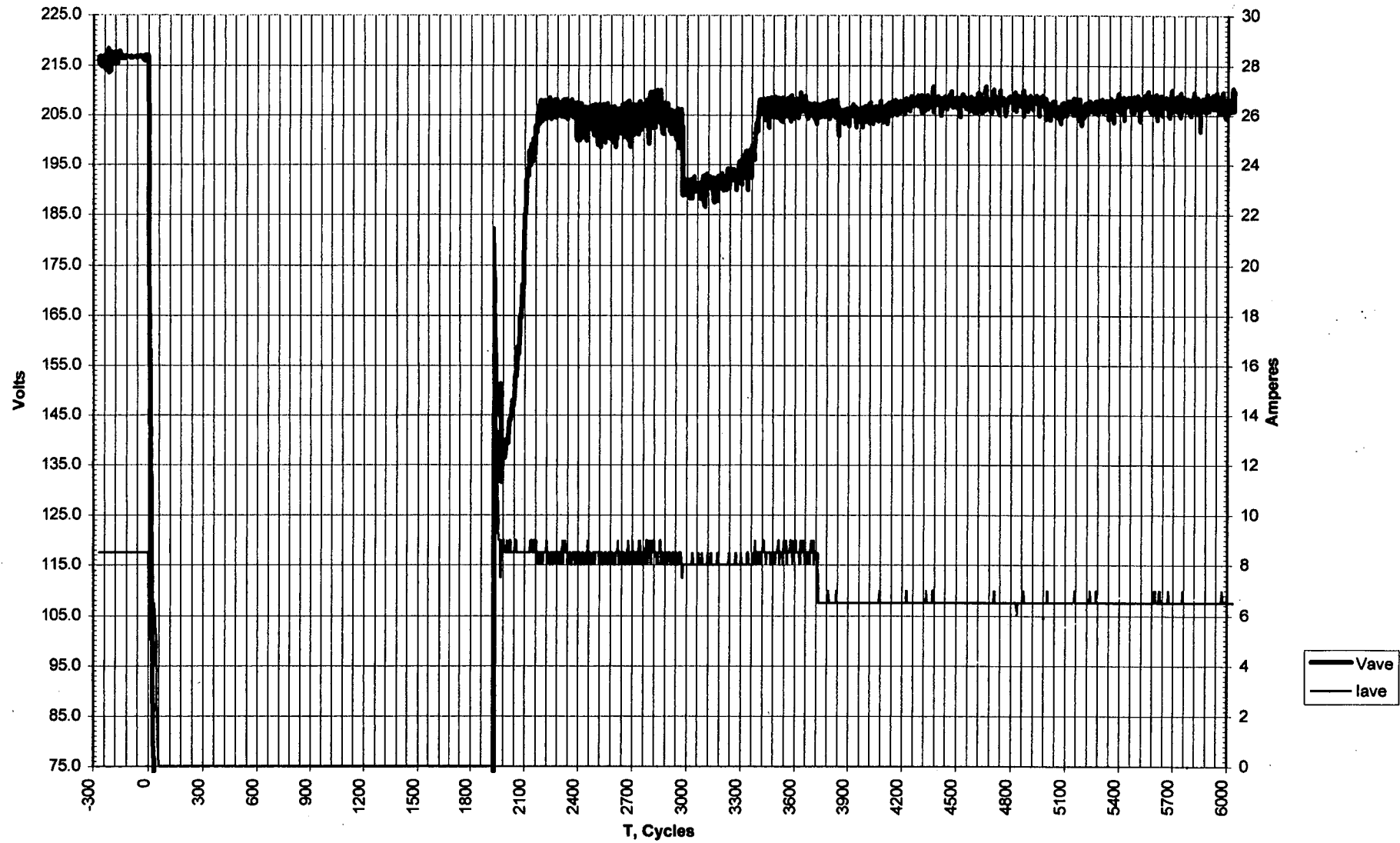


Figure 4.1.7-4: Test1, 208V 3XS2 KVA and KW



Figure 4.1.7-5: Test1, 208V 3XS3 Voltage and Current

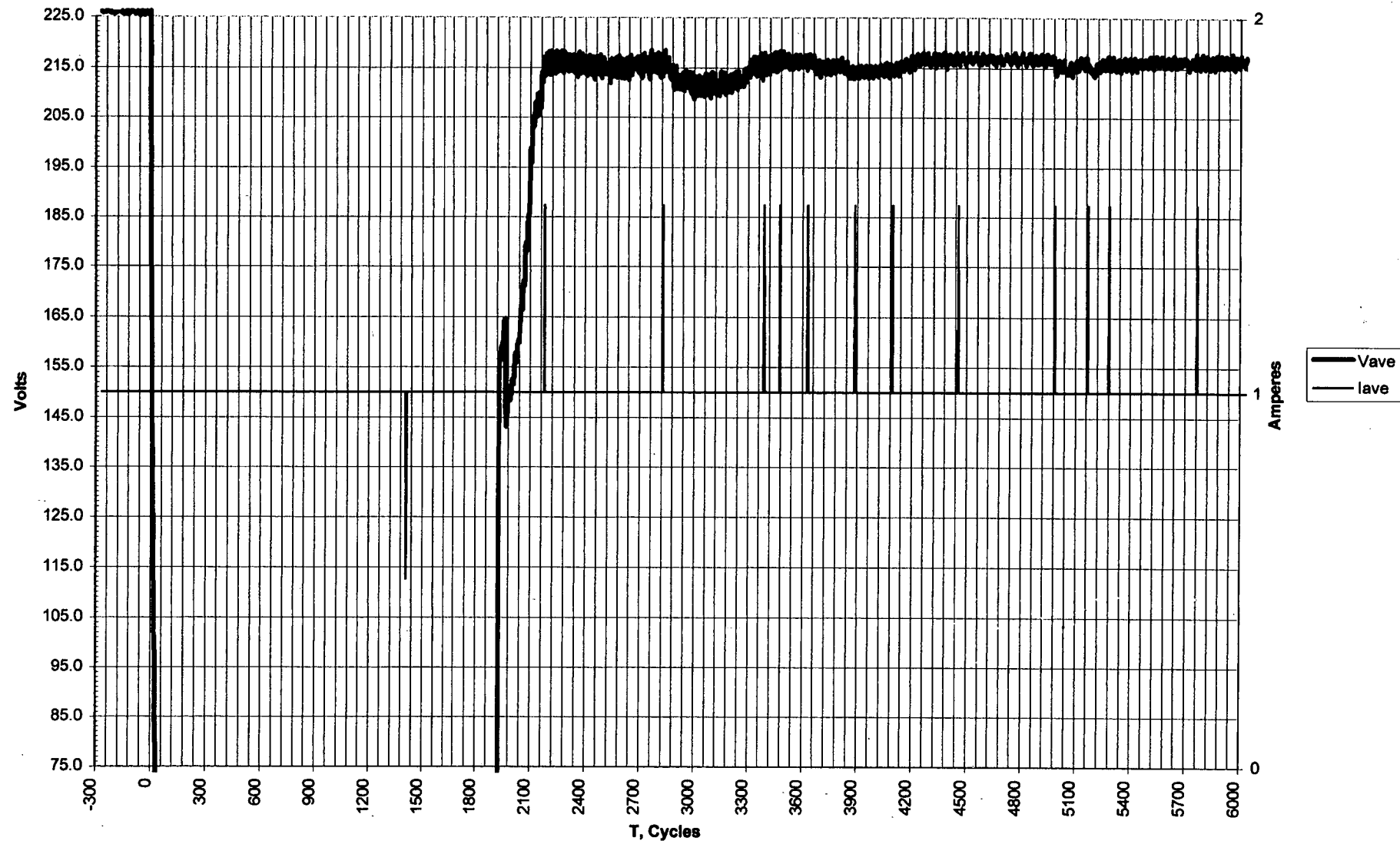


Figure 4.1.7-6: Test1, 208V 3XS3 KVA and KW

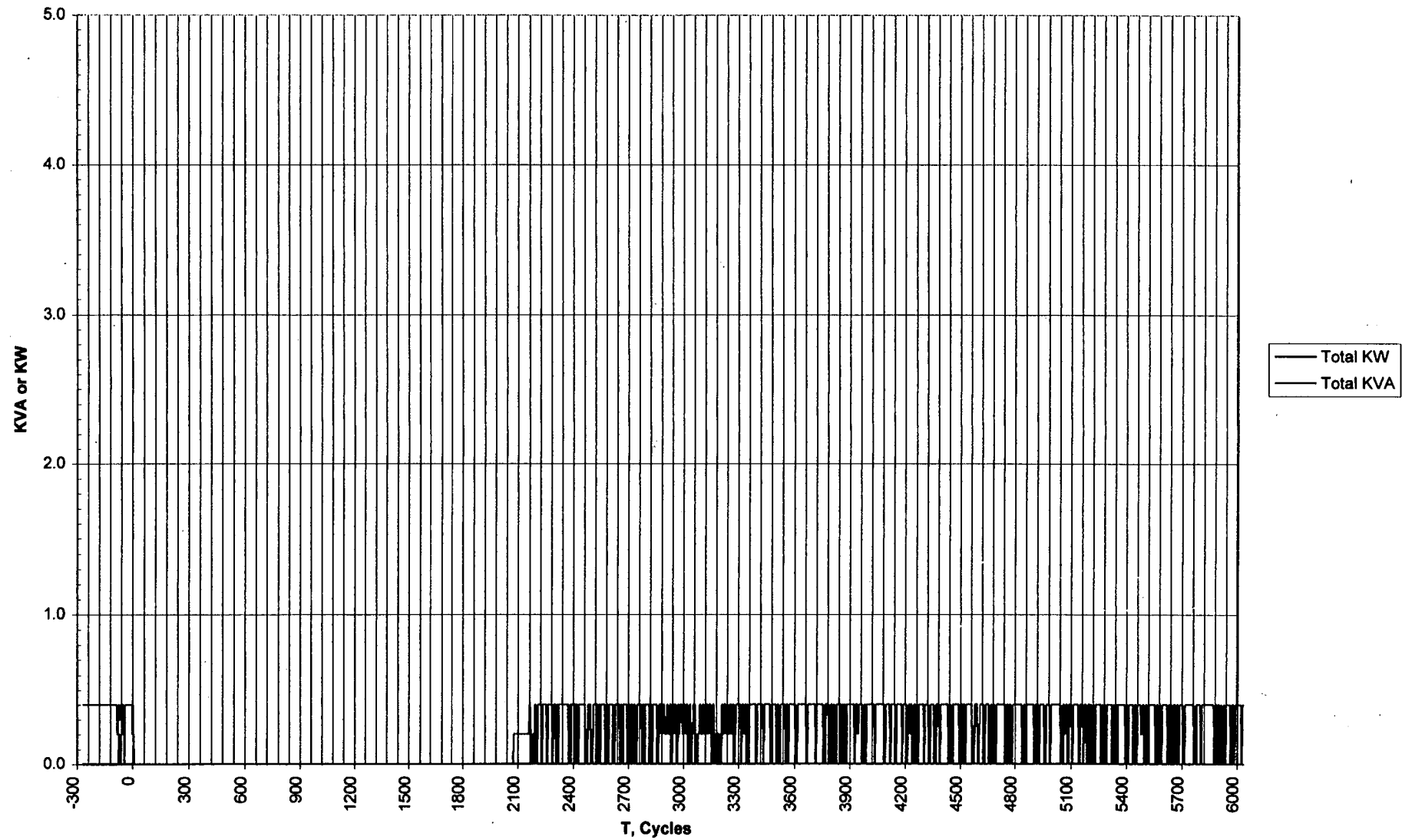
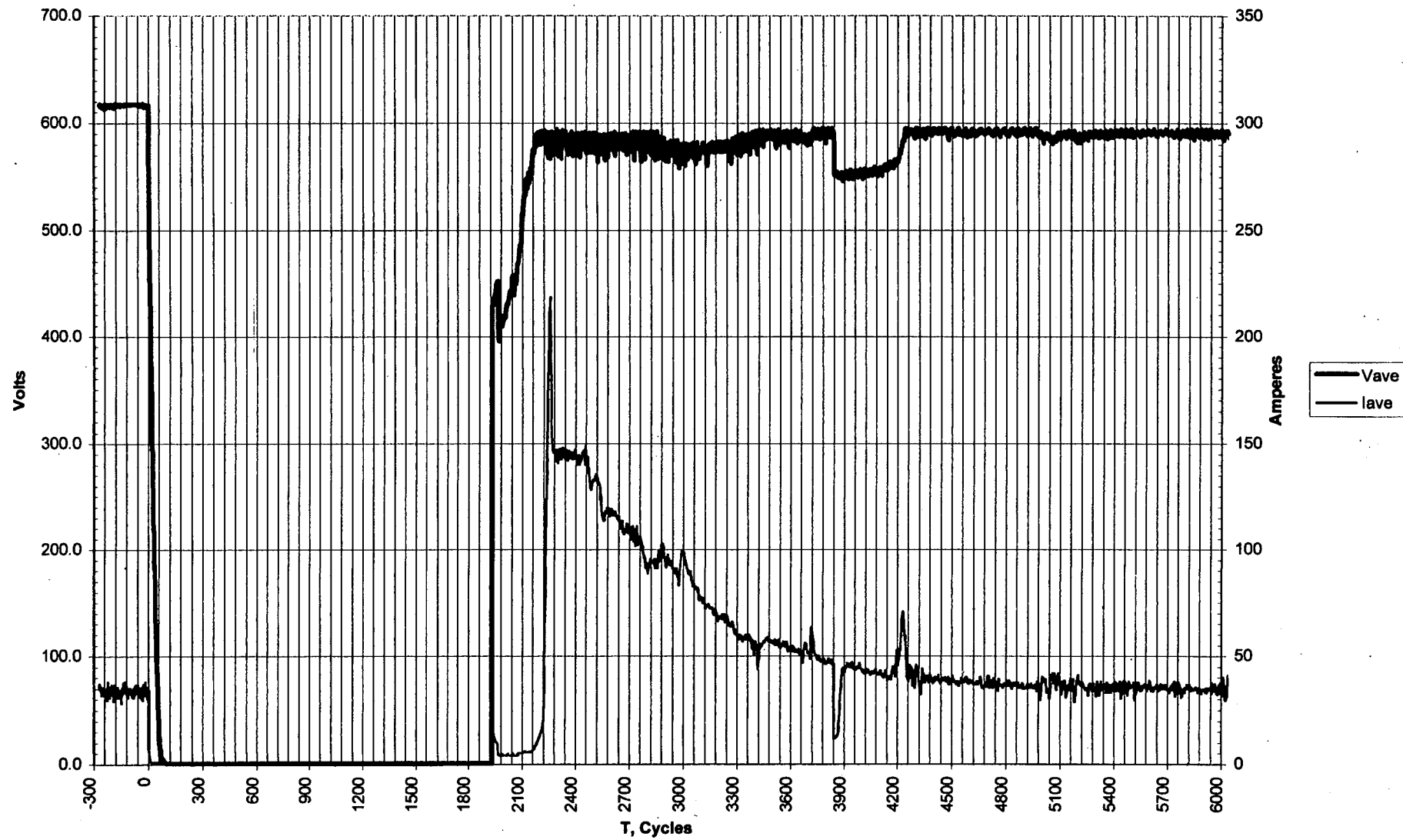


Figure 4.1.8-1: Test1, Battery Charger 3CA Input Voltage and Current



Appendix 2 - Test 2, Figures of Results

APPENDIX 2: Figures for Test 2

FIGURE	Page
Figure 4.2.1-1: Test2, Keowee Voltage and Current.....	2-2
Figure 4.2.1-2: Test2, Keowee Voltage.....	2-3
Figure 4.2.1-3: Test2, Keowee KVA.....	2-4
Figure 4.2.1-4: Test2, Keowee KW.....	2-5
Figure 4.2.1-5: Test2, Keowee Frequency and Current.....	2-6
Figure 4.2.1-6: Test2, Keowee Frequency.....	2-7
Figure 4.2.2-1: Test2, Unit 1 MFB Voltage and Current	2-8
Figure 4.2.2-2: Test2, Unit 1 MFB KVA or KW	2-9
Figure 4.2.2-3: Test2, Unit 2 MFB Voltage and Current	2-10
Figure 4.2.2-4: Test2, Unit 2 MFB KVA and KW	2-11
Figure 4.2.2-5: Test2, Unit 3 MFB Voltage and Current	2-12
Figure 4.2.2-6: Test2, Unit 3 MFB KVA and KW	2-13
Figure 4.2.3-1: Test2, EFW 3B Voltage and Current.....	2-14
Figure 4.2.3-2: Test2, EFW 3B KVA or KW.....	2-15
Figure 4.2.3-3: Test2, HPI 3B Voltage and Current.....	2-16
Figure 4.2.3-4: Test2, HPI 3B KVA and KW	2-17
Figure 4.2.3-5: Test2, EFW Pump 1A Voltage and Current	2-18
Figure 4.2.3-6: Test2, EFW 1A KVA and KW	2-19
Figure 4.2.3-7: Test2, LPSW 3B Voltage and Current.....	2-20
Figure 4.2.3-8: Test2, LPSW 3B KVA and KW	2-21
Figure 4.2.5-1: Test2, 1X5 Voltage and Current.....	2-22
Figure 4.2.5-2: Test2, 1X5 KVA and KW.....	2-23
Figure 4.2.5-3: Test2, 1X6 Voltage and Current.....	2-24
Figure 4.2.5-4: Test2, 1X6 KVA or KW	2-25
Figure 4.2.5-5: Test2, 3X5 Voltage and Current.....	2-26
Figure 4.2.5-6: Test2, 3X5 KVA and KW.....	2-27
Figure 4.2.5-7: Test2, 3X6 Voltage and Current.....	2-28
Figure 4.2.5-8: Test2, 3X6 KVA and KW.....	2-29
Figure 4.2.5-9: Test2, 3X8 Voltage and Current.....	2-30
Figure 4.2.5-10: Test2, 3X8 KVA and KW.....	2-31
Figure 4.2.5-11: Test2, 3X9 Voltage and Current.....	2-32
Figure 4.2.5-12: Test2, 3X9 KVA and KW.....	2-33
Figure 4.2.6-1: Test2, 600V 3XS1 Voltage and Current.....	2-34
Figure 4.2.6-2: Test2, 600V 3XS1 KVA and KW.....	2-35
Figure 4.2.6-3: Test2, 600V 3XS2 Voltage and Current.....	2-36
Figure 4.2.6-4: Test2, 600V 3XS2 KVA and KW.....	2-37
Figure 4.2.6-5: Test2, 600V 3XS3 Voltage and Current.....	2-38
Figure 4.2.6-6: Test2, 600V 3XS3 KVA and KW.....	2-39
Figure 4.2.7-1: Test2, 208V 3XS1 Voltage and Current.....	2-40
Figure 4.2.7-2: Test2, 208V 3XS1 KVA and KW.....	2-41
Figure 4.2.7-3: Test2, 208V 3XS2 Voltage and Current.....	2-42
Figure 4.2.7-4: Test2, 208V 3XS2 KVA and KW.....	2-43
Figure 4.2.7-5: Test2, 208V 3XS3 Voltage and Current.....	2-44
Figure 4.2.7-6: Test2, 208V 3XS3 KVA and KW.....	2-45
Figure 4.2.8-1: Test2, Battery Charger 3CA Voltage and Current.....	2-46

Figure 4.2.1-1: Test2, Keowee Voltage and Current

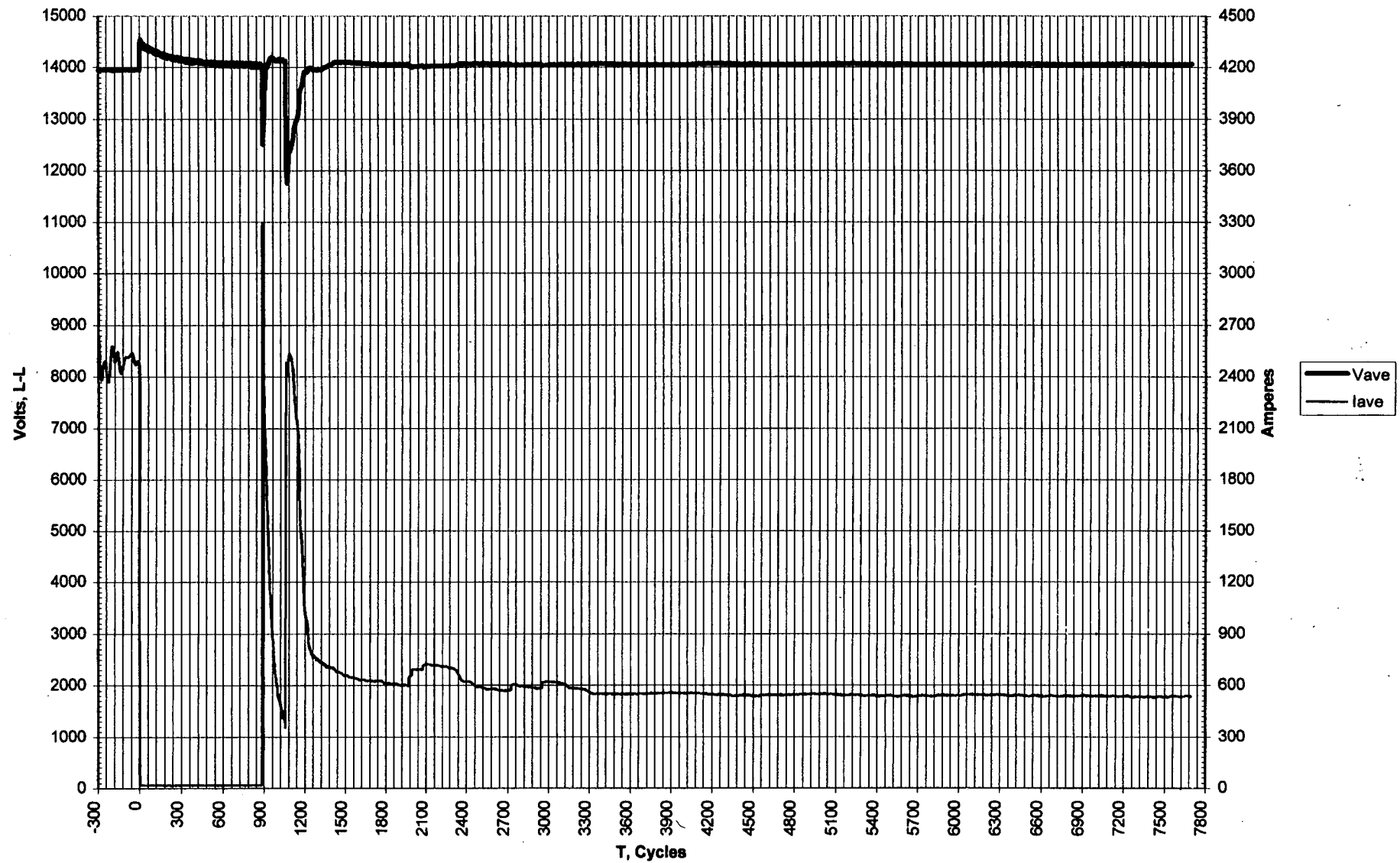


Figure 4.2.1-2: Test2, Keowee Voltage

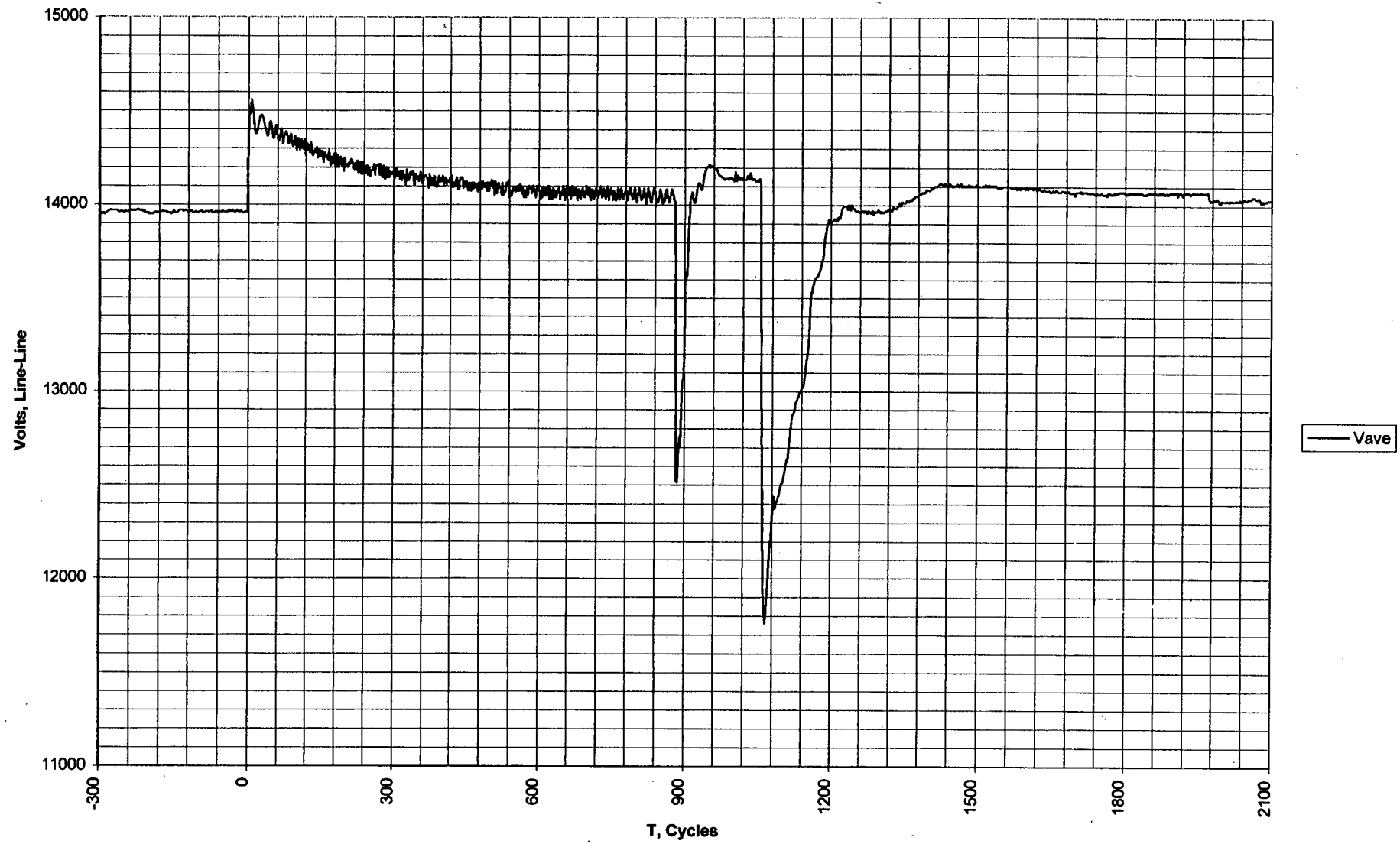


Figure 4.2.1-3: Test2, Keowee KVA

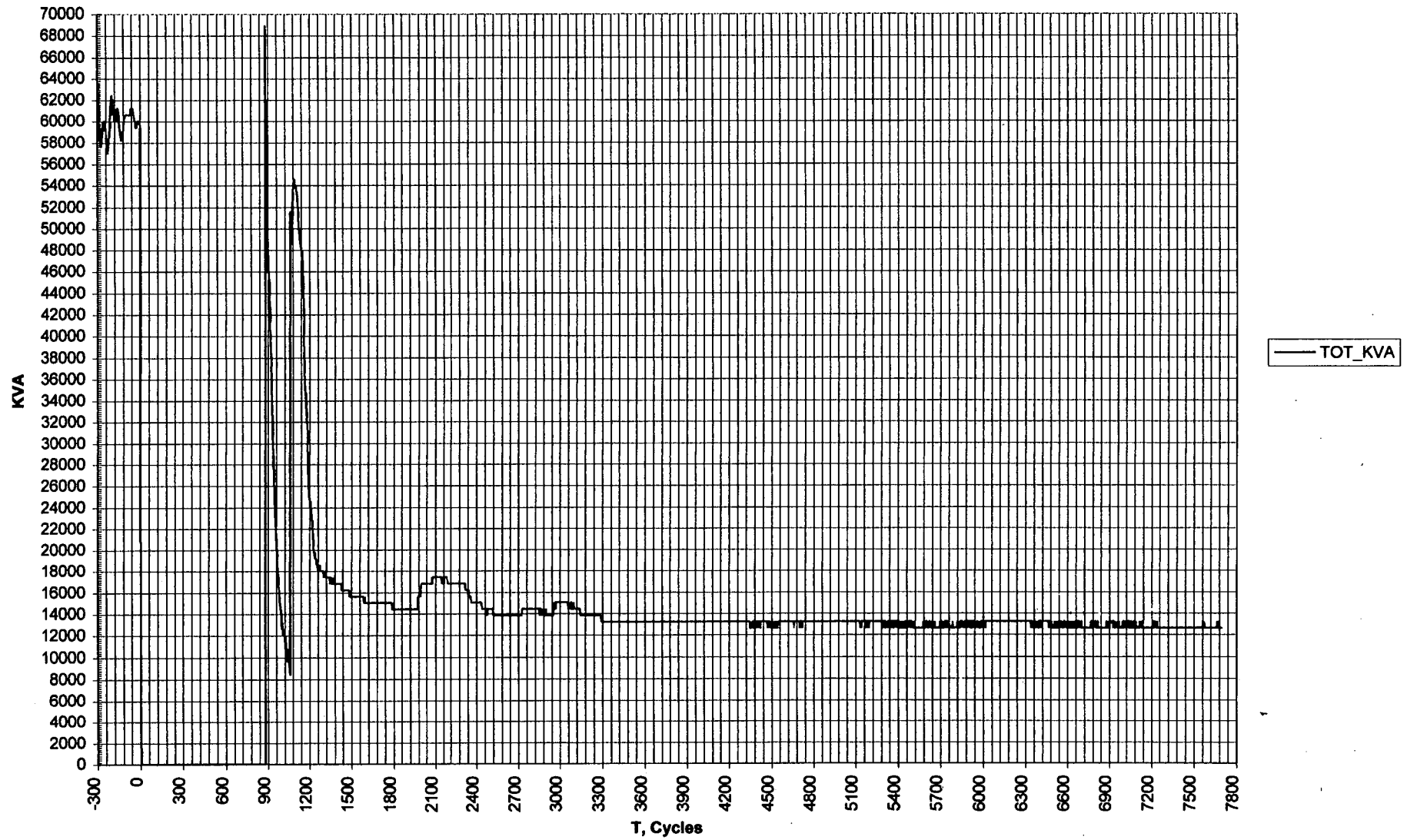


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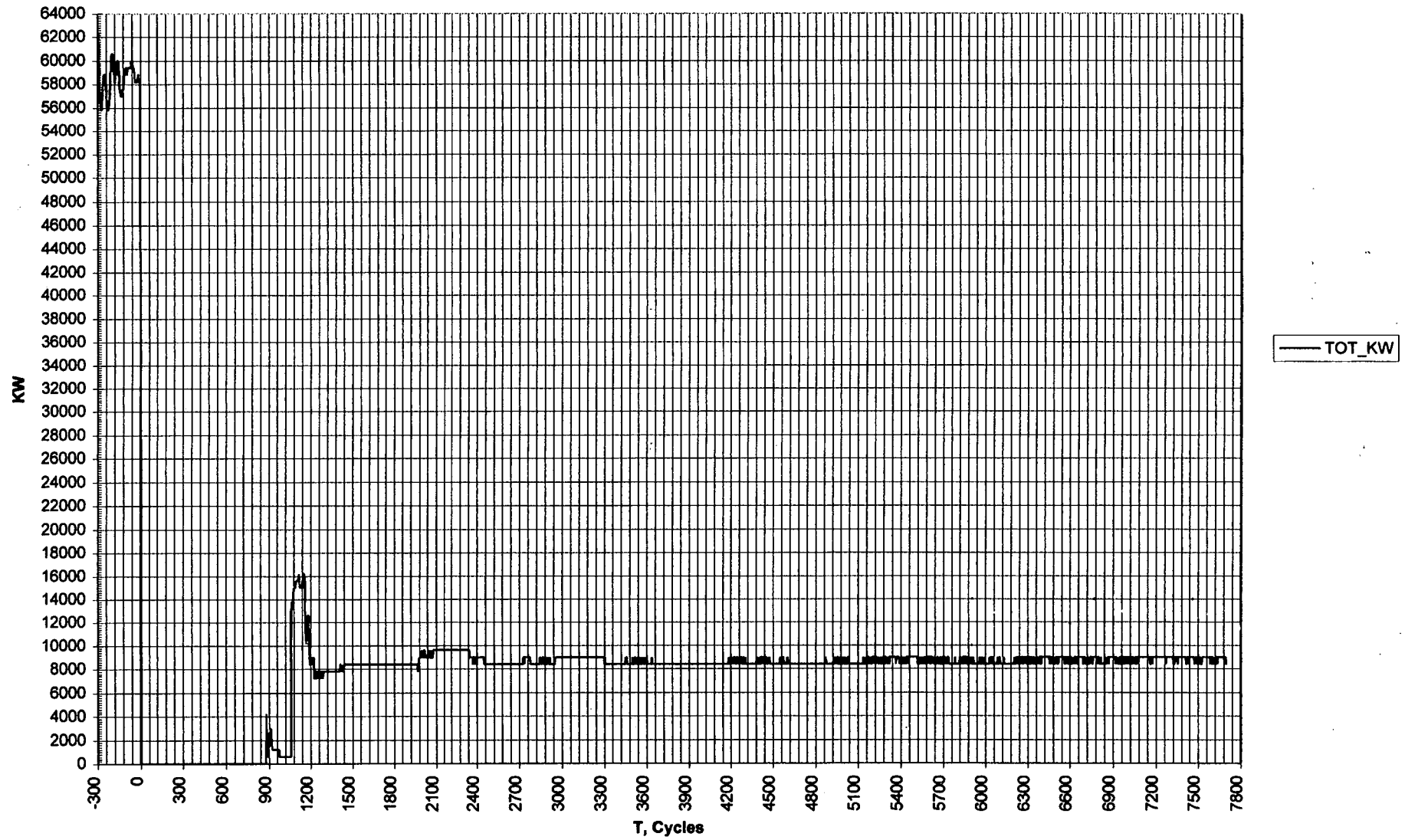


Figure 4.2.1-5: Test2, Keowee Frequency and Current

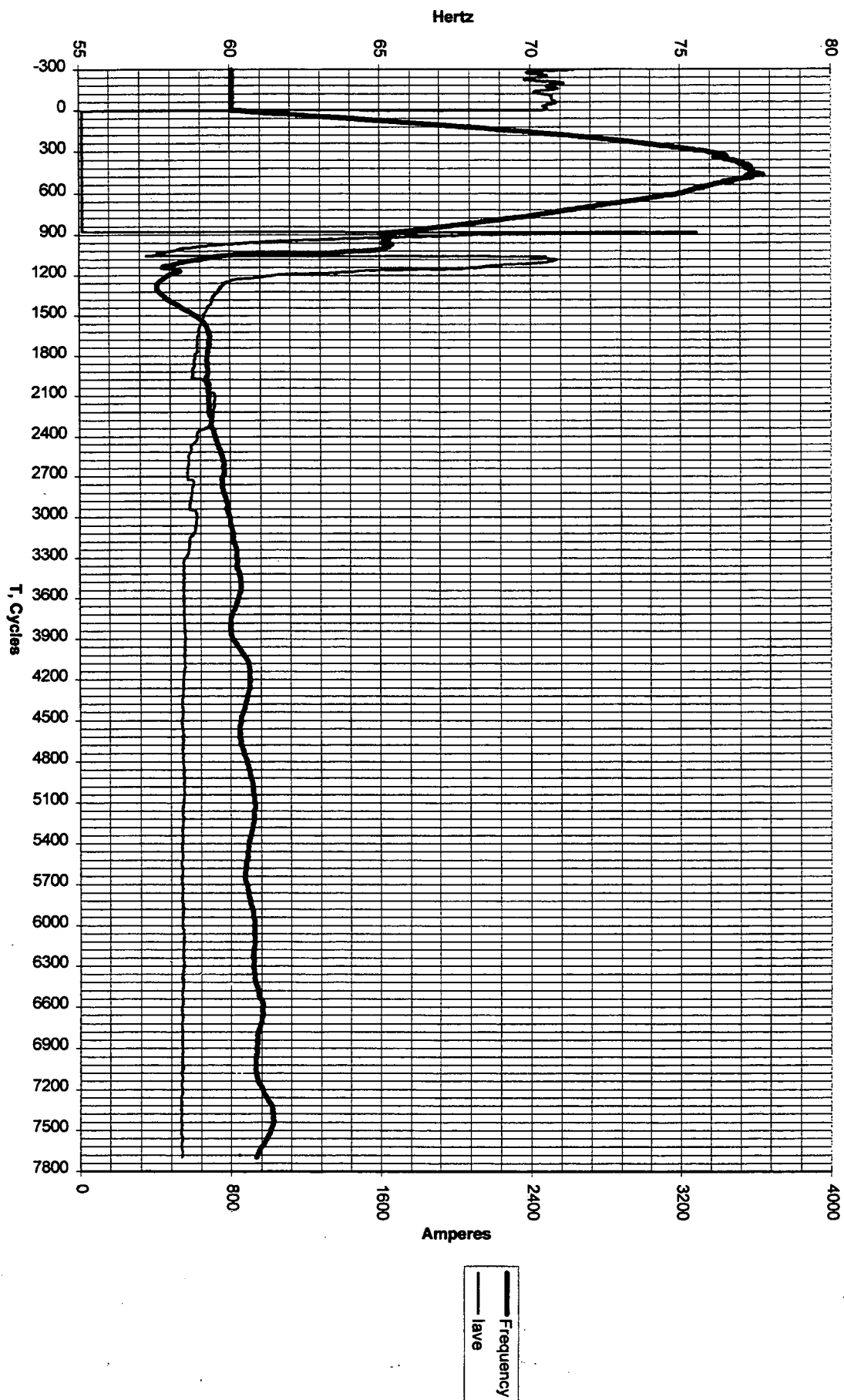


Figure 4.2.1-6: Test2, Keowee Frequency

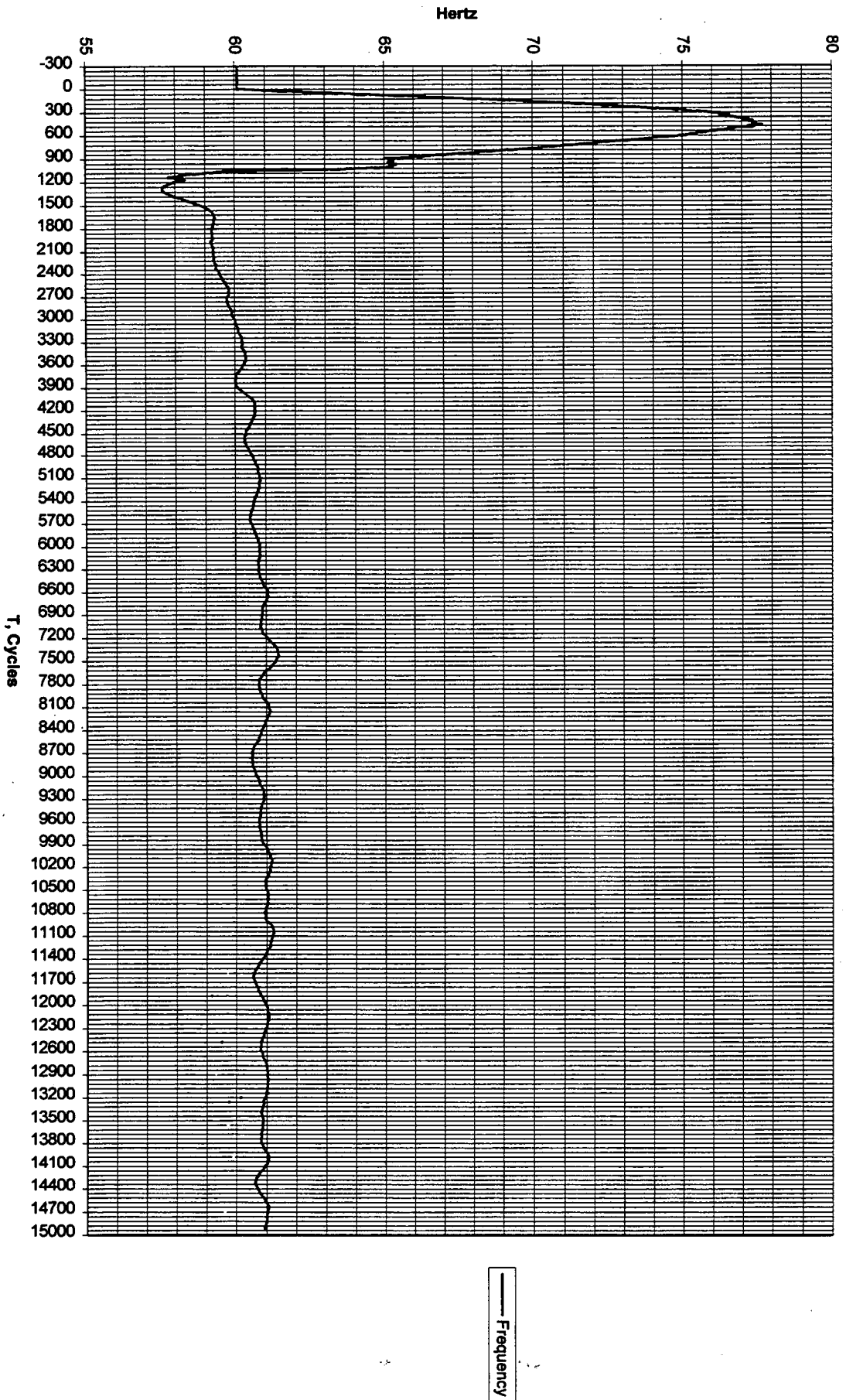


Figure 4.2.2-1: Test2, Unit 1 MFB Voltage and Current



Figure 4.2.2-2: Test2, Unit 1 MFB KVA or KW

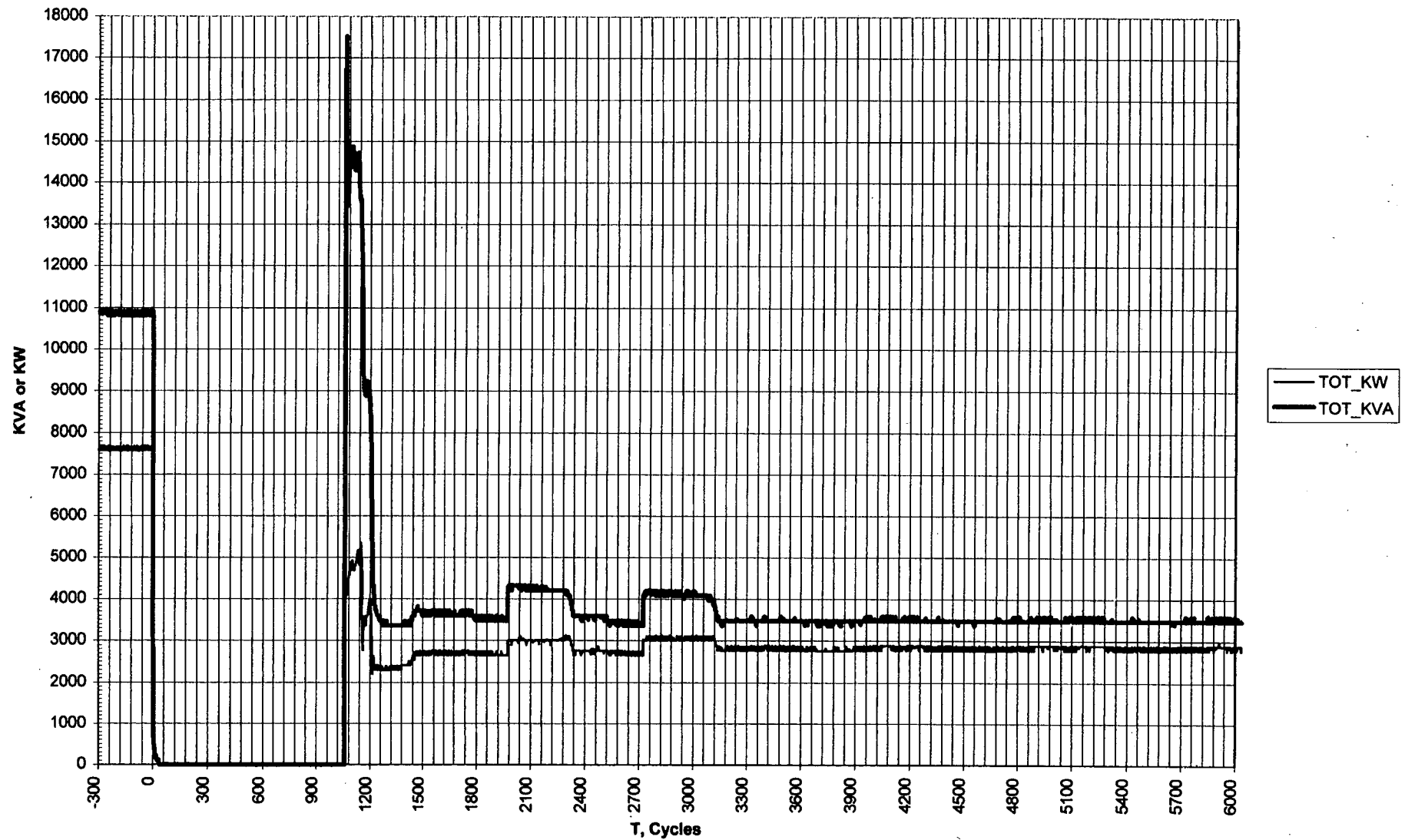


Figure 4.2.2-3: Test2, Unit 2 MFB Voltage and Current

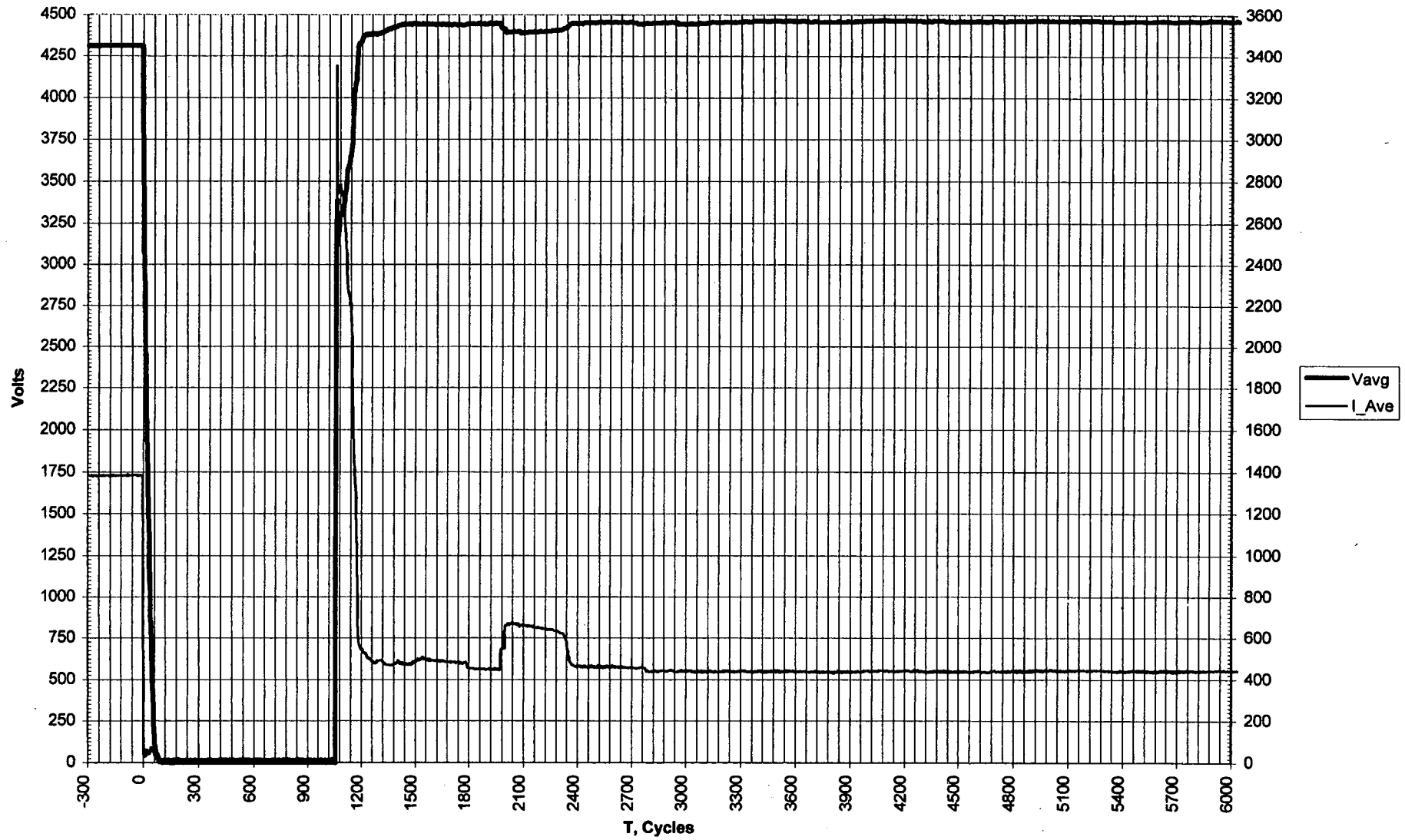


Figure 4.2.2-4: Test2, Unit 2 MFB KVA and KW

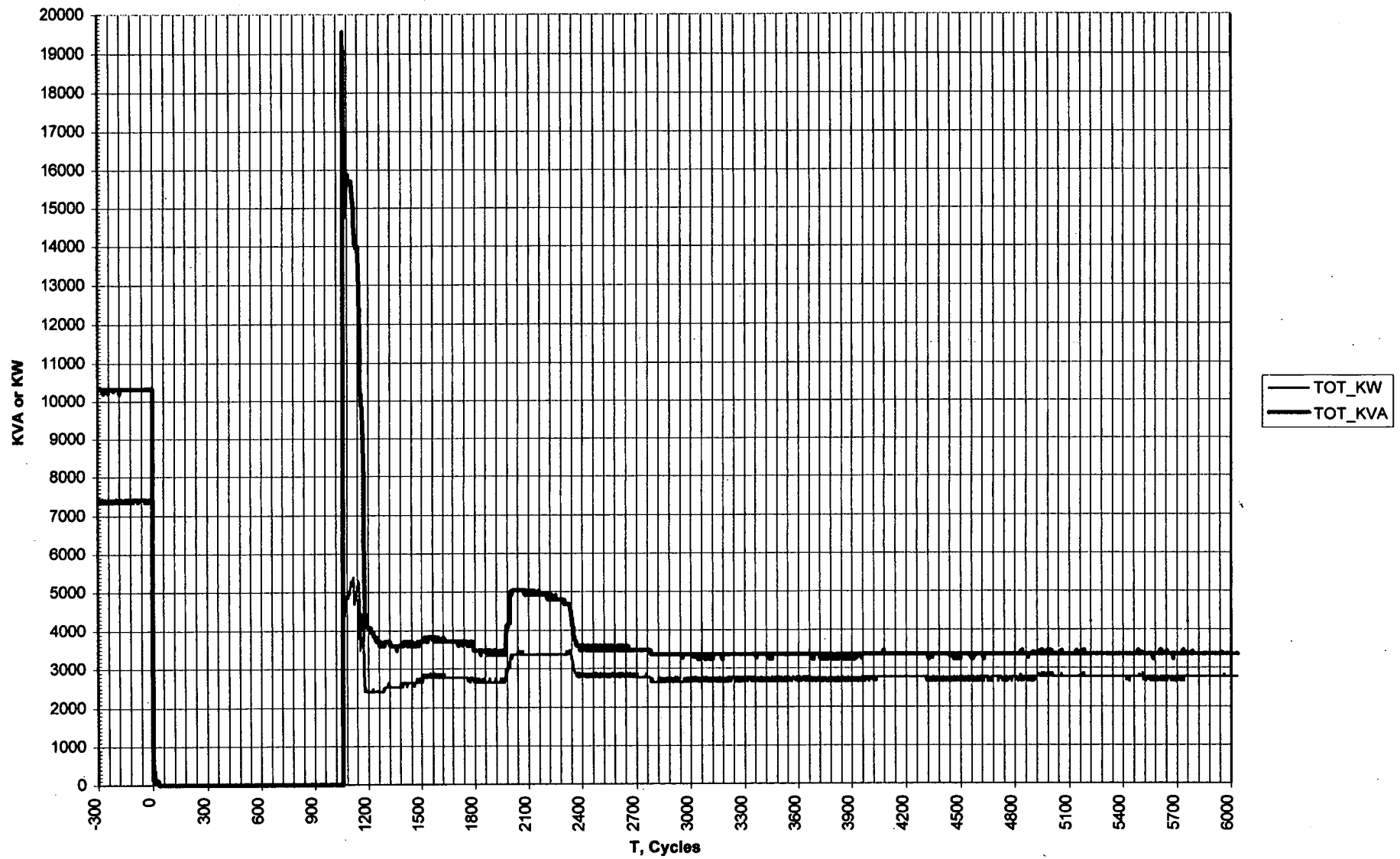


Figure 4.2.2-5: Test2, Unit 3 MFB Voltage and Current



Figure 4.2.2-6: Test2, Unit 3 MFB KVA and KW

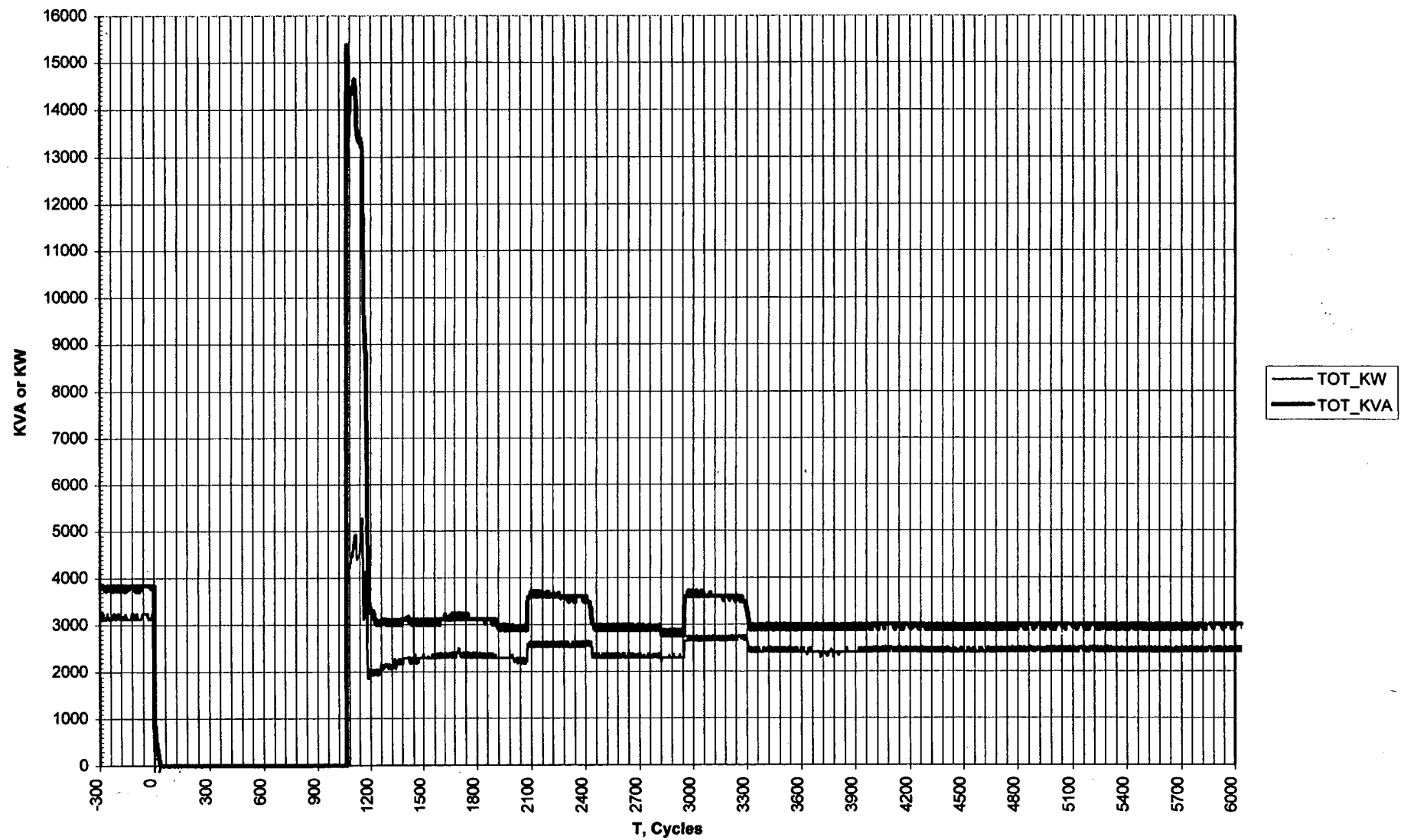


Figure 4.2.3-1: Test2, EFW 3B Voltage and Current

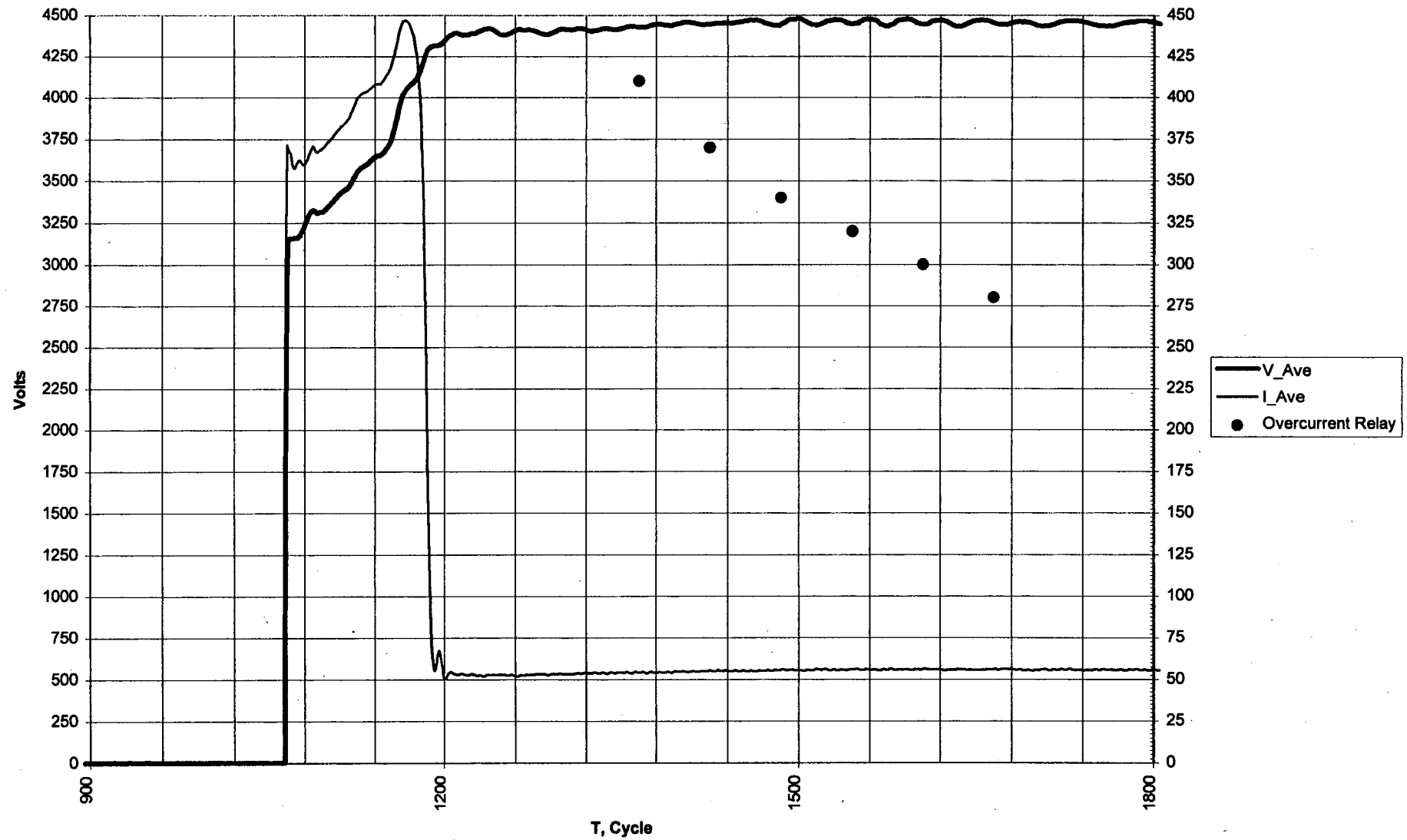


Figure 4.2.3-2: Test2, EFW 3B KVA or KW

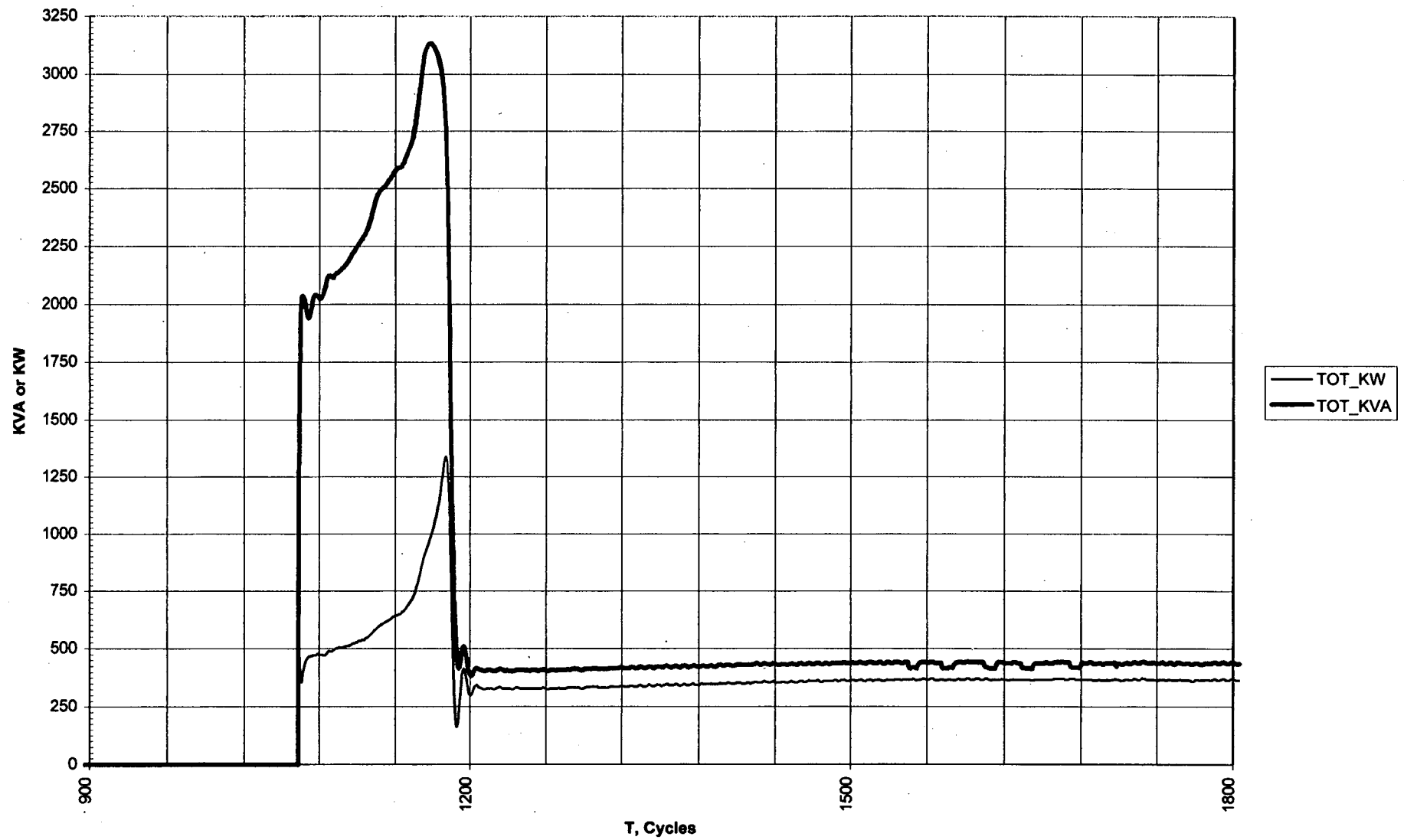


Figure 4.2.3-3: Test2, HPI 3B Voltage and Current

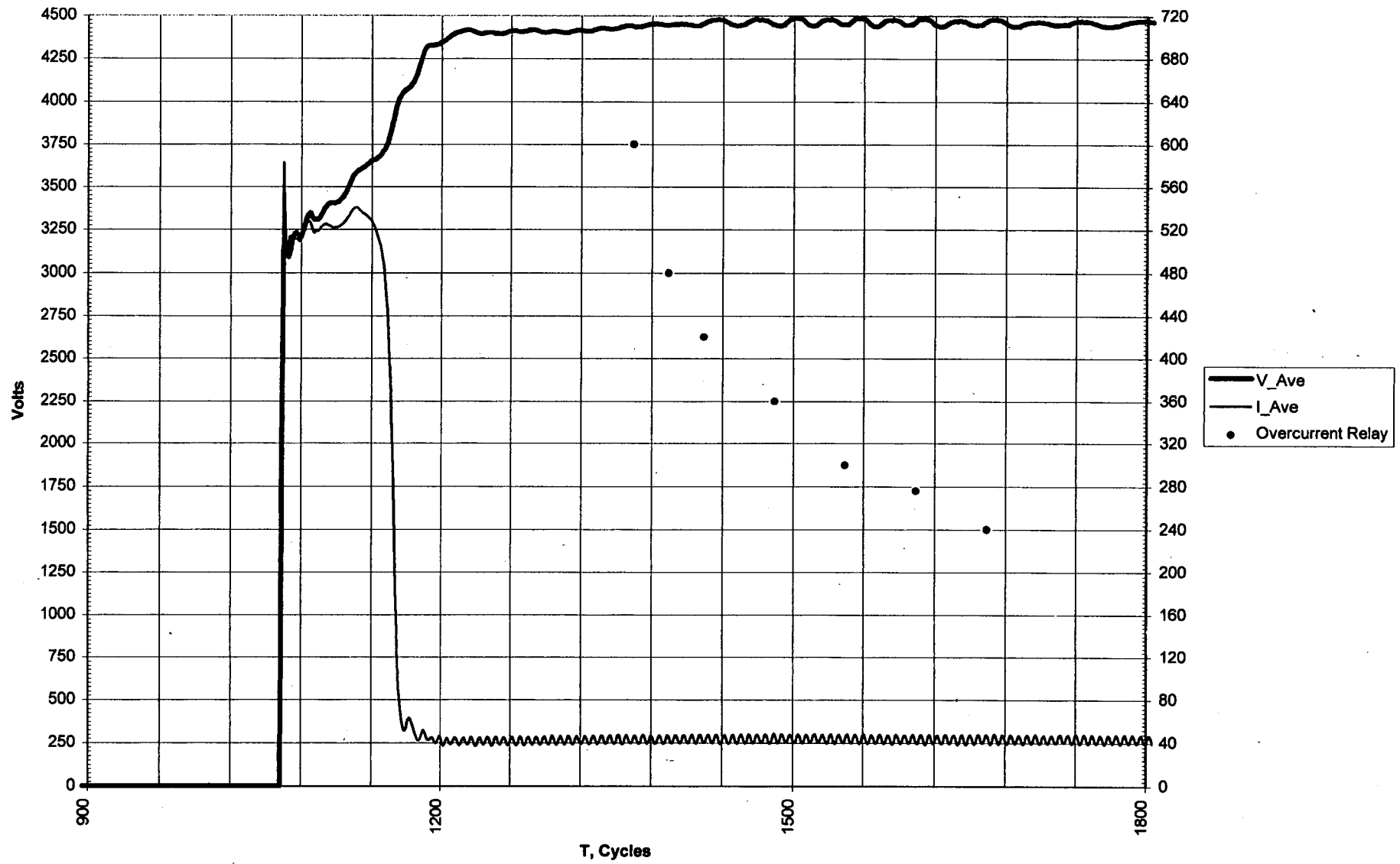


Figure 4.2.3-4: Test2, HPI 3B KVA and KW

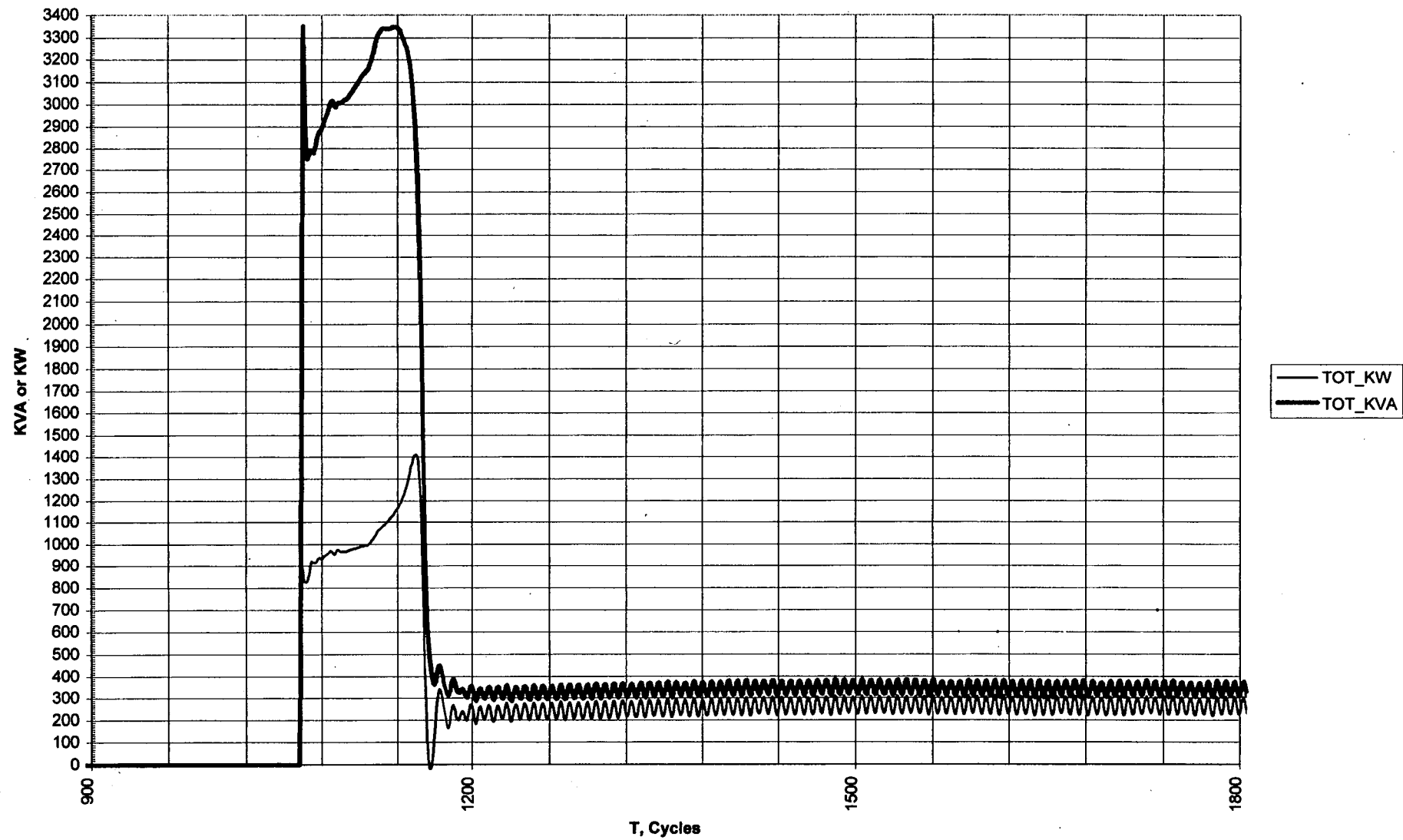


Figure 4.2.3-5: Test2, EFW Pump 1A Voltage and Current

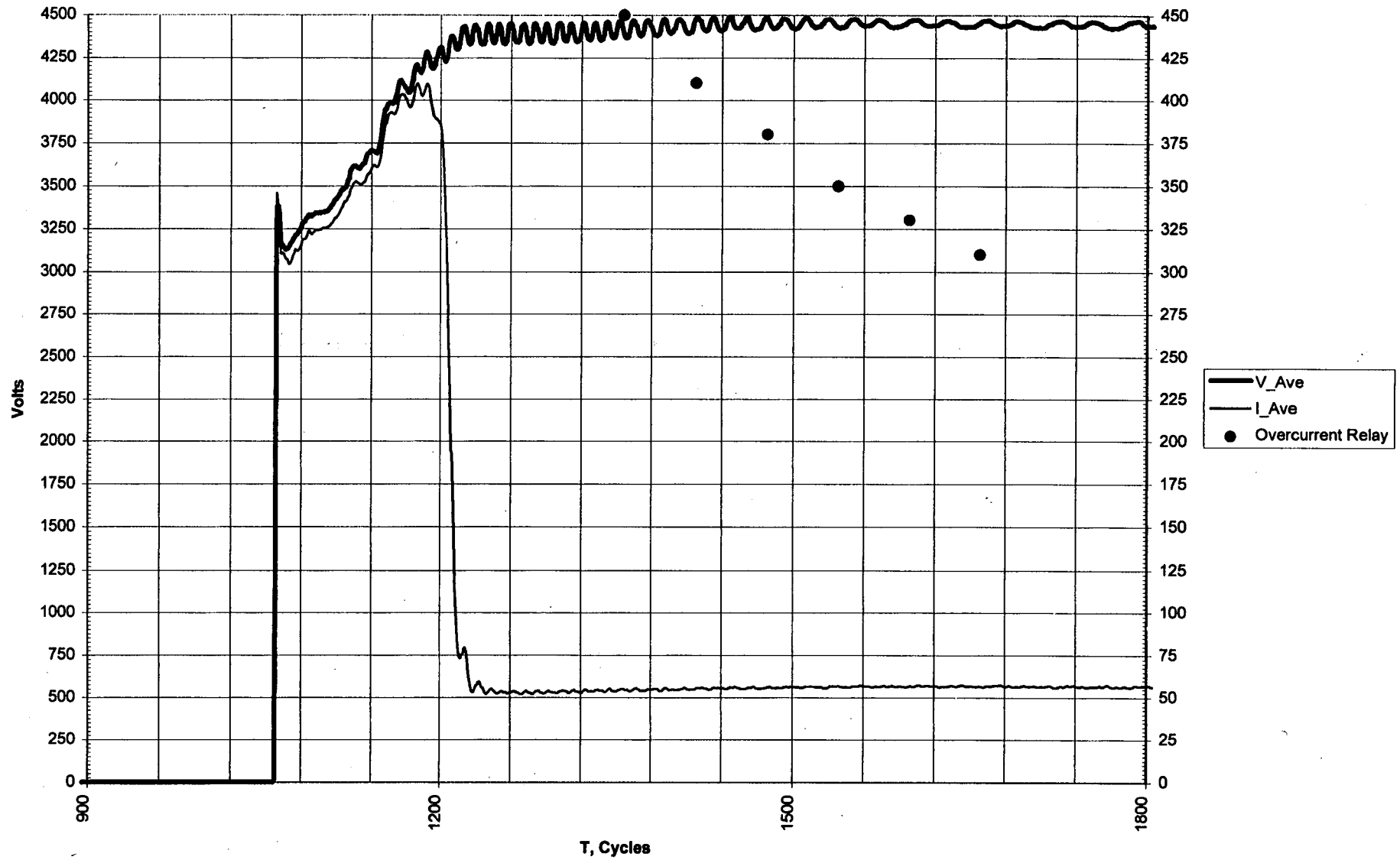


Figure 4.2.3-6: Test2, EFW 1A KVA and KW

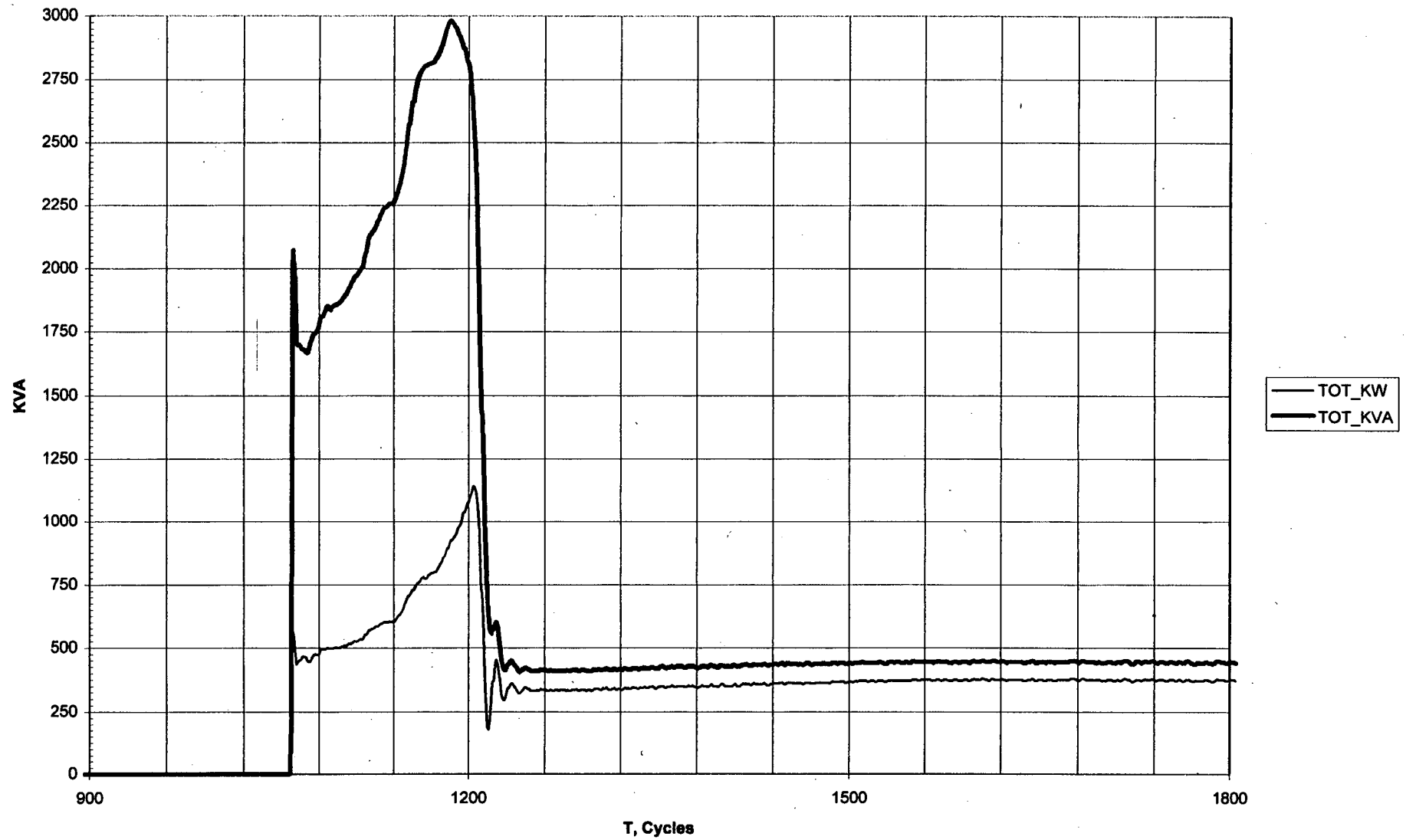


Figure 4.2.3-7: Test2, LPSW 3B Voltage and Current

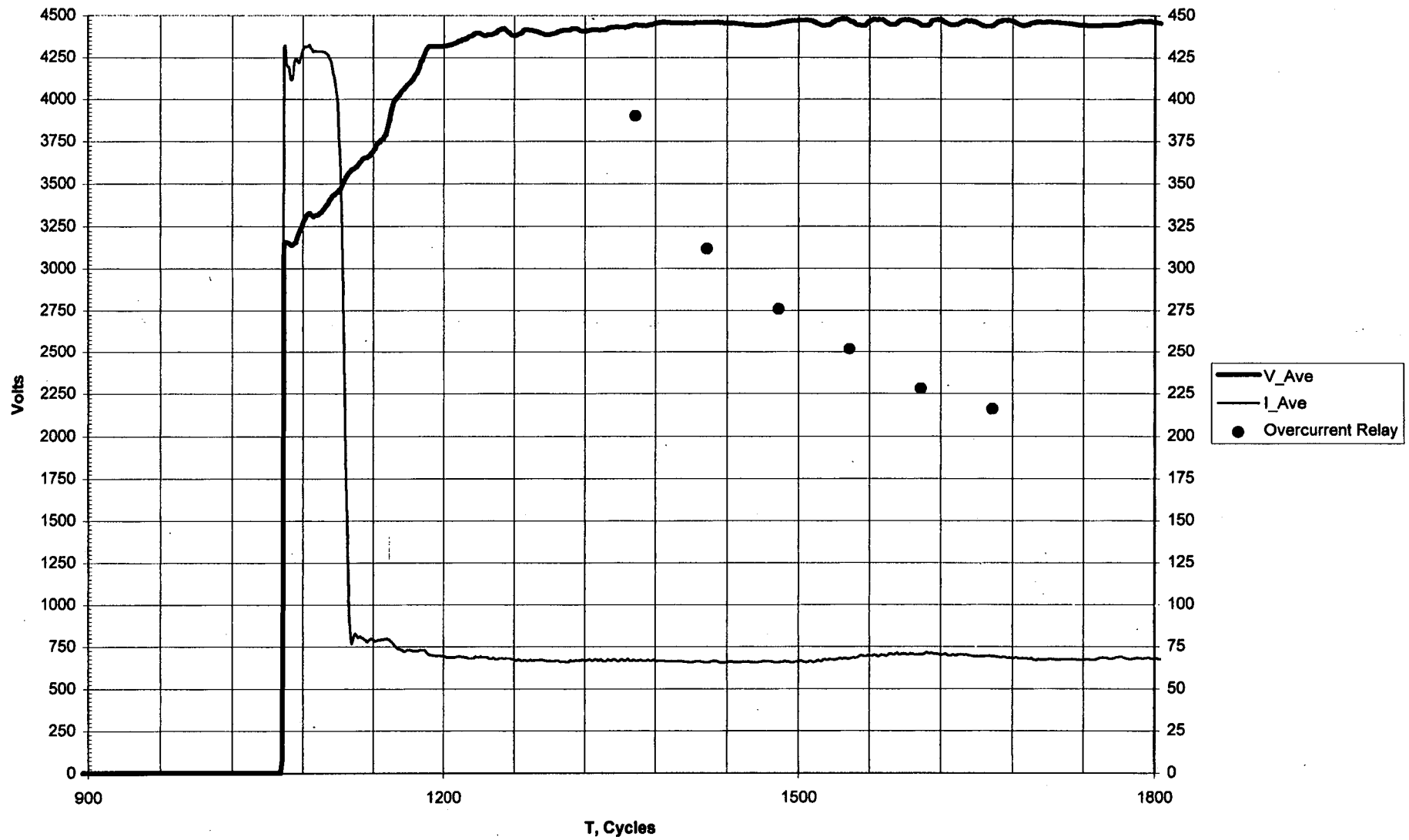


Figure 4.2.3-8: Test2, LPSW 3B KVA and KW

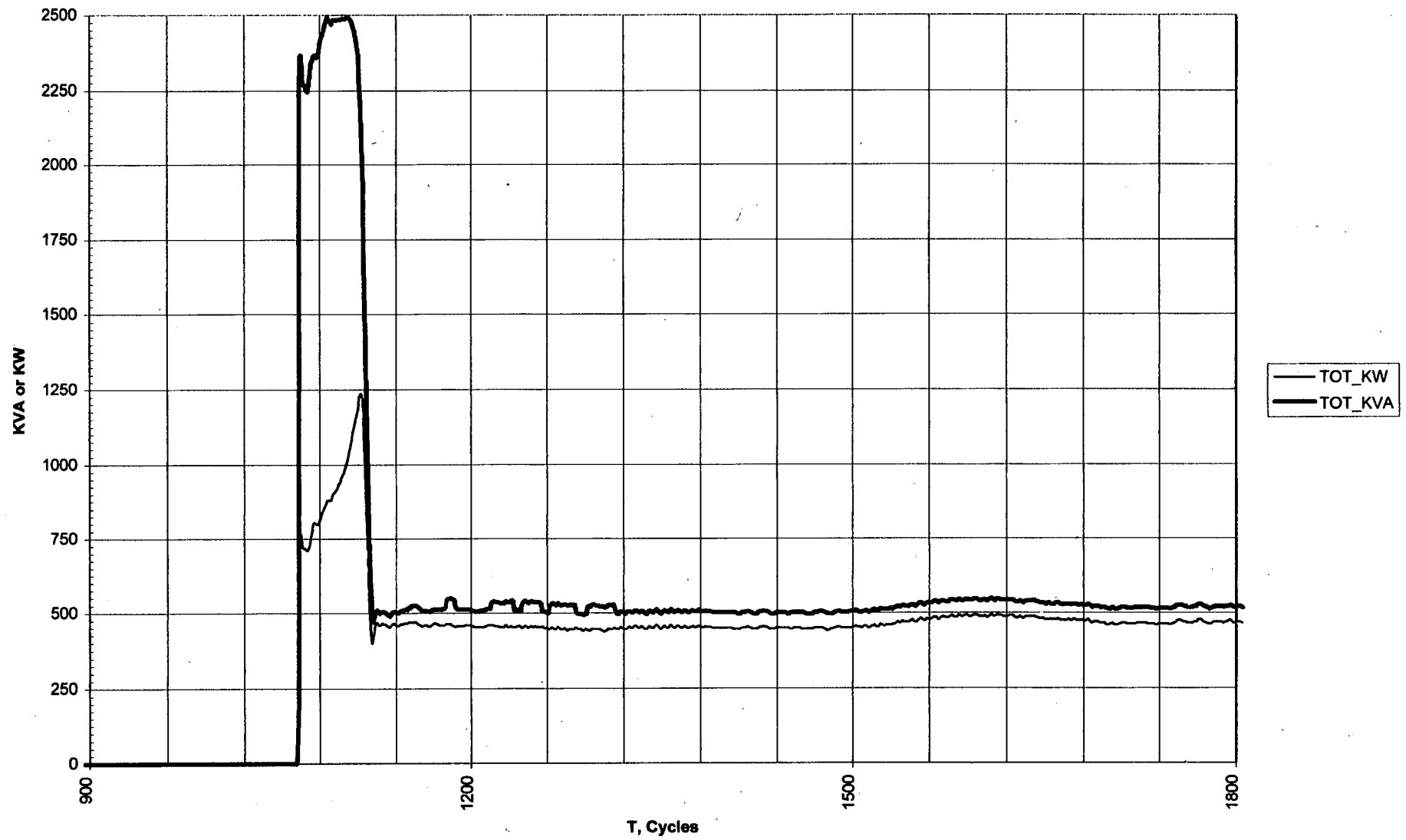


Figure 4.2.5-1: Test2, 1X5 Voltage and Current

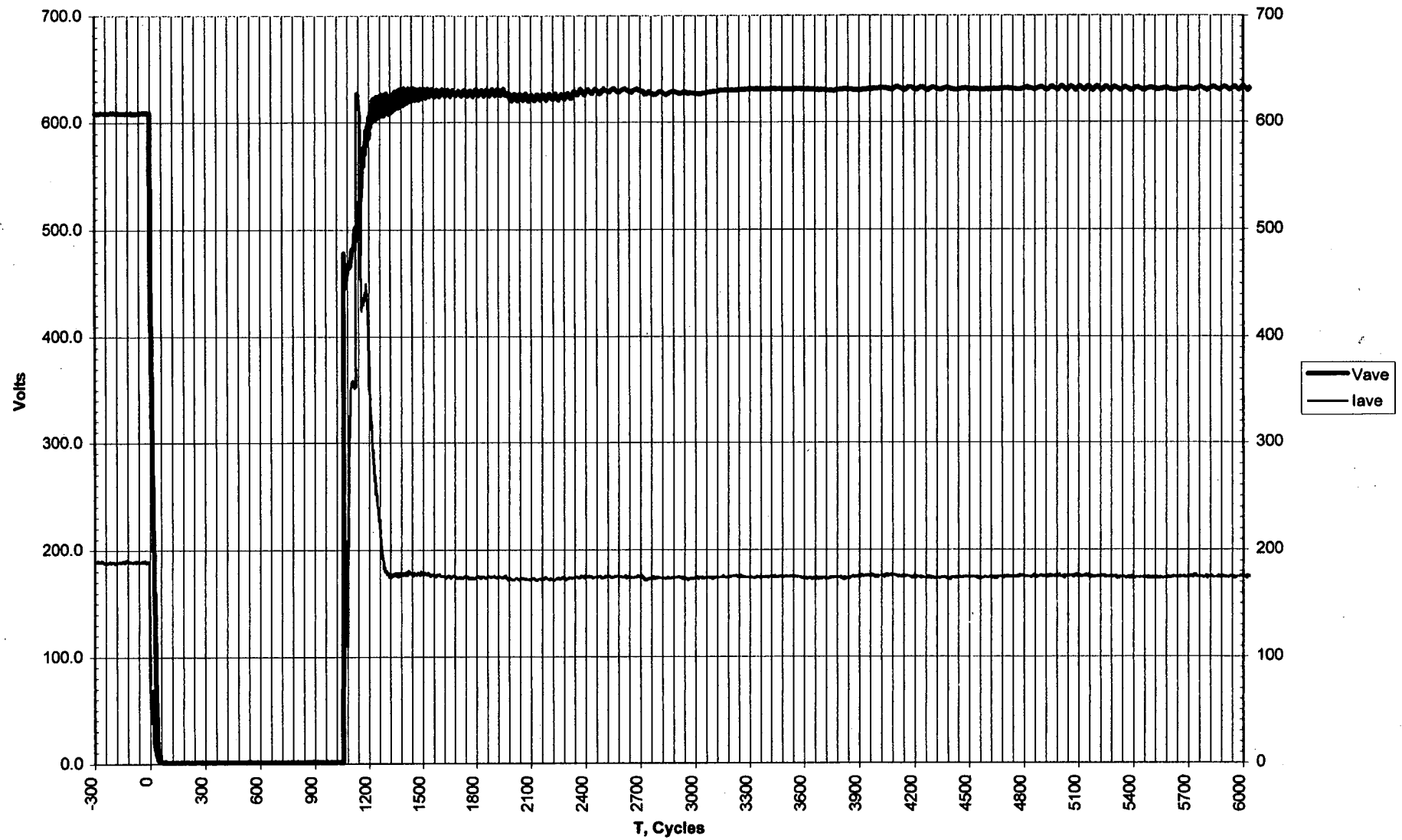


Figure 4.2.5-2: Test2, 1X5 KVA and KW

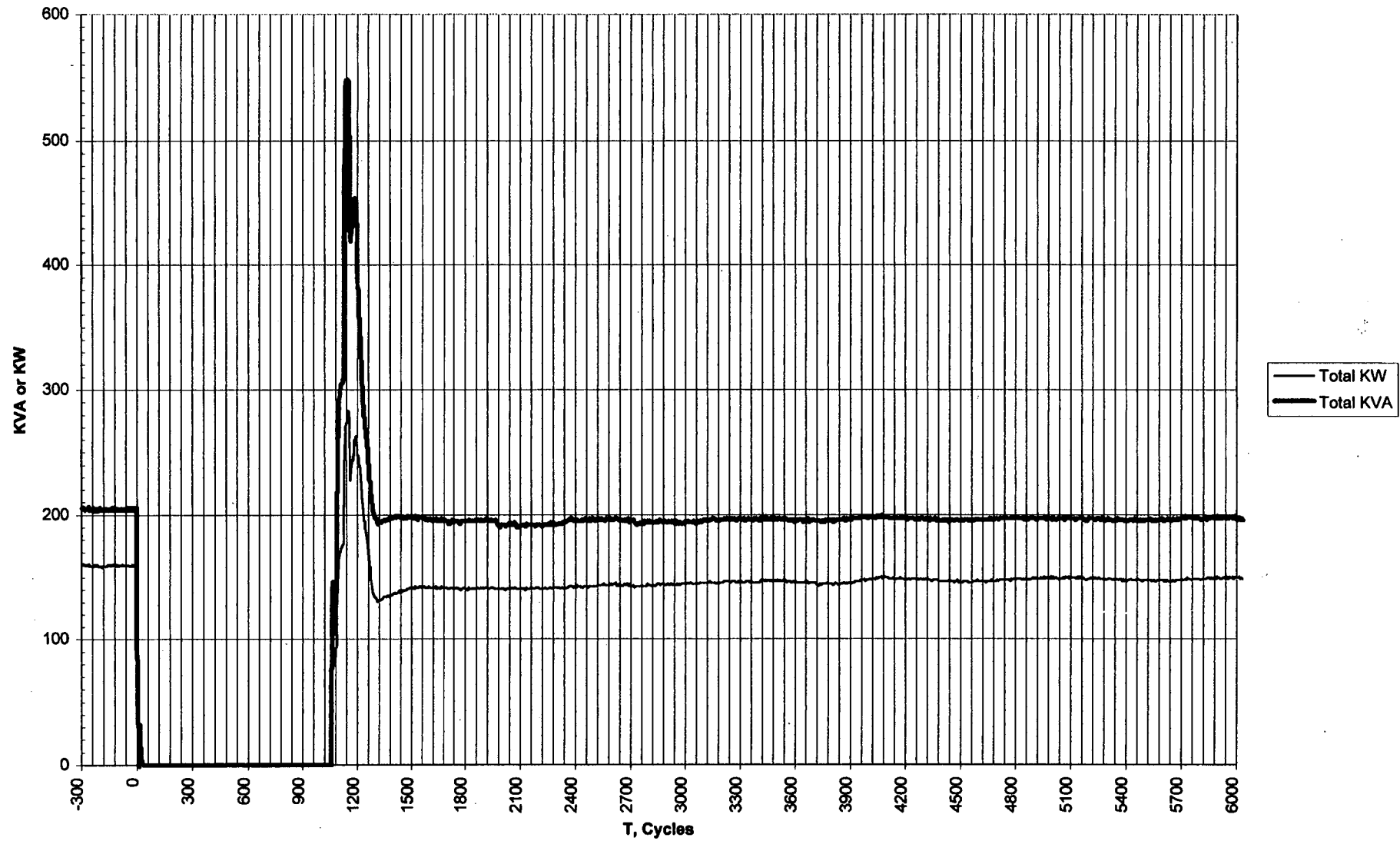


Figure 4.2.5-3: Test2, 1X6 Voltage and Current



Figure 4.2.5-4: Test2, 1X6 KVA or KW

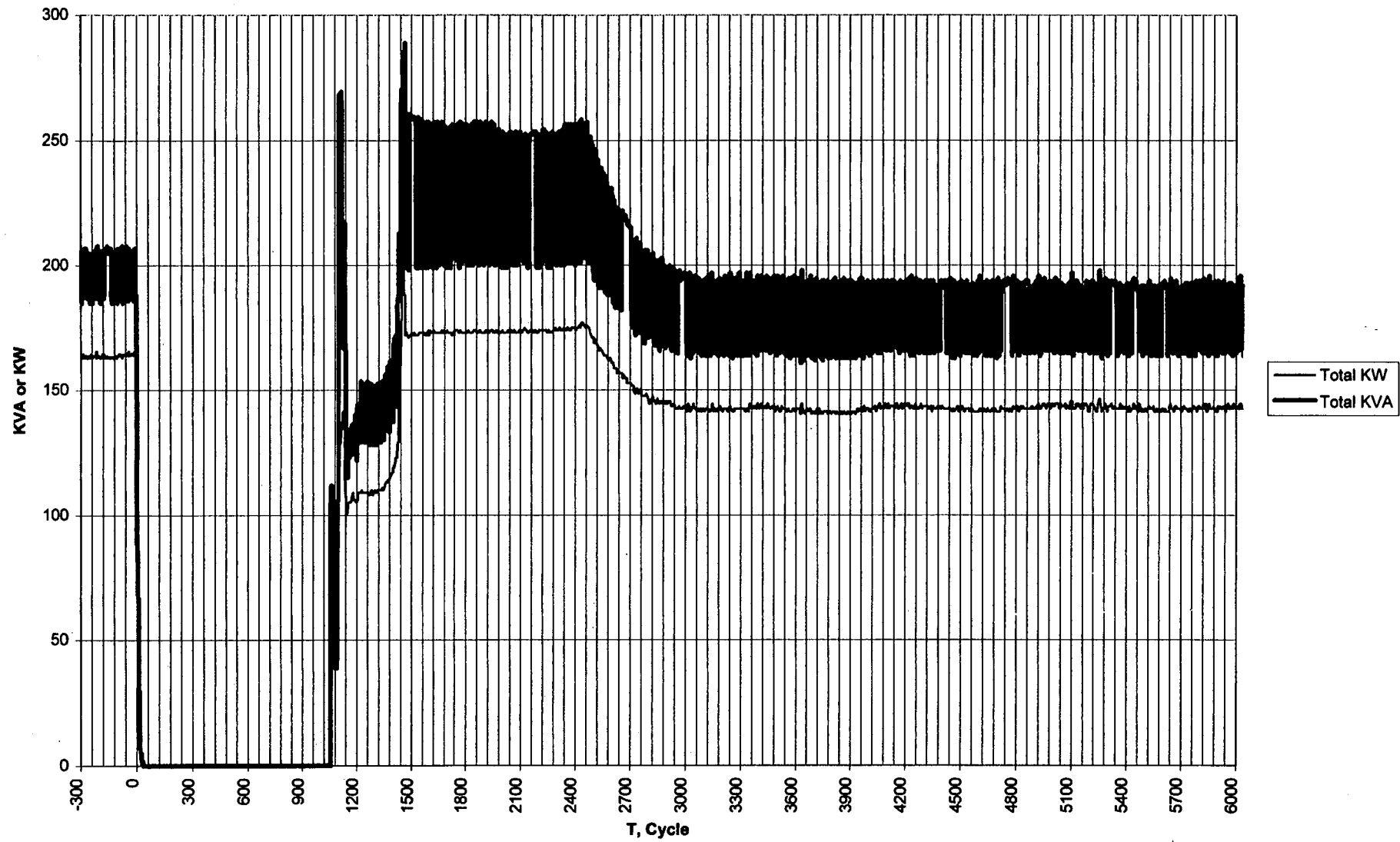


Figure 4.2.5-5: Test2, 3X5 Voltage and Current

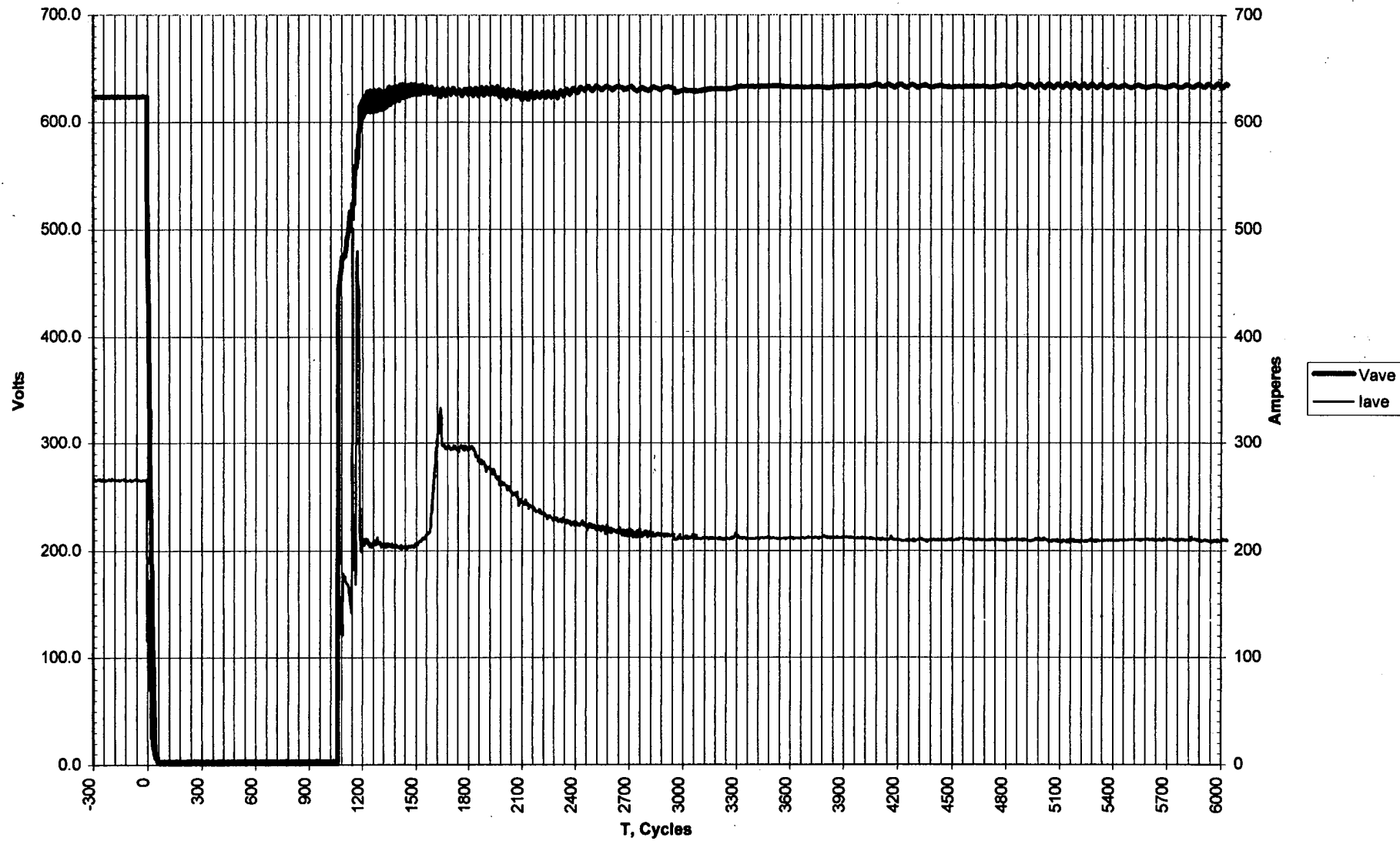


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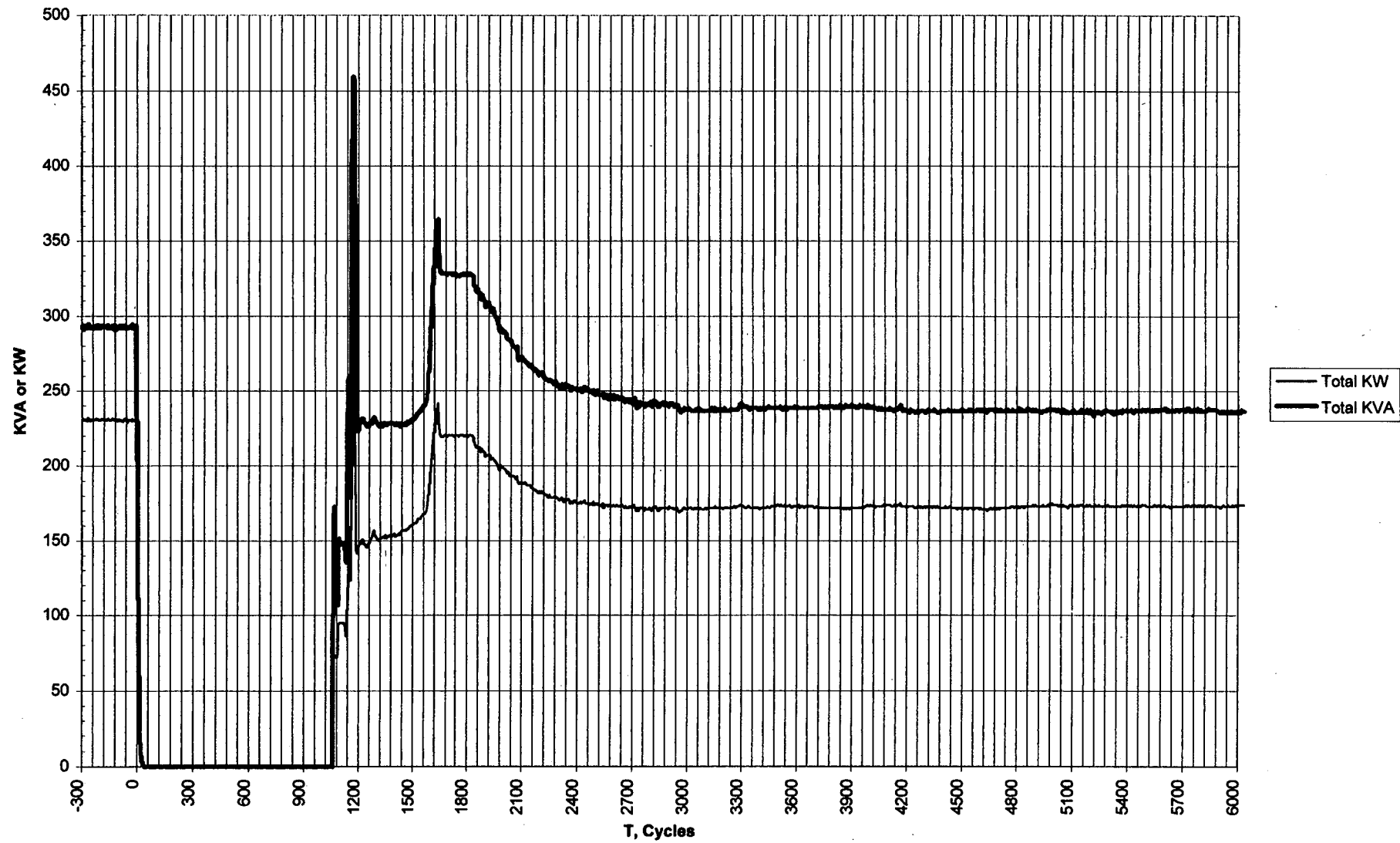


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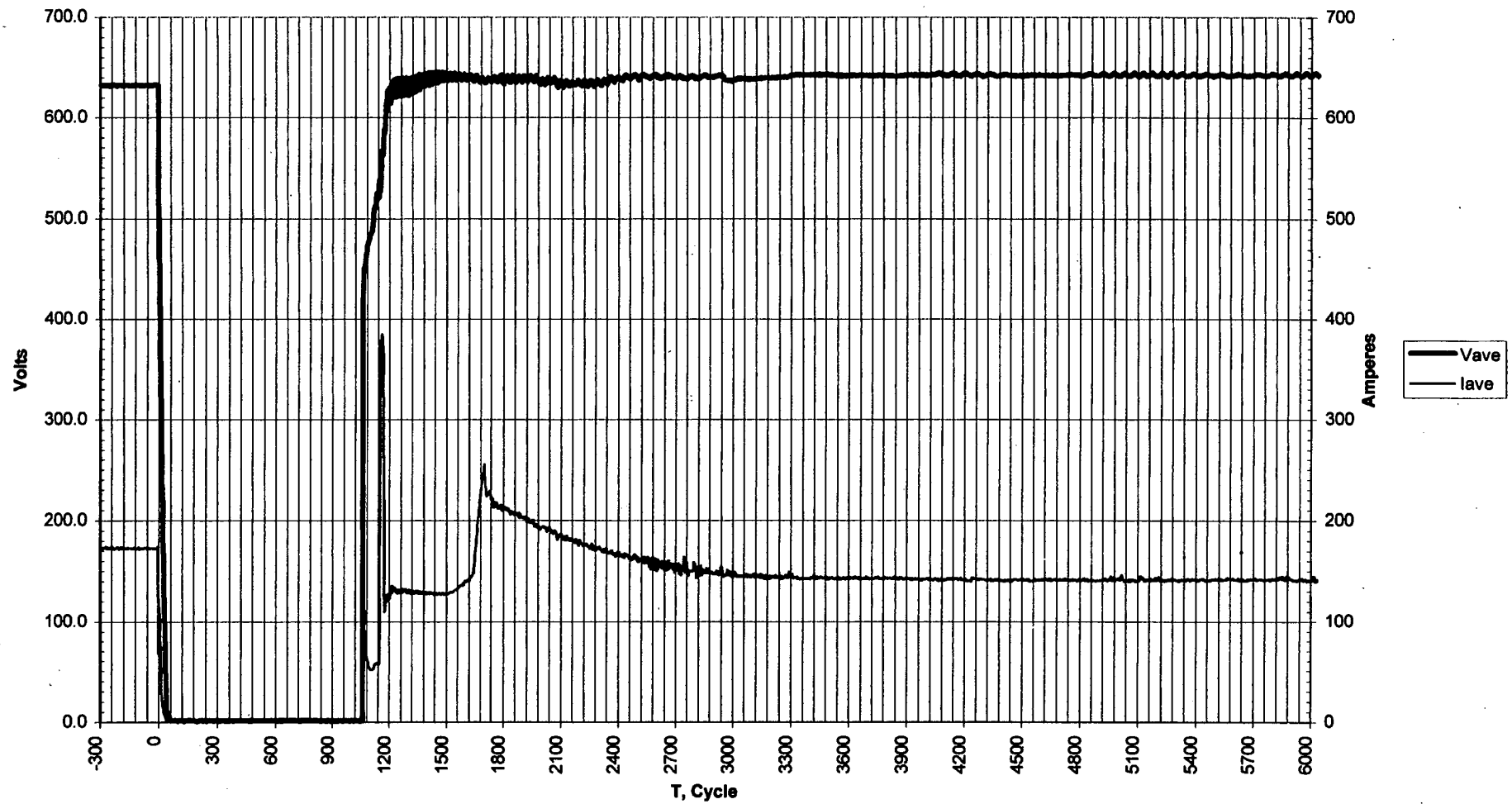


Figure 4.2.5-8: Test2, 3X6 KVA and KW

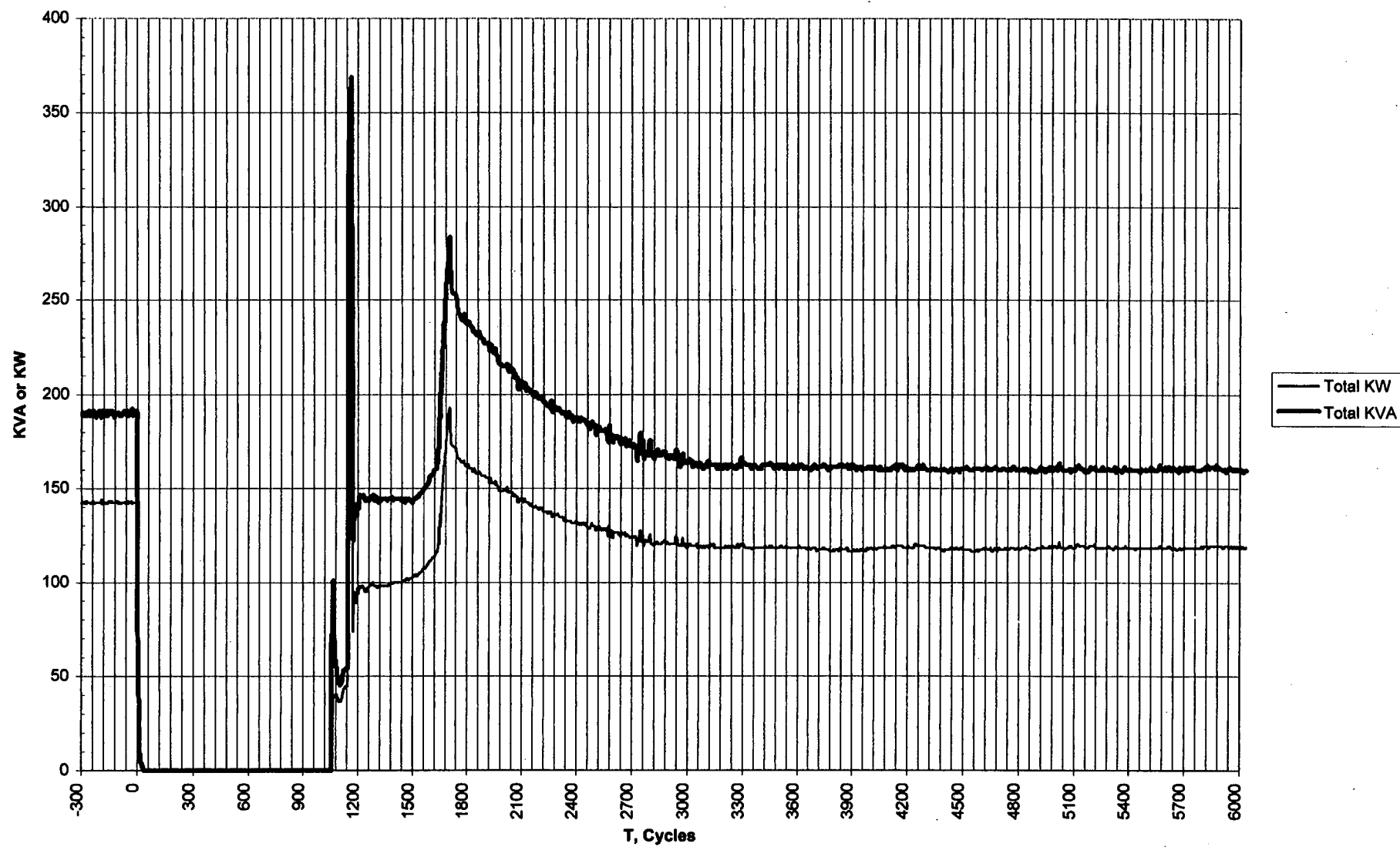


Figure 4.2.5-9: Test2, 3X8 Voltage and Current

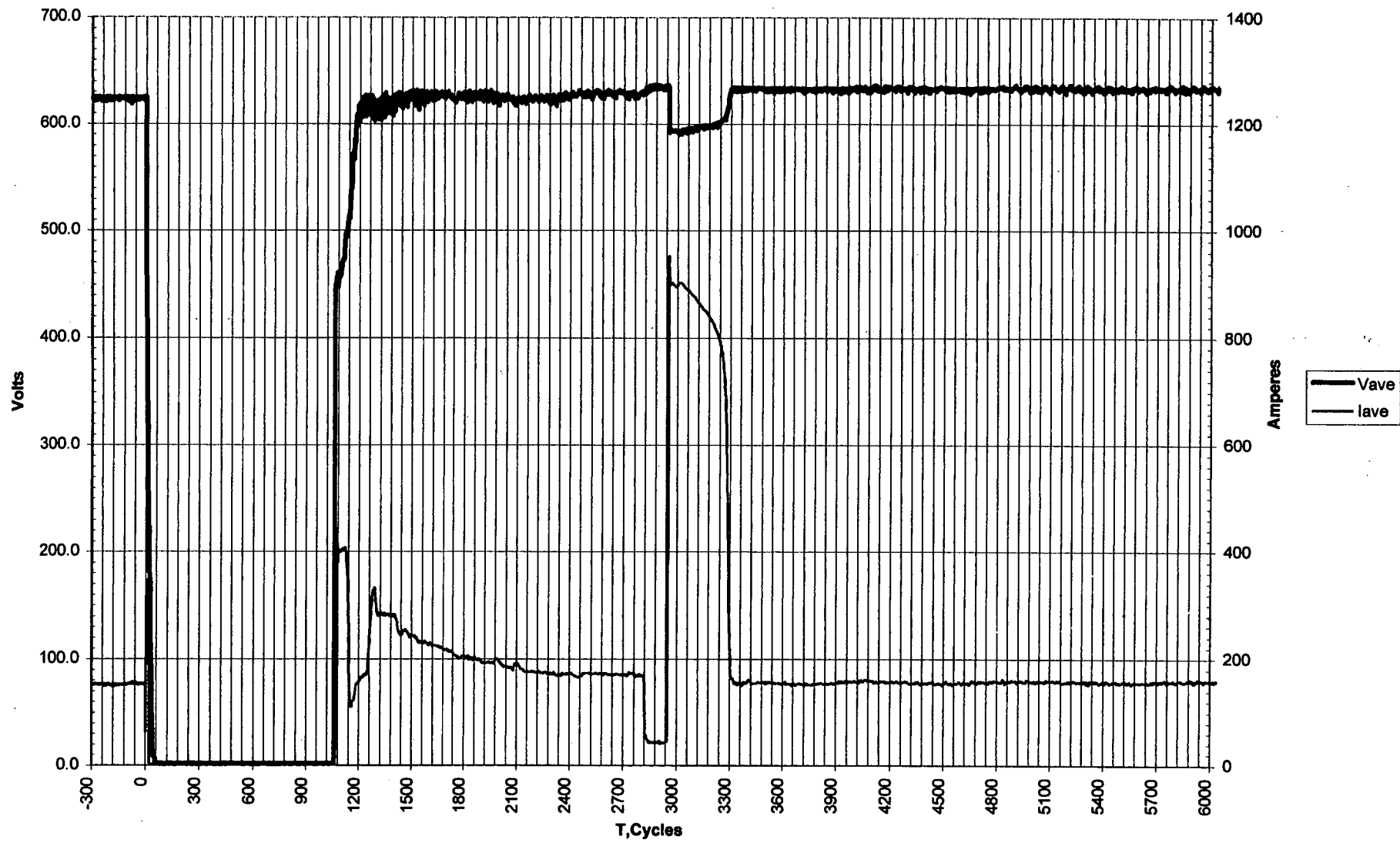


Figure 4.2.5-10: Test2, 3X8 KVA and KW

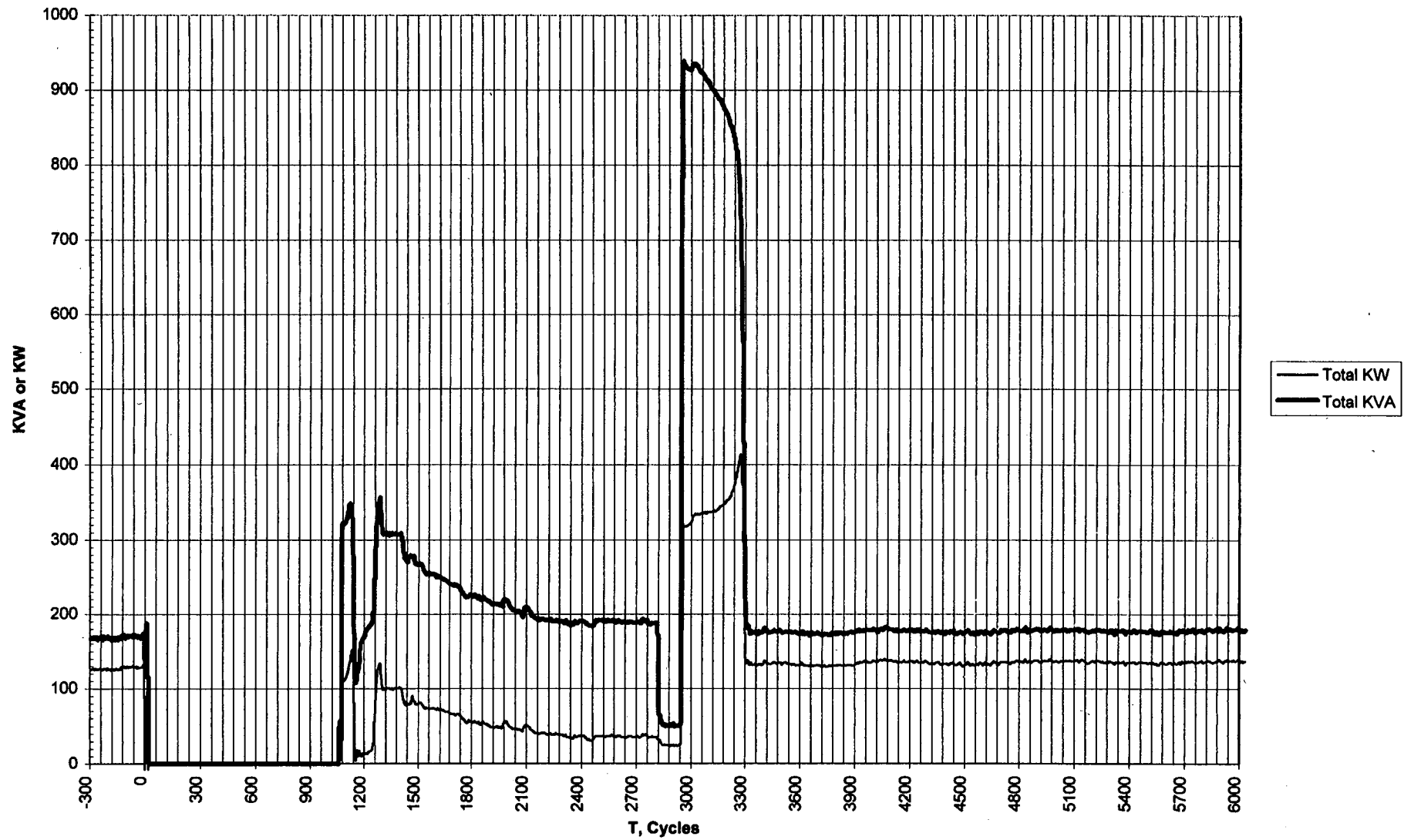


Figure 4.2.5-11: Test2, 3X9 Voltage and Current

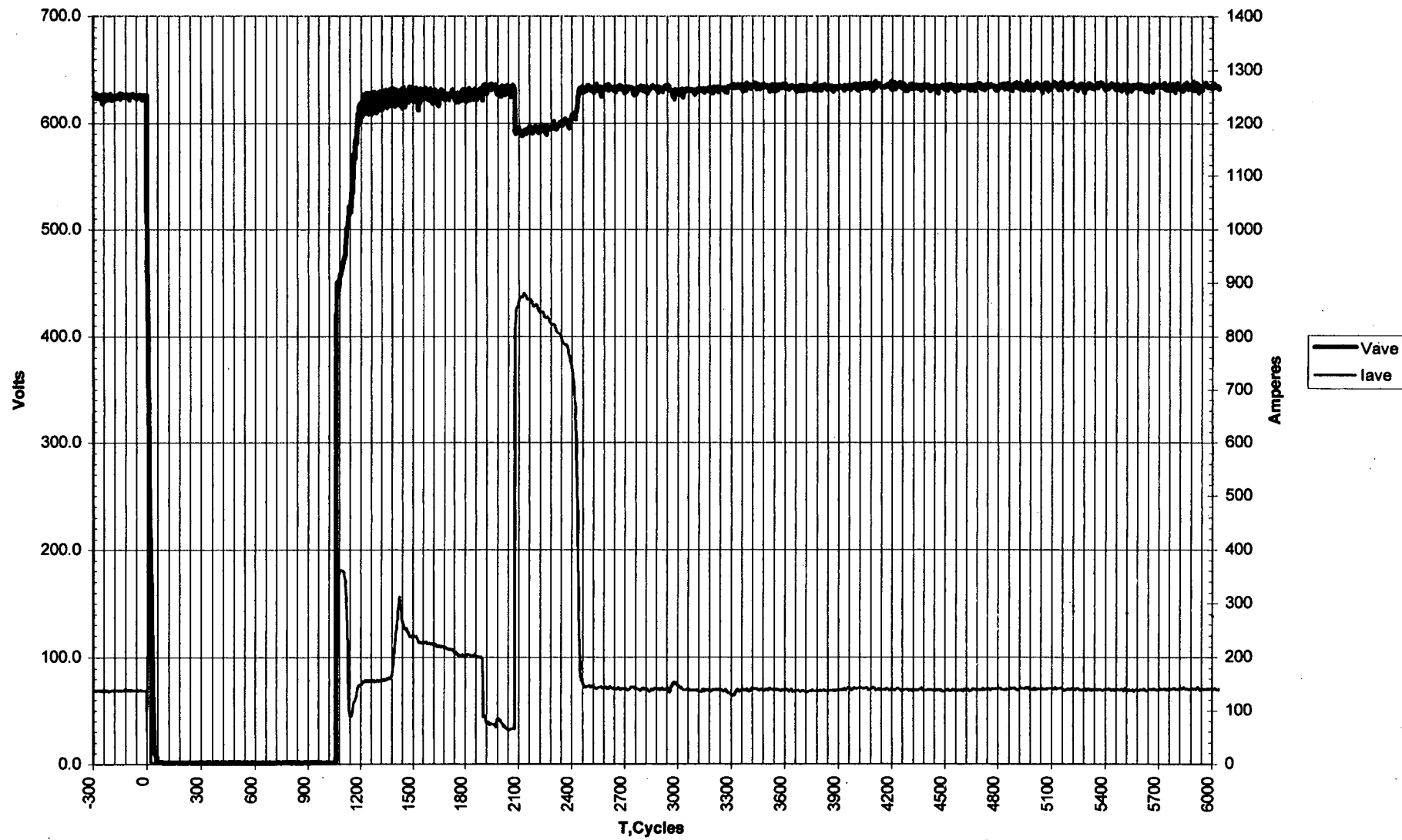


Figure 4.2.5-12: Test2, 3X9 KVA and KW

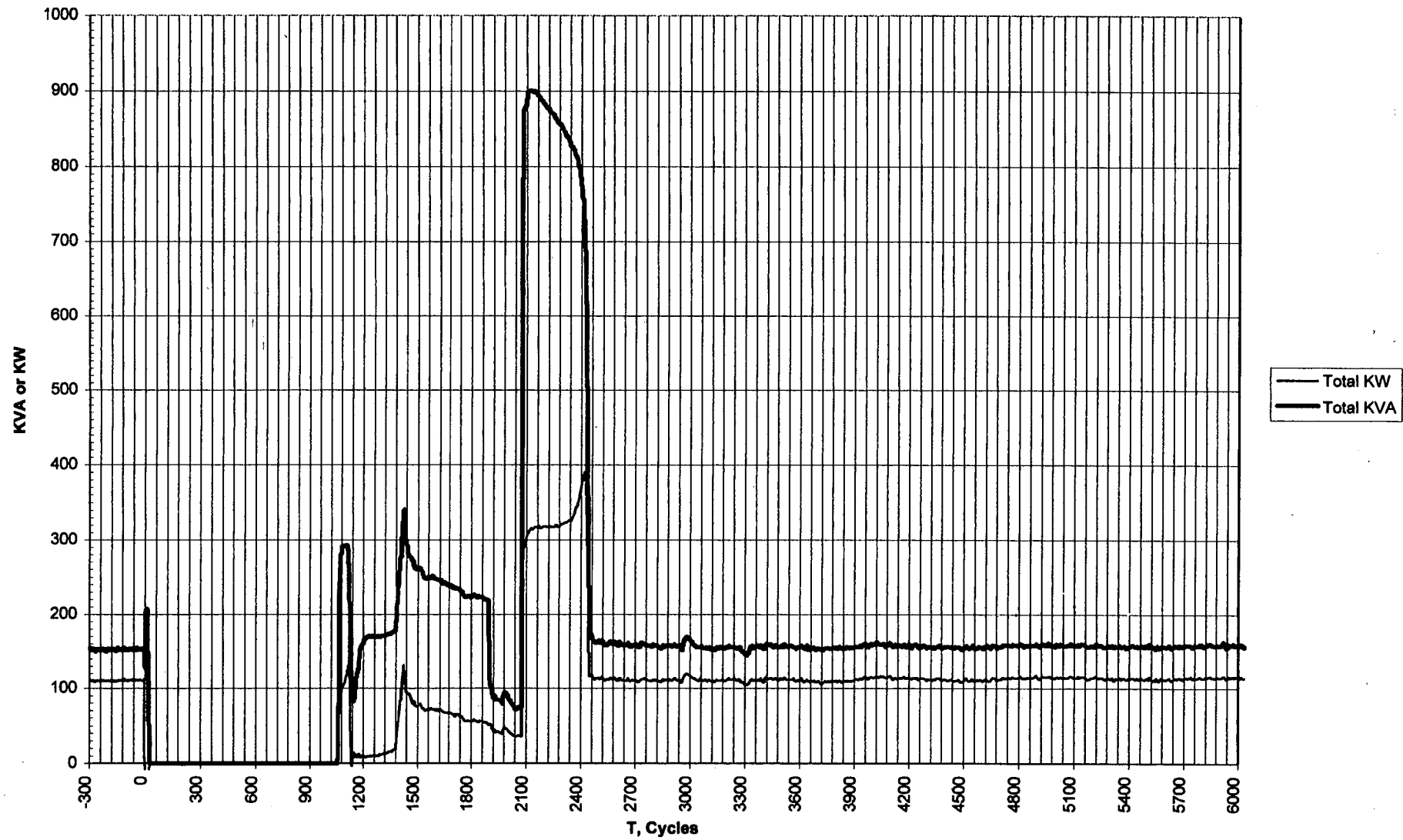


Figure 4.2.6-1: Test2, 600V 3XS1 Voltage and Current

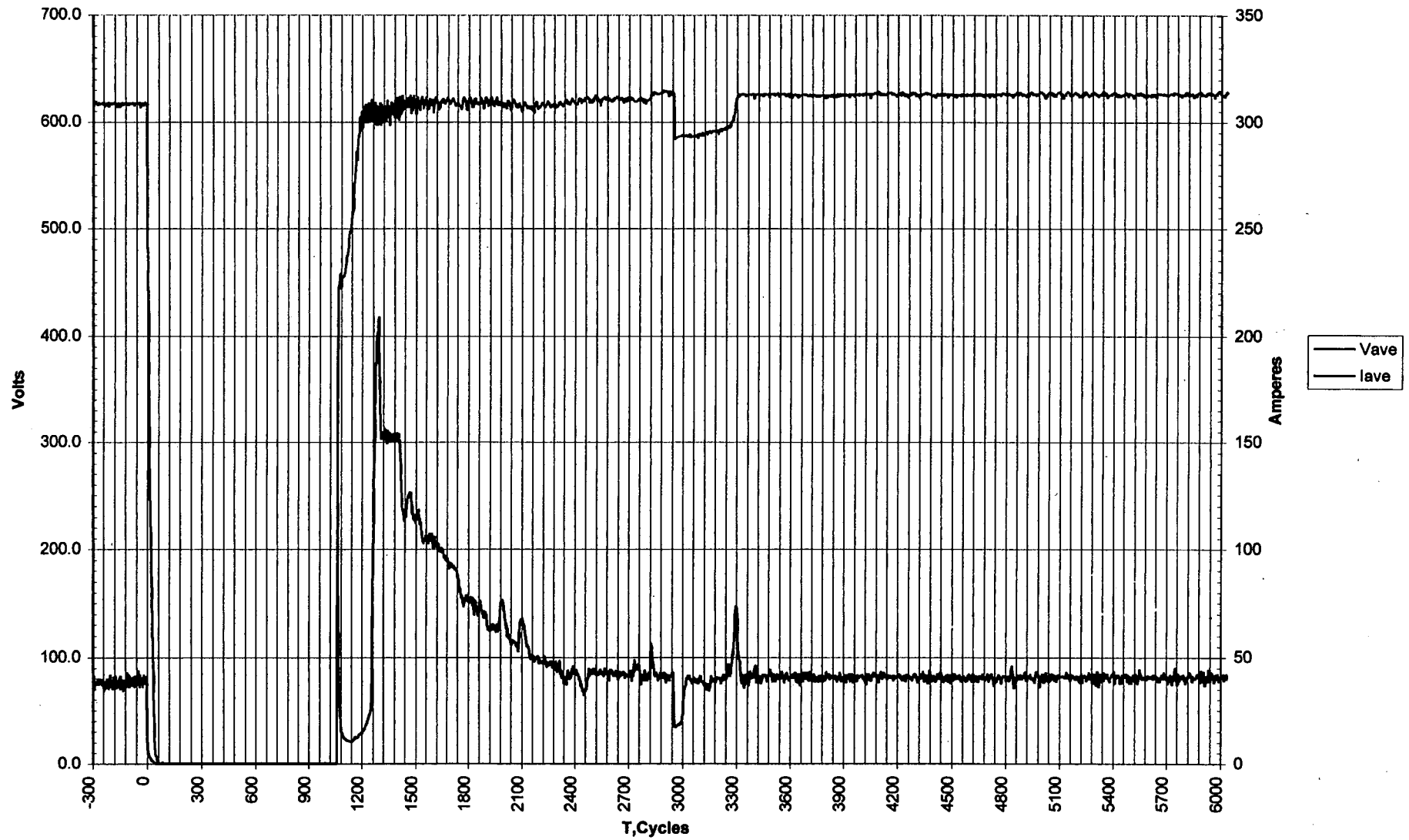


Figure 4.2.6-2: Test2, 600V 3XS1 KVA and KW

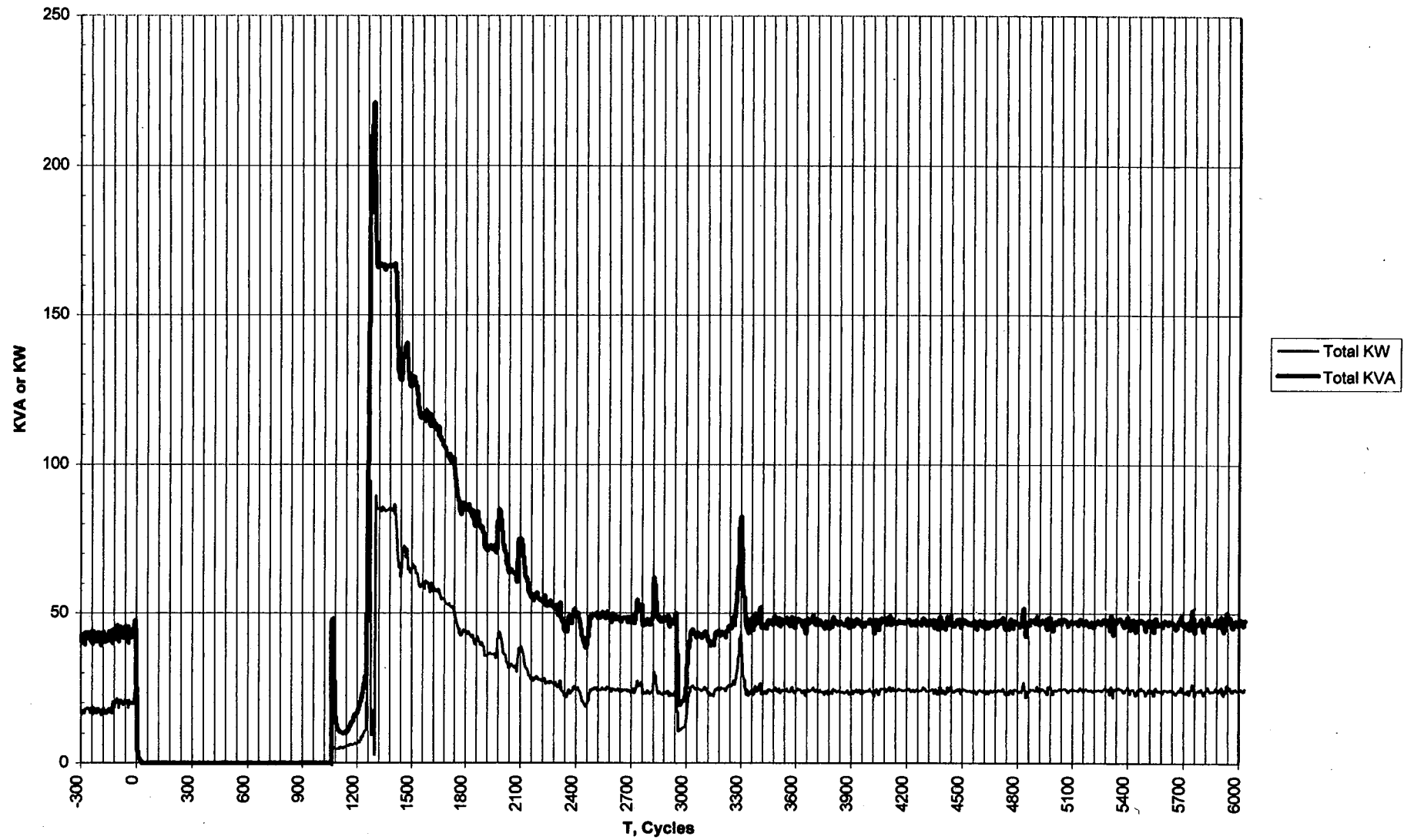


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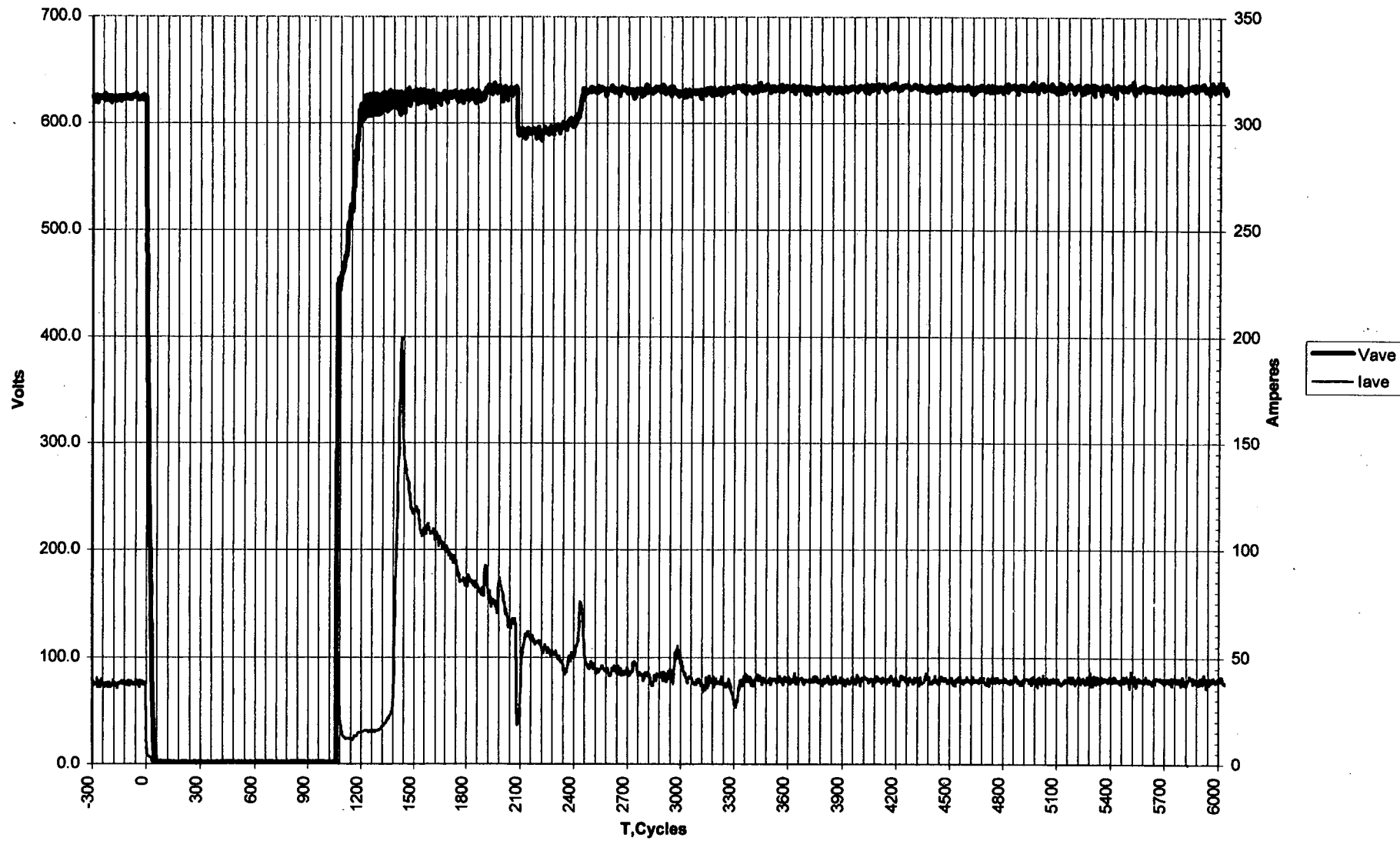


Figure 4.2.6-4: Test2, 600V 3XS2 KVA and KW

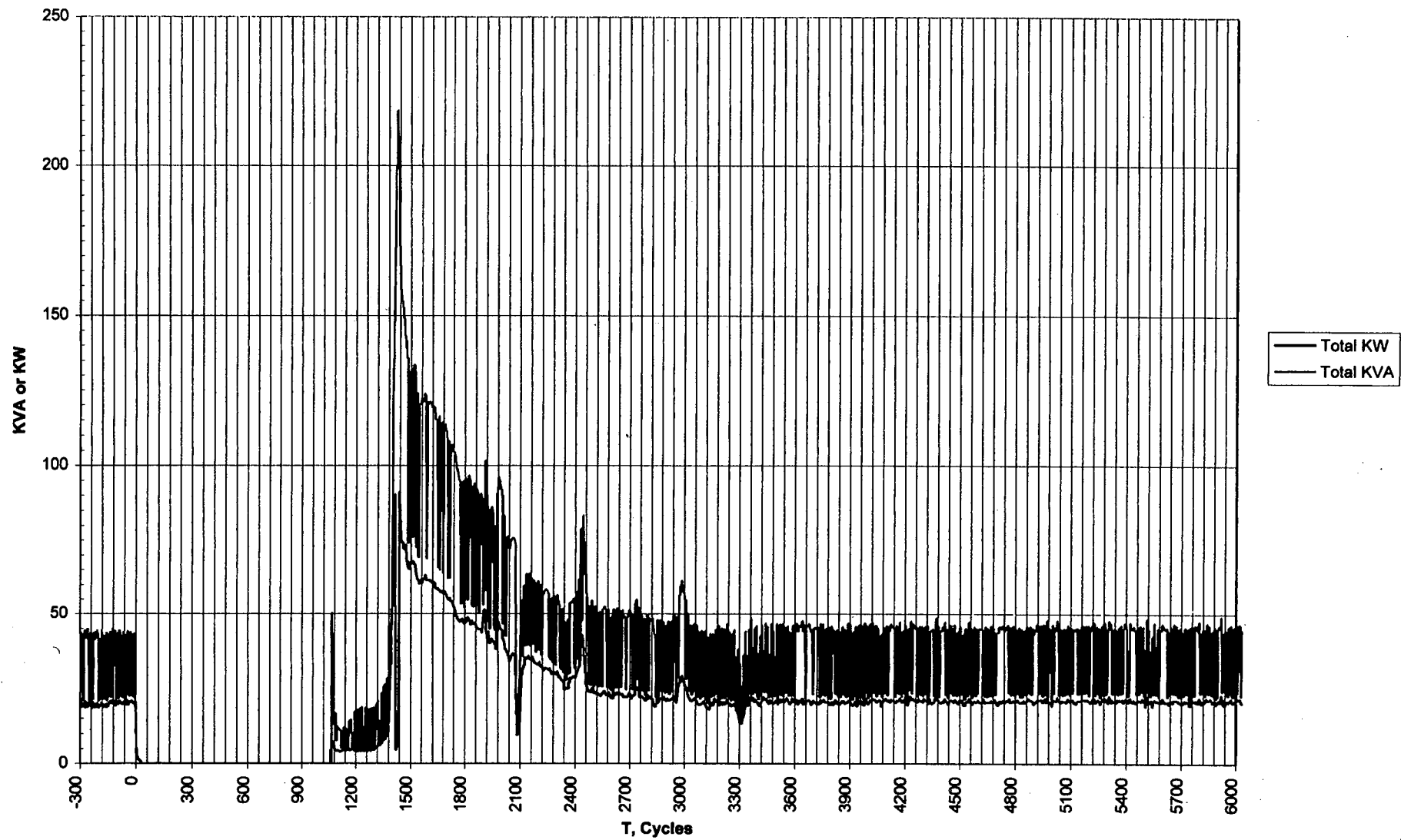


Figure 4.2.6-5: Test2, 600V 3XS3 Voltage and Current



Figure 4.2.6-6: Test2, 600V 3XS3 KVA and KW

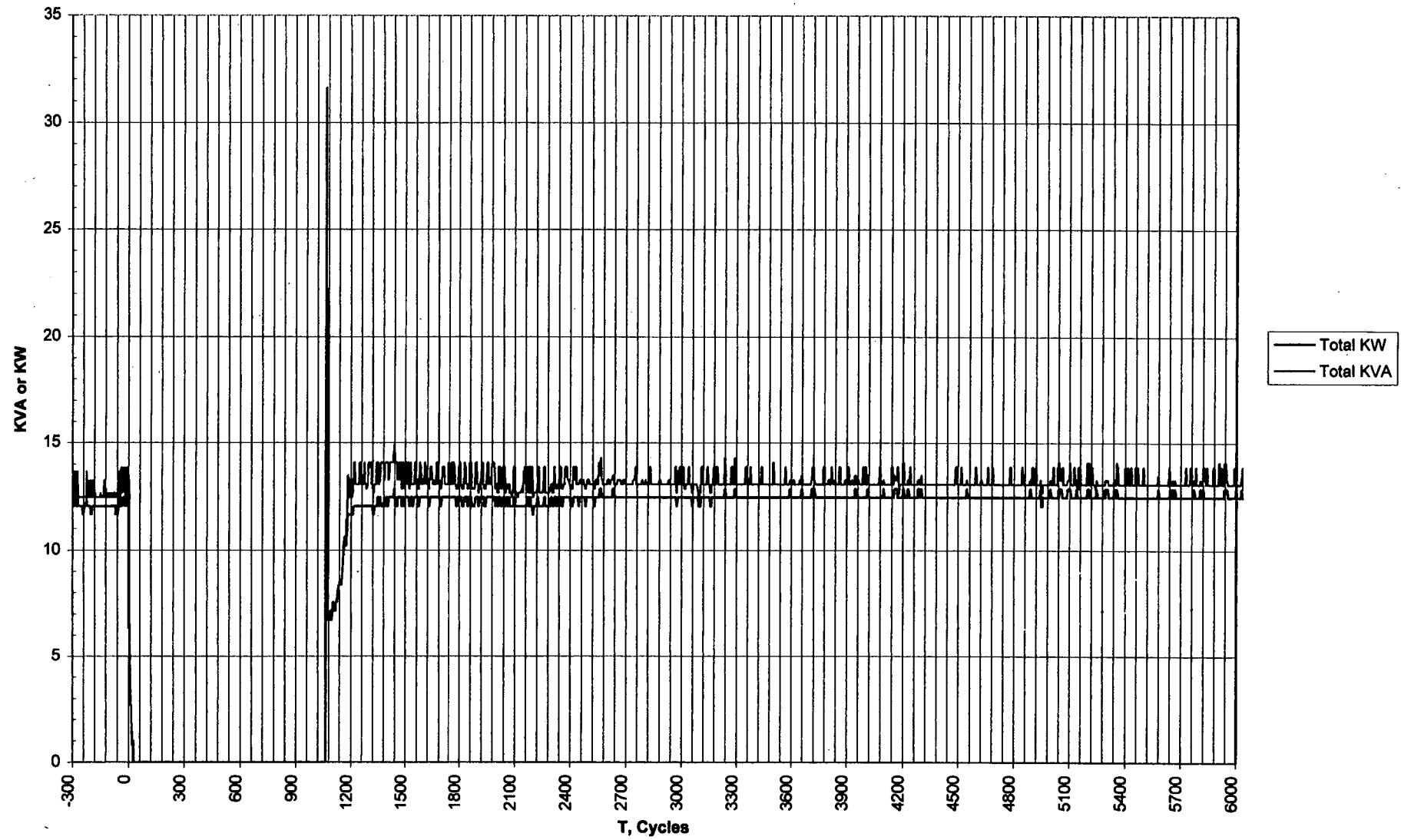


Figure 4.2.7-1: Test2, 208V 3XS1 Voltage and Current

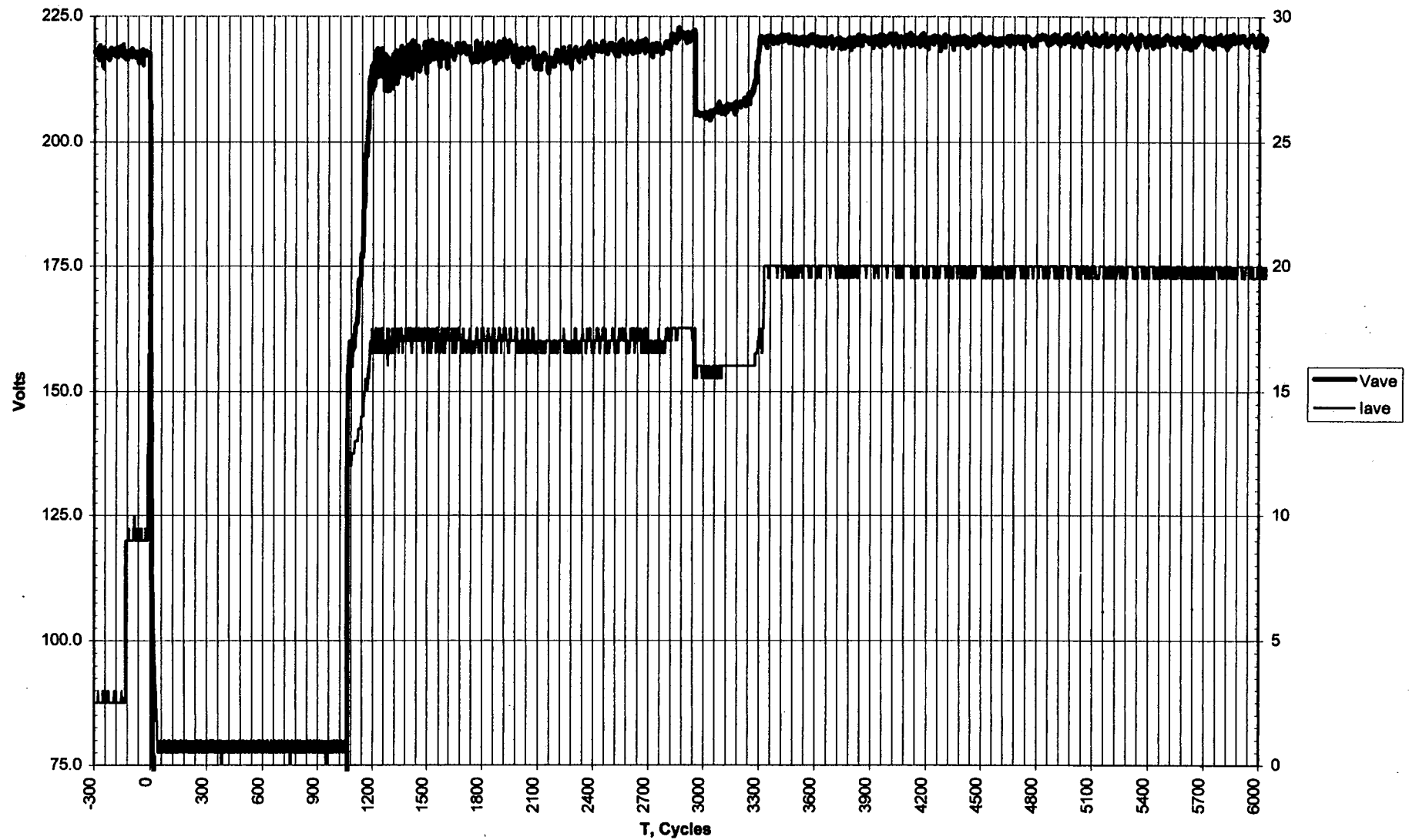


Figure 4.2.7-2: Test2, 208V 3XS1 KVA and KW



Figure 4.2.7-3: Test2, 208V 3XS2 Voltage and Current

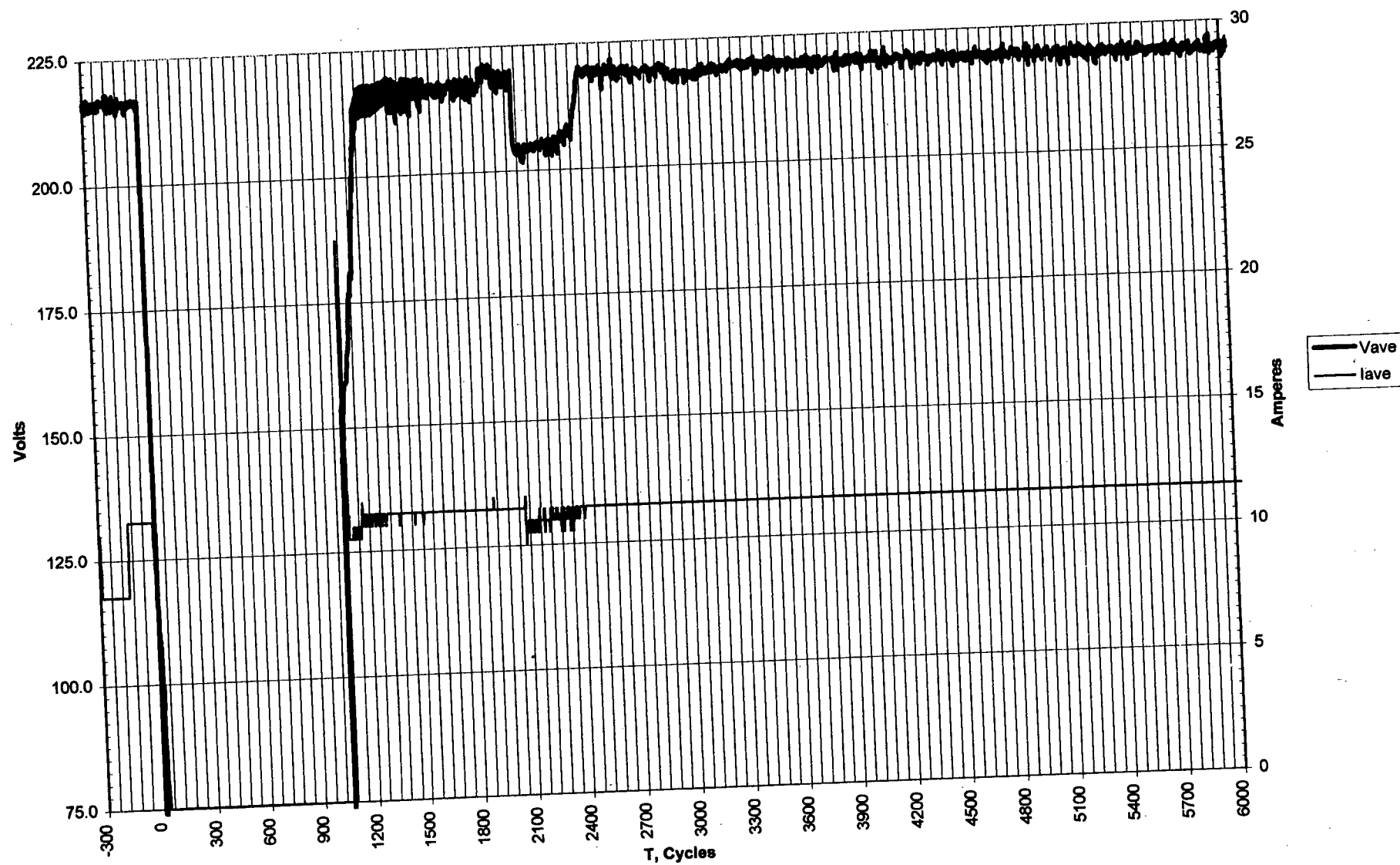


Figure 4.2.7-4: Test2, 208V 3XS2 KVA and KW



Figure 4.2.7-5: Test2, 208V 3XS3 Voltage and Current

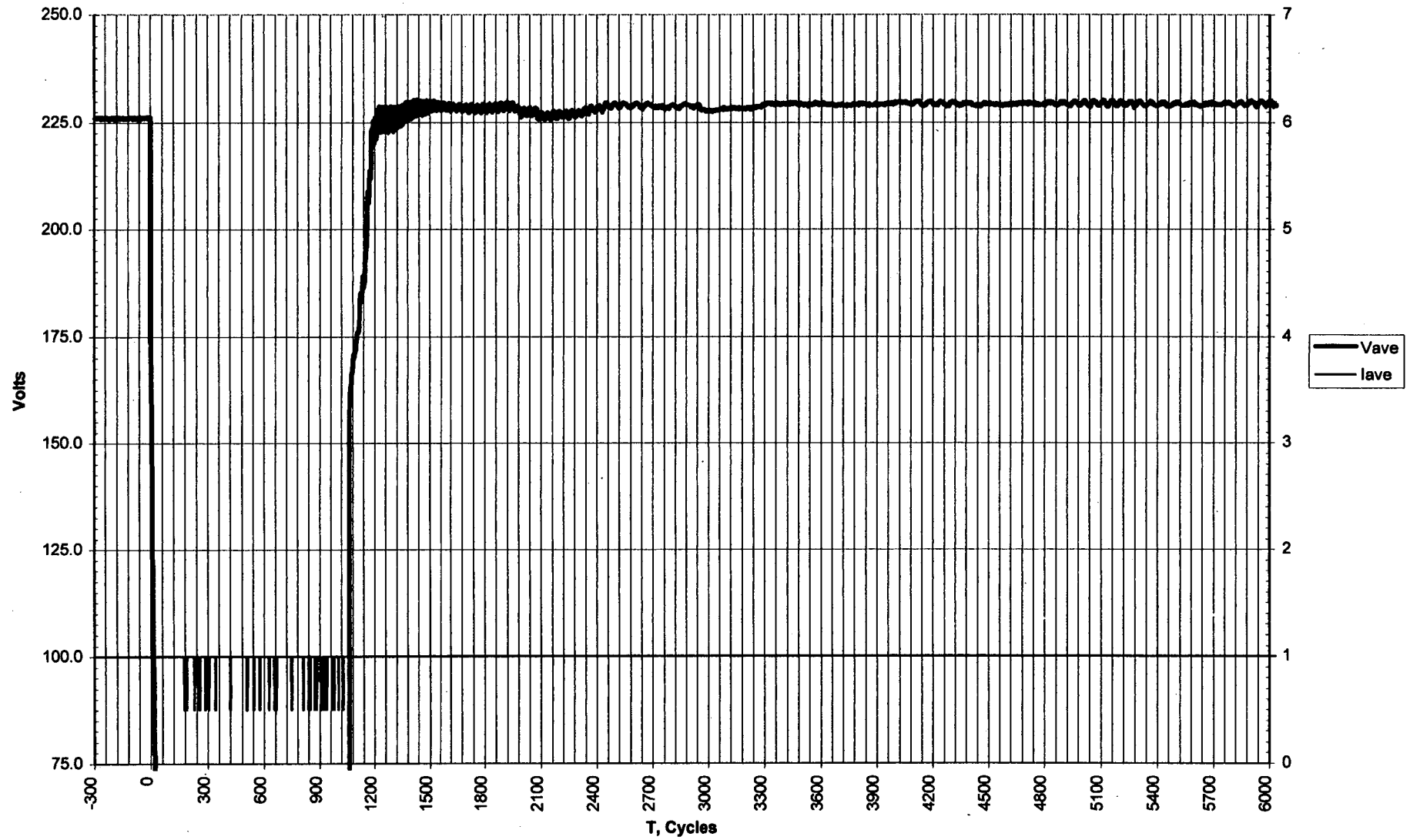


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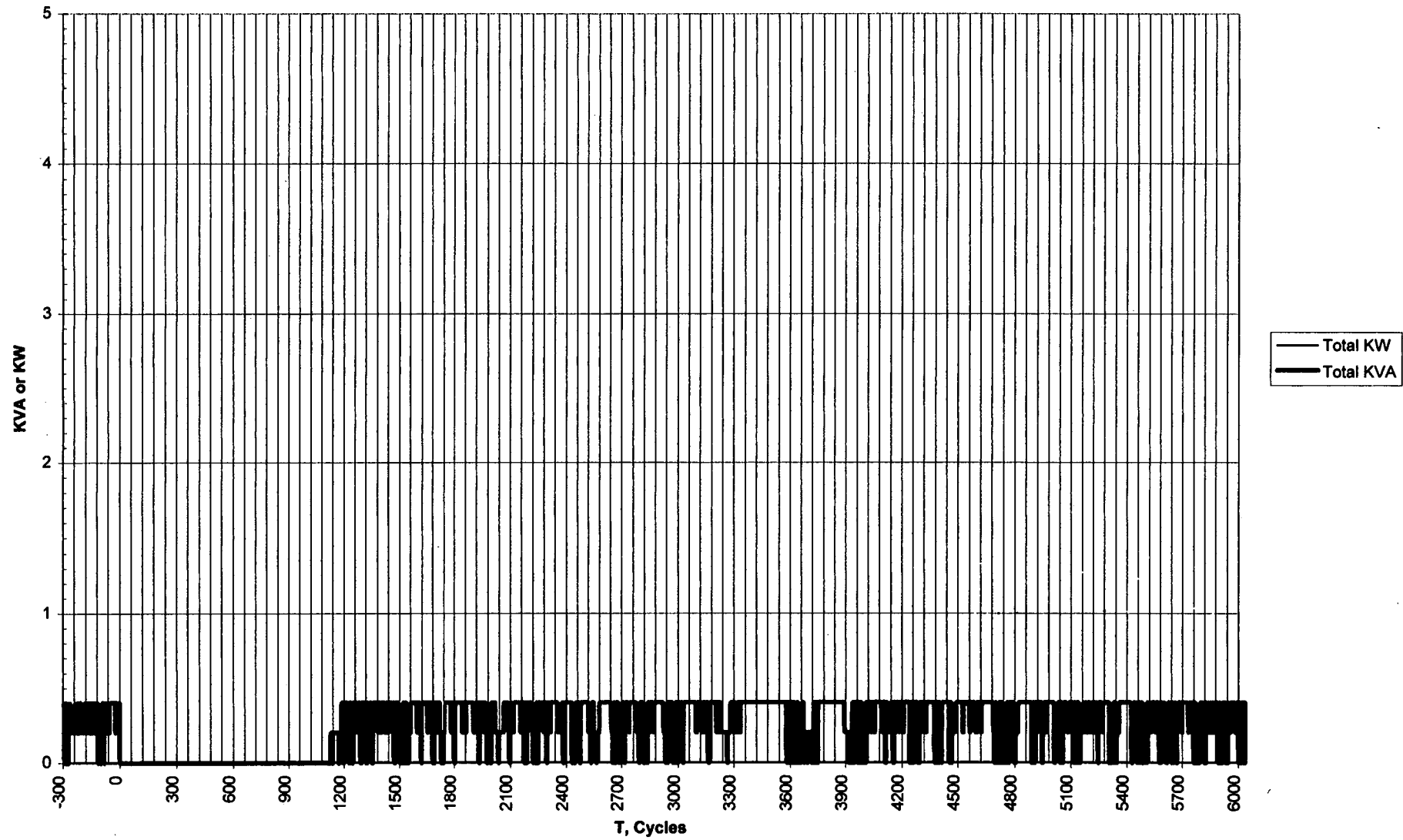
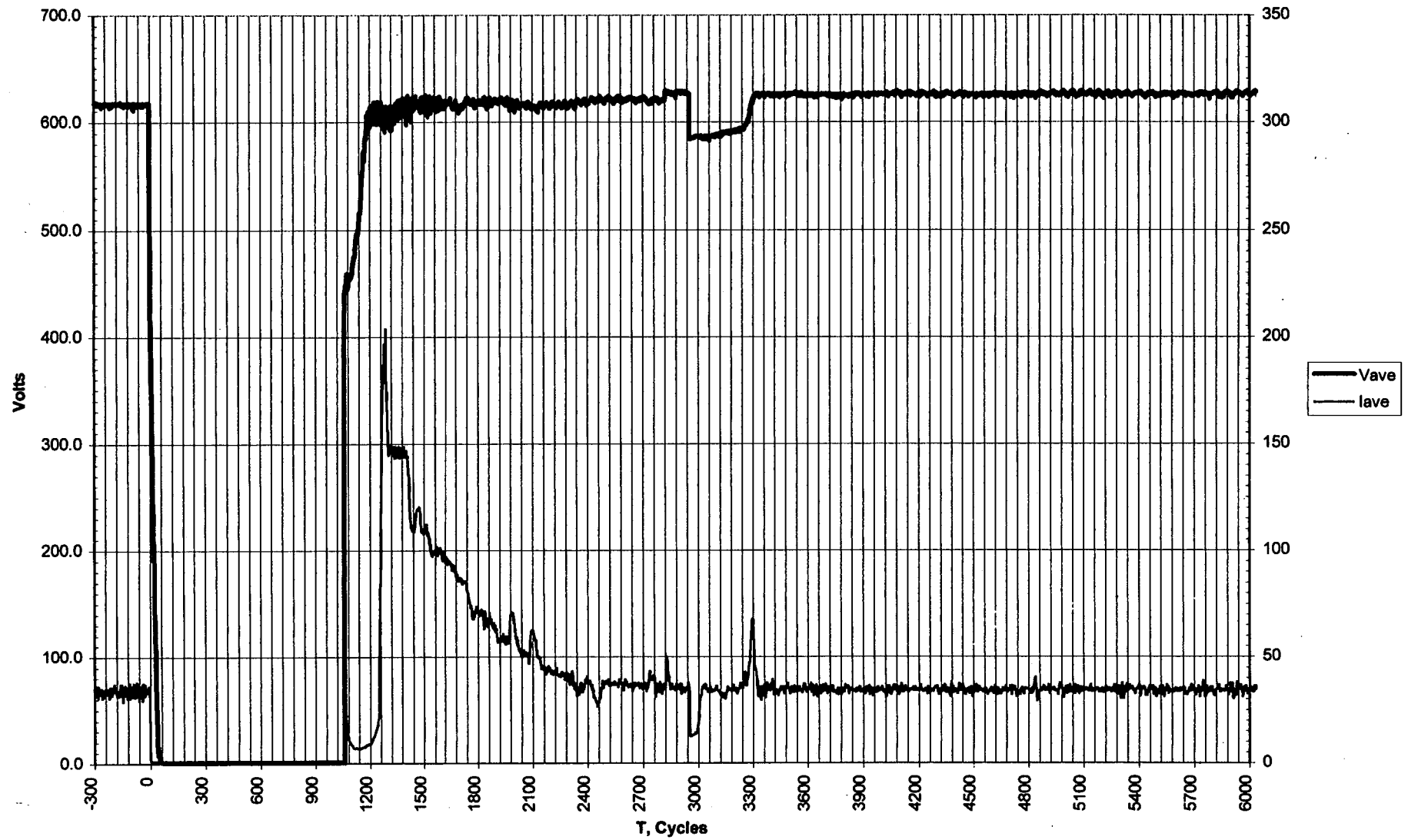


Figure 4.2.8-1: Test2, Battery Charger 3CA Voltage and Current



Appendix 3 - Test 3, Figures of Results

APPENDIX 3: Figures for Test 3

FIGURE	Page
Figure 4.3.1-1: Test 3, Keowee Voltage and Current.....	3-3
Figure 4.3.1-2: Test 3, Keowee Voltage.....	3-4
Figure 4.3.1-3, Test 3, Keowee KVA.....	3-5
Figure 4.3.1-4: Test 3, Keowee KW.....	3-6
Figure 4.3.1-5: Test 3, Keowee Frequency and Current.....	3-7
Figure 4.3.1-6: Test 3, Keowee Frequency and V/Hz.....	3-8
Figure 4.3.2-1: Test 3, Unit 1 MFB Voltage and Current.....	3-9
Figure 4.3.2-2: Test 3, Unit 1 MFB KVA and KW.....	3-10
Figure 4.3.2-3: Test 3, Standby Bus Volts, Unit 3 MFB Current.....	3-11
Figure 4.3.2-4: Test 3, Unit 3 MFB KVA and KW.....	3-12
Figure 4.3.3-1: Test 3, EFW 3B Voltage and Current.....	3-13
Figure 4.3.3-2: Test 3, EFW 3B KVA and KW.....	3-14
Figure 4.3.3-3: Test 3, HPI 3B Voltage and Current.....	3-15
Figure 4.3.3-4: Test 3, HPI 3B KVA and KW.....	3-16
Figure 4.3.3-5: Test 3, EFW 1A Voltage and Current.....	3-17
Figure 4.3.3-6: Test 3, EFW 1A KVA and KW.....	3-18
Figure 4.3.3-7: Test 3, LPSW 3B Voltage and Current.....	3-19
Figure 4.3.3-8: Test 3, LPSW 3B KVA and KW.....	3-20
Figure 4.3.3-9: Test 3, LPI 3B Voltage and Current.....	3-21
Figure 4.3.3-10: Test 3, LPI 3B KVA and KW.....	3-22
Figure 4.3.3-11: Test 3, RBS 3B Voltage and Current.....	3-23
Figure 4.3.3-12: Test 3, RBS 3B KVA and KW.....	3-24
Figure 4.3.4-1: Test 3, RBCU 3B Voltage and Current.....	3-25
Figure 4.3.4-2: Test 3, RBCU 3B KVA and KW.....	3-26
Figure 4.3.5-1: Test 3, 1X5 Voltage and Current.....	3-27
Figure 4.3.5-2: Test 3, 1X5 KVA and KW.....	3-28
Figure 4.3.5-3: Test 3, 1X6 Voltage and Current.....	3-29
Figure 4.3.5-4: Test 3, 1X6 KVA and KW.....	3-30
Figure 4.3.5-5: Test 3, 3X5 Voltage and Current.....	3-31
Figure 4.3.5-6: Test 3, 3X5 KVA and KW.....	3-32
Figure 4.3.5-7: Test 3, 3X6 Voltage and Current.....	3-33
Figure 4.3.5-8: Test 3, 3X6 KVA and KW.....	3-34
Figure 4.3.5-9: Test 3, 3X8 Voltage and Current.....	3-35
Figure 4.3.5-10: Test 3, 3X8 KVA and KW.....	3-36
Figure 4.3.5-11: Test 3, 3X9 Voltage and Current.....	3-37
Figure 4.3.5-12: Test 3, 3X9 KVA and KW.....	3-38
Figure 4.3.5-13: Test 3, 3X4 Primary Voltage and Current.....	3-39
Figure 4.3.5-14: Test 3, 3X4 KVA and KW.....	3-40
Figure 4.3.5-15: Test 3, CX Primary Voltage and Amperes.....	3-41
Figure 4.3.5-16: Test 3, CX Primary KVA and KW.....	3-42
Figure 4.3.6-1: Test 3, 600V 3XS1 Voltage and Current.....	3-43
Figure 4.3.6-2: Test 3, 600V 3XS1 KVA and KW.....	3-44
Figure 4.3.6-3: Test 3, 600V 3XS2 Voltage and Current.....	3-45
Figure 4.3.6-4: Test 3, 600V 3XS2 KVA and KW.....	3-46
Figure 4.3.6-5: Test 3, 600V 3XS3 Voltage and Current.....	3-47
Figure 4.3.6-6: Test 3, 600V 3XS3 KVA and KW.....	3-48
Figure 4.3.7-1: Test 3, 208V 3XS1 Voltage and Current.....	3-49
Figure 4.3.7-2: Test 3, 208V 3XS1 KVA and KW.....	3-50
Figure 4.3.7-3: Test 3, 208V 3XS2 Voltage and Current.....	3-51
Figure 4.3.7-4: Test 3, 208 3XS2 KVA and KW.....	3-52

Figure 4.3.7-5: Test 3, 208V 3XS3 Voltage and Current.....	3-53
Figure 4.3.7-6: Test 3, 208V 3XS3 KVA and KW.....	3-54
Figure 4.3.8-1: Test 3, Battery Charger 3CA Voltage and Current.....	3-55
Figure 4.3.9-1: Test 3, 3HP-24 Voltage and Current at LOOP.....	3-56
Figure 4.3.9-2: Test 3, 3HP-26 Voltage and Current at LOOP.....	3-57
Figure 4.3.9.1-1: Test 3, 3HP-24 Full Stroke Voltage and Current.....	3-58
Figure 4.3.9.1-2: Test 3, 3HP-24 Inrush Voltage and Current.....	3-59
Figure 4.3.9.1-3: Test 3, 3HP-24 Full Stroke Total Real Power (KW).....	3-60
Figure 4.3.9.2-1: Test 3, 3HP-26 Full Stroke Voltage and Current.....	3-61
Figure 4.3.9.2-2: Test 3, 3HP-26 Inrush Voltage and Current.....	3-62
Figure 4.3.9.2-3: Test 3, 3HP-26 Full Stroke Total Real Power (KW).....	3-63
Figure 4.3.9.3-1: Test 3, 3LP-17 Full Stroke Voltage and Current.....	3-64
Figure 4.3.9.3-2: Test 3, 3LP-17 Inrush Voltage and Current.....	3-65
Figure 4.3.9.3-3: Test 3, 3LP-17 Full Stroke Total Real Power (KW).....	3-66
Figure 4.3.9.4-1: Test 3, 3BS-2 Full Stroke Voltage and Current.....	3-67
Figure 4.3.9.4-2: Test 3, 3BS-2 Inrush Voltage and Current.....	3-68
Figure 4.3.9.4-3: Test 3, 3BS-2 Full Stroke Total Real Power (KW).....	3-69
Figure 4.3.9.5-1: Test 3, 3HP-27 Full Stroke Voltage and Current.....	3-70
Figure 4.3.9.5-2: Test 3, 3HP-27 Inrush Voltage and Current.....	3-71
Figure 4.3.9.5-3: Test 3, 3HP-27 Full Stroke Total Real Power (KW).....	3-72
Figure 4.3.9.6-1: Test 3, 3LPSW-24 Full Stroke Voltage and Current.....	3-73
Figure 4.3.9.6-2: Test 3, 3LPSW-24 Inrush Voltage and Current.....	3-74
Figure 4.3.9.6-3: Test 3, 3LPSW-24 Full Stroke Total Real Power (KW).....	3-75
Figure 4.3.9.7-1: Test 3, 3PR-19 Full Stroke Voltage and Current.....	3-76
Figure 4.3.9.7-2: Test 3, 3PR-19 Inrush Voltage and Current.....	3-77
Figure 4.3.9.7-3: Test 3, 3PR-19 Full Stroke Total Real Power (KW).....	3-78
Figure 4.3.9.8-1: Test 3, 3LPSW-6 Full Stroke Voltage and Current.....	3-79
Figure 4.3.9.8-2: Test 3, 3LPSW-6 Inrush Voltage and Current.....	3-80
Figure 4.3.9.8-3: Test 3, 3LPSW-6 Full Stroke Total Real Power (KW).....	3-81
Figure 4.3.9.9-1: Test 3, 3LPSW-565 Full Stroke Voltage and Current.....	3-82
Figure 4.3.9.9-2: Test 3, 3LPSW-565 Inrush Voltage and Current.....	3-83
Figure 4.3.9.9-3: Test 3, 3LPSW-565 Full Stroke Total Real Power (KW).....	3-84
Figure 4.3.9.10-1: Test 3, 3HP-4 Full Stroke Voltage and Current.....	3-85
Figure 4.3.9.10-2: Test 3, 3HP-4 Inrush Voltage and Current.....	3-86
Figure 4.3.9.10-3: Test 3, 3HP-4 Full Stroke Total Real Power (KW).....	3-87
Figure 4.3.9.11-1: Test 3, 3HP-20 Full Stroke Voltage and Current.....	3-88
Figure 4.3.9.11-2: Test 3, 3HP-20 Inrush Voltage and Current.....	3-89
Figure 4.3.9.11-3: Test 3, 3HP-20 Full Stroke Total Real Power (KW).....	3-90

Figure 4.3.1-1: Test3, Keowee Voltage and Current

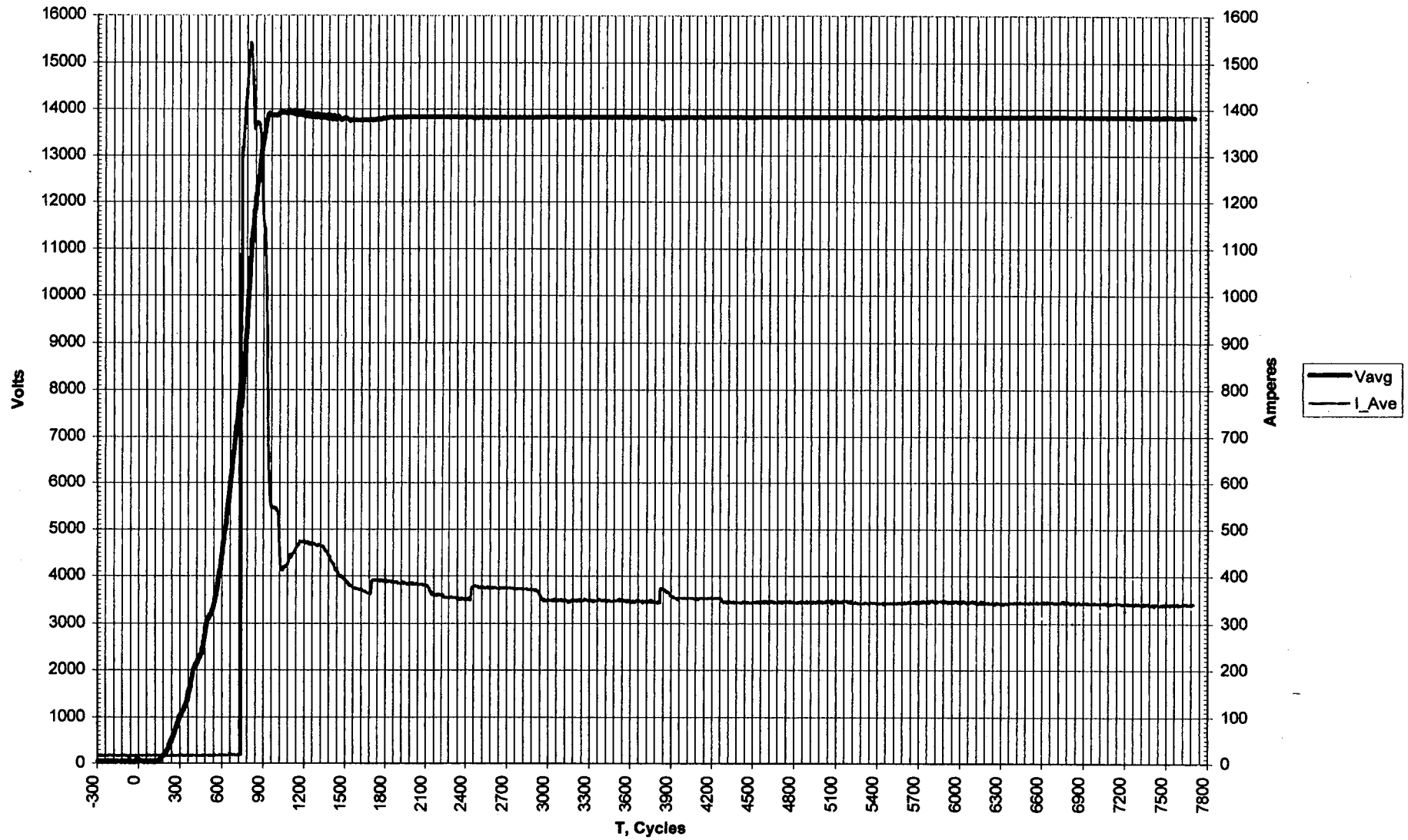


Figure 4.3.1-2: Test3, Keowee Voltage

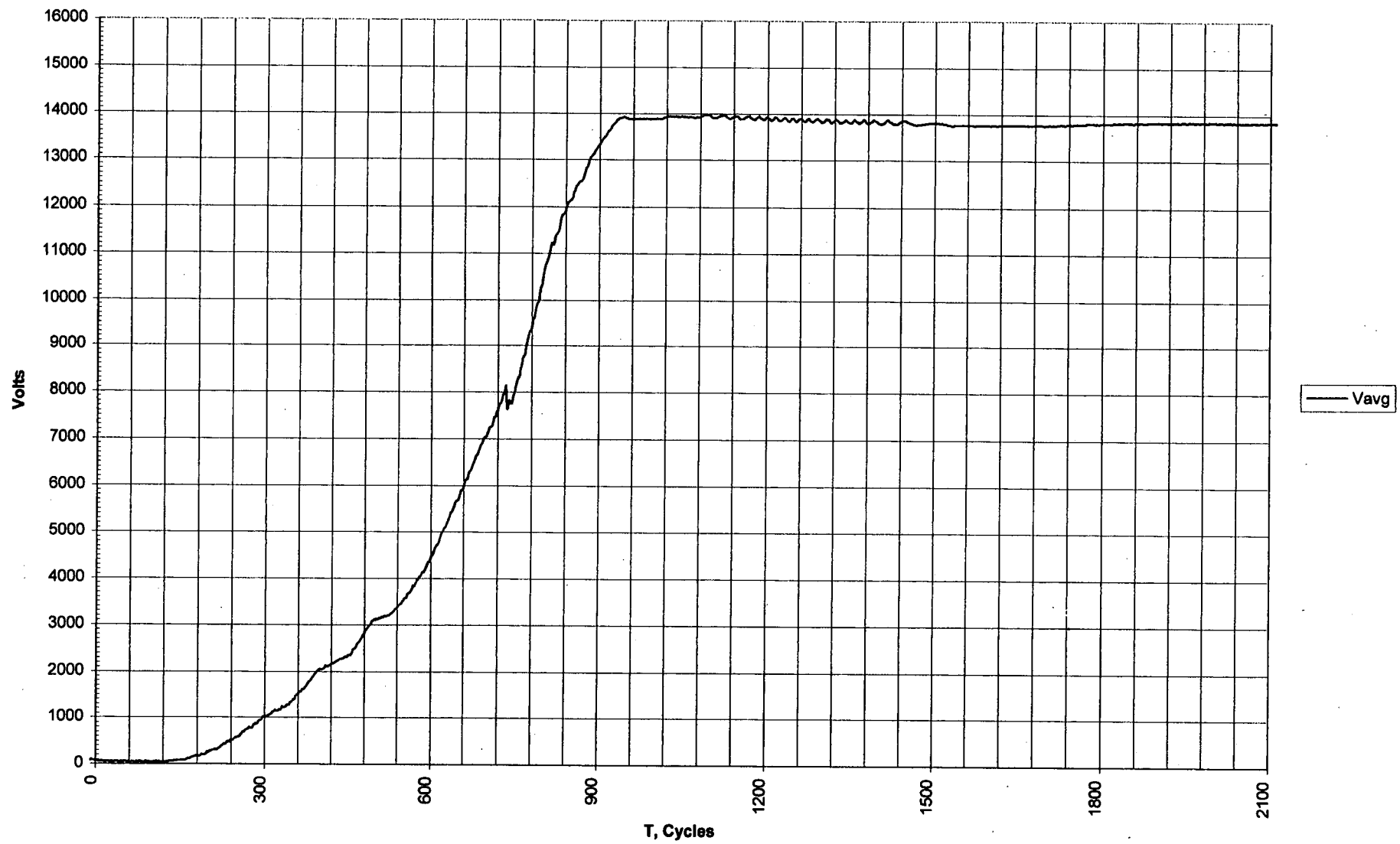


Figure 4.3.1-3, Test3, Keowee KVA

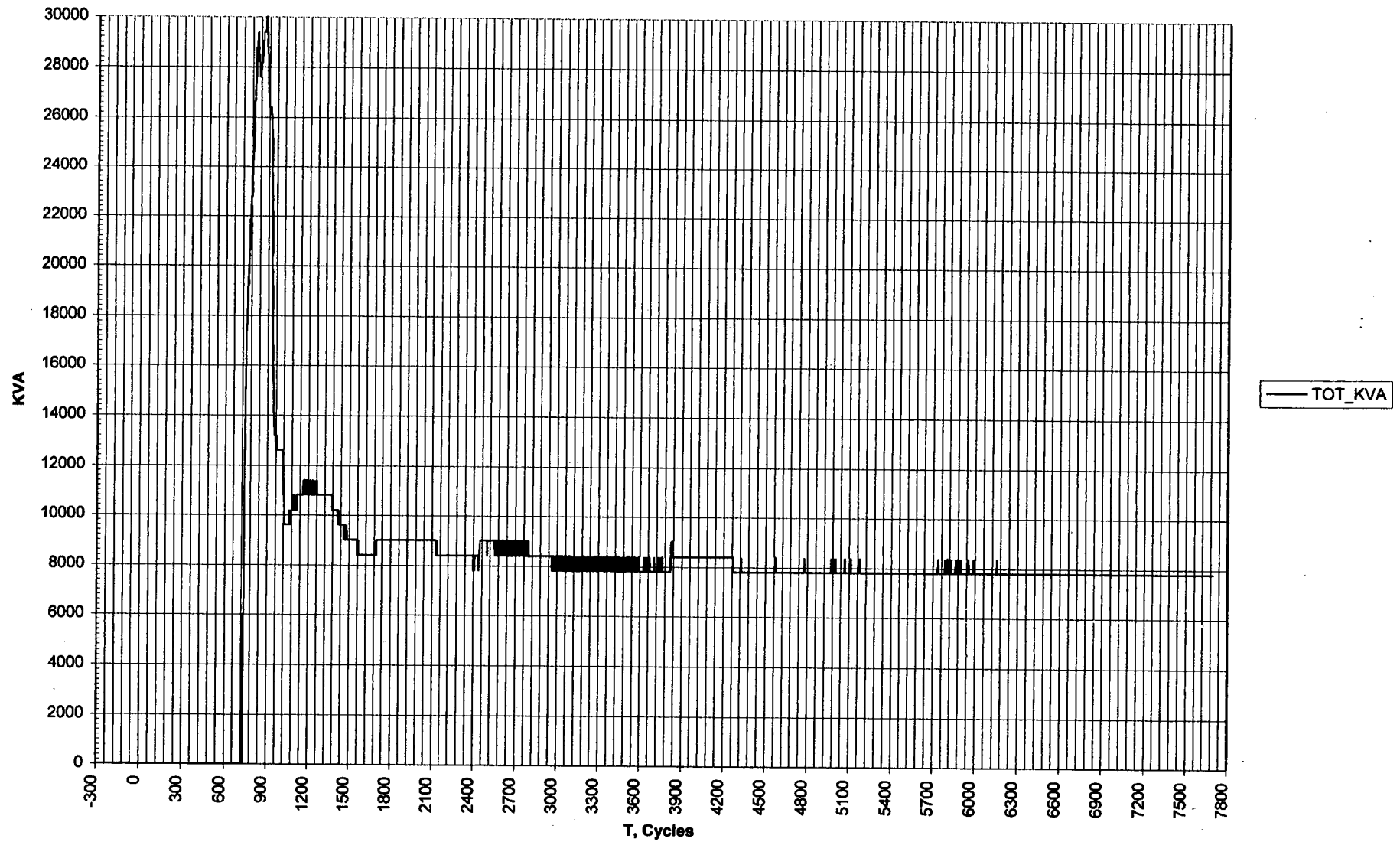


Figure 4.3.1-4: Test3, Keowee KW

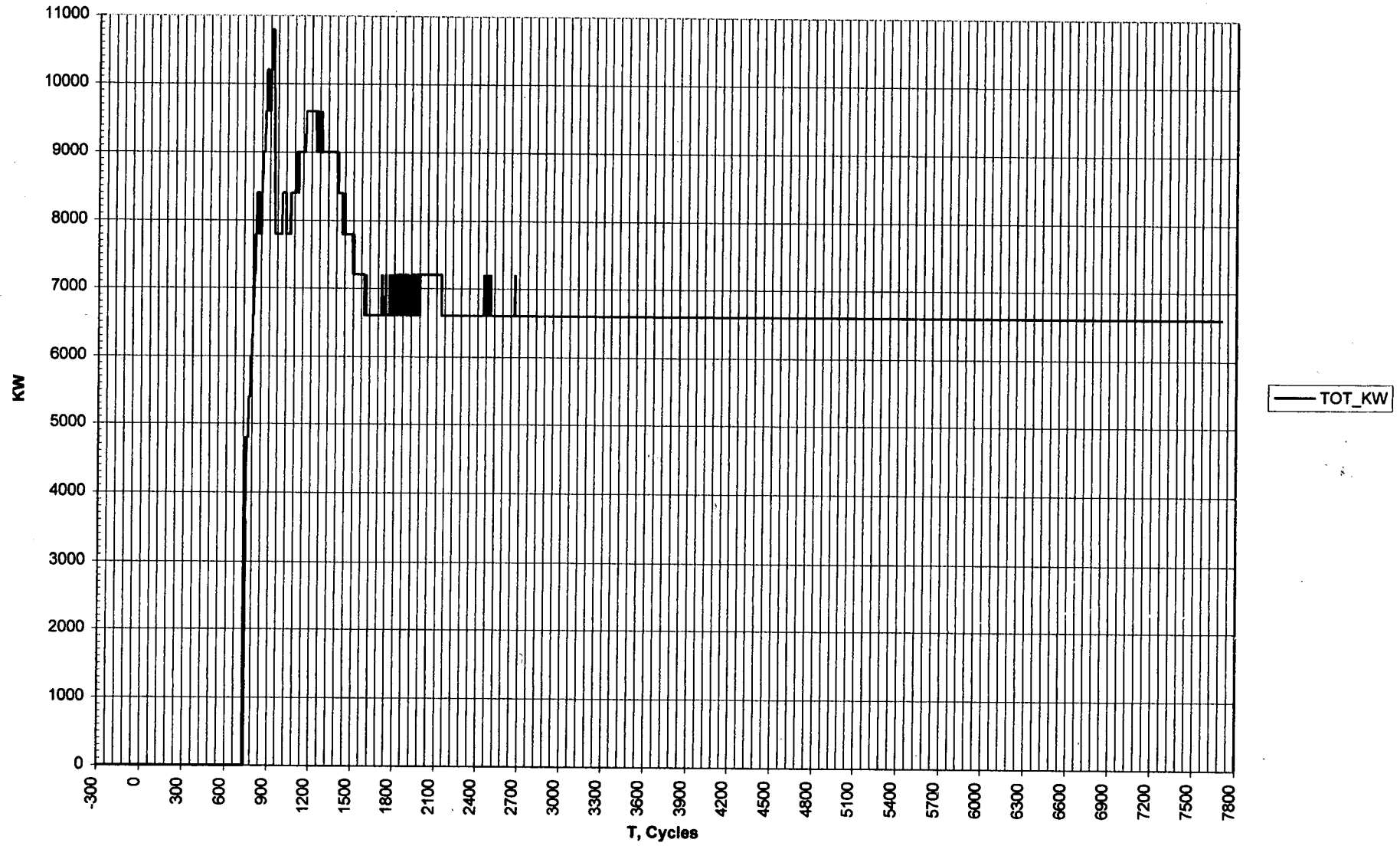


Figure 4.3.1-5: Test3, Keowee Frequency and Current

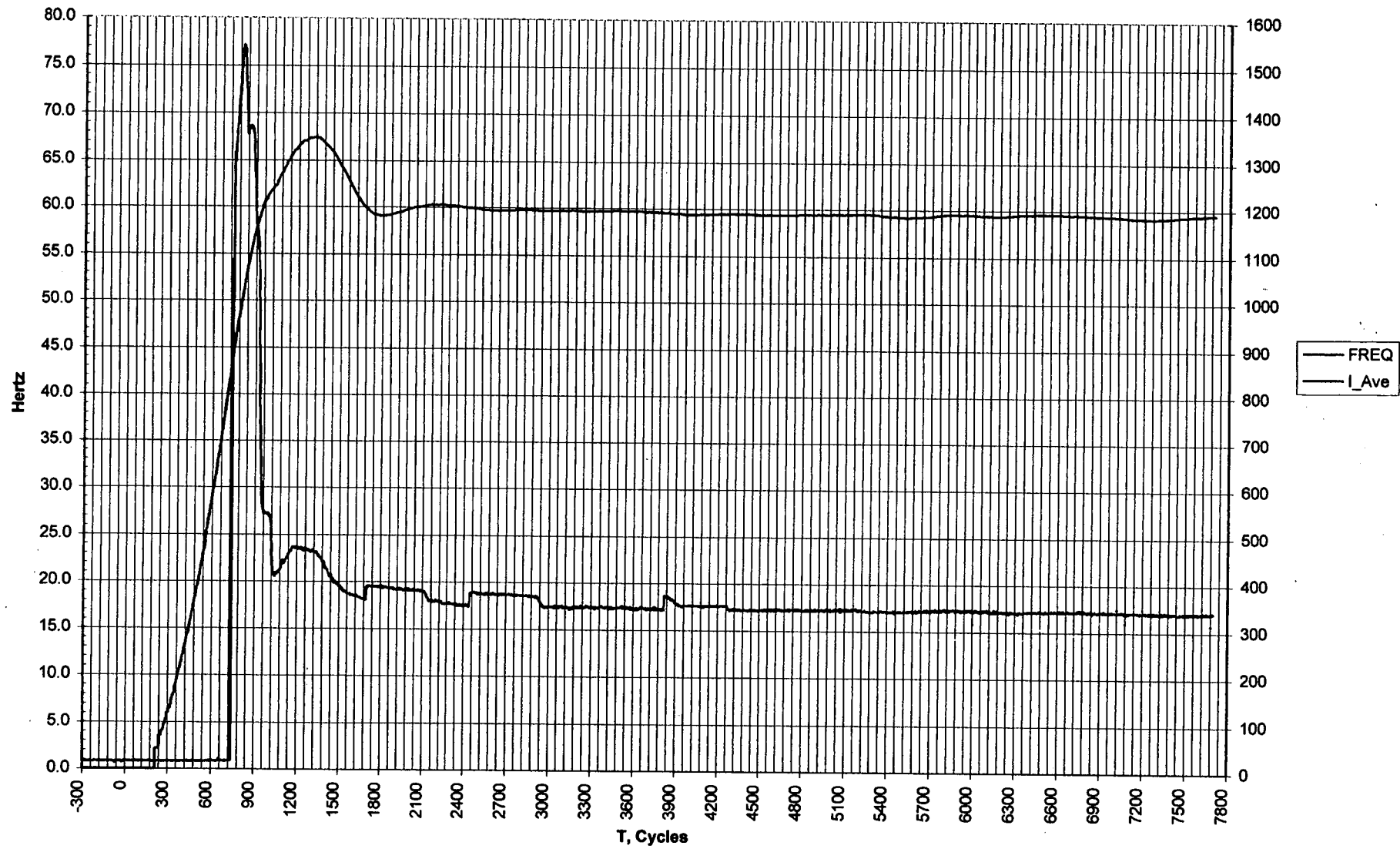


Figure 4.3.1-6: Test3, Keowee Frequency and V/Hz

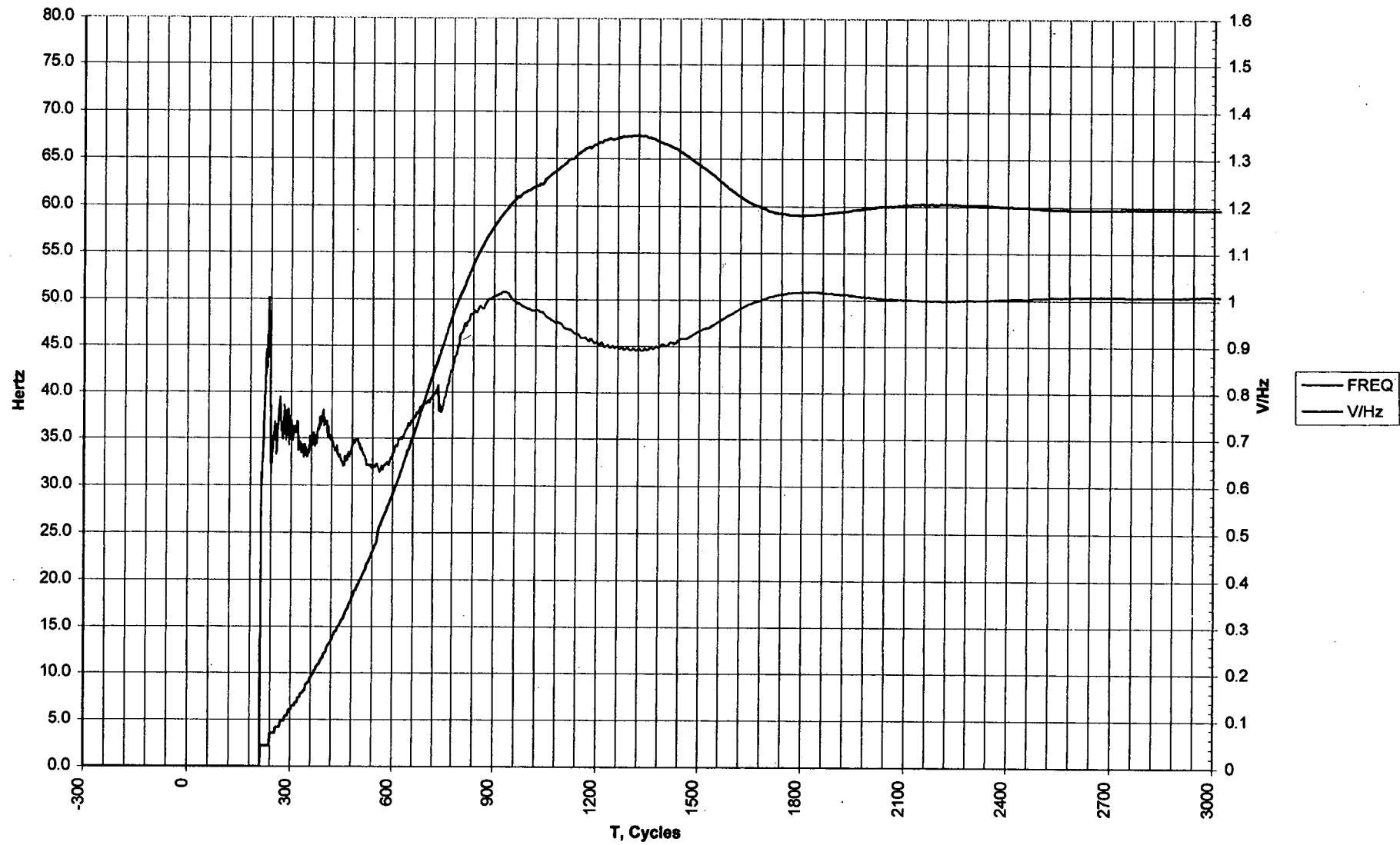


Figure 4.3.2-1: Test3, Unit 1 MFB Voltage and Current

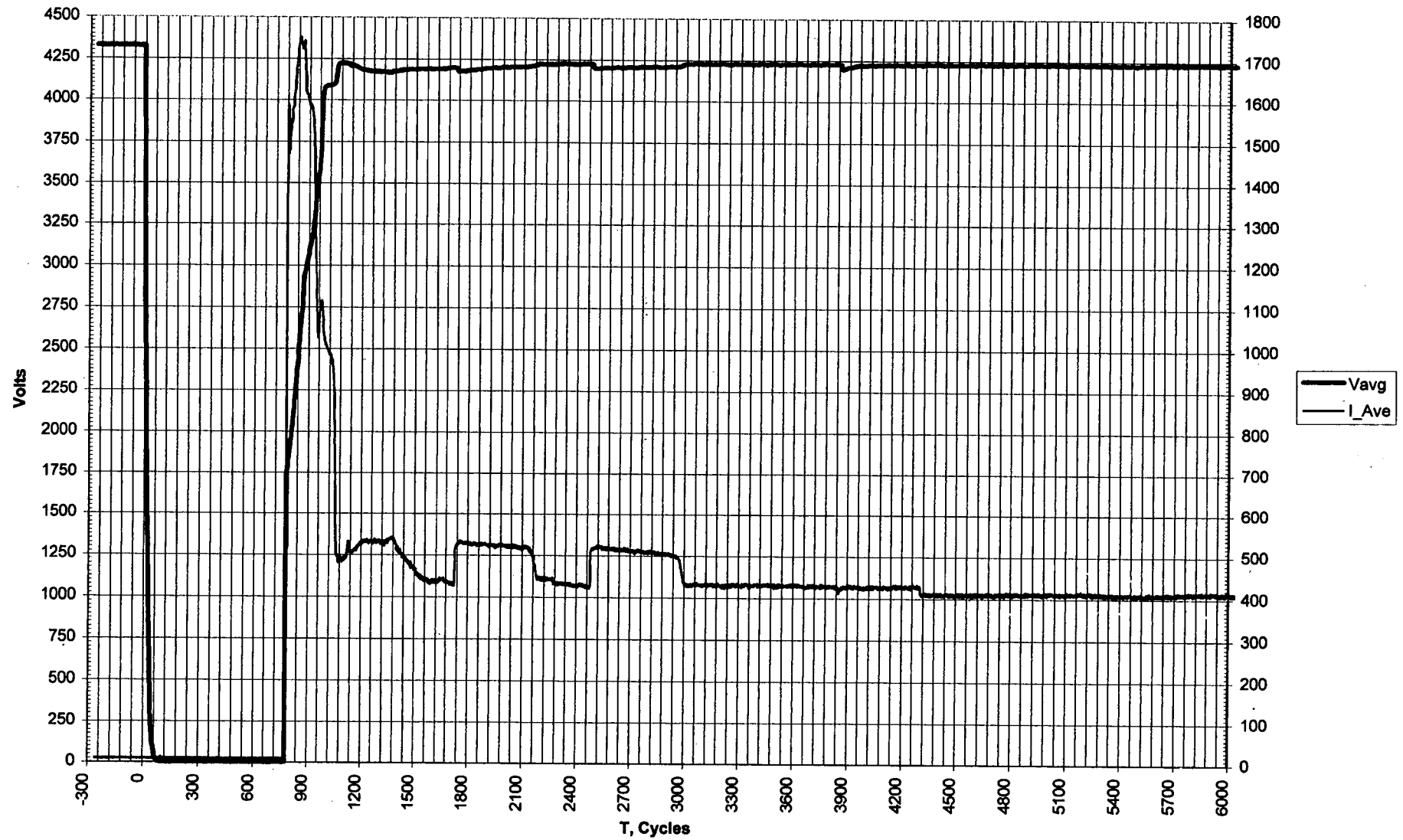


Figure 4.3.2-2: Test3, Unit 1 MFB KVA and KW

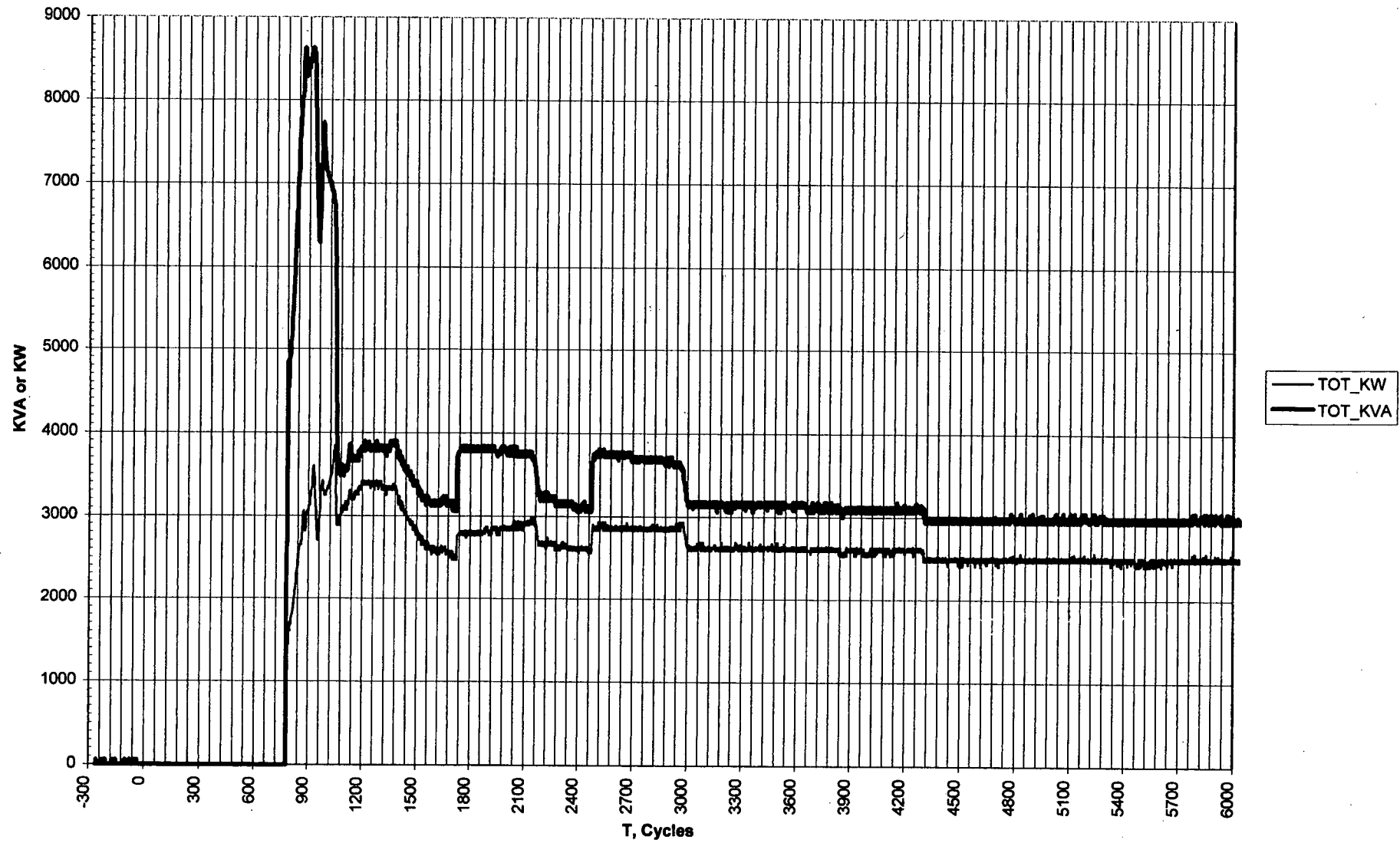


Figure 4.3.2-3: Test3, Standby Bus Volts, Unit 3 MFB Current

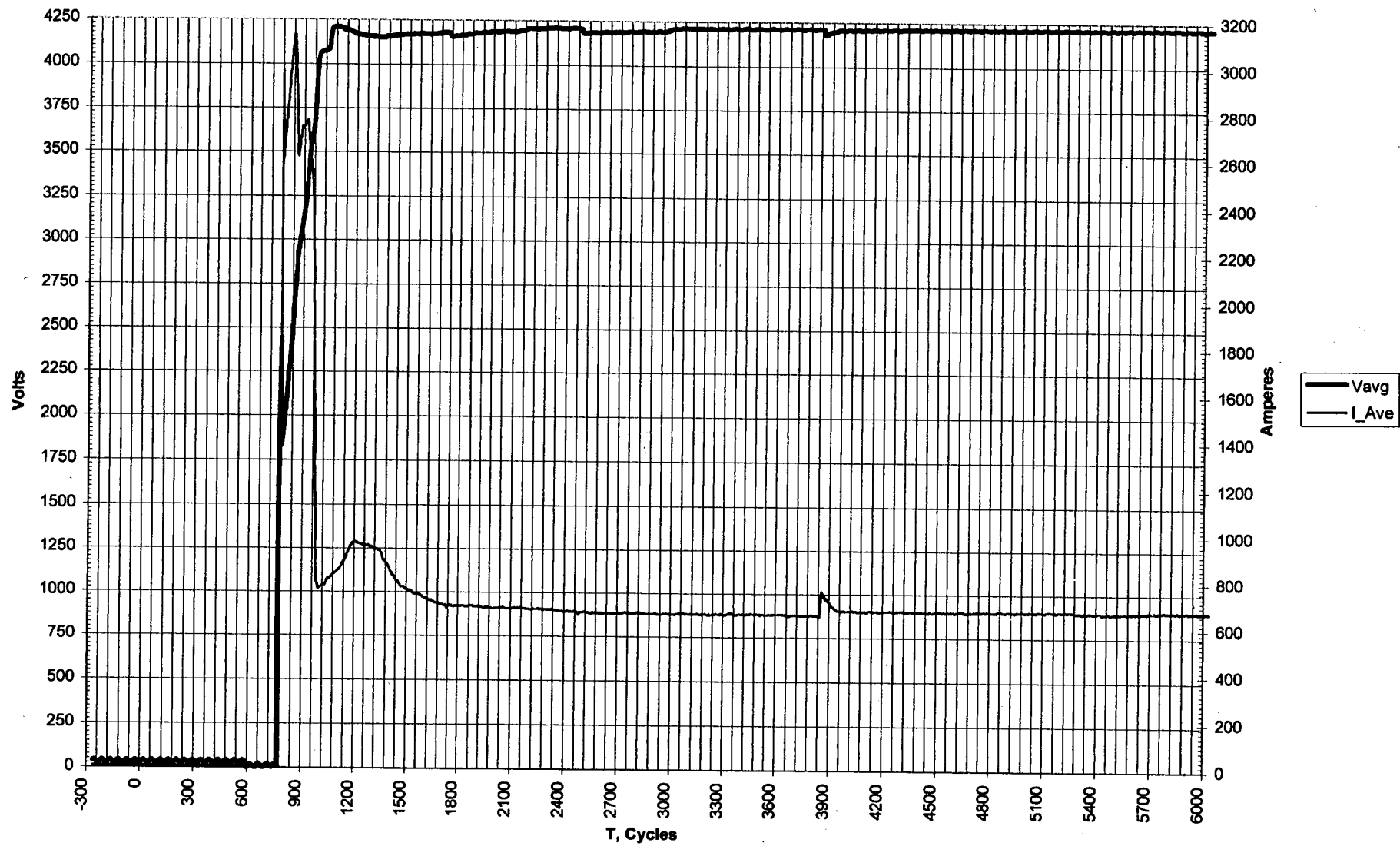


Figure 4.3.2-4: Test3, Unit 3 MFB KVA and KW

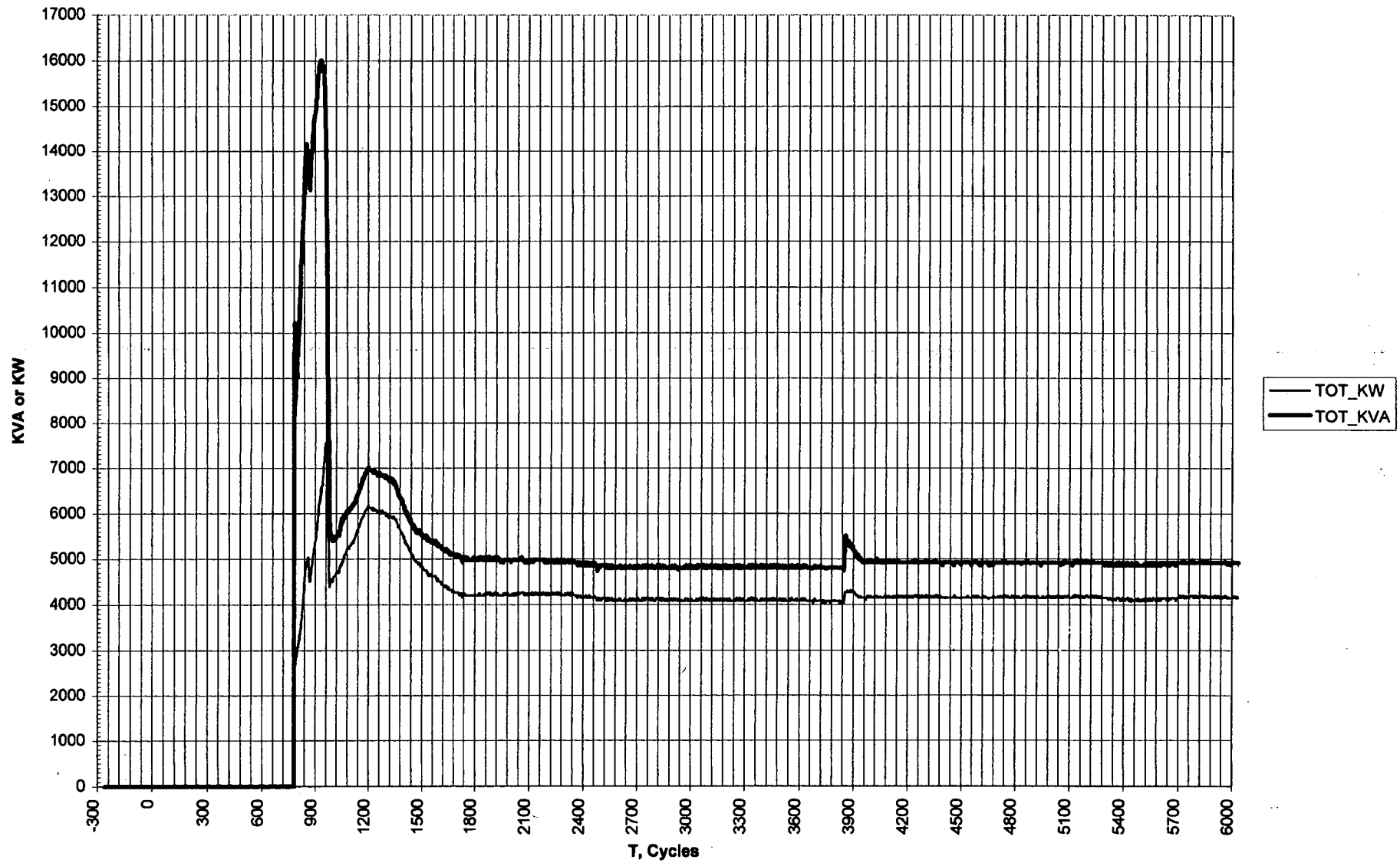


Figure 4.3.3-1: Test3, EFW 3B Voltage and Current

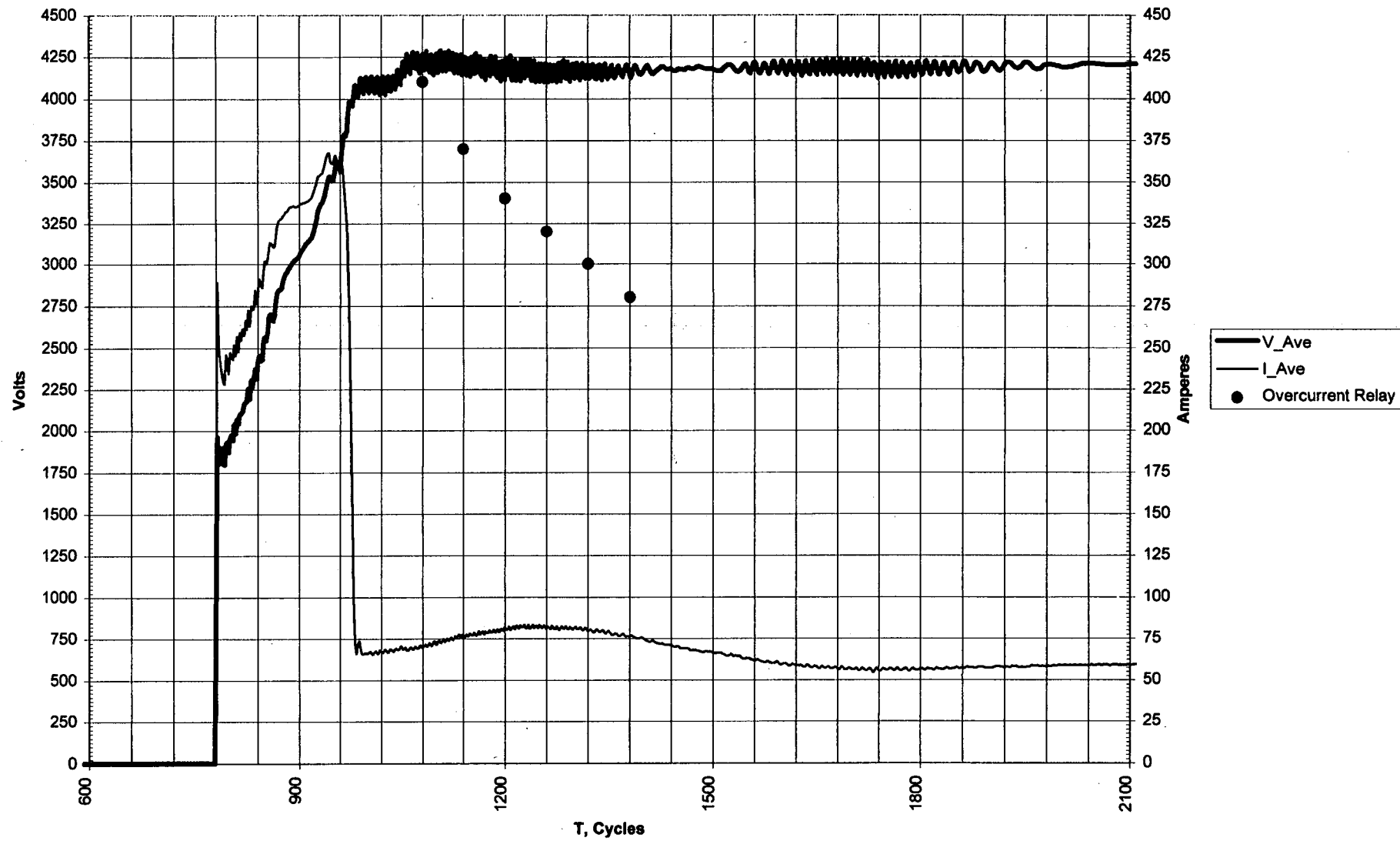


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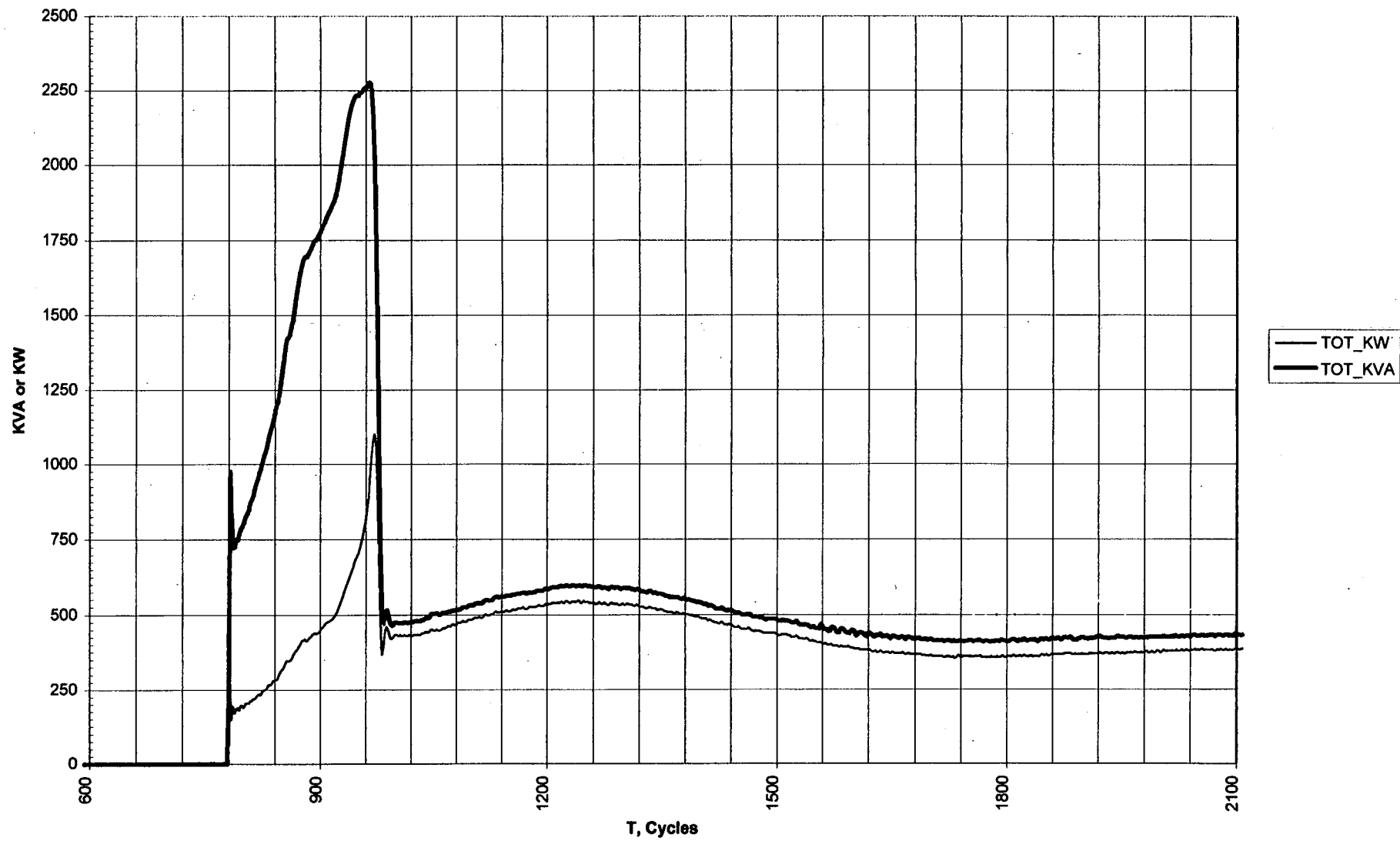


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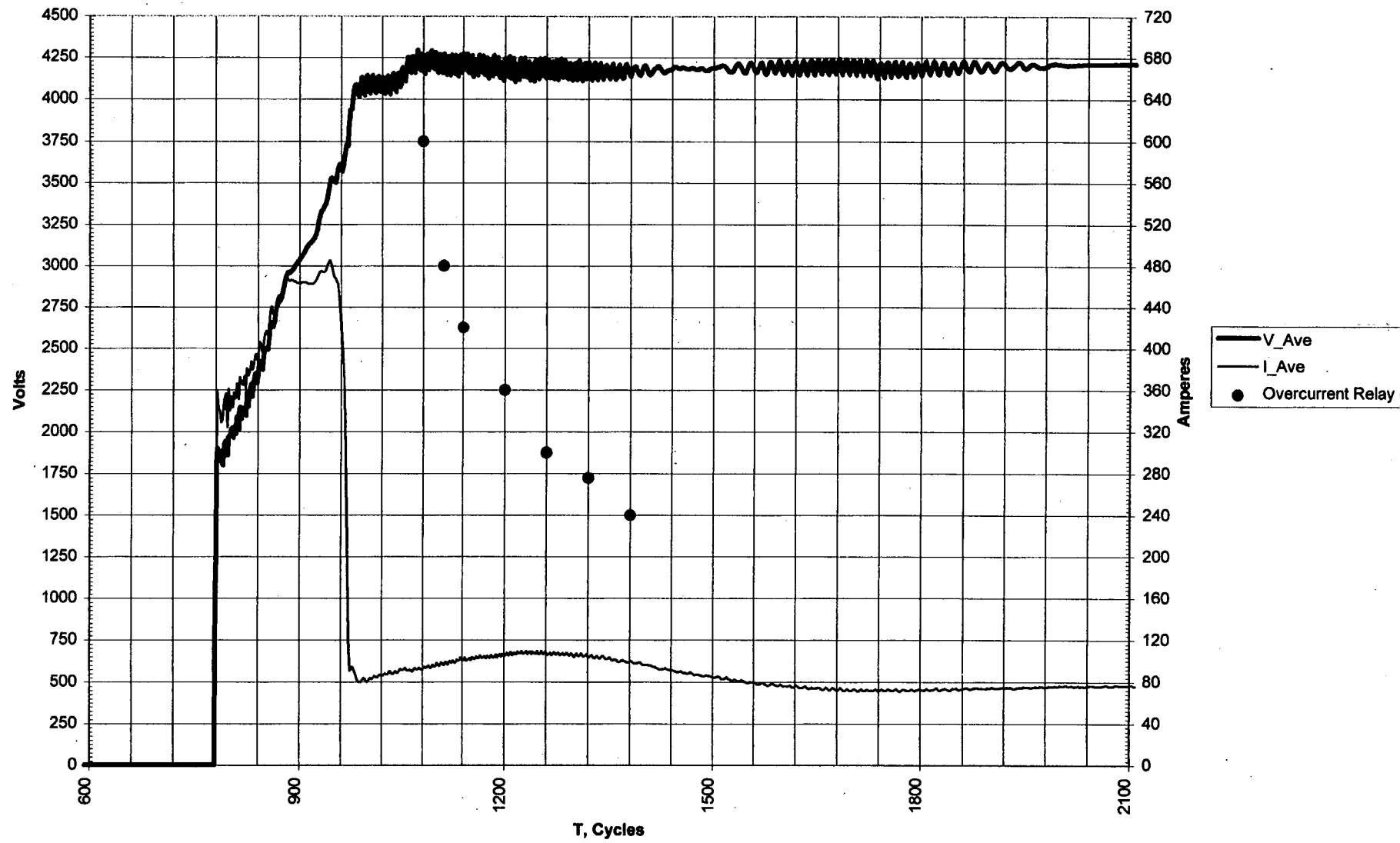


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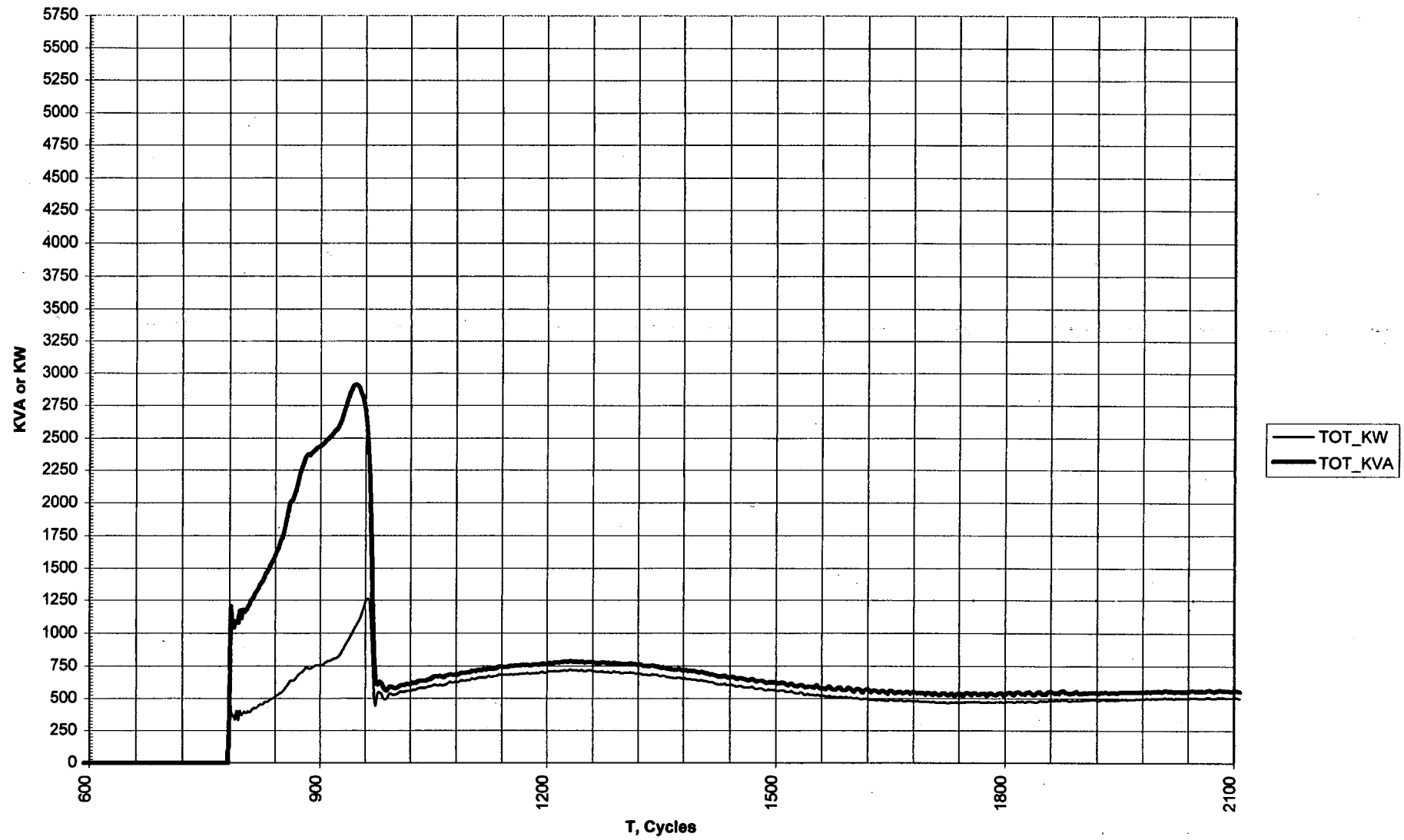


Figure 4.3.3-5: Test3, EFW 1A Voltage and Current

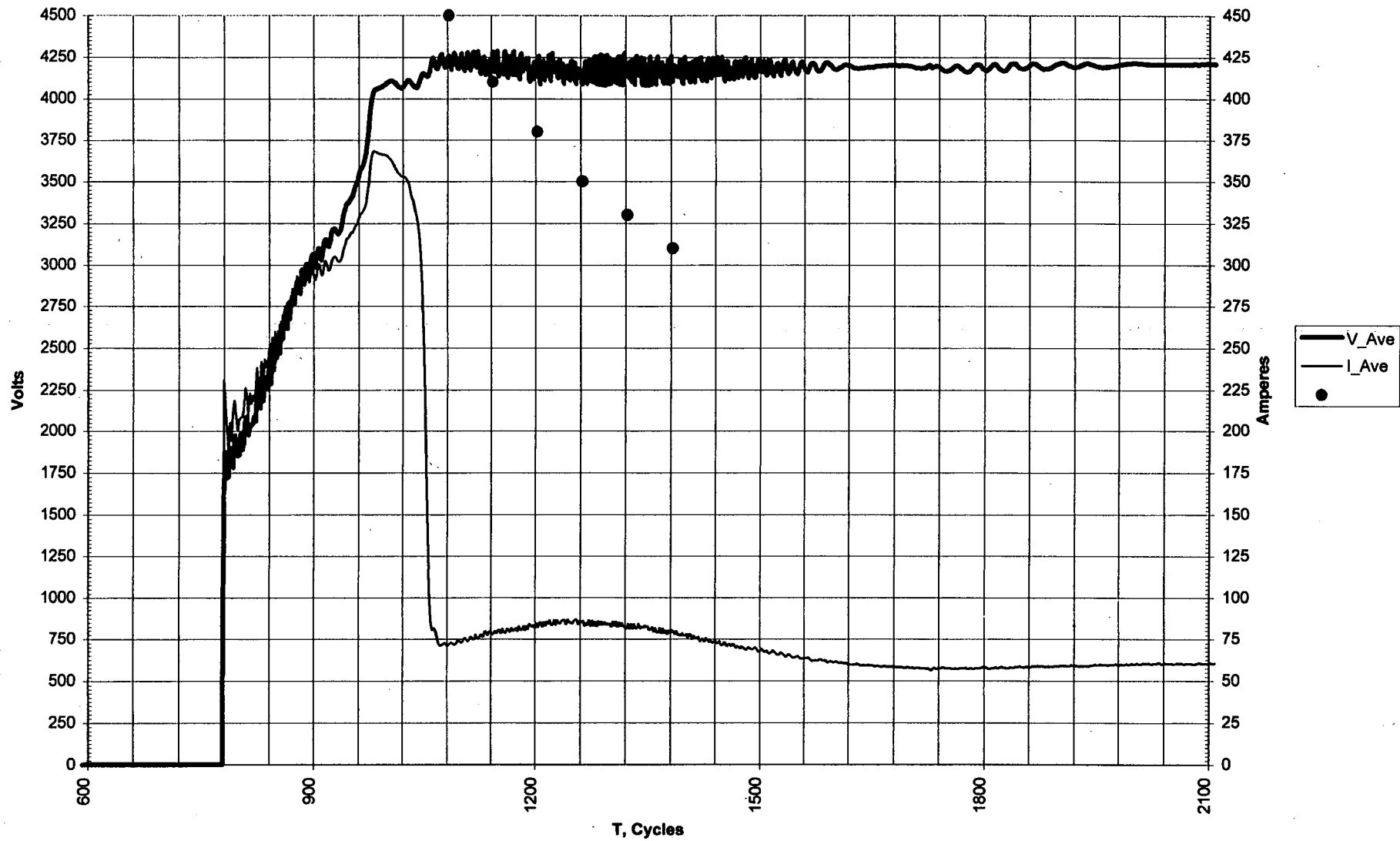


Figure 4.3.3-6: Test3, EFW 1A KVA and KW

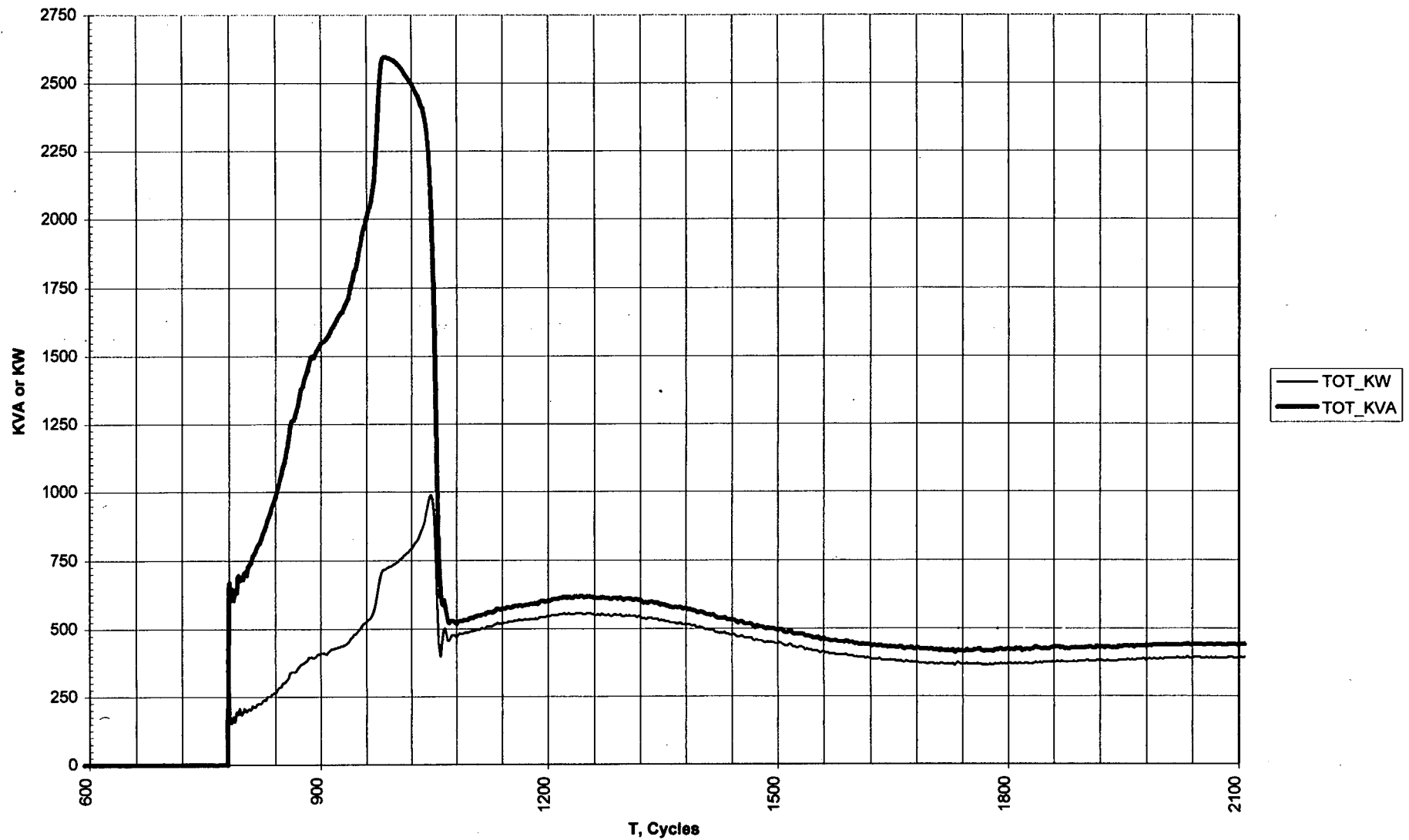


Figure 4.3.3-7: Test3, LPSW 3B Voltage and Current

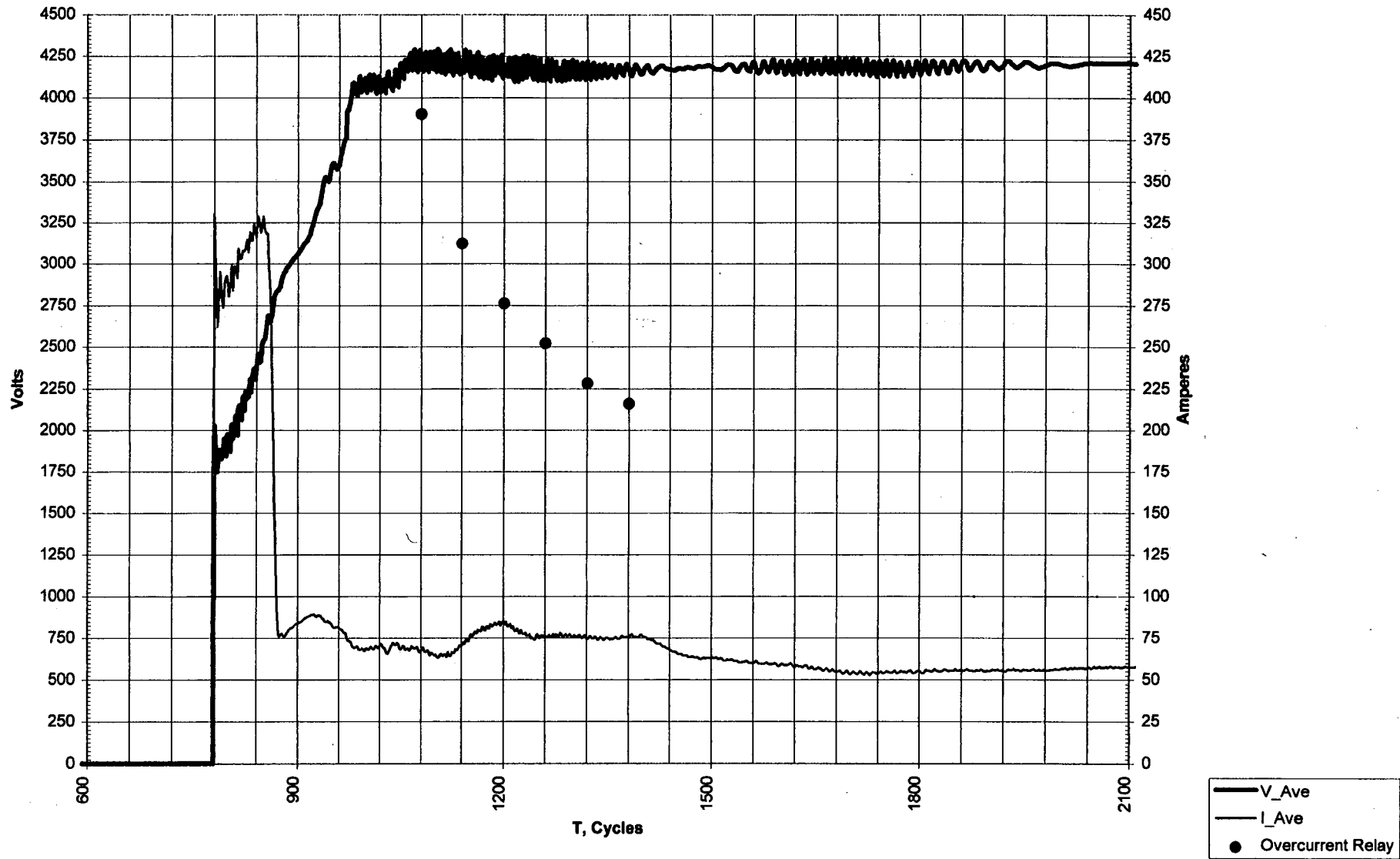


Figure 4.3.3-8: Test3, LPSW 3B KVA and KW

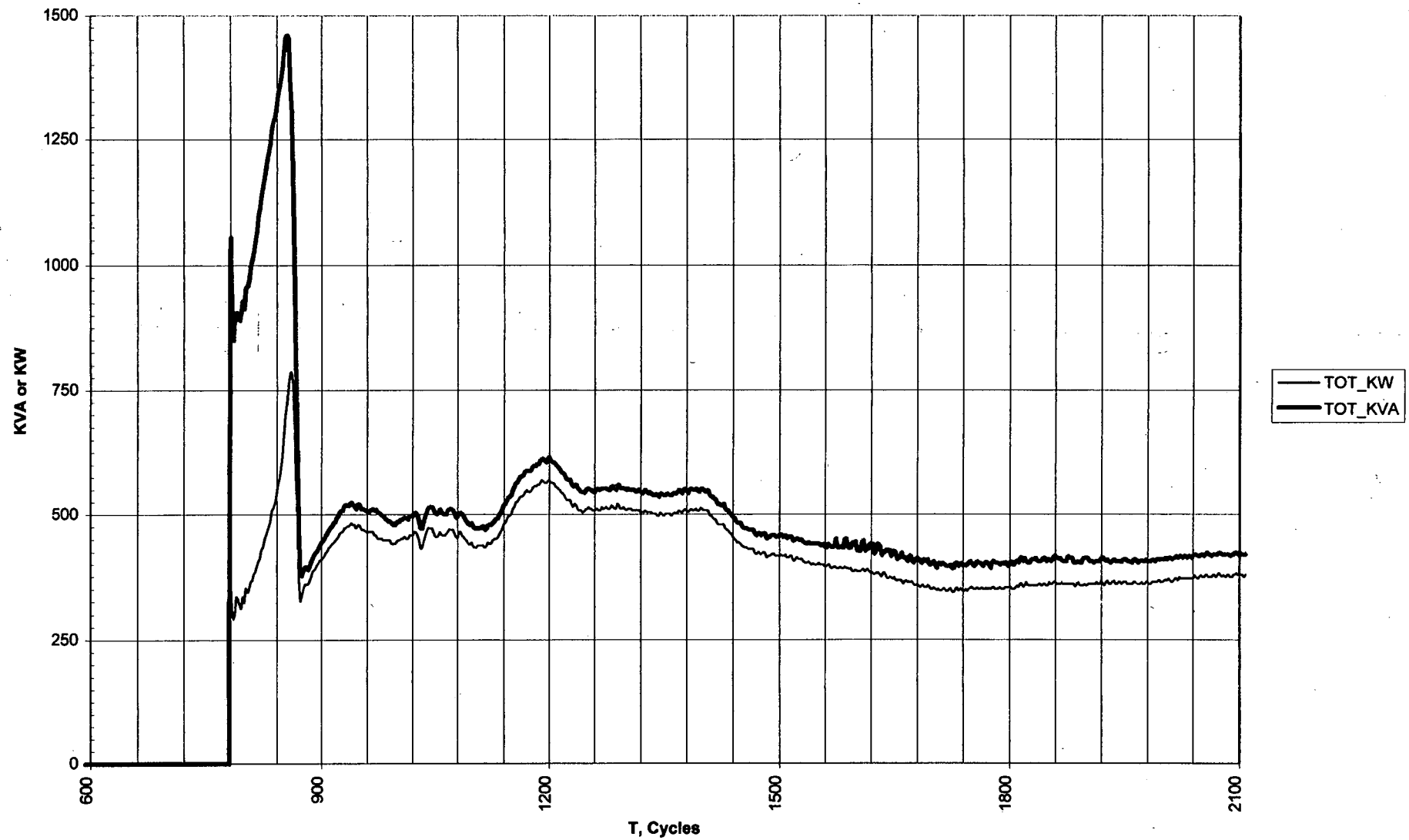


Figure 4.3.3-9: Test3, LPI 3B Voltage and Current

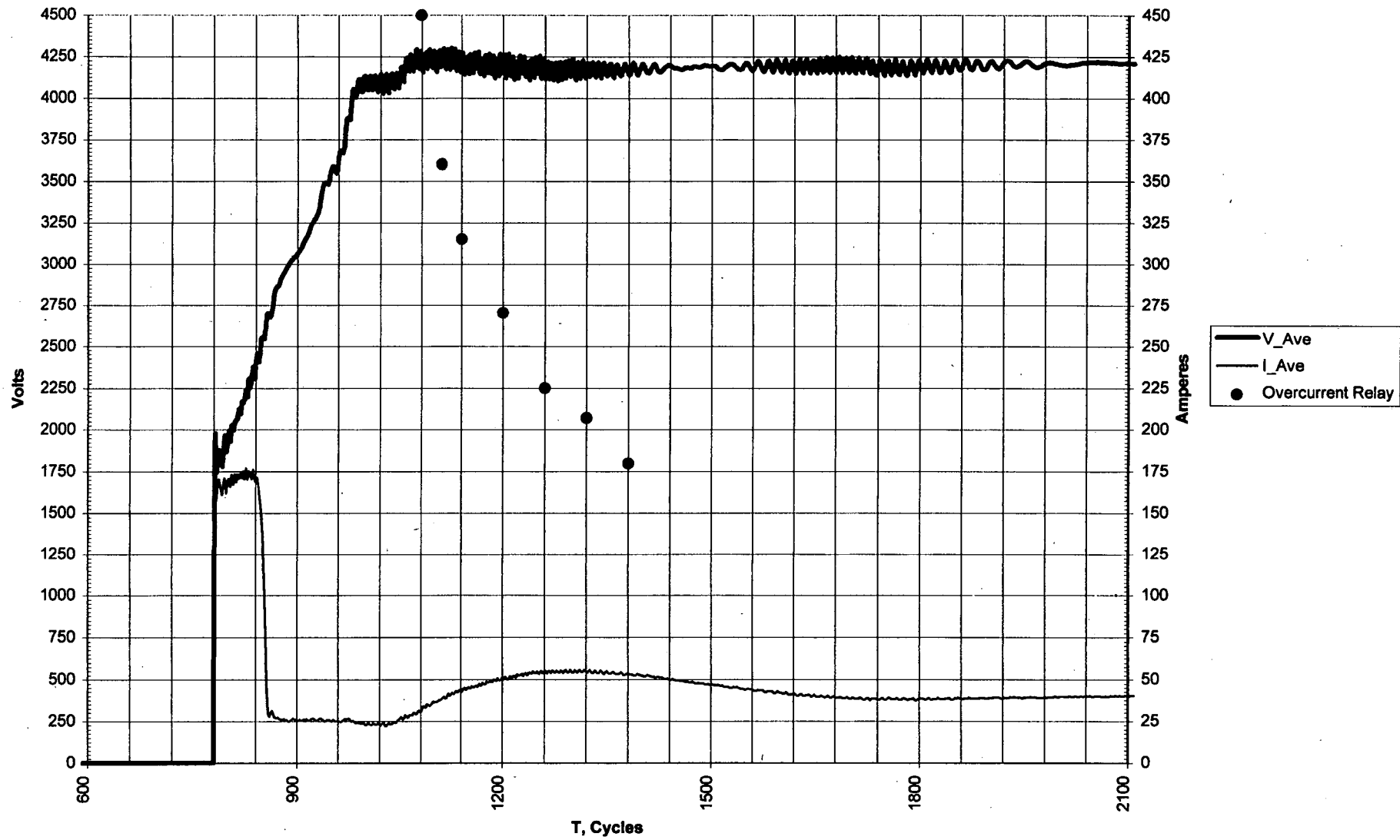


Figure 4.3.3-10: Test3, LPI 3B KVA and KW

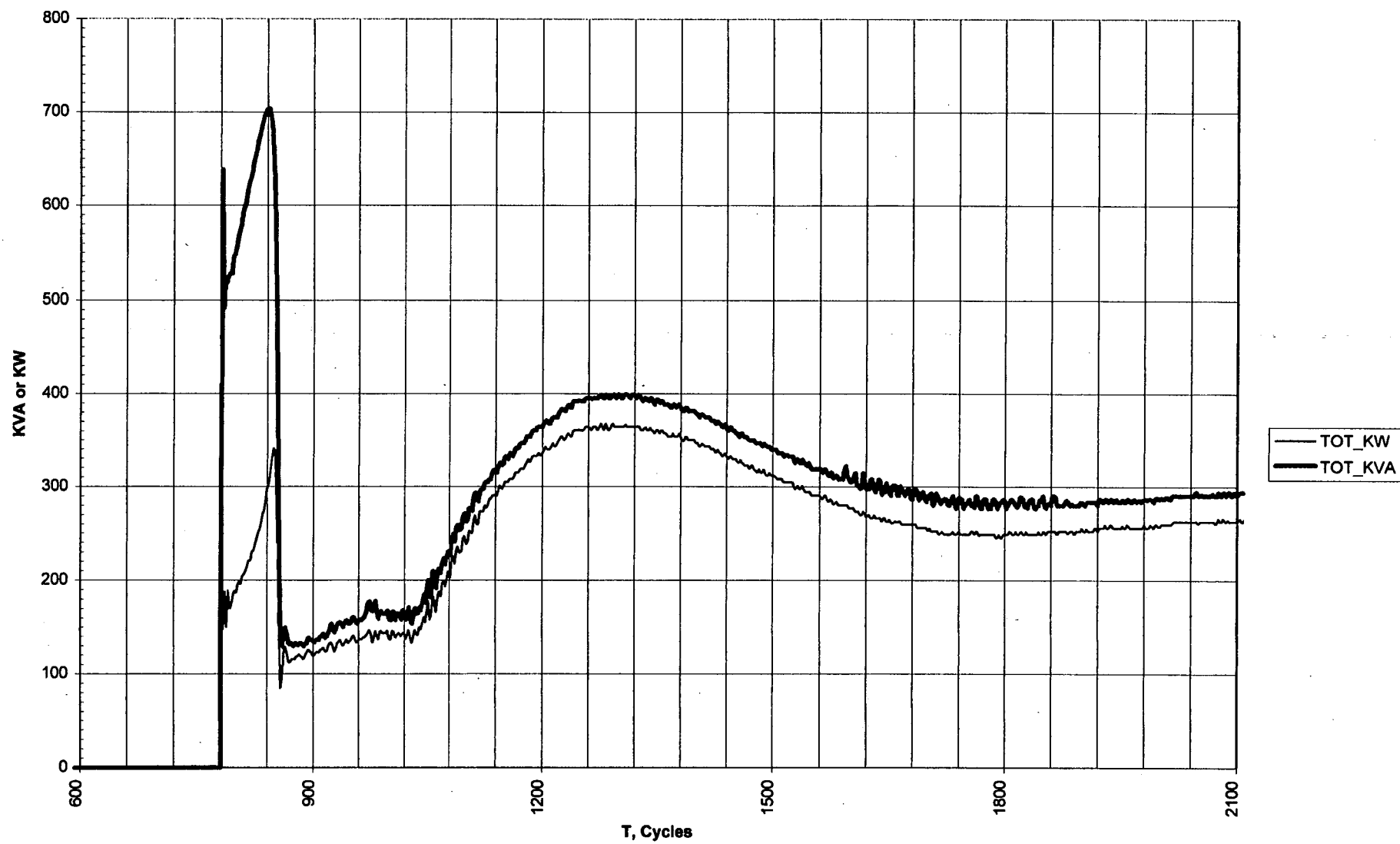


Figure 4.3.3-11: Test3, RBS 3B Voltage and Current

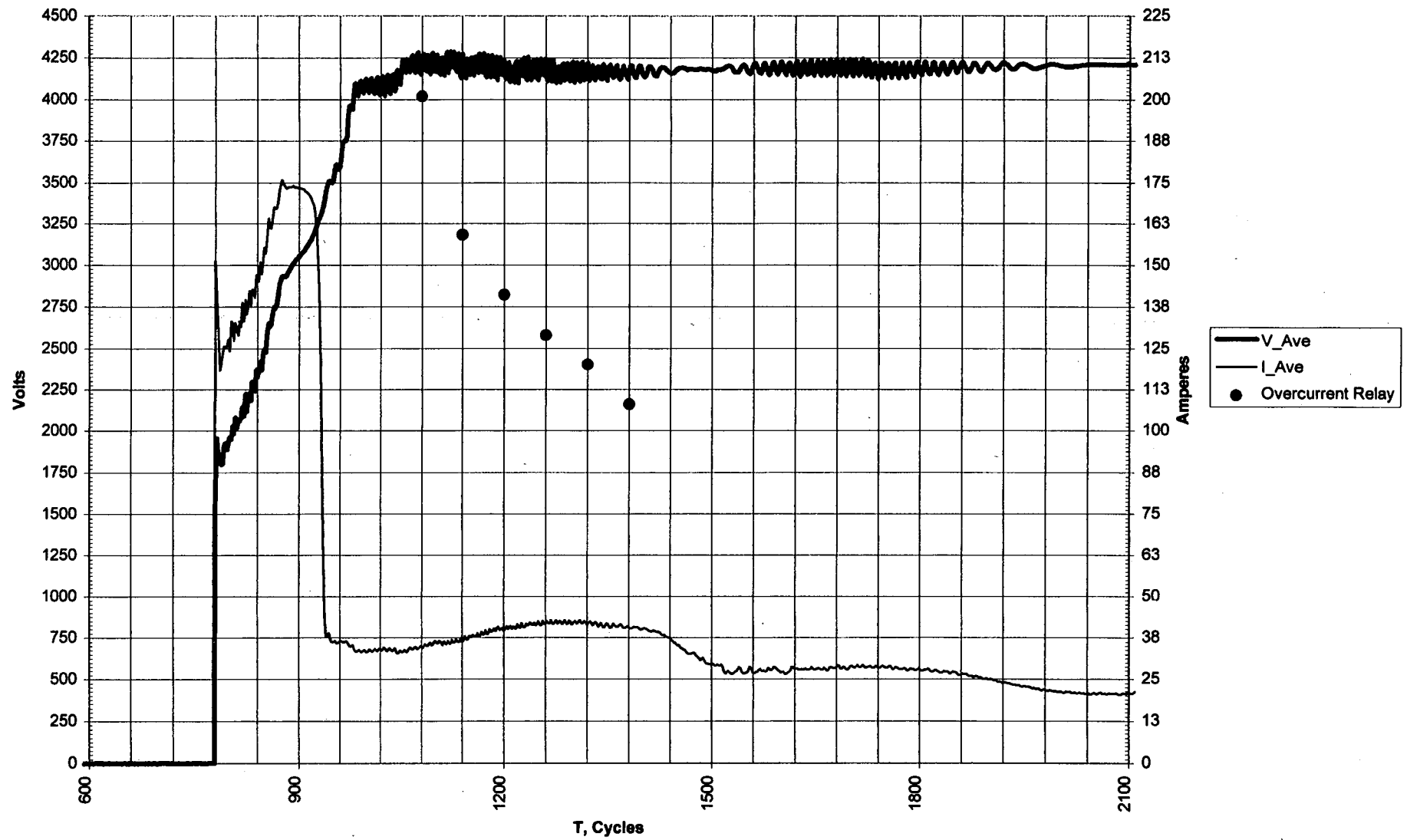


Figure 4.3.3-12: Test3, RBS 3B KVA and KW

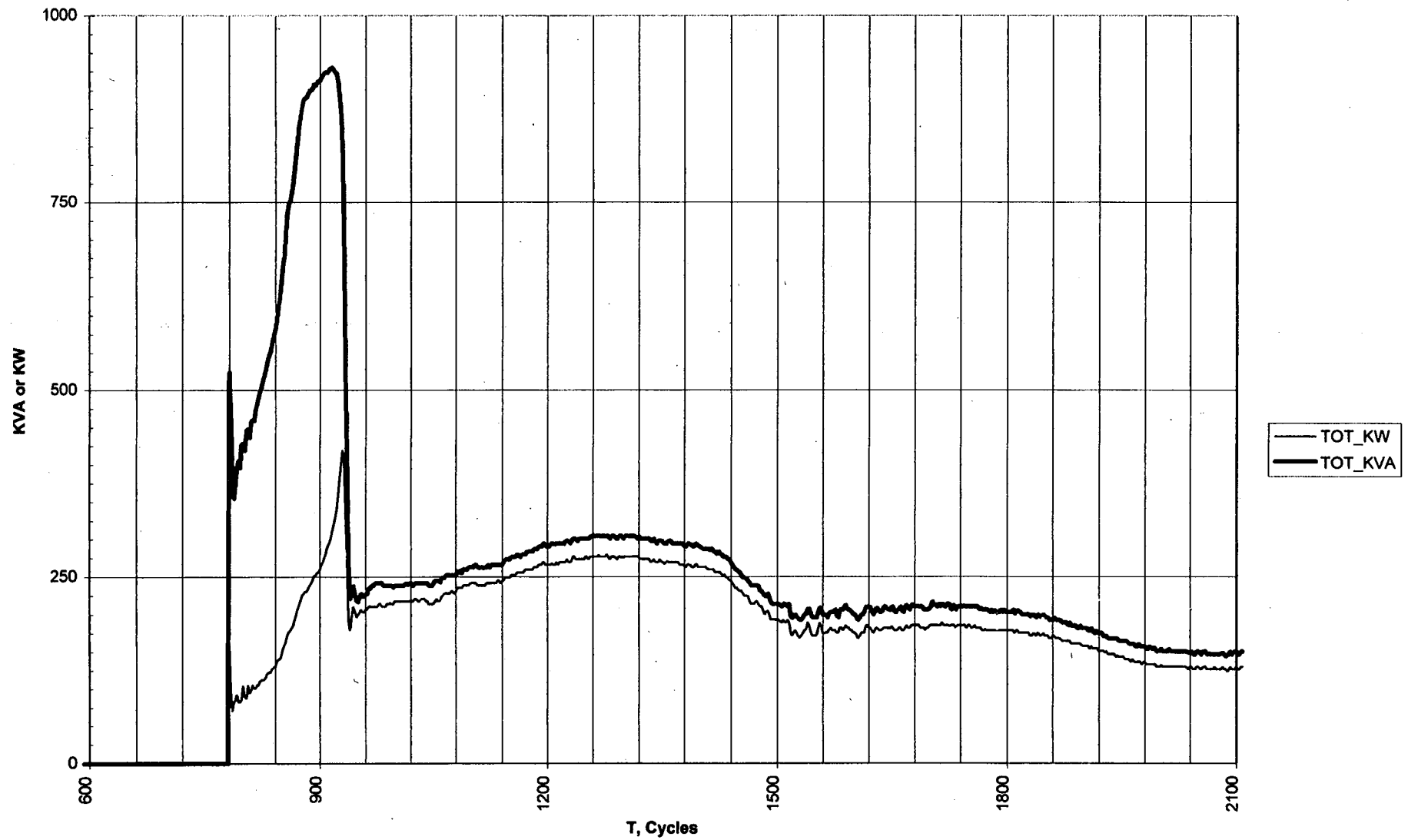


Figure 4.3.4-1: Test3, RBCU 3B Voltage and Current

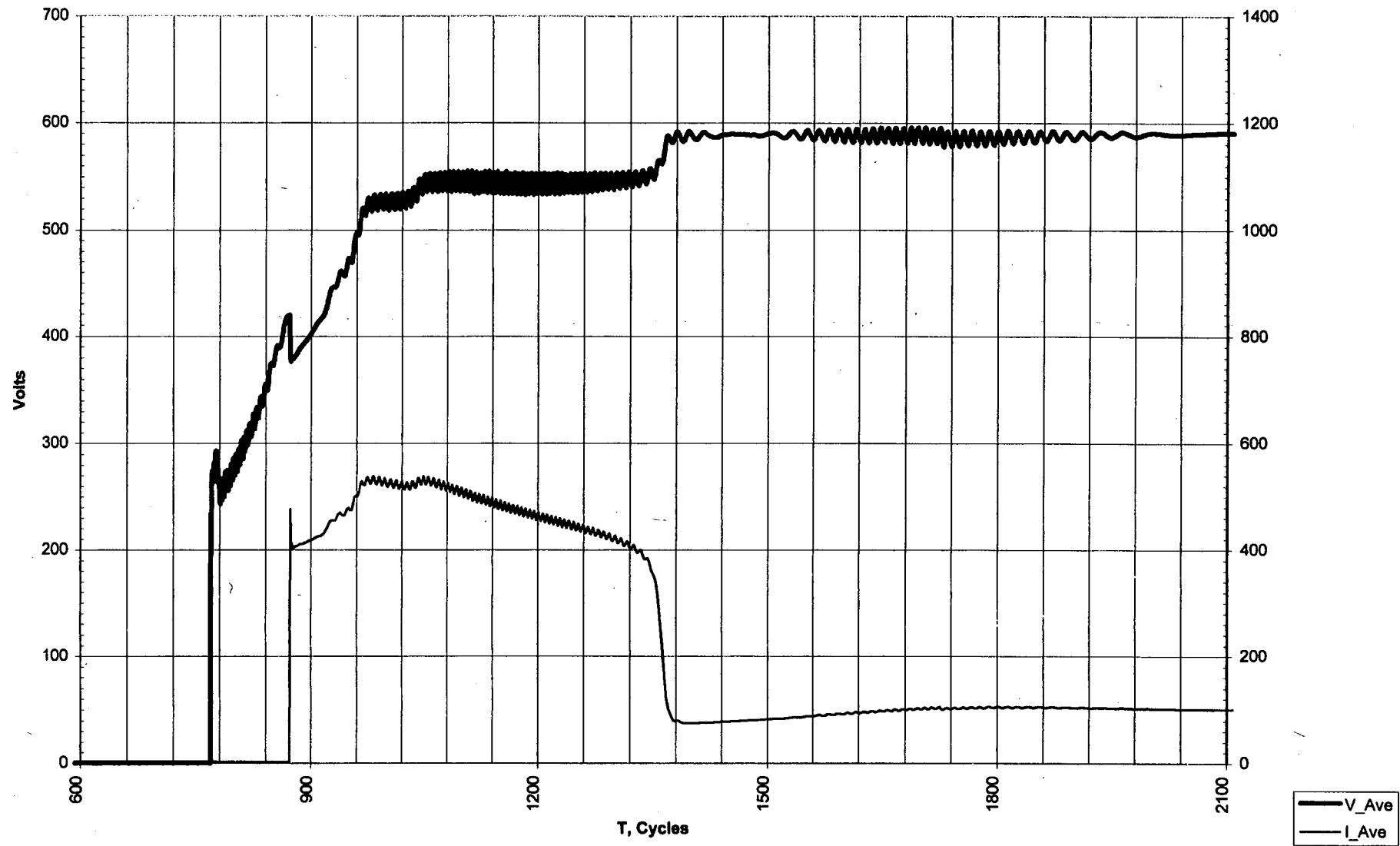


Figure 4.3.4-2: Test3, RBCU 3B KVA and KW

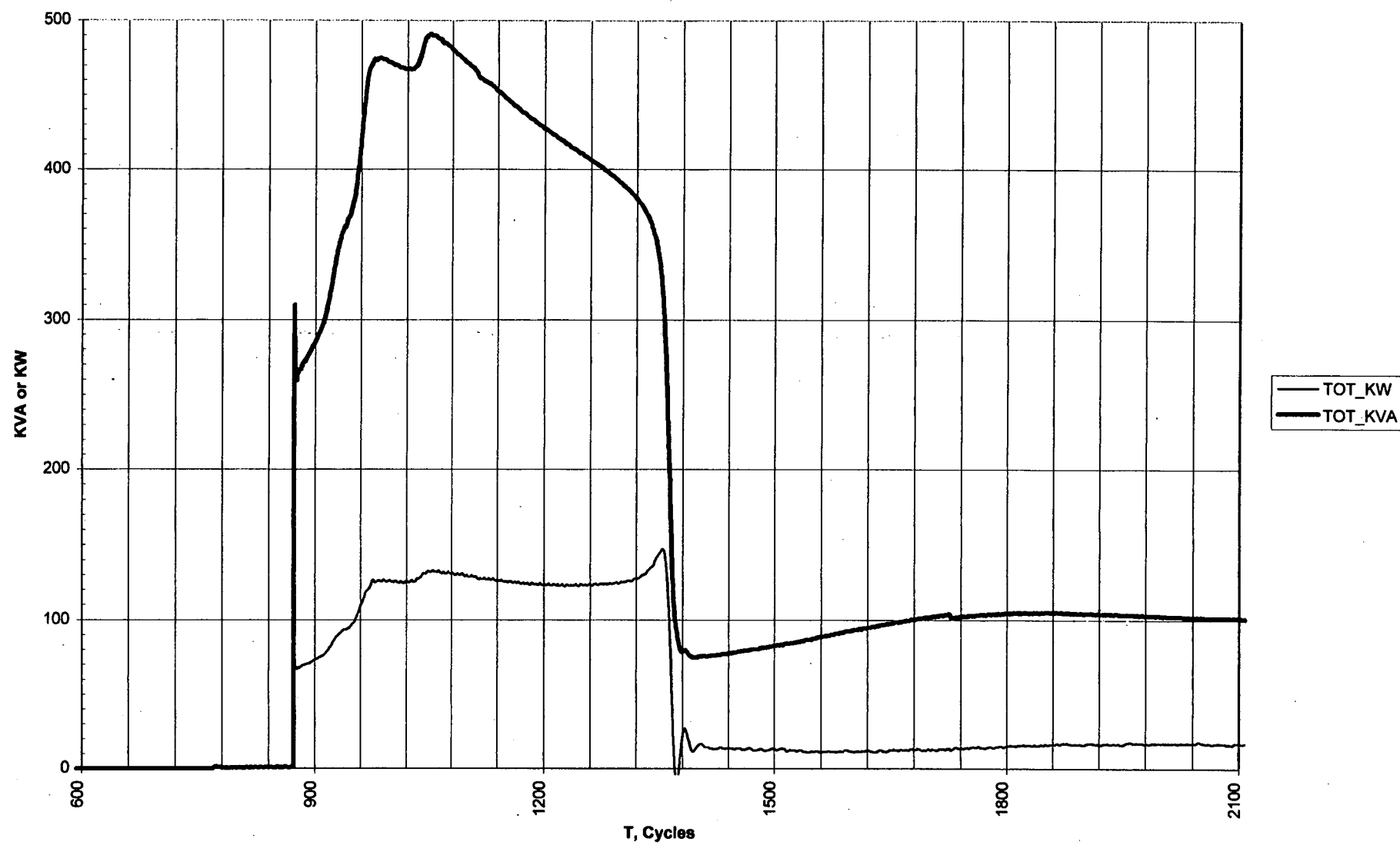


Figure 4.3.5-1: Test3, 1X5 Voltage and Current

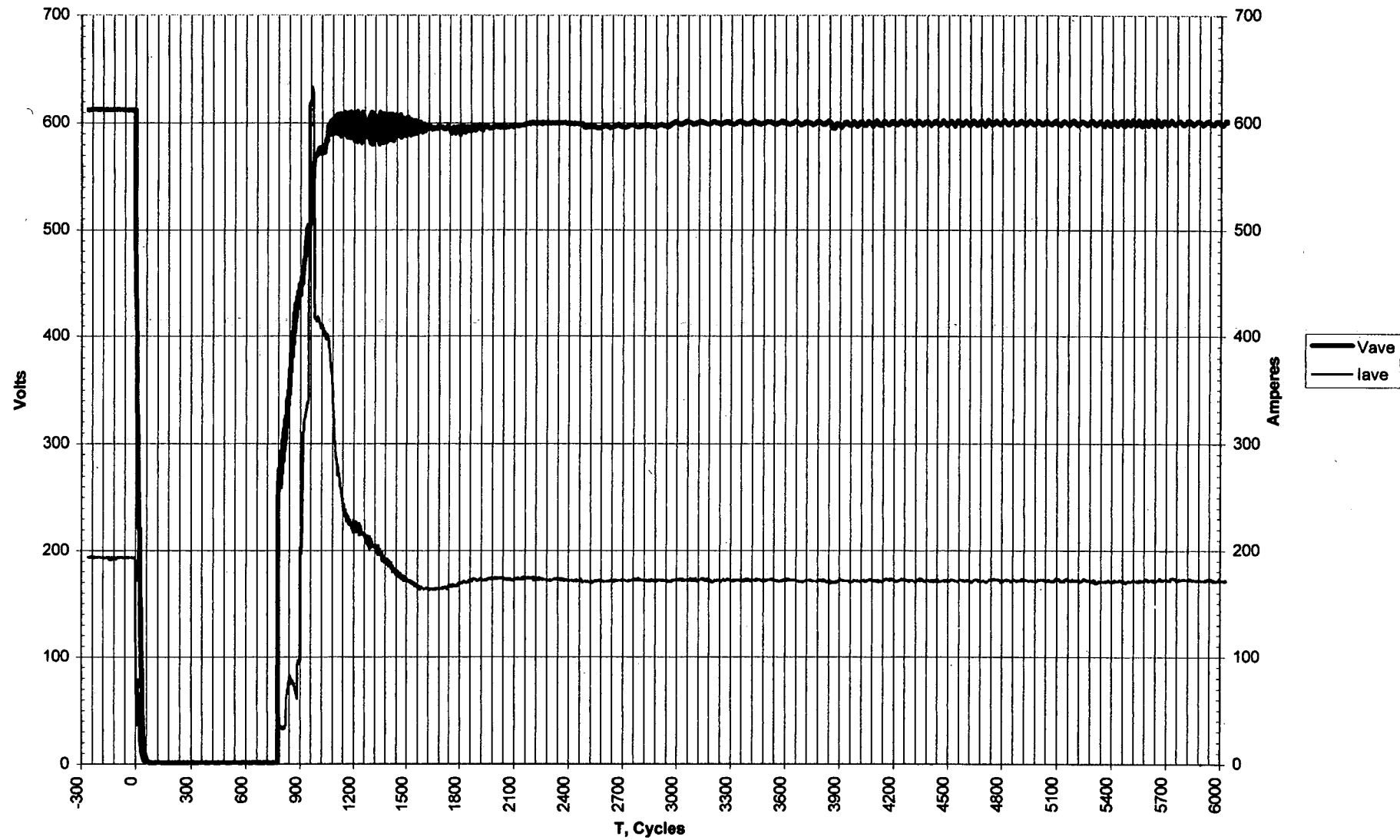


Figure 4.3.5-2: Test3, 1X5 KVA and KW

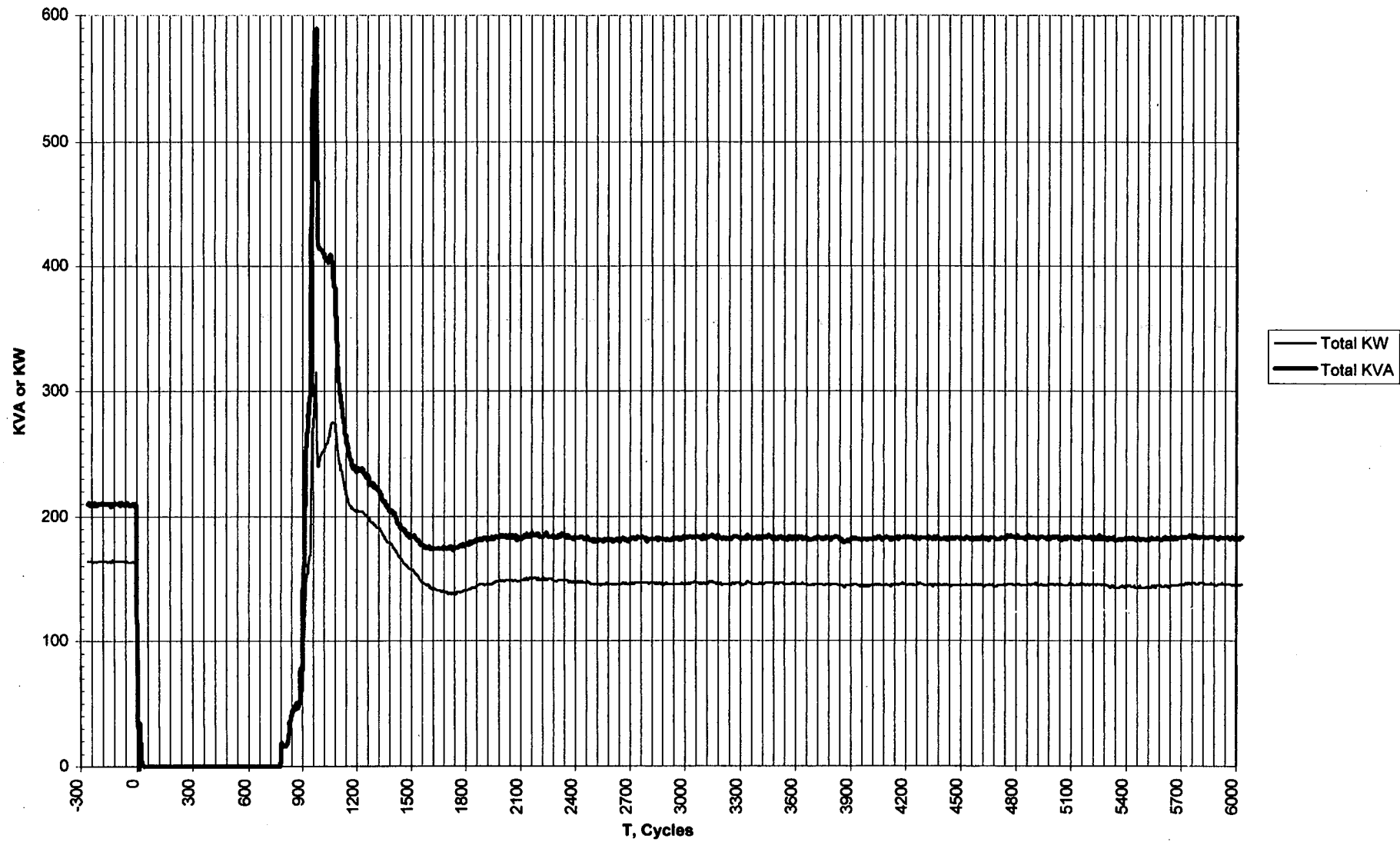


Figure 4.3.5-3: Test3, 1X6 Voltage and Current

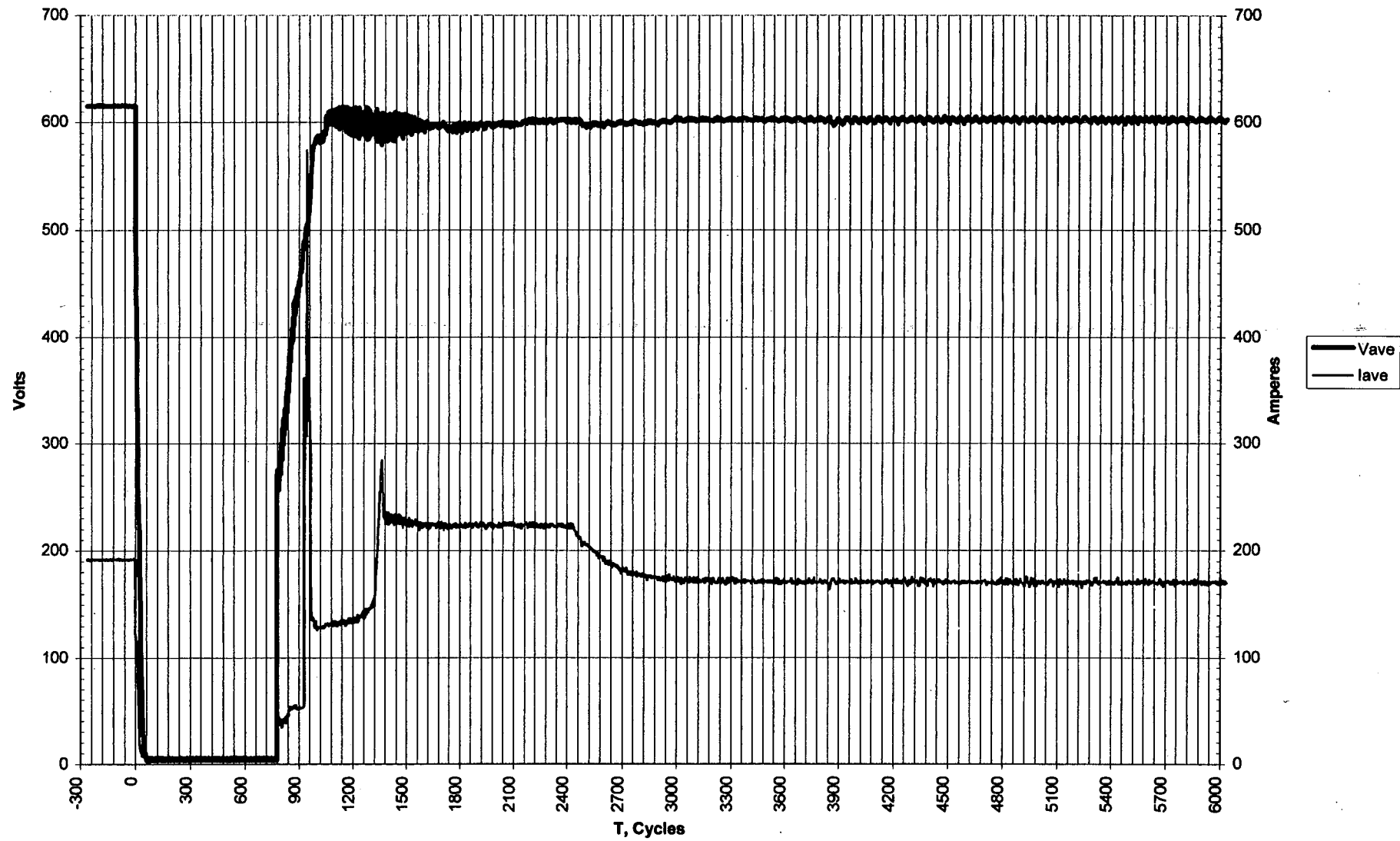


Figure 4.3.5-4: Test3, 1X6 KVA and KW

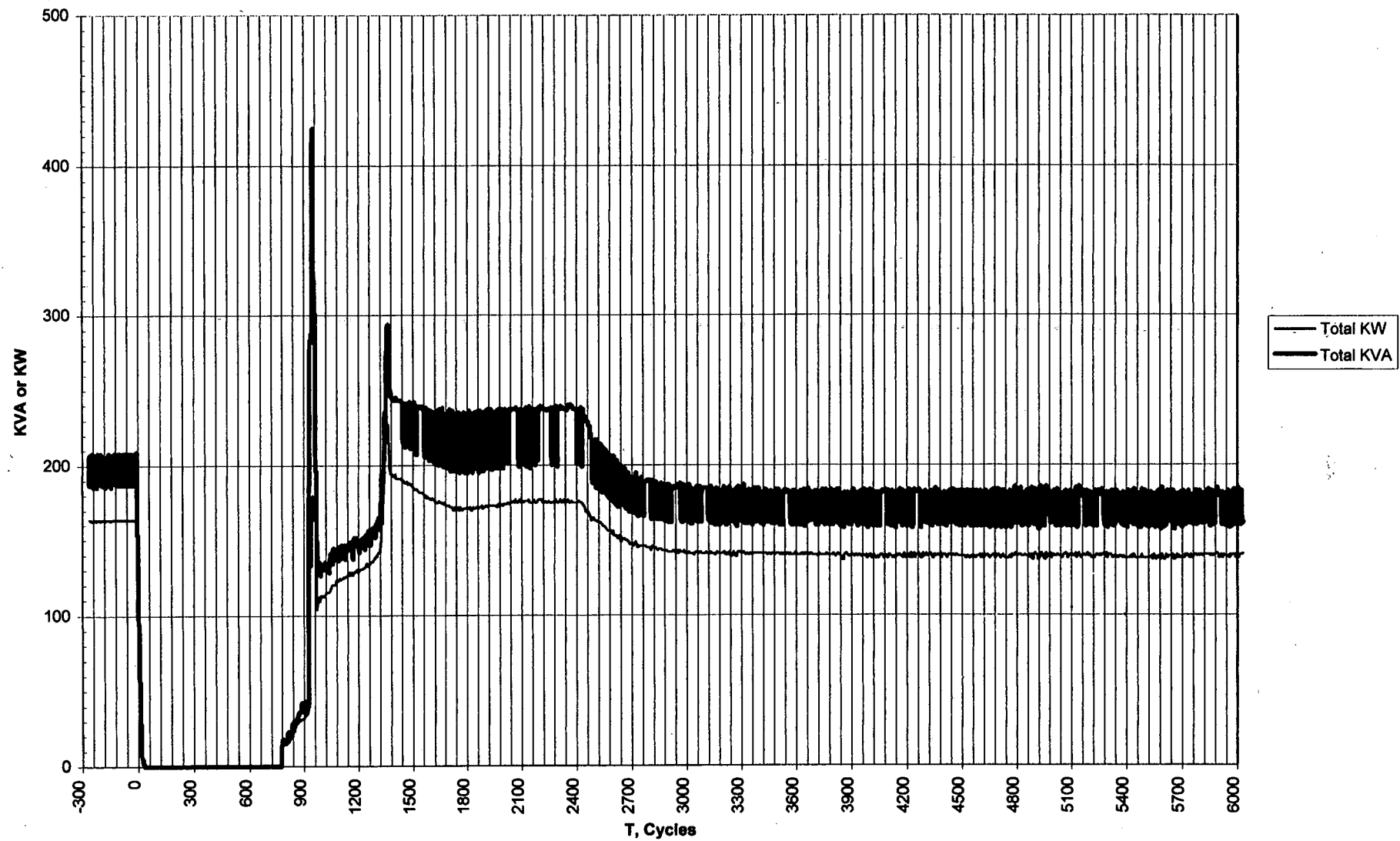


Figure 4.3.5-5: Test3, 3X5 Voltage and Current

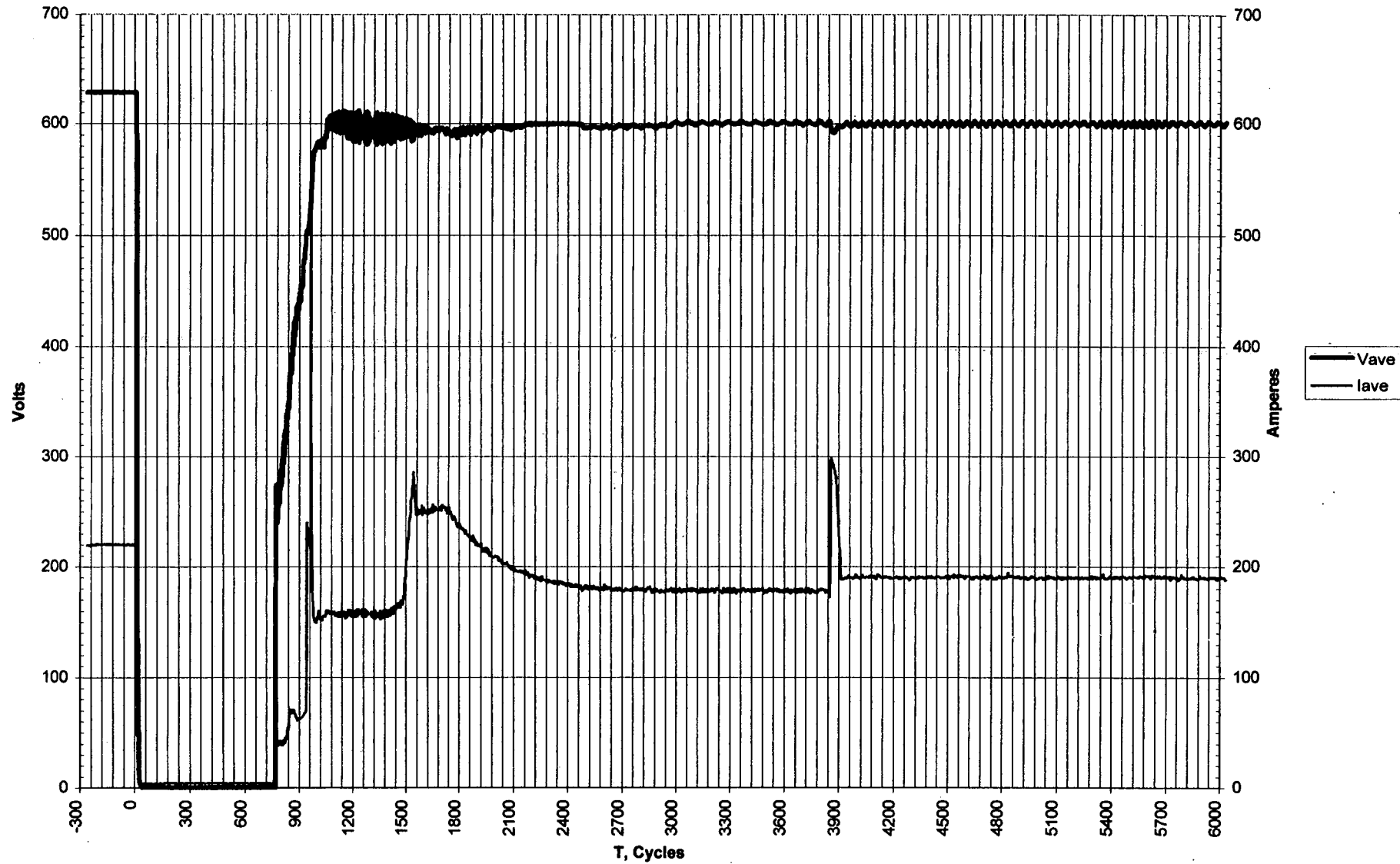


Figure 4.3.5-6: Test3, 3X5 KVA and KW

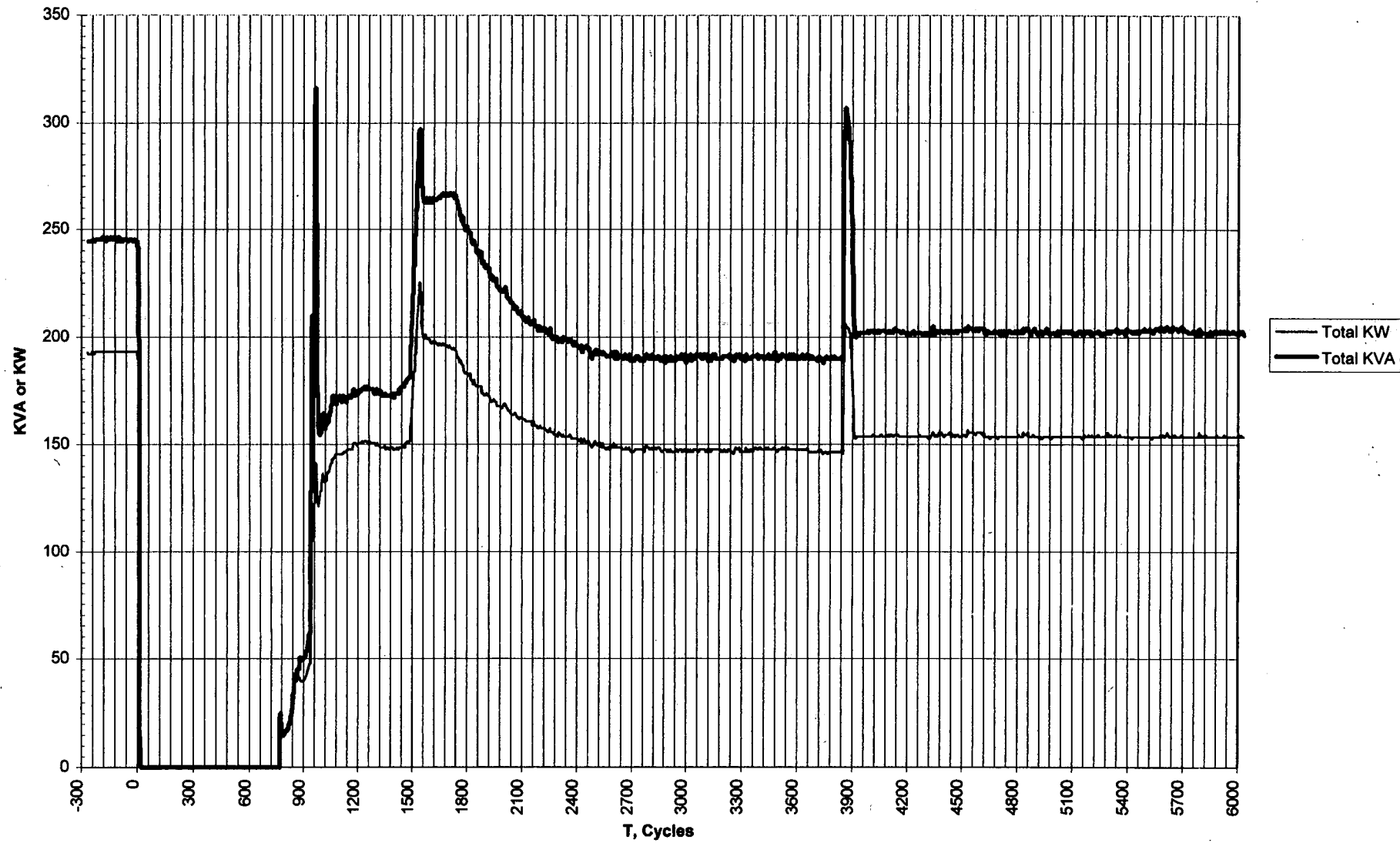


Figure 4.3.5-7: Test3, 3X6 Voltage and Current

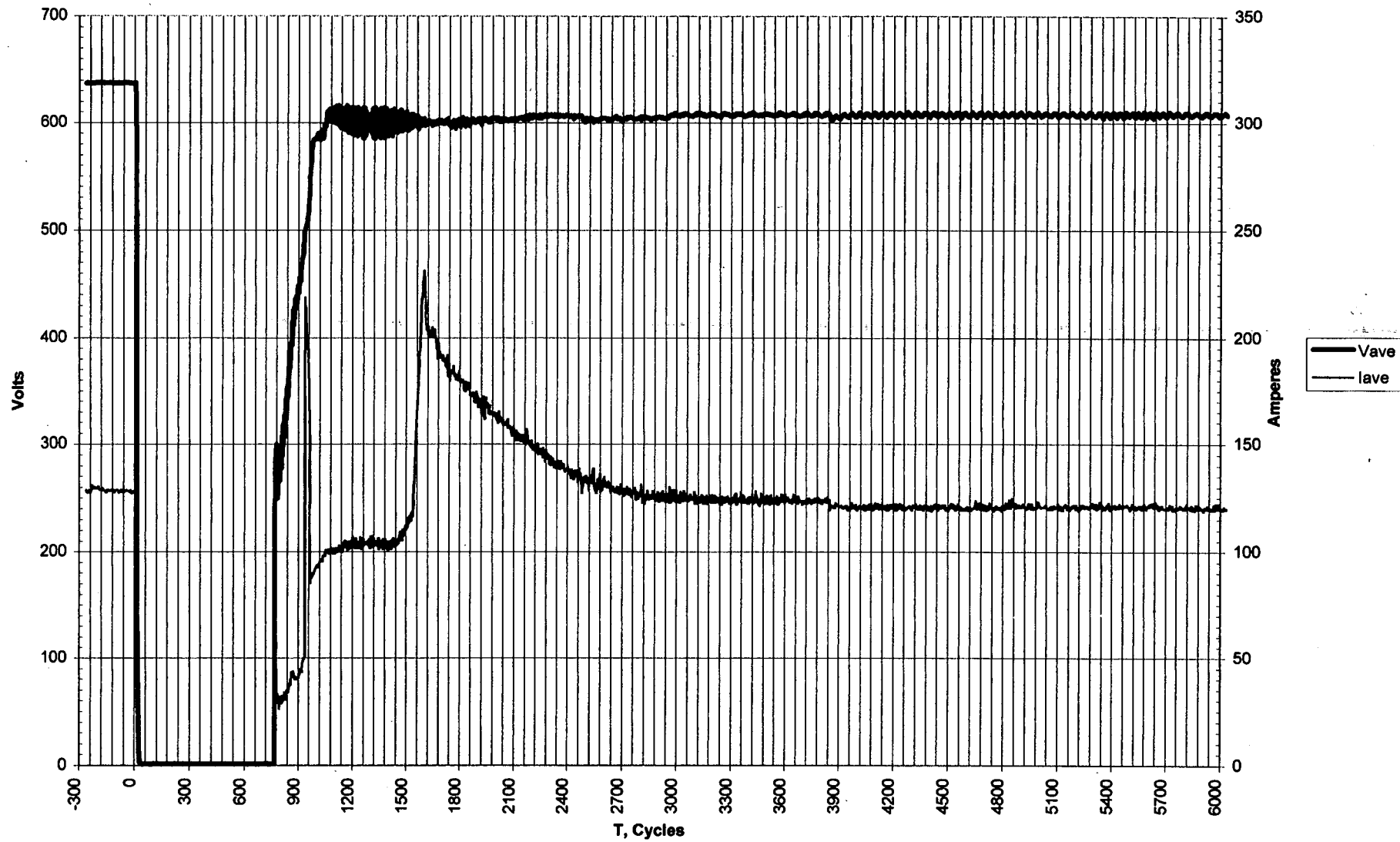


Figure 4.3.5-8: Test3, 3X6 KVA and KW



Figure 4.3.5-9: Test3, 3X8 Voltage and Current

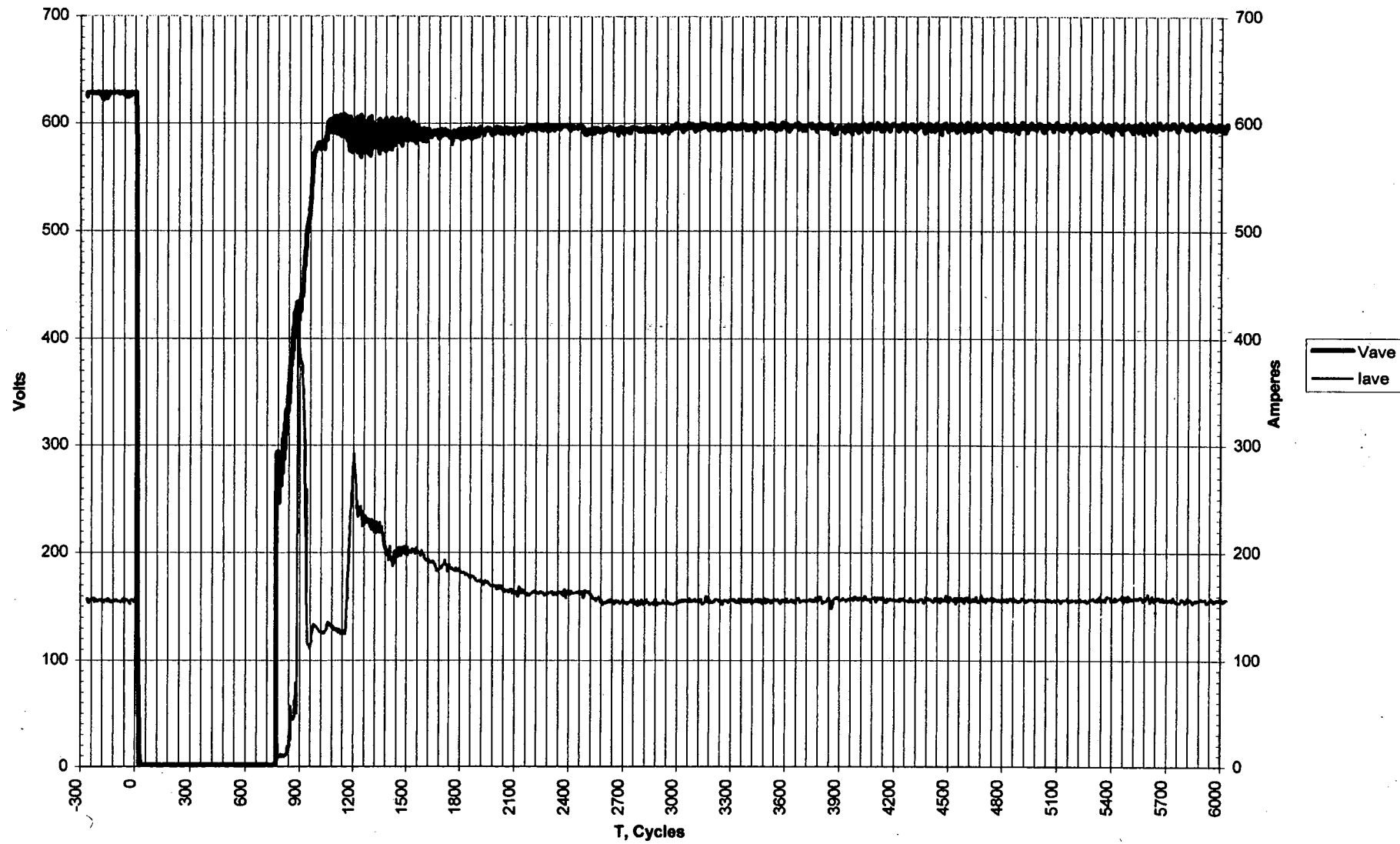


Figure 4.3.5-10: Test3, 3X8 KVA and KW

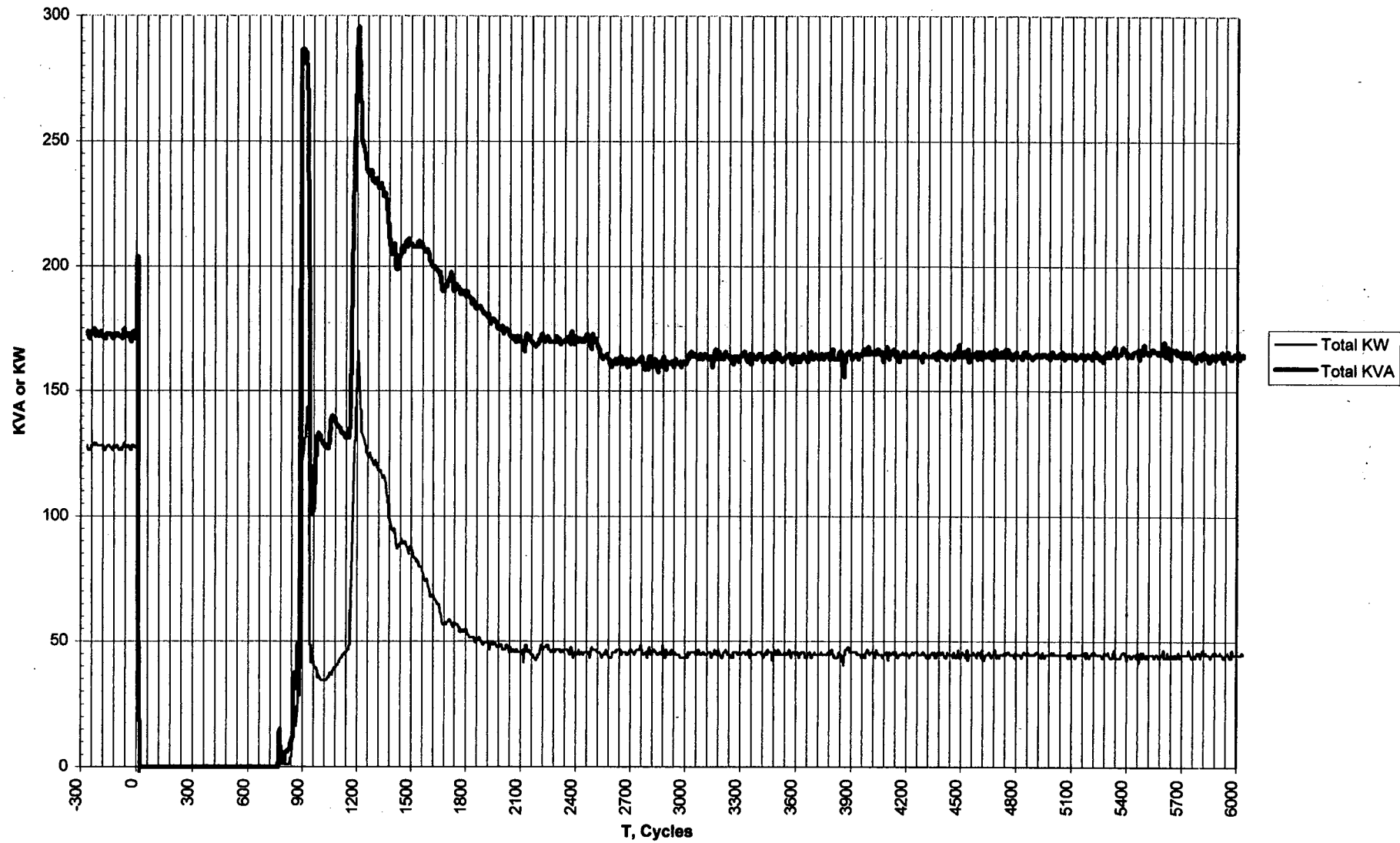


Figure 4.3.5-11: Test3, 3X9 Voltage and Current

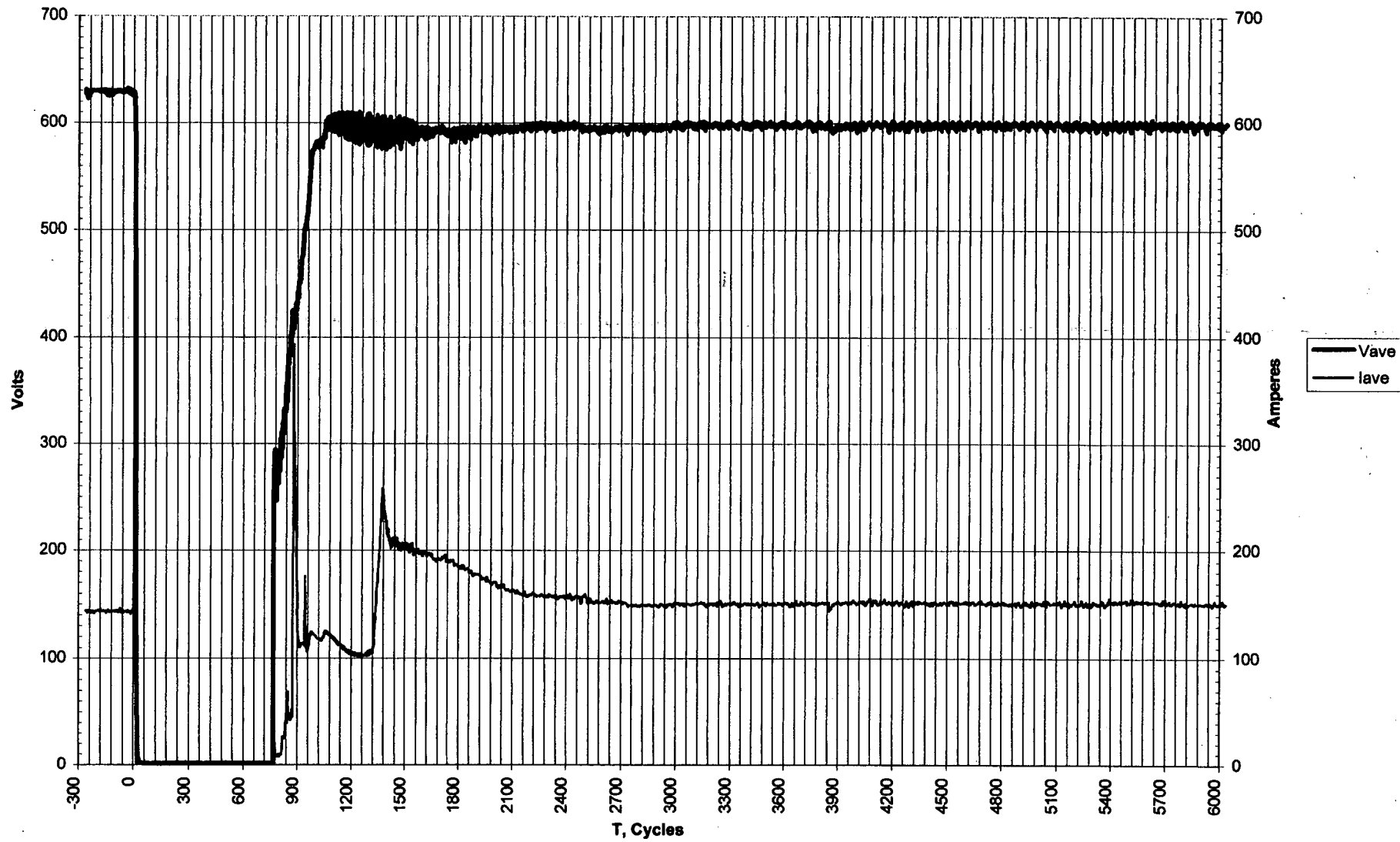


Figure 4.3.5-12: Test3, 3X9 KVA and KW

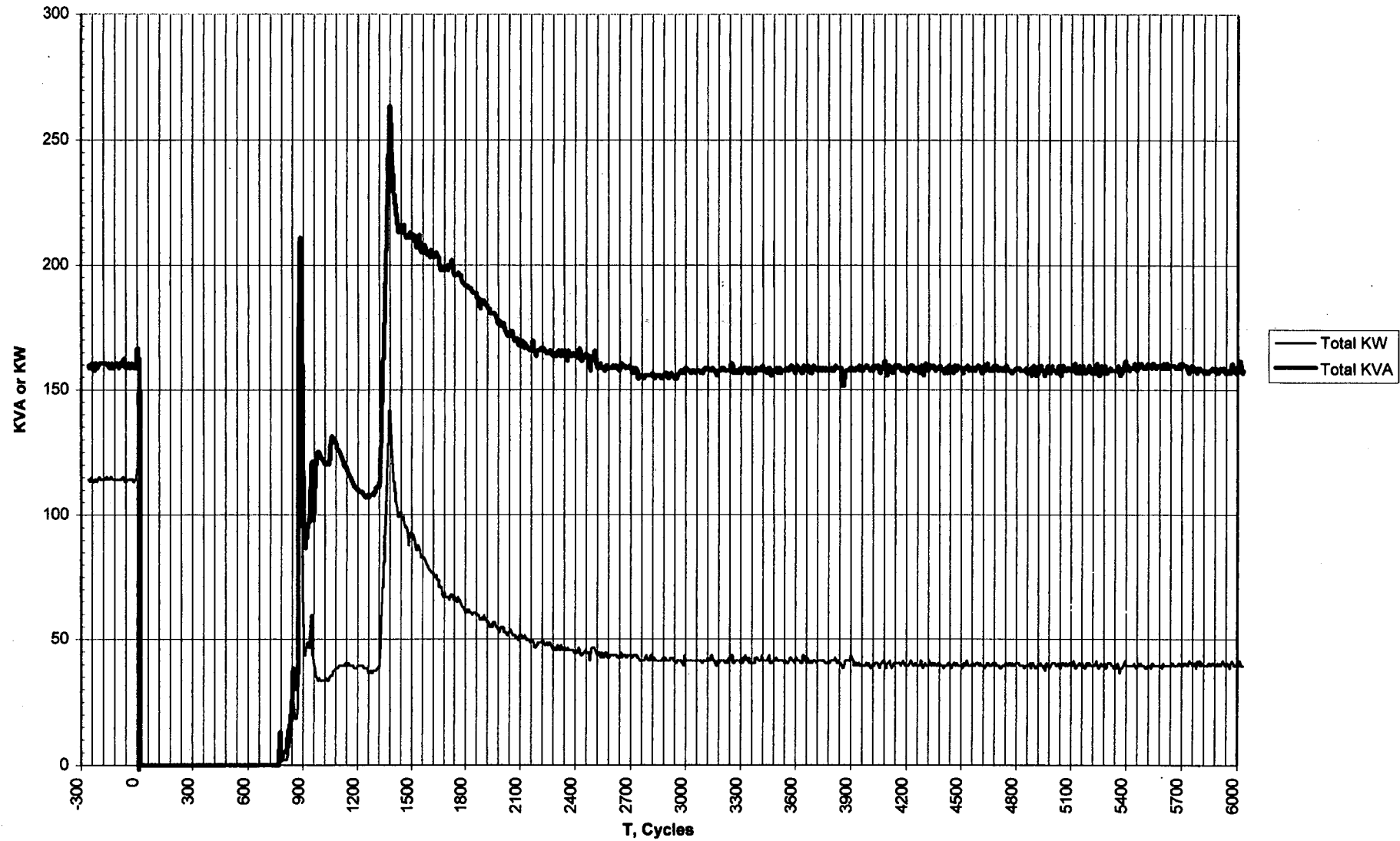


Figure 4.3.5-13: Test3, 3X4 Primary Voltage and Current

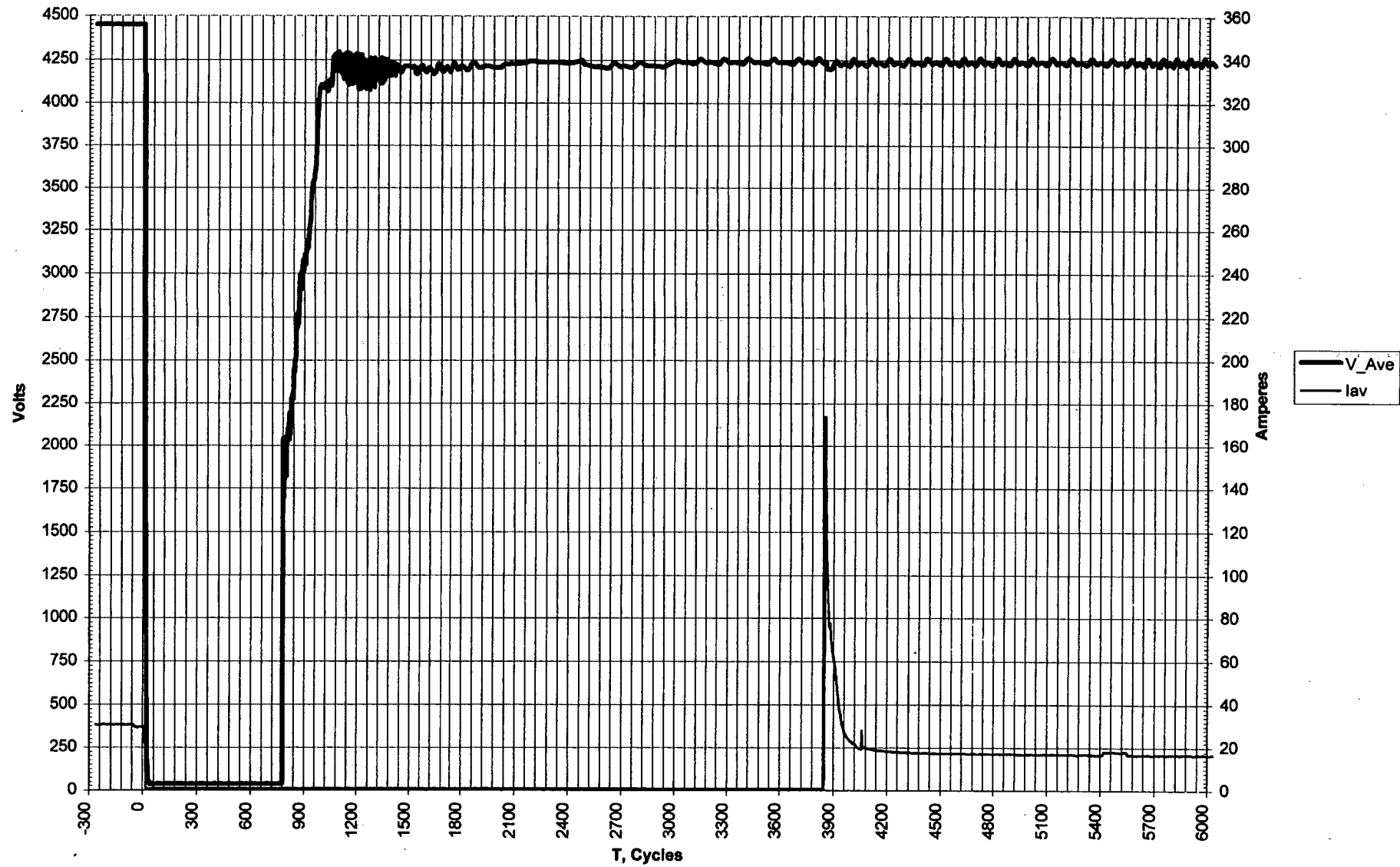


Figure 4.3.5-14: Test3, 3X4 KVA and KW

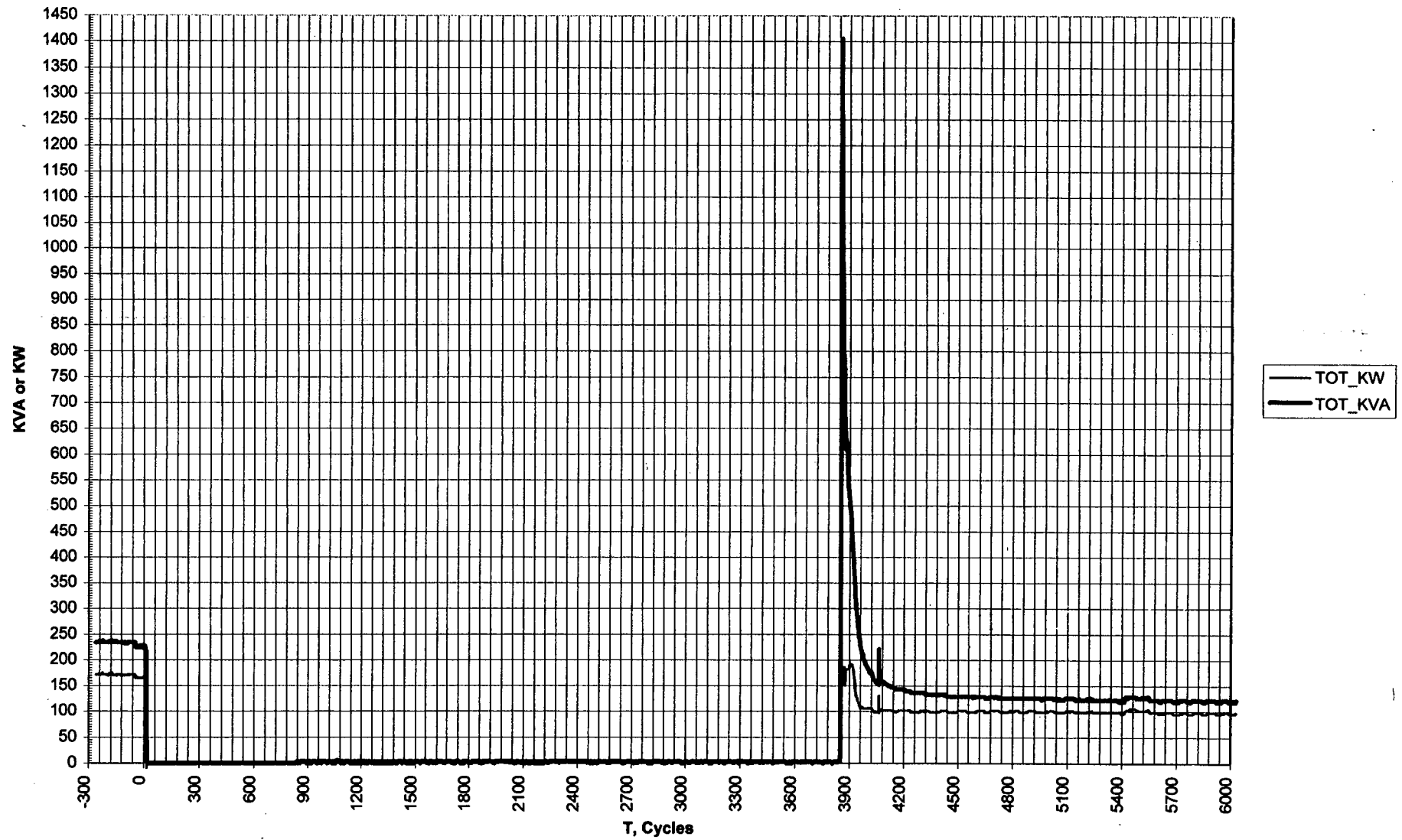


Figure 4.3.5-15: Test3, CX Primary Voltage and Amperes

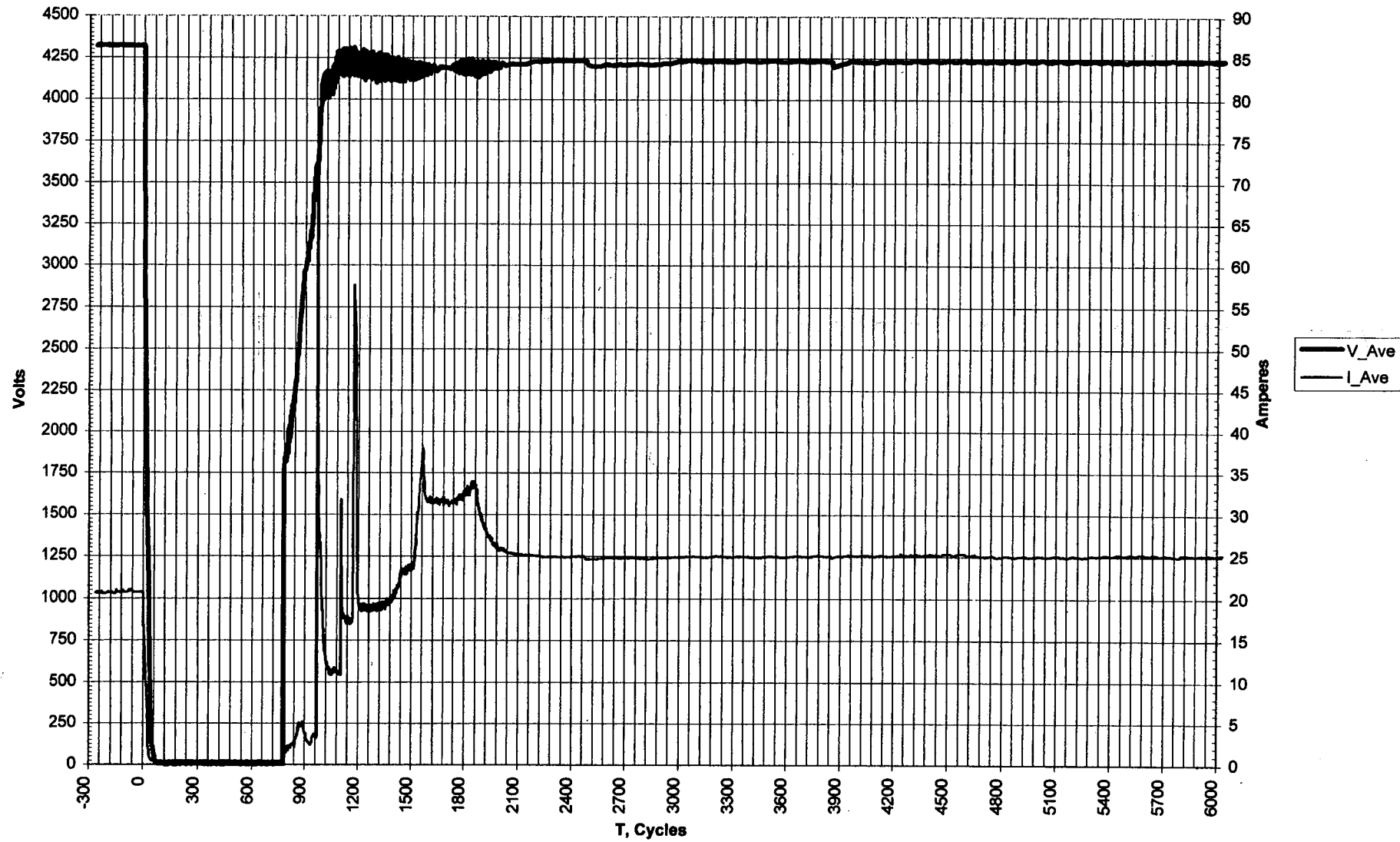


Figure 4.3.5-16: Test3, CX Primary KVA and KW

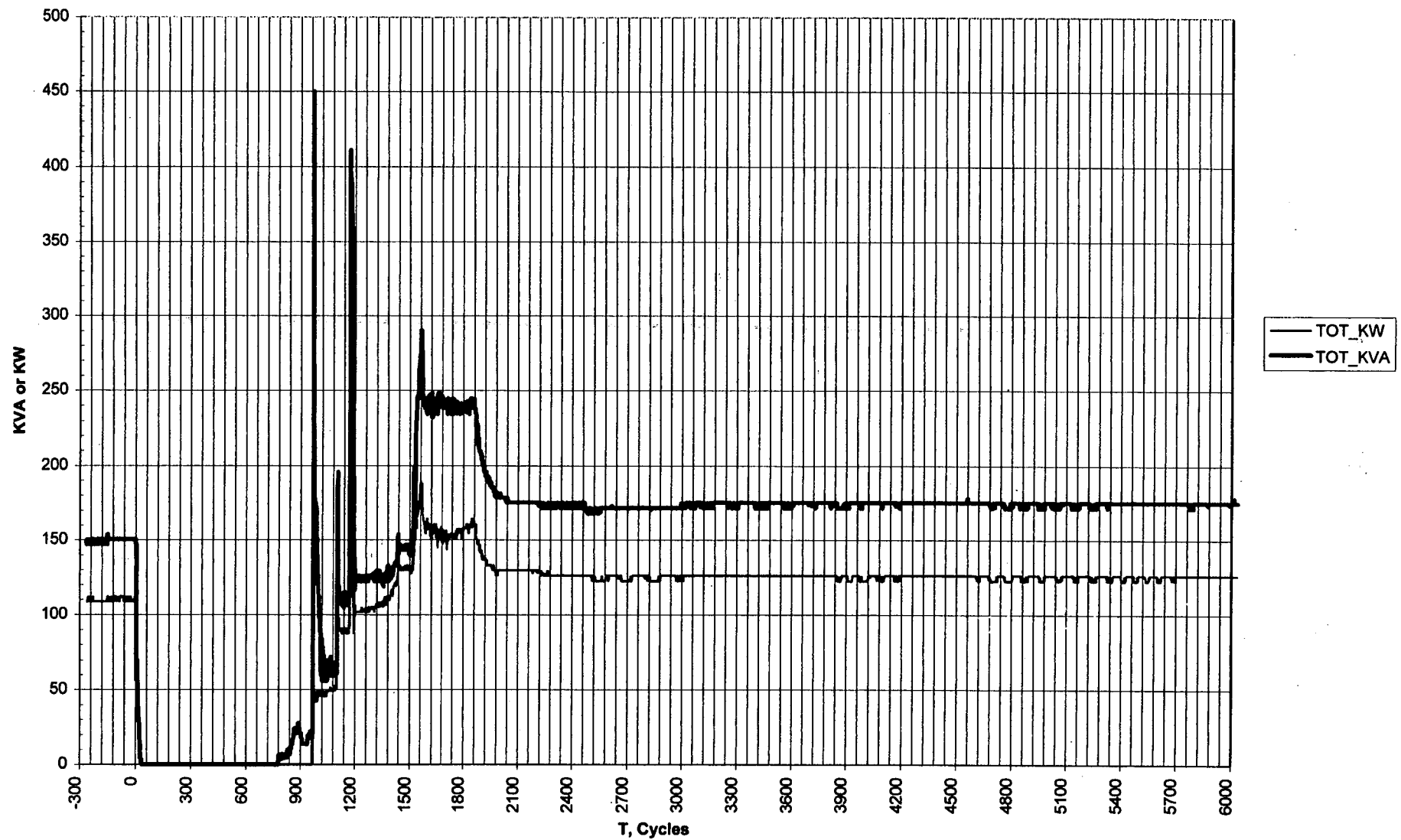


Figure 4.3.6-1: Test3, 600V 3XS1 Voltage and Current

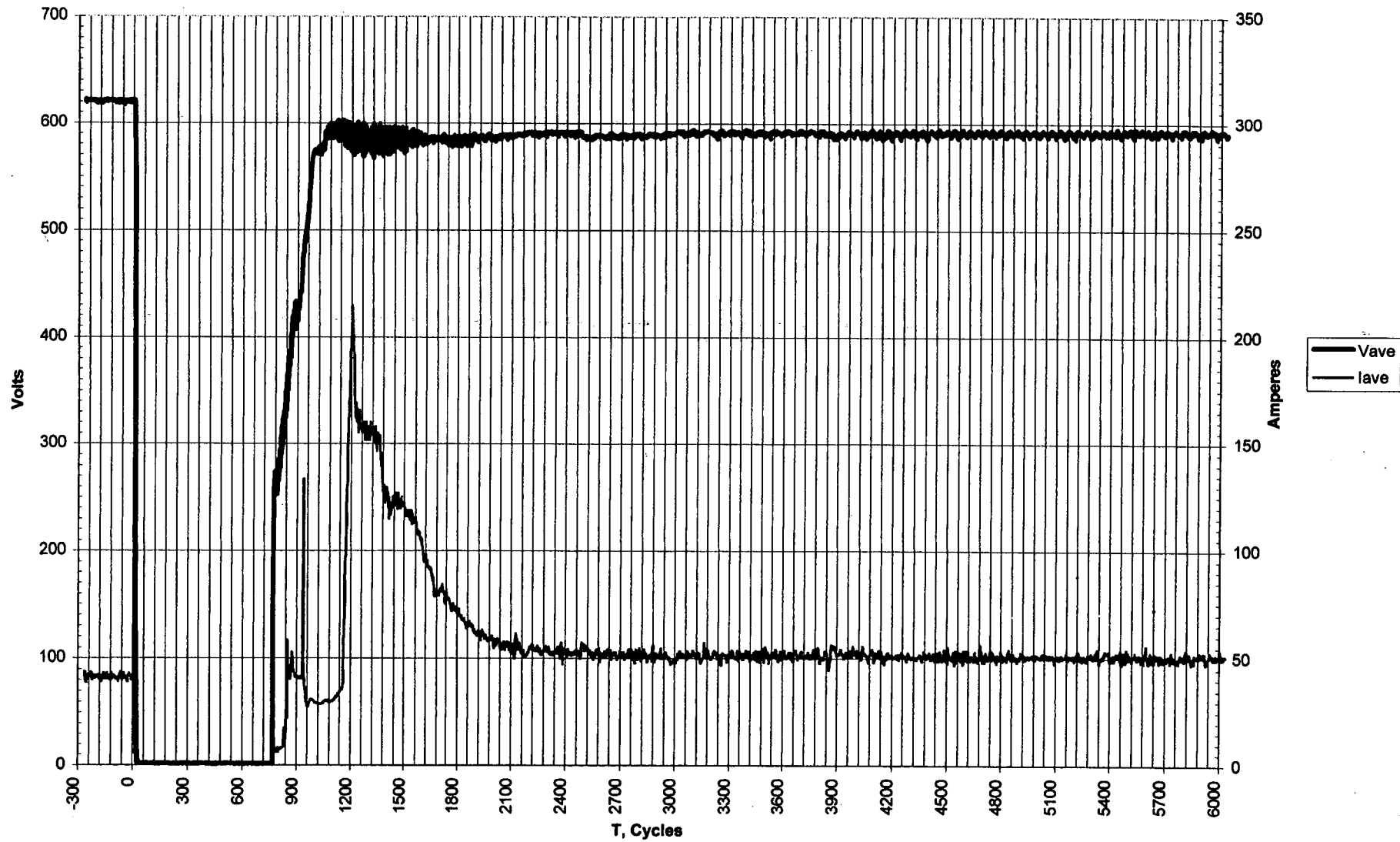


Figure 4.3.6-2: Test3, 600V 3XS1 KVA and KW

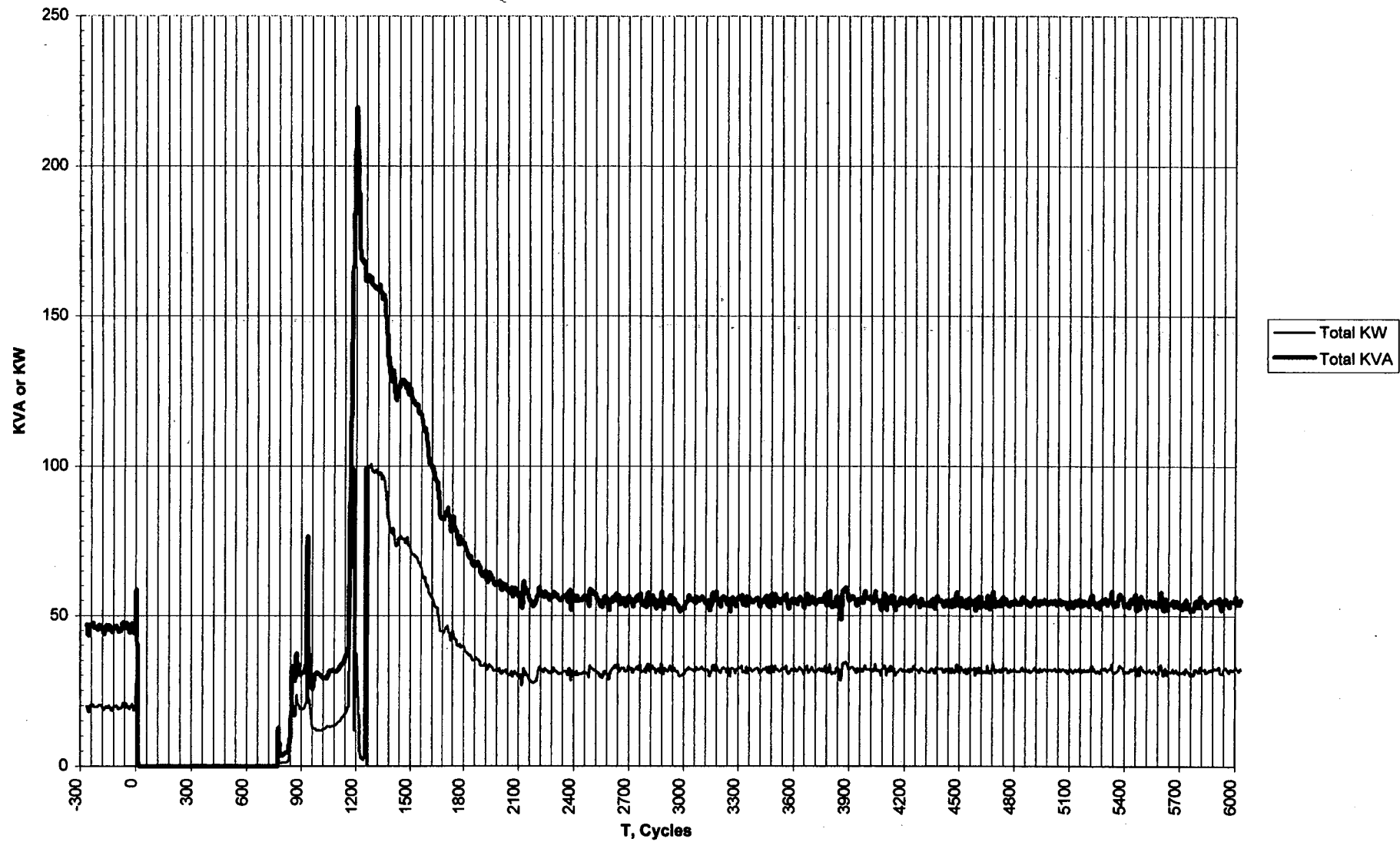


Figure 4.3.6-3: Test3, 600V 3XS2 Voltage and Current

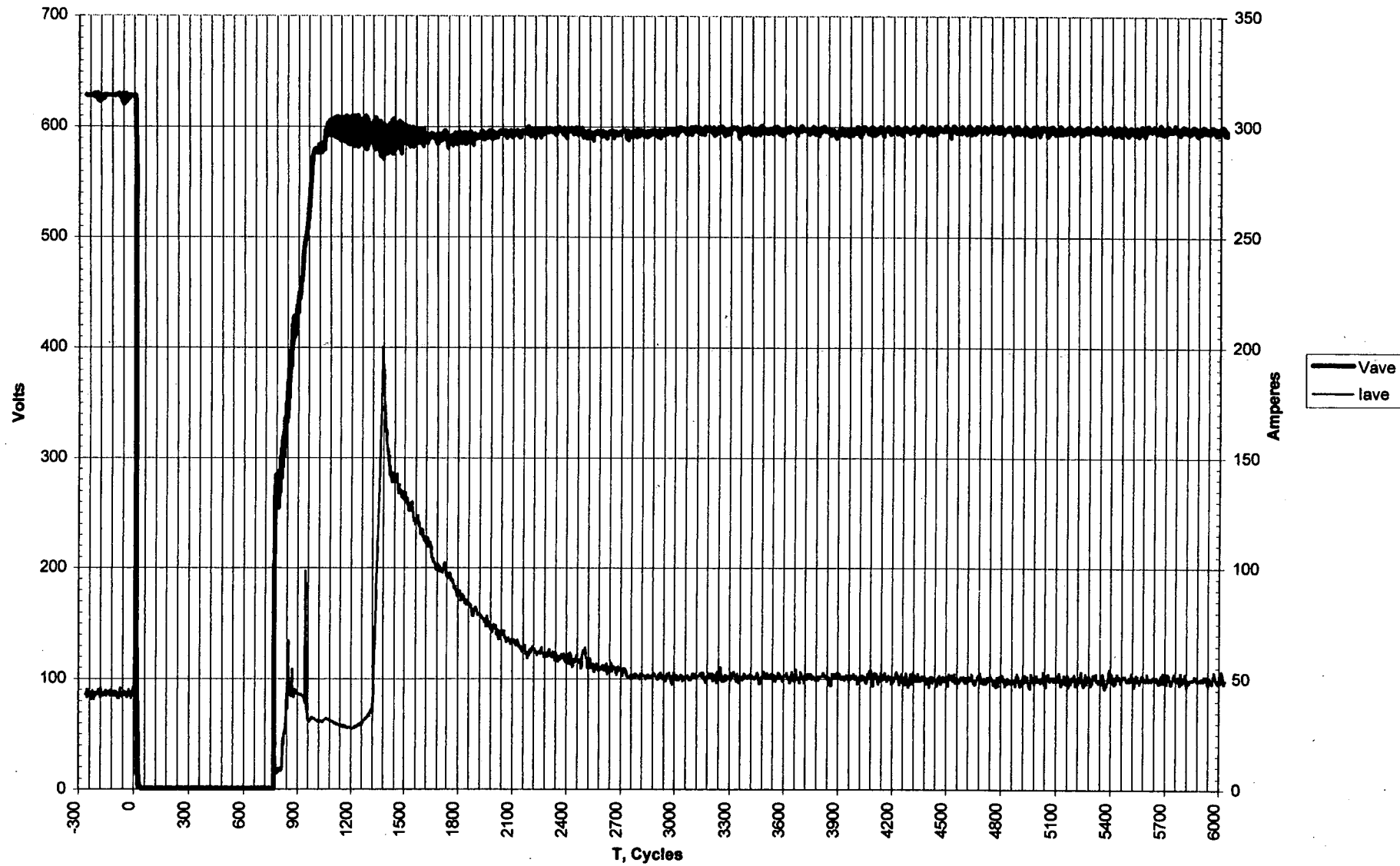


Figure 4.3.6-4: Test3, 600V 3XS2 KVA and KW

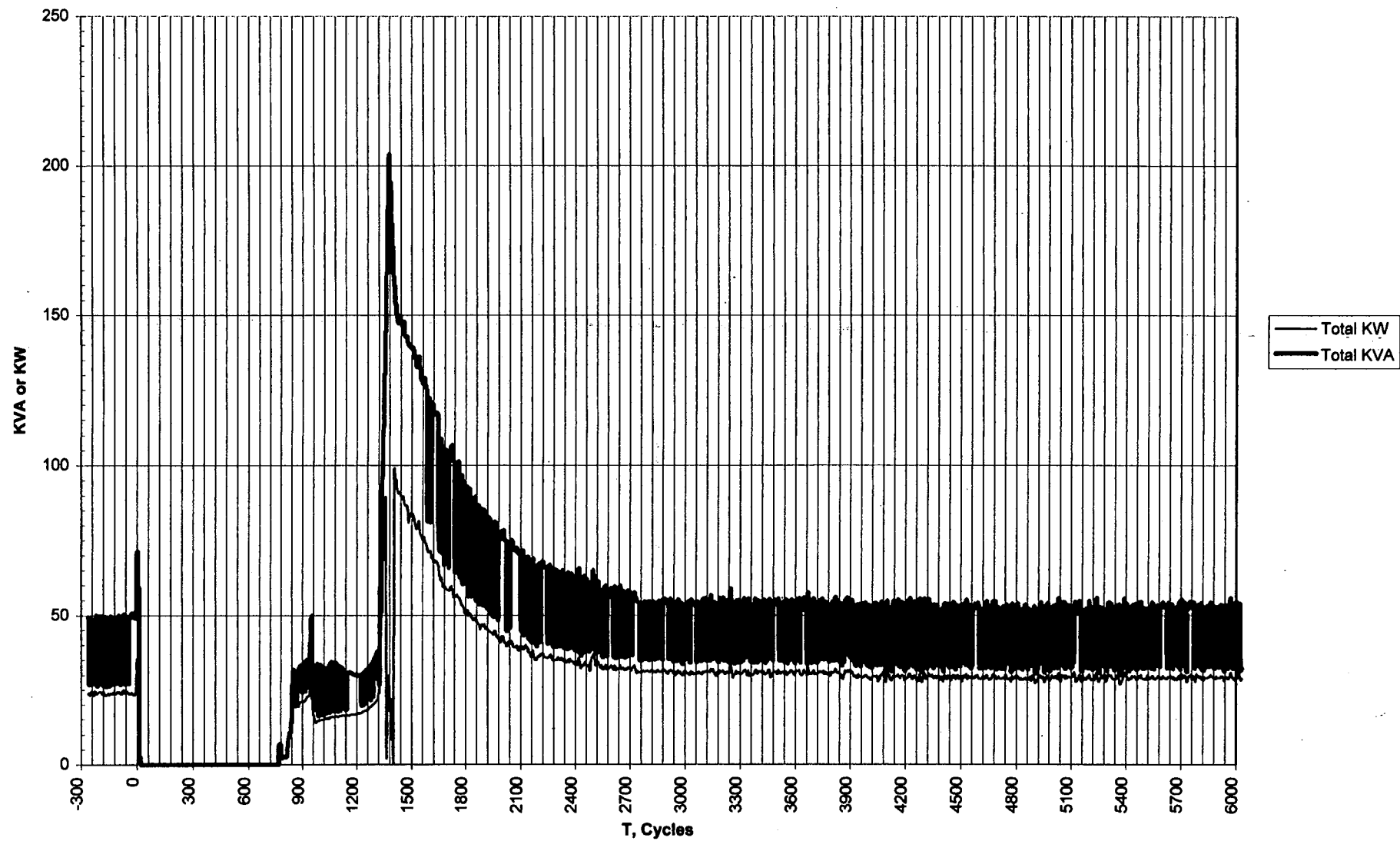


Figure 4.3.6-5: Test3, 600V 3XS3 Voltage and Current



Figure 4.3.6-6: Test3, 600V 3XS3 KVA and KW

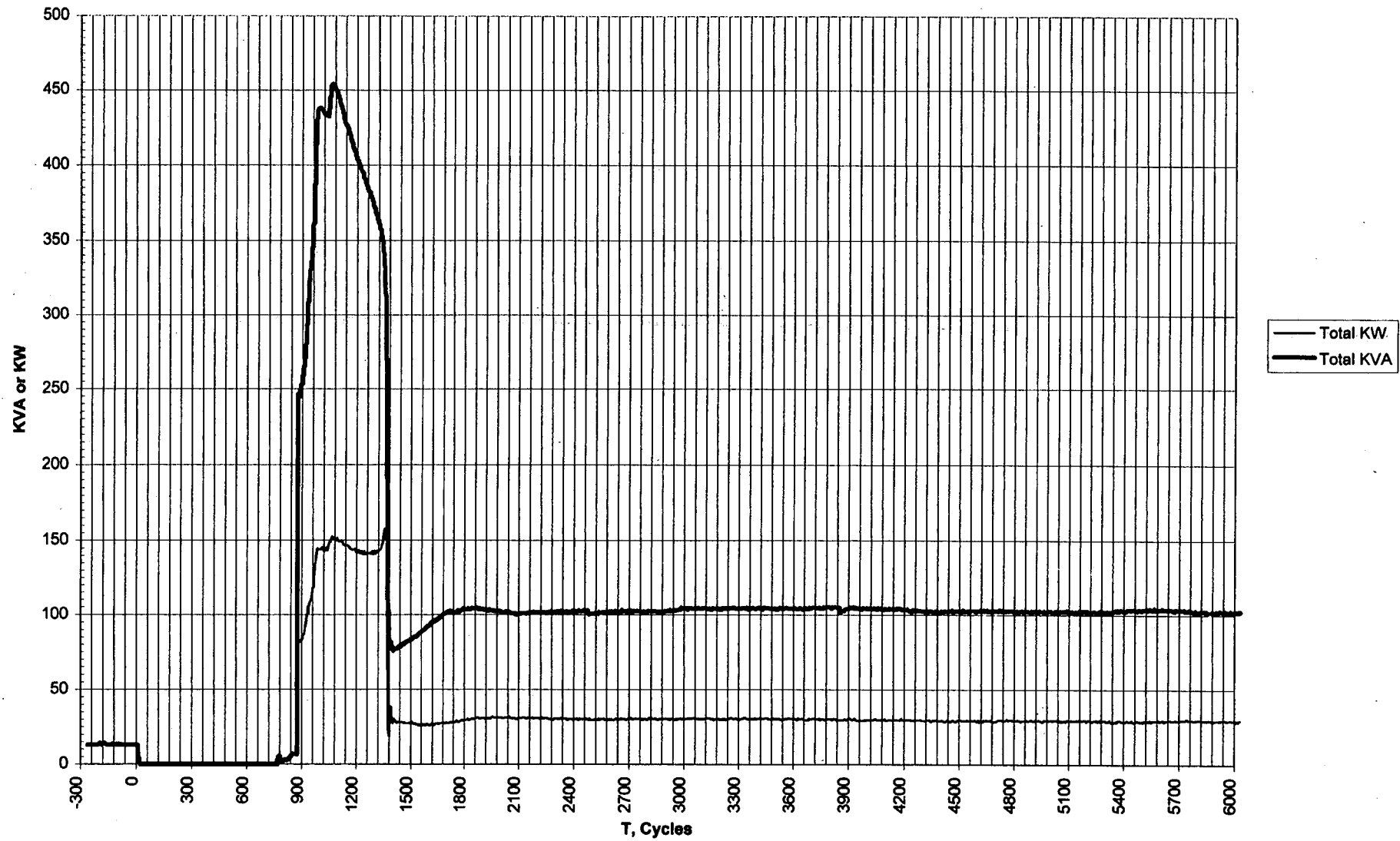


Figure 4.3.7-1: Test3, 208V 3XS1 Voltage and Current

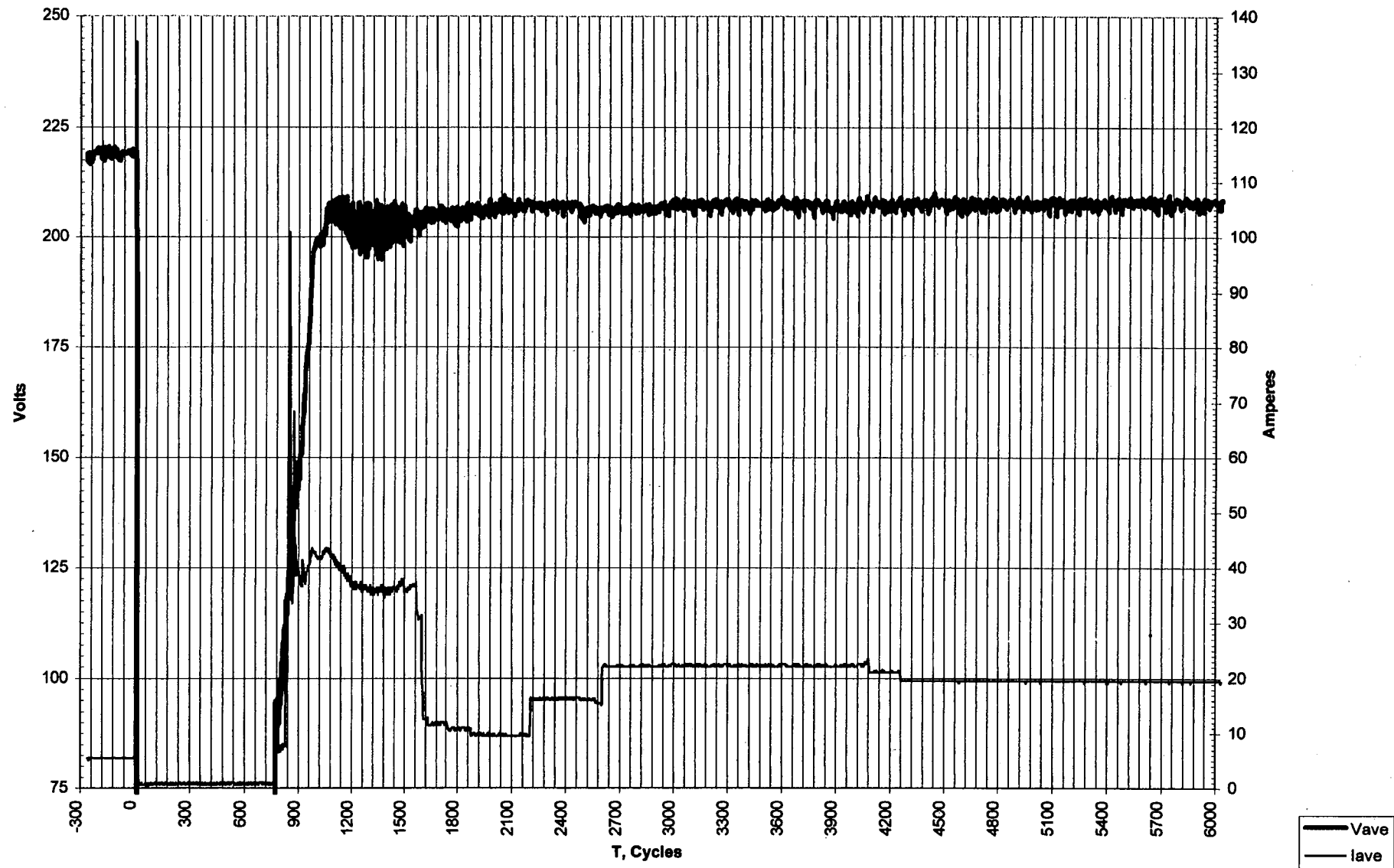


Figure 4.3.7-2: Test3, 208V 3XS1 KVA and KW

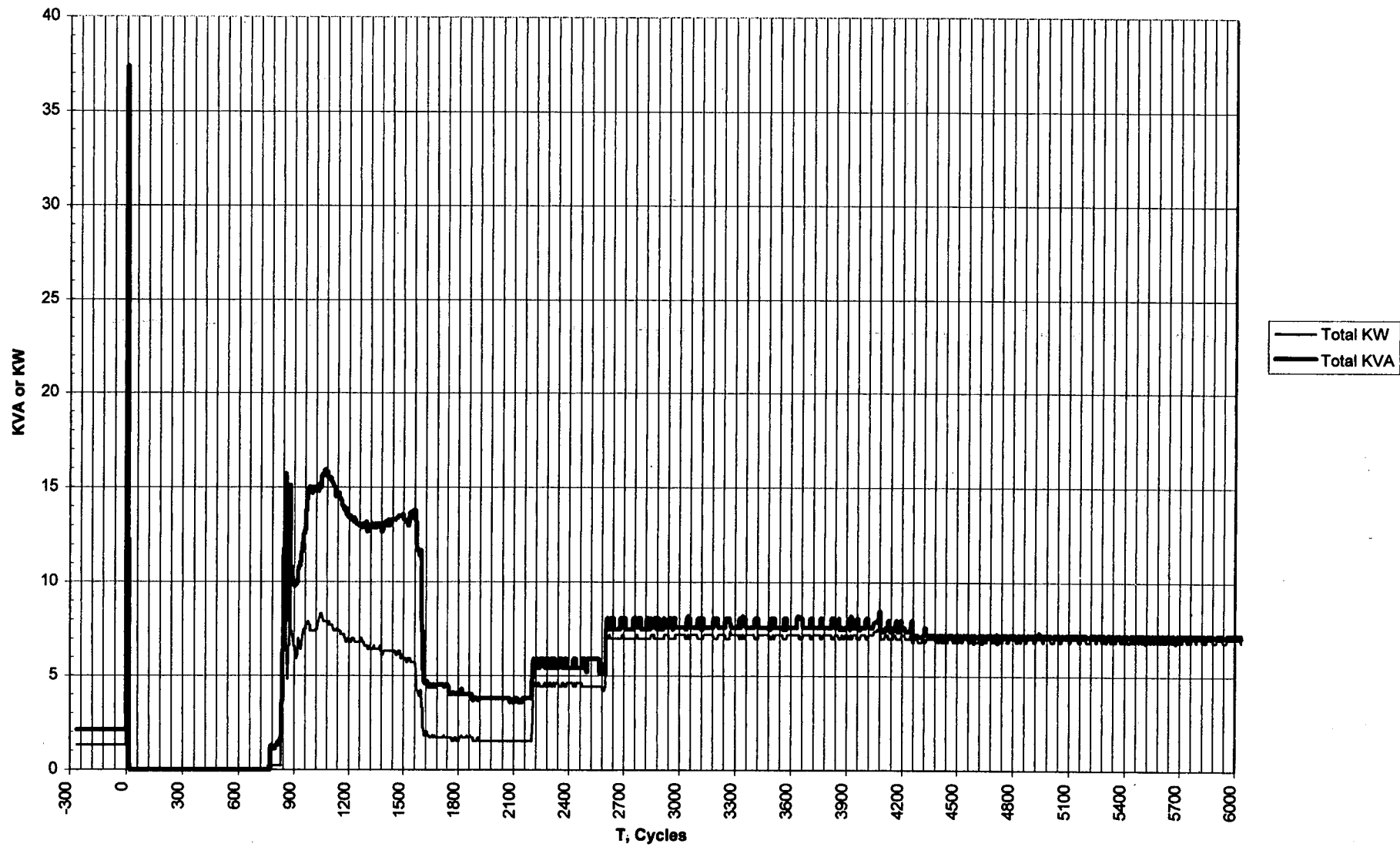


Figure 4.3.7-3: Test3, 208V 3XS2 Voltage and Current

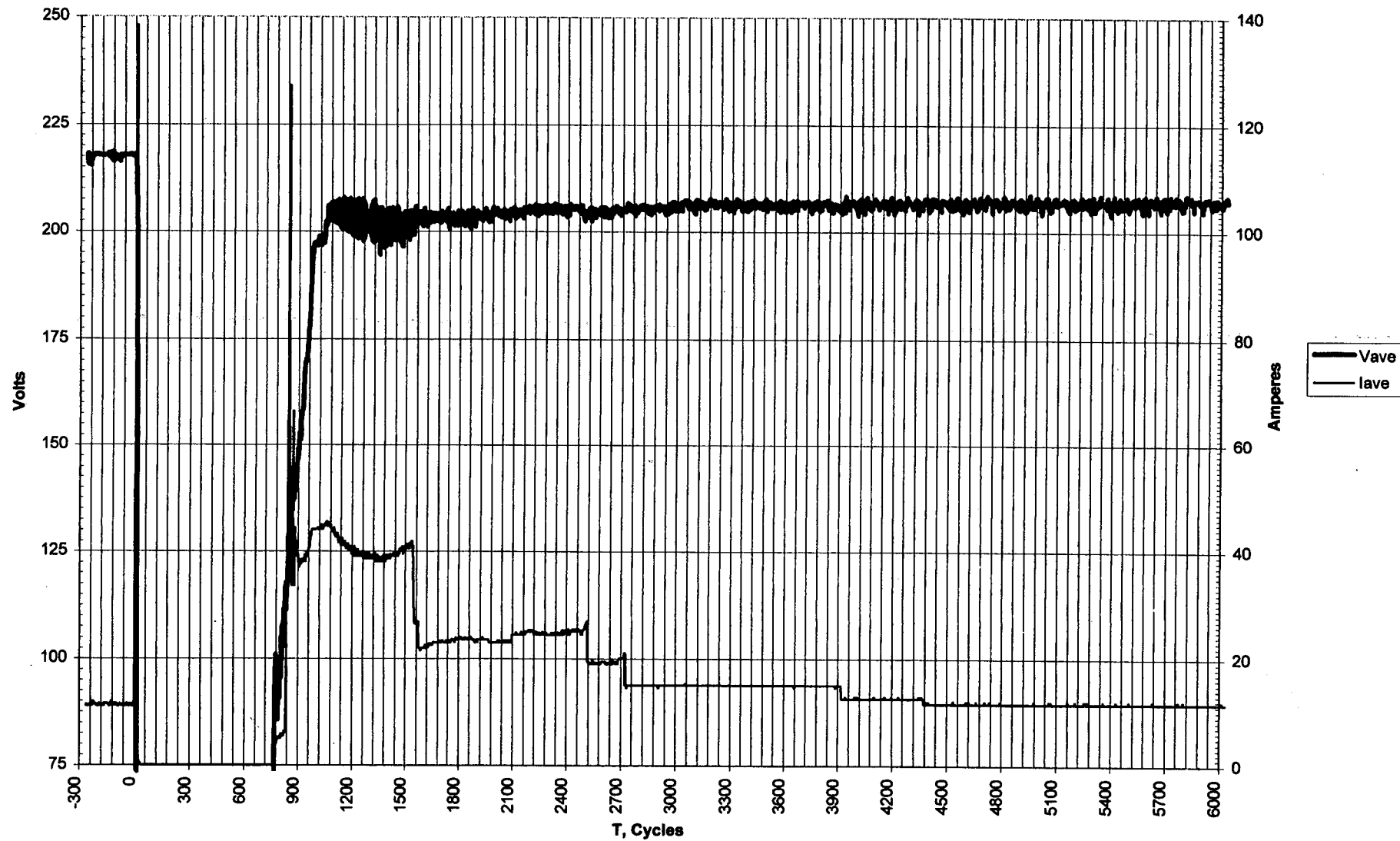


Figure 4.3.7-4: Test3, 208 3XS2 KVA and KW

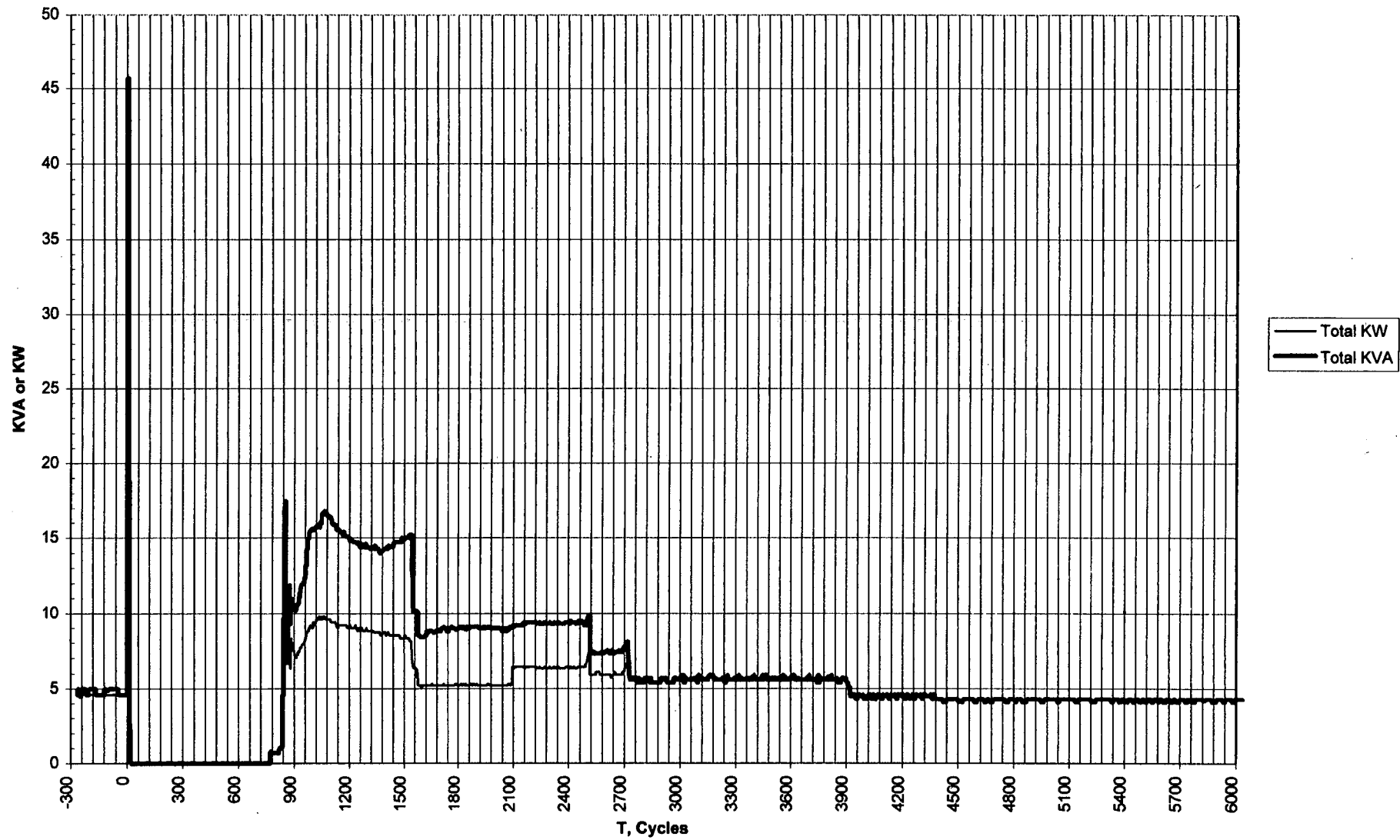


Figure 4.3.7-5: Test3, 208V 3XS3 Voltage and Current

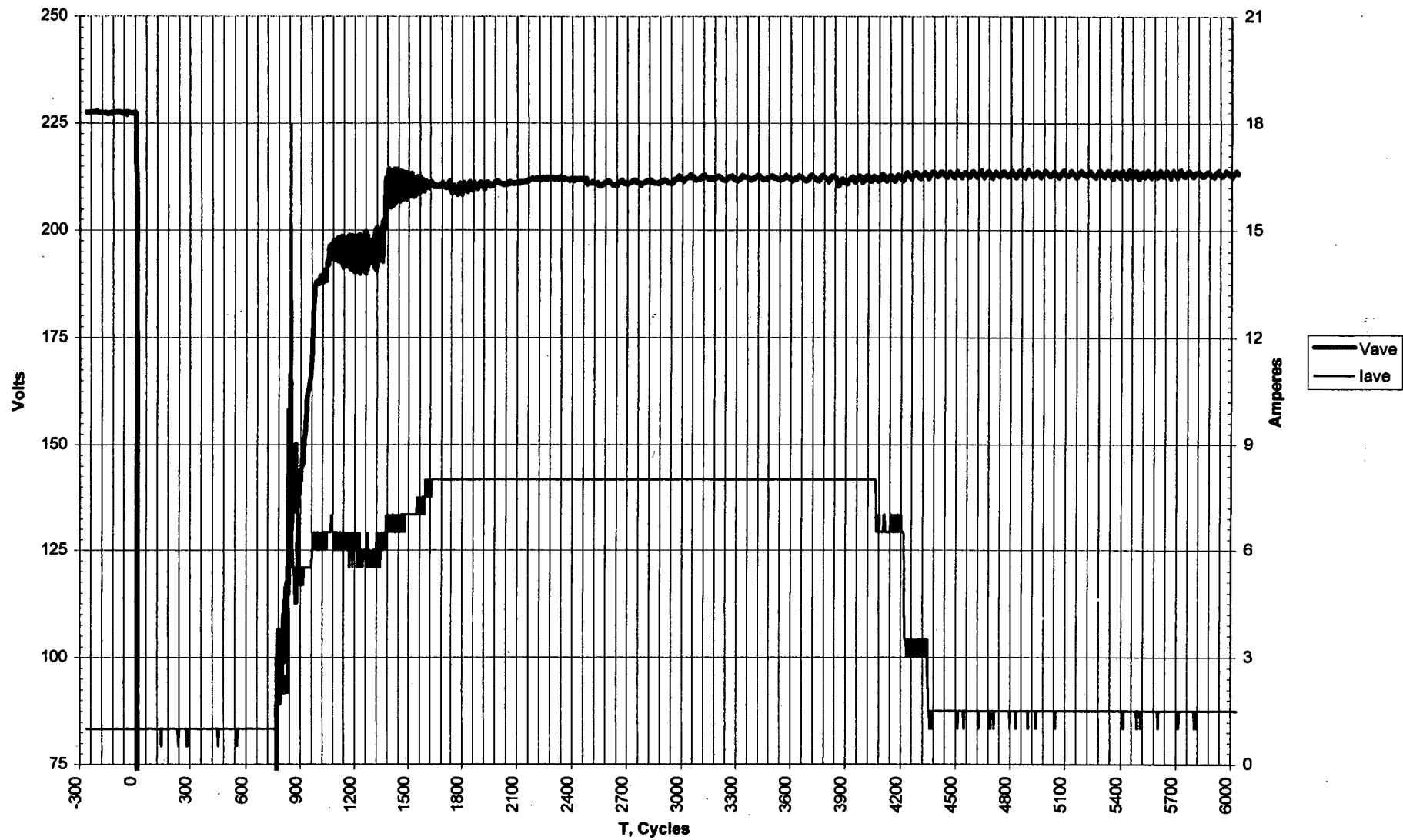


Figure 4.3.7-6: Test3, 208V 3XS3 KVA and KW

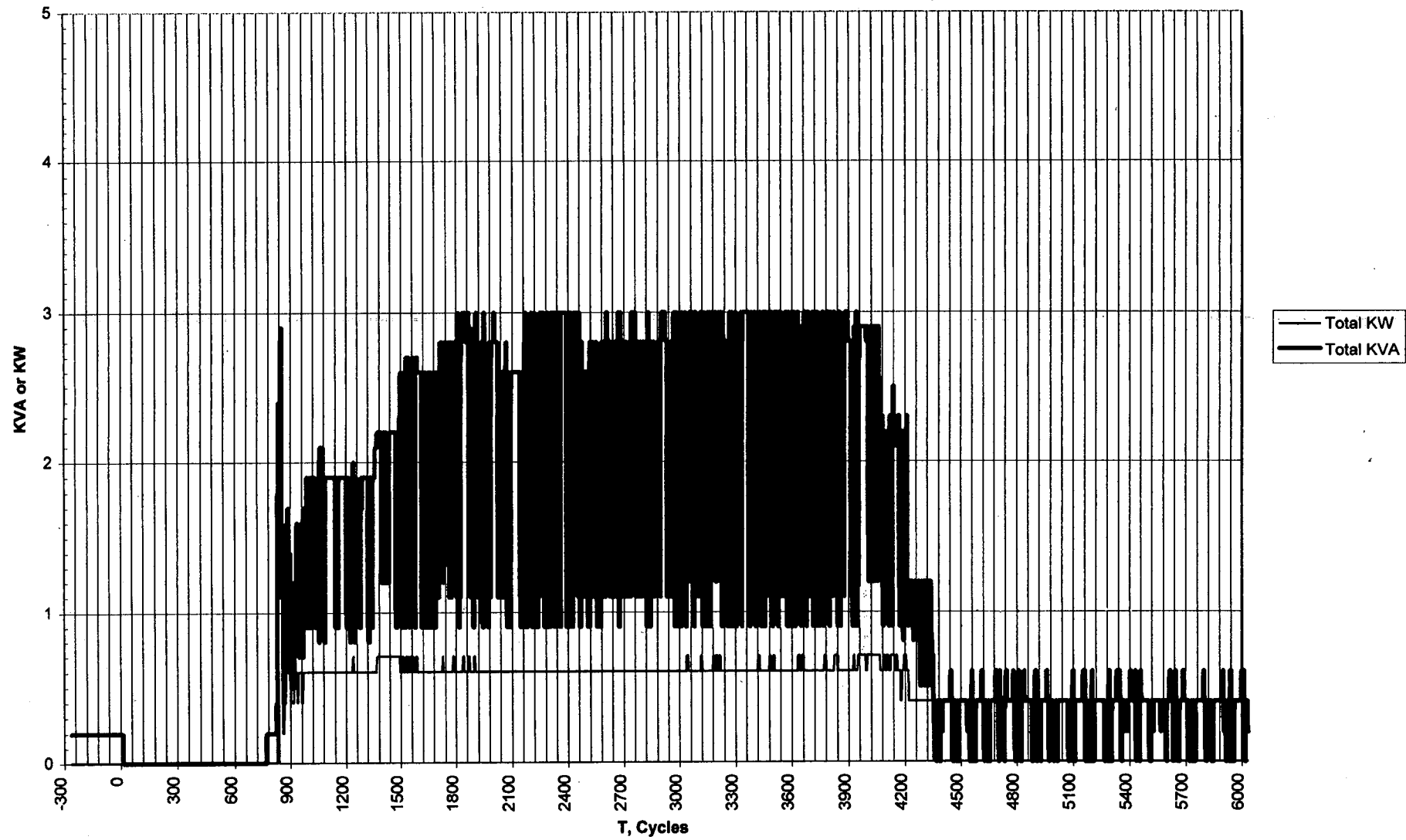
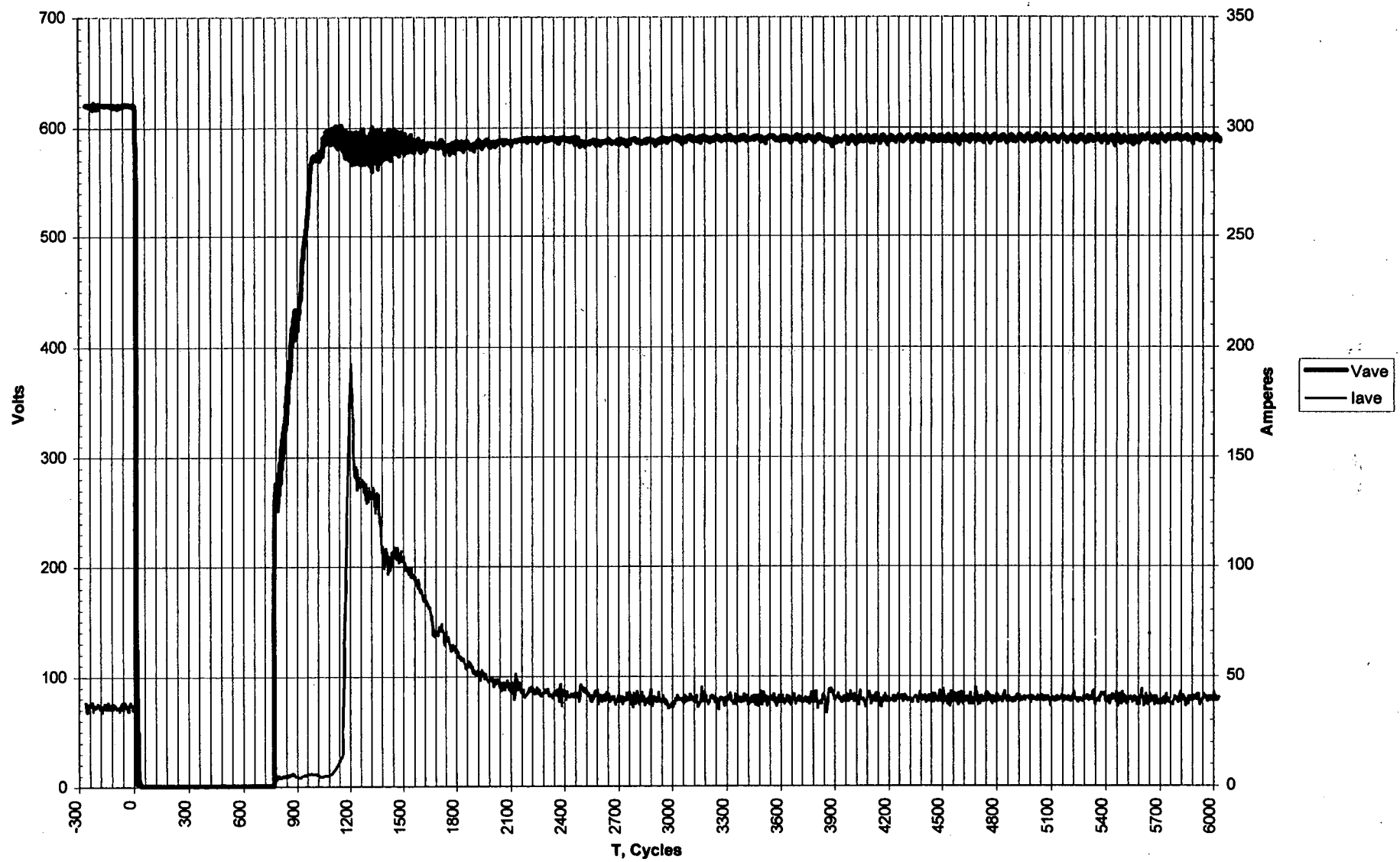
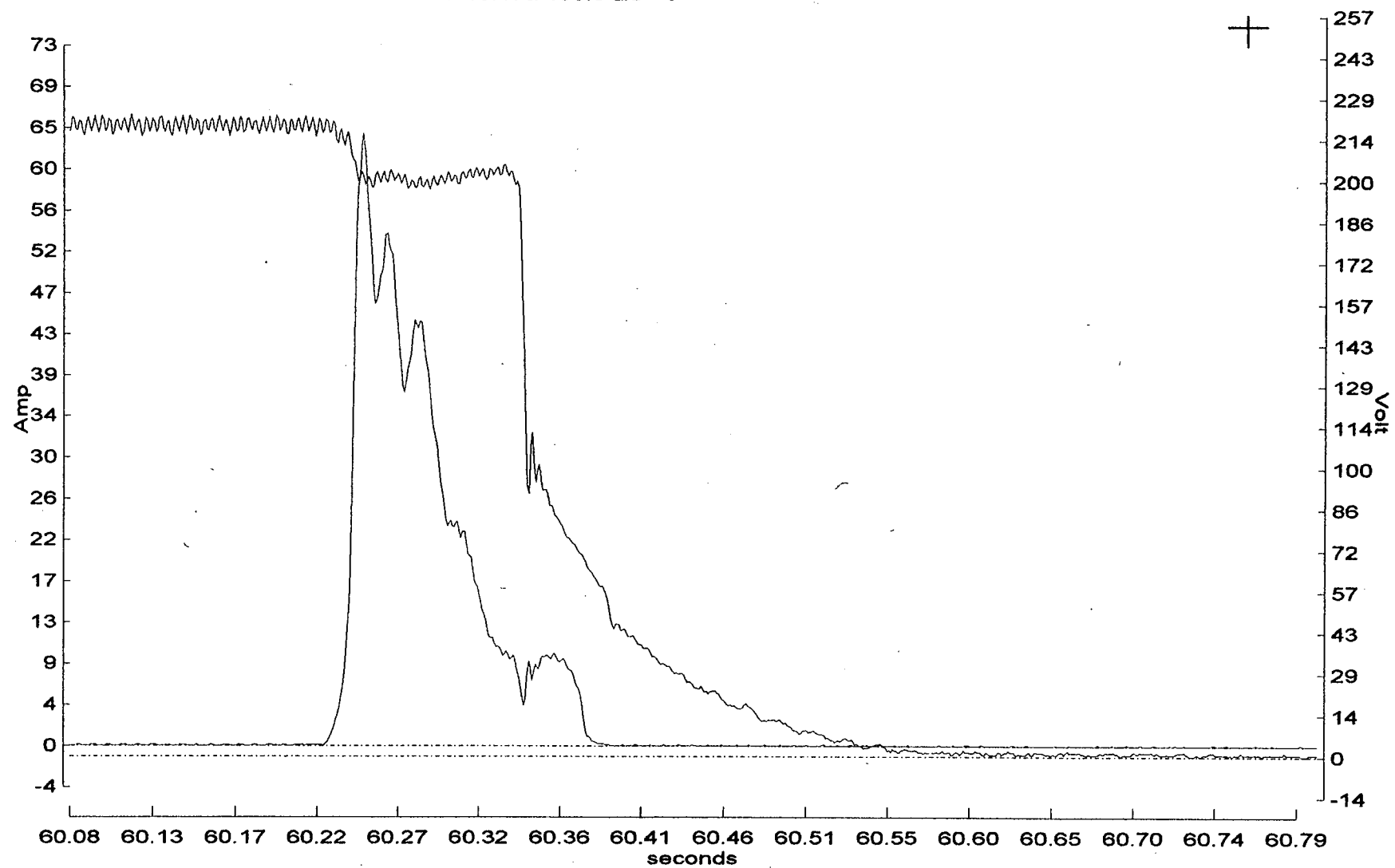


Figure 4.3.8-1: Test3, Battery Charger 3CA Voltage and Current

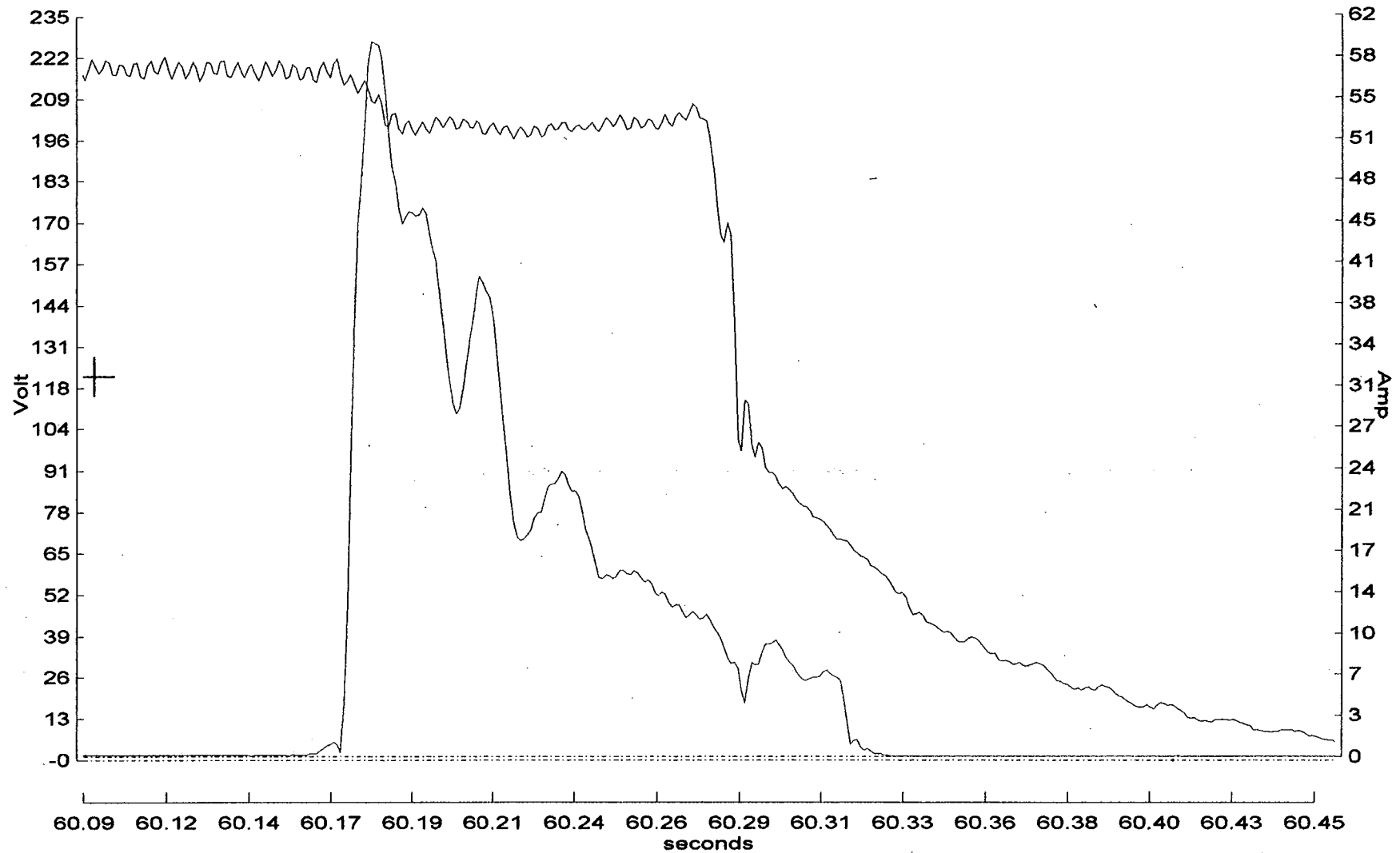




3HP-024
ES Test # 3
Voltage and Current at Loss of Power

Figure 4.3.9-1: Test 3, 3HP-24 Voltage and Current at LOOP

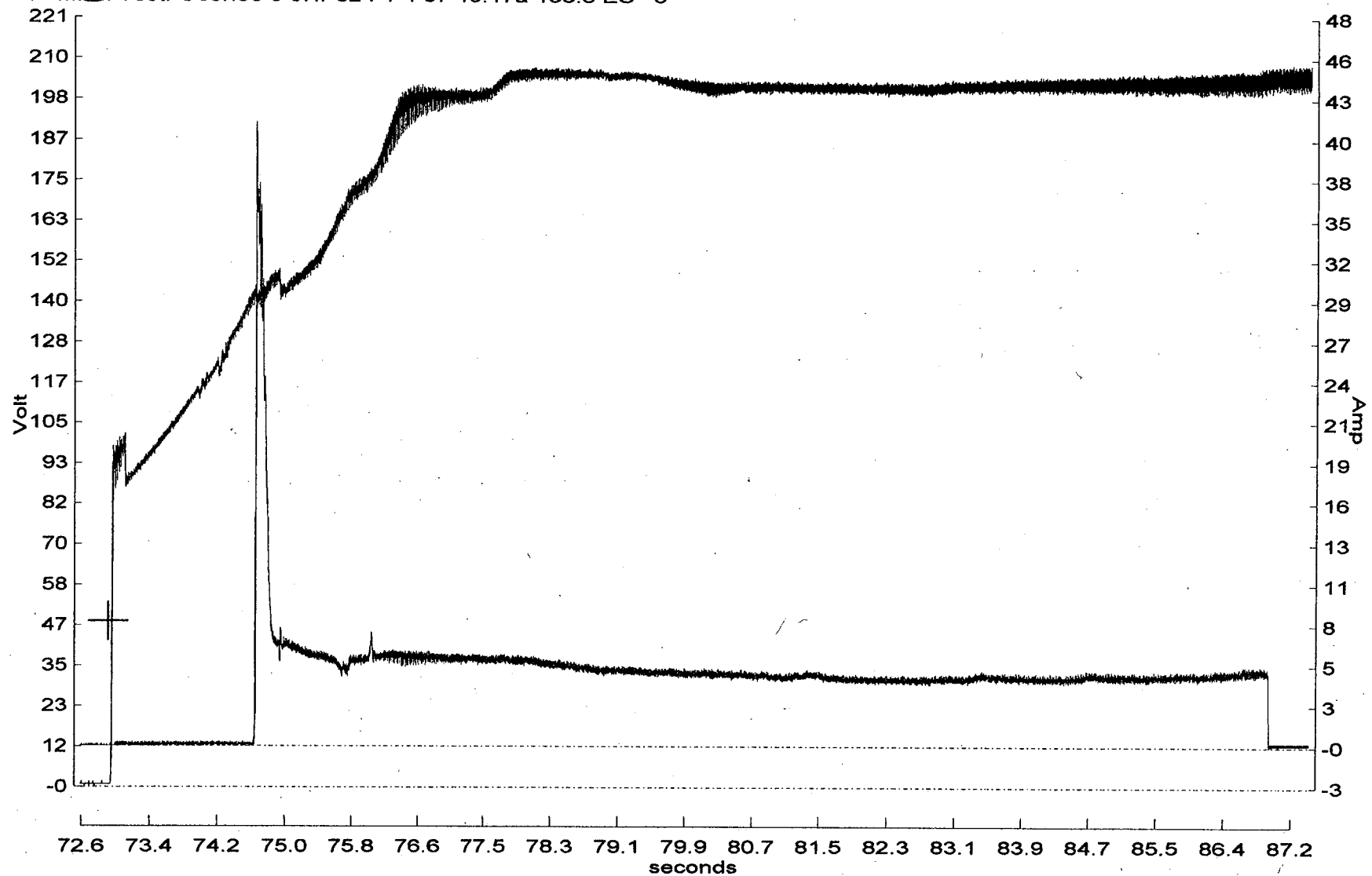
<1> M Test: Ocone 3 3HP026 1-4-97 10:17a 133.8 ES 3



3HP-026
ES Test # 3
Voltage and Current at Loss of Power

Figure 4.3.9-2: Test 3, 3HP-26 Voltage and Current at LOOP

<1> M Test: Ocone 3 3HP024 1-4-97 10:17a 133.5 ES 3



Cursor coordinates = 72.9seconds, 47.7Volt

— Vab-rms — Ia-rms

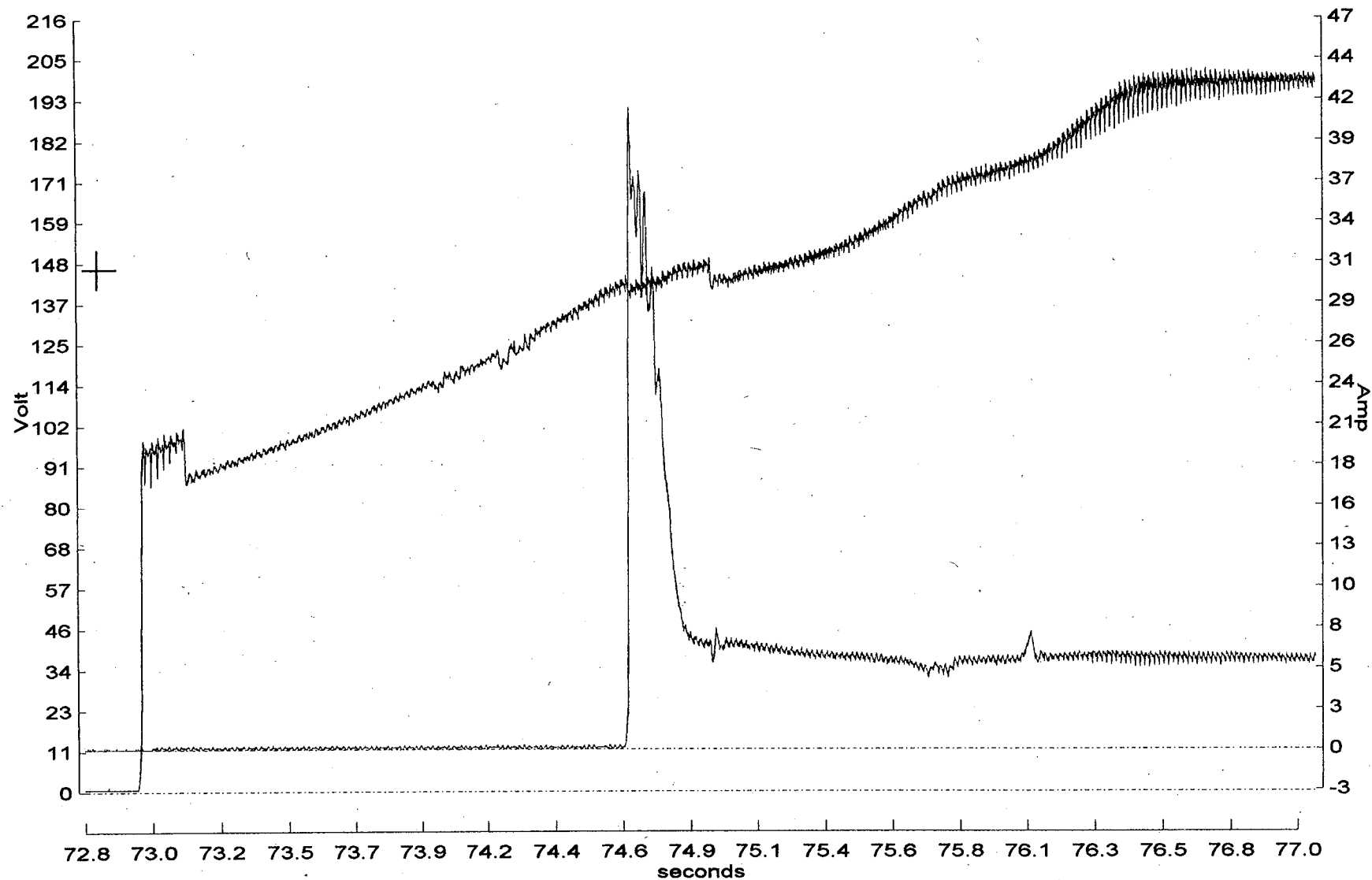
3HP-024

ES Test # 3

Full Stroke Voltage and Current

Figure 4.3.9.1-1: Test 3, 3HP-24 Full Stroke Voltage and Current

<1> Min Test: Ocone 3 3HP024 1-4-97 10:17a 133.5 ES 3

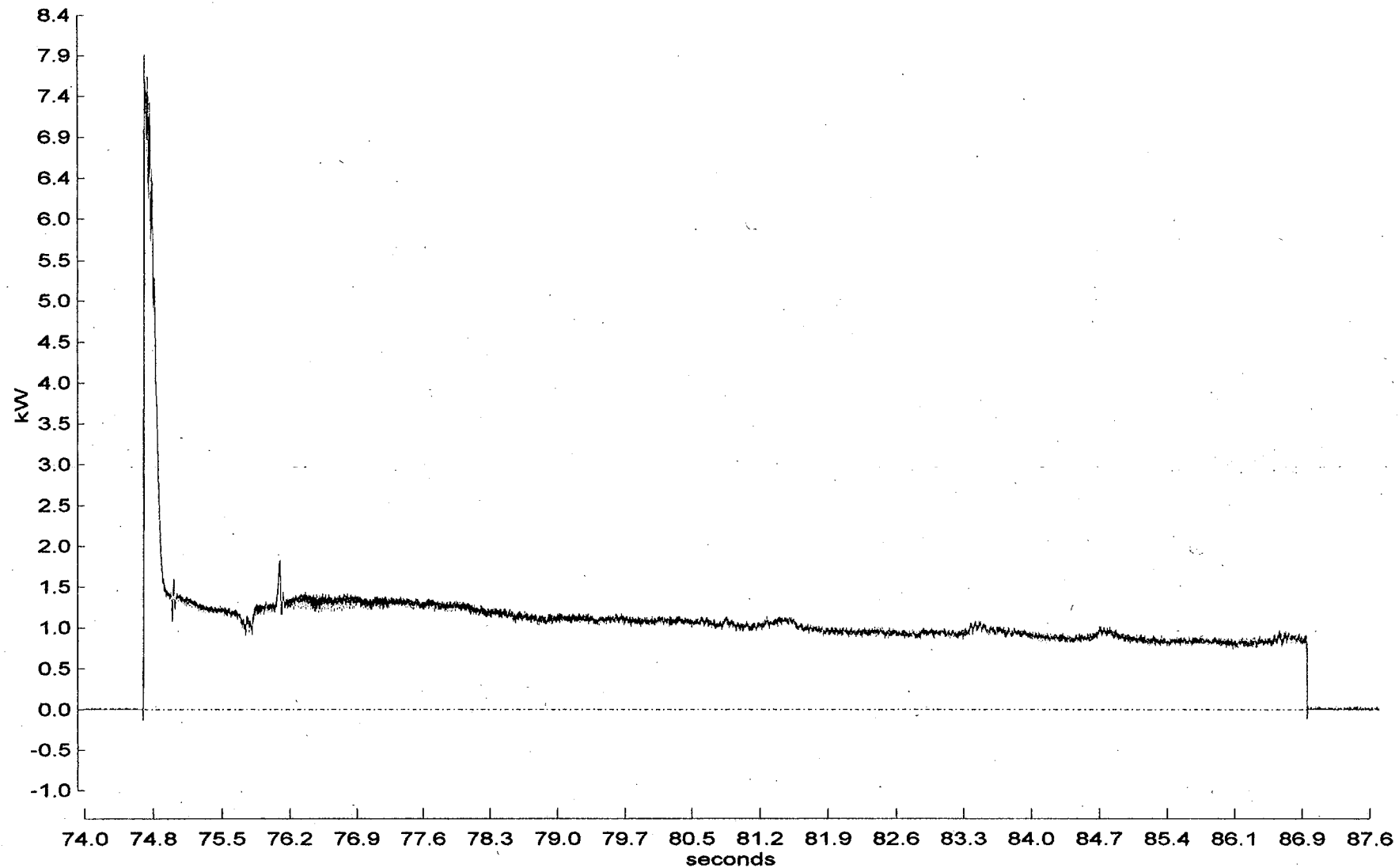


Cursor coordinates = 72.8seconds, 146Volt
—Vab-rms—Ia-rms

3HP-024
ES Test # 3
Inrush Voltage and Current

Figure 4.3.9.1-2: Test 3, 3HP-24 Inrush Voltage and Current

<1> M... Test: Ocone 3 3HP024 1-4-97 10:17a 133.5 ES 3



Cursor coordinates = 75.6seconds, 161kW

TRP

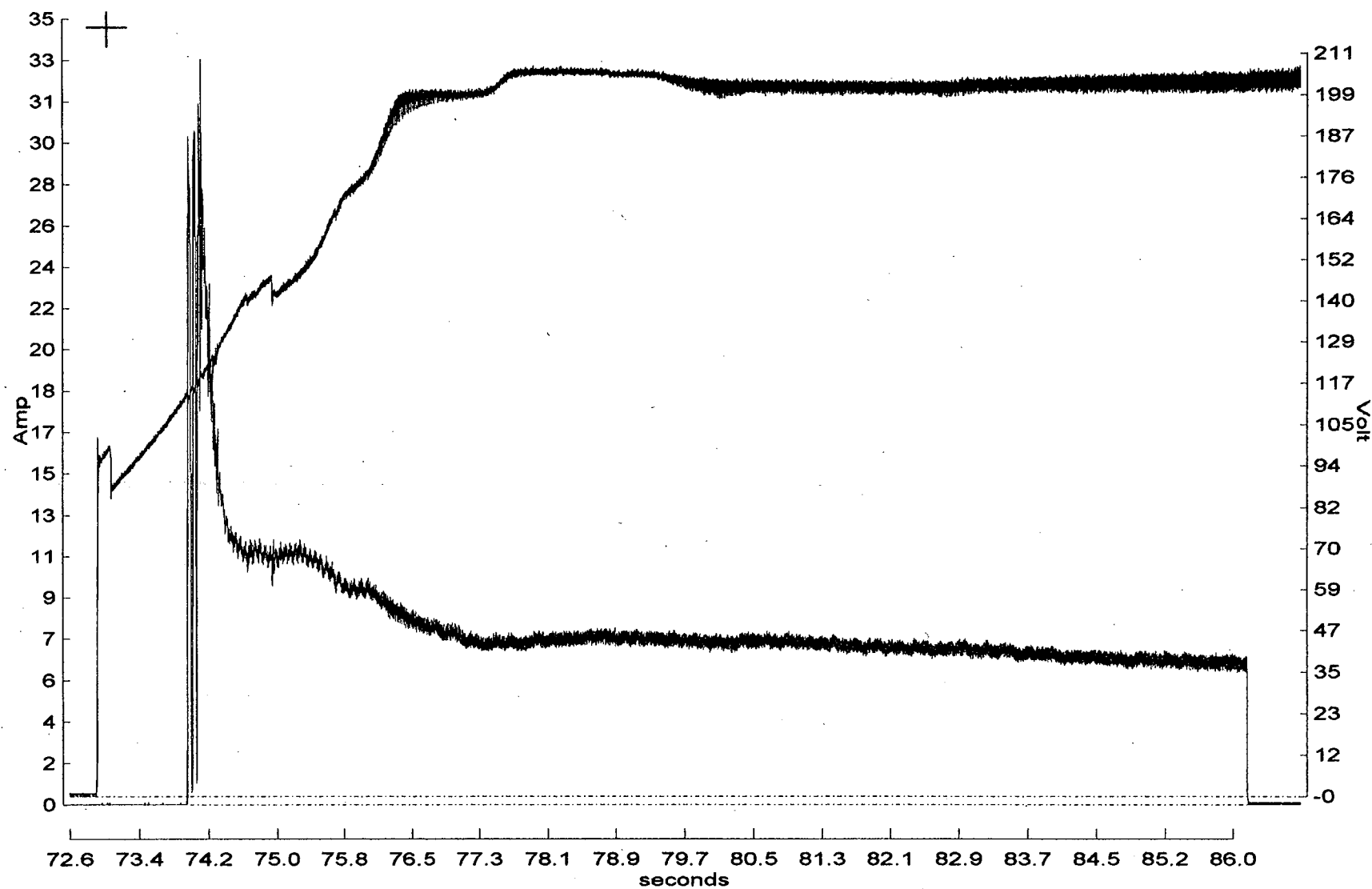
3HP-024

ES Test # 3

Full Stroke Total Real Power

Figure 4.3.9.1-3: Test 3, 3HP-24 Full Stroke Total Real Power (KW)

<1> M Test: Ocone 3 3HP026 1-4-97 10:17a 133.8 ES 3



Cursor coordinates = 73seconds, 34.7Amp

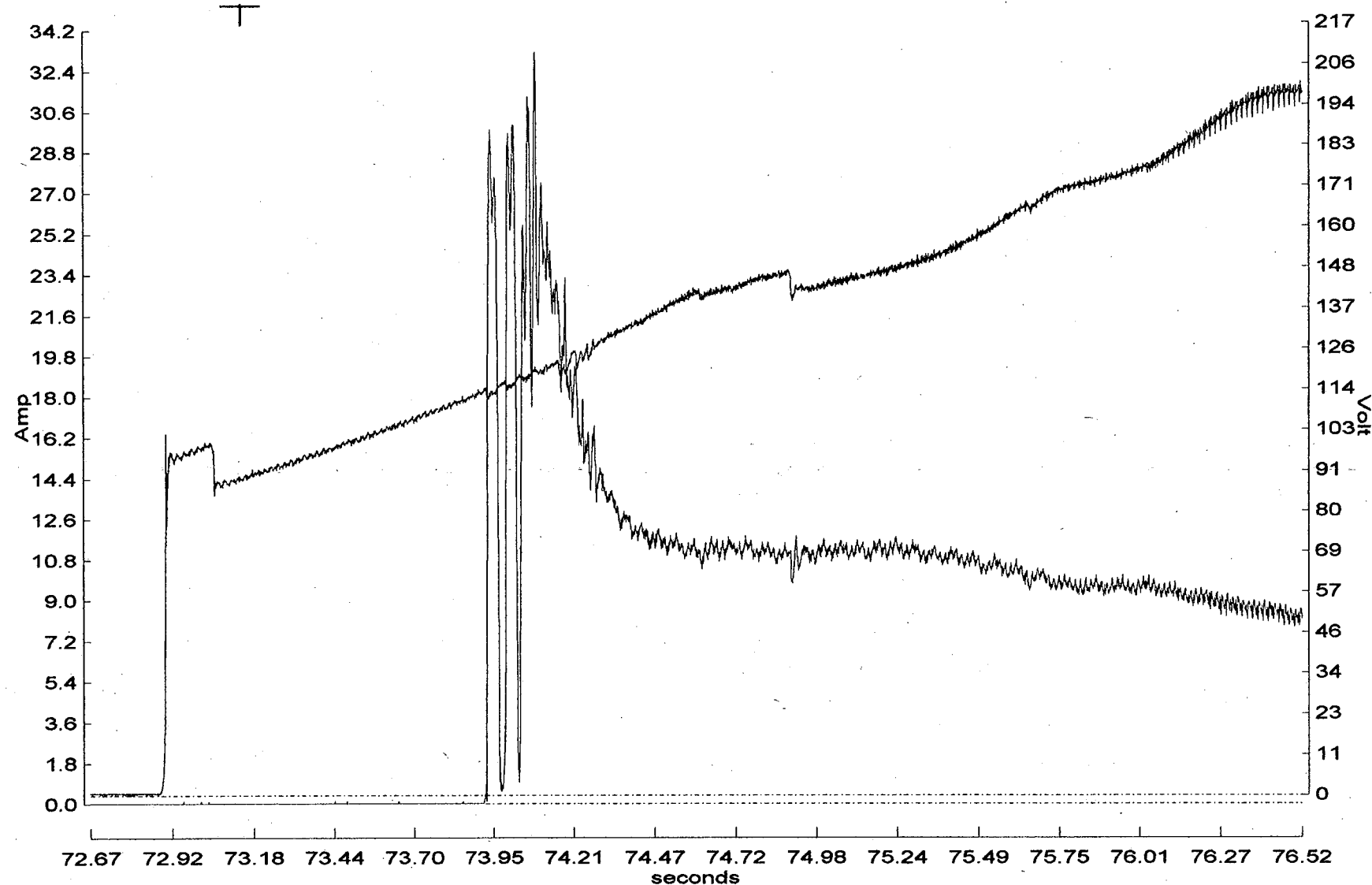
— Vab-rms — Ia-rms

3HP-026

ES Test # 3

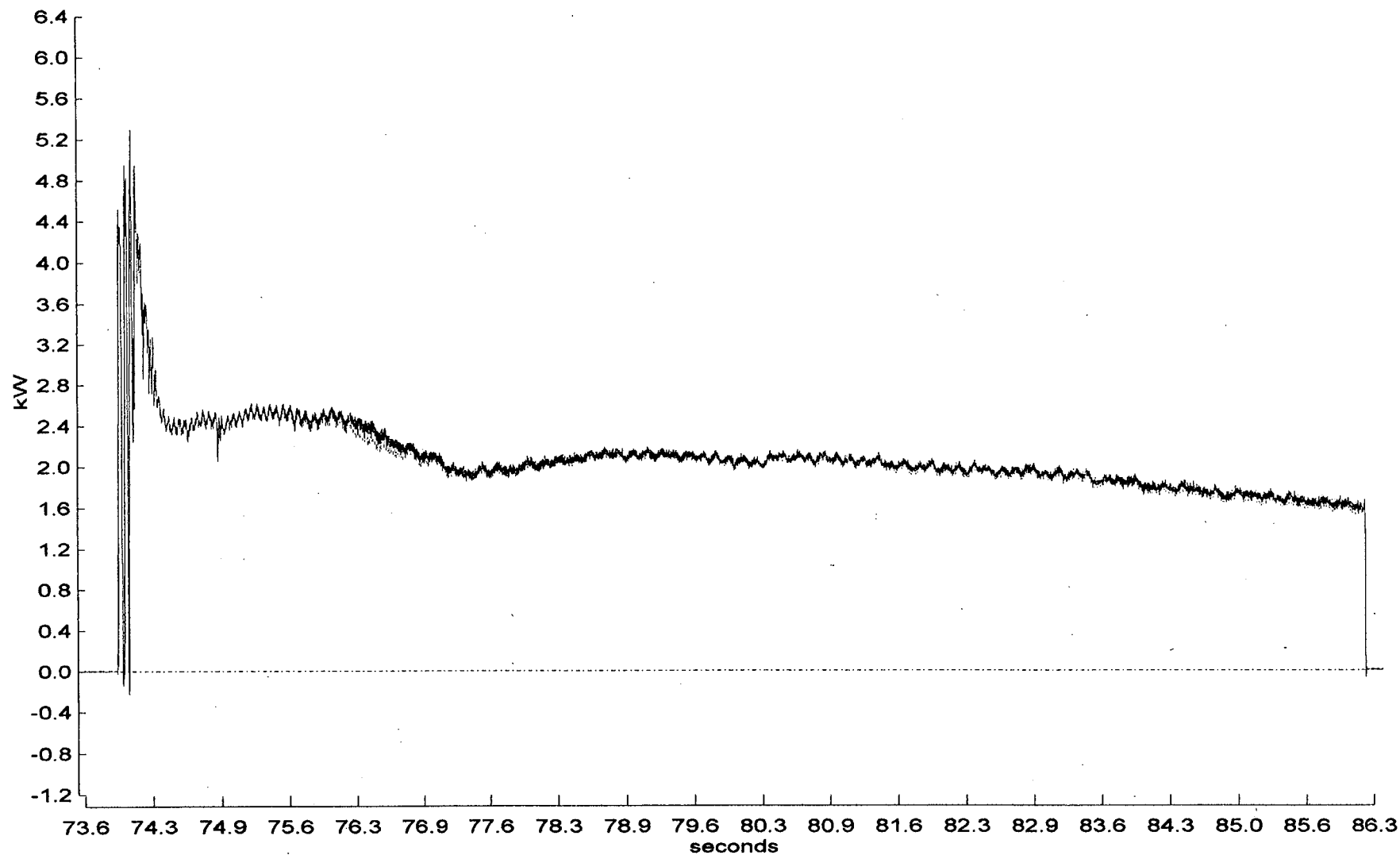
Full Stroke Voltage and Current

Figure 4.3.9.2-1: Test 3, 3HP-26 Full Stroke Voltage and Current



3HP-026
ES Test # 3
Inrush Voltage and Current

Figure 4.3.9.2-2: Test 3, 3HP-26 Inrush Voltage and Current



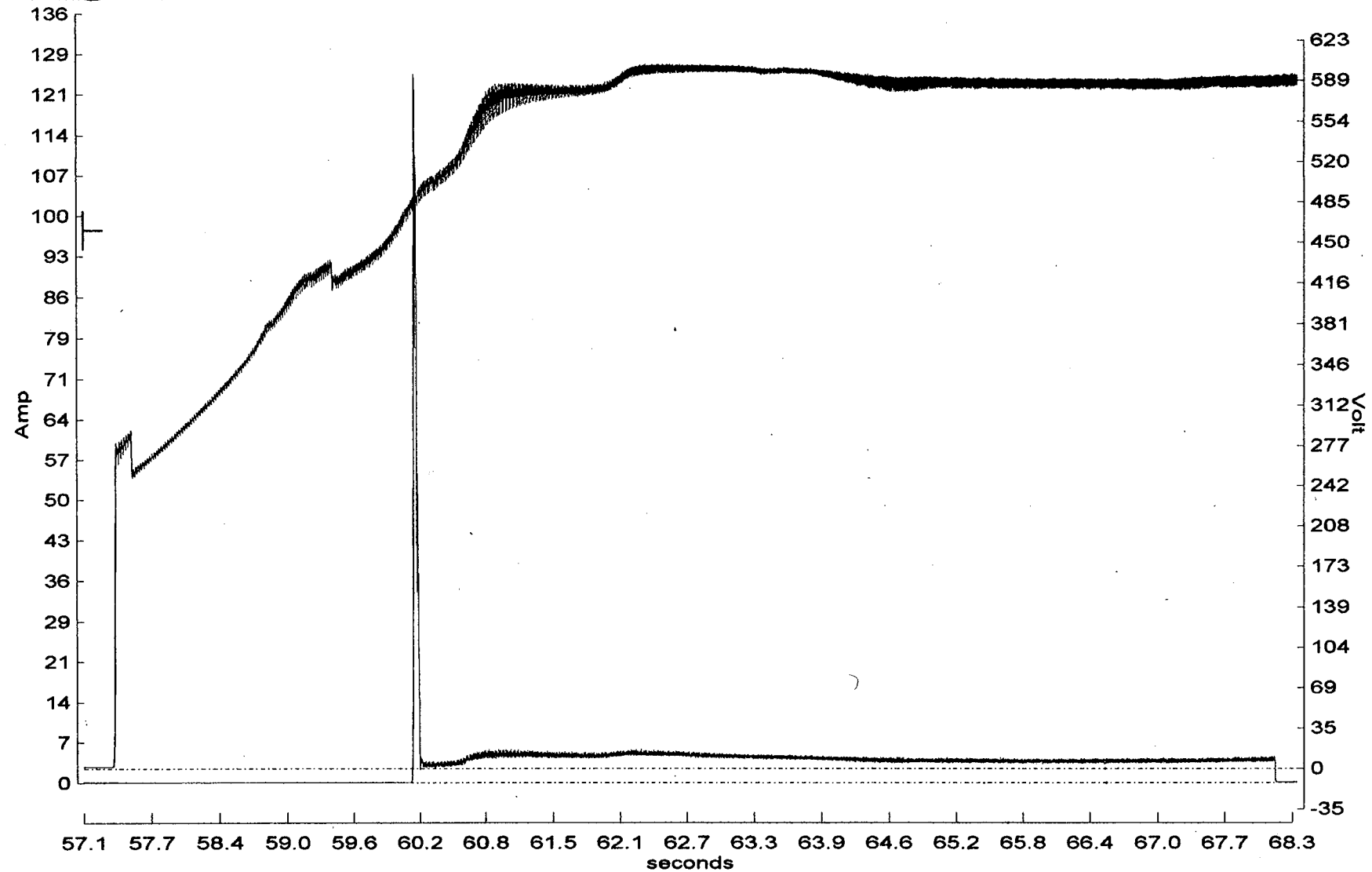
Cursor coordinates = 75seconds, 8.7kW

TRP

3HP-026
ES Test # 3
Full Stroke Total Real Power

Figure 4.3.9.2-3: Test 3, 3HP-26 Full Stroke Total Real Power (KW)

<1> M Test: Ocone 3 3LP017 1-4-97 10:21a 128.5 3 ES



Cursor coordinates = 57.1seconds, 97.5Amp

— Vab-rms — Ia-rms

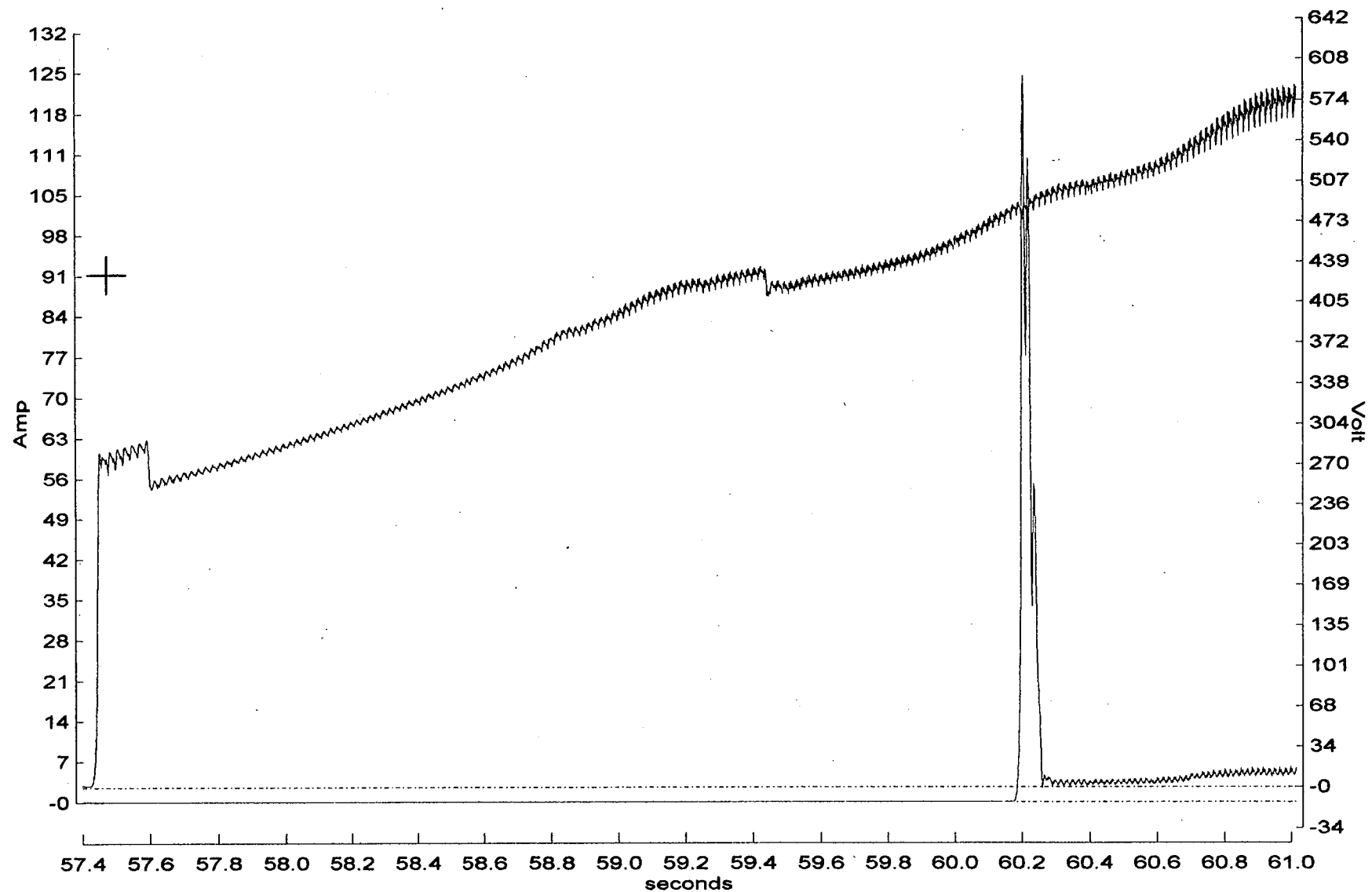
3LP-017

ES Test # 3

Full Stroke Voltage and Current

Figure 4.3.9.3-1: Test 3, 3LP-17 Full Stroke Voltage and Current

<1> MP Test: Ocone 3 3LP017 1-4-97 10:21a 128.5 3 ES



Cursor coordinates = 57.4seconds, 90.8Amp

——Vab-rms——Ia-rms

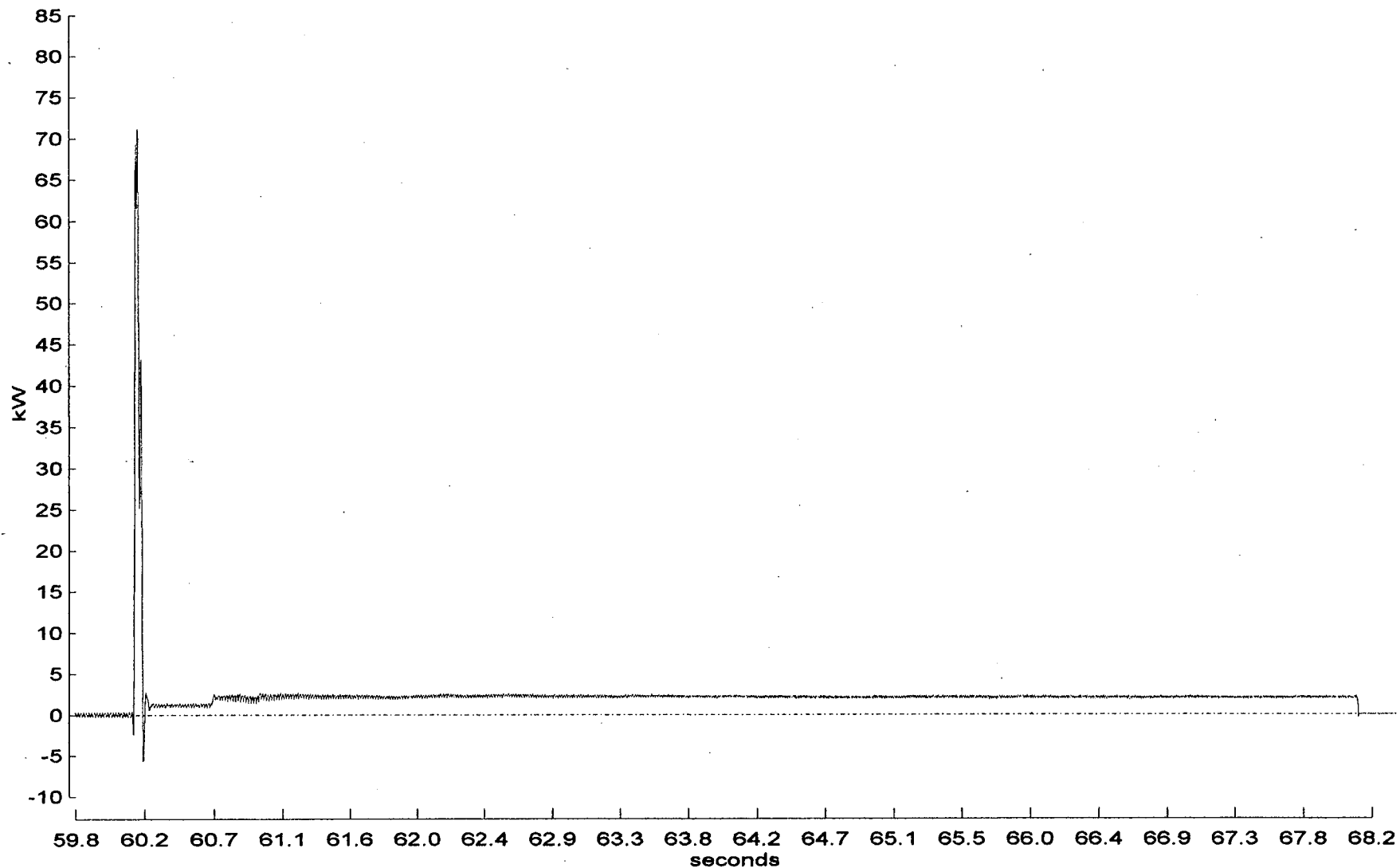
3LP-017

ES Test # 3

Inrush Voltage and Current

Figure 4.3.9-3-2: Test 3, 3HP-17 Inrush Voltage and Current

<1> M... Test: Ocone 3 3LP017 1-4-97 10:21a 128.5 3 ES



Cursor coordinates = 59.8seconds, 83.9kW

TRP

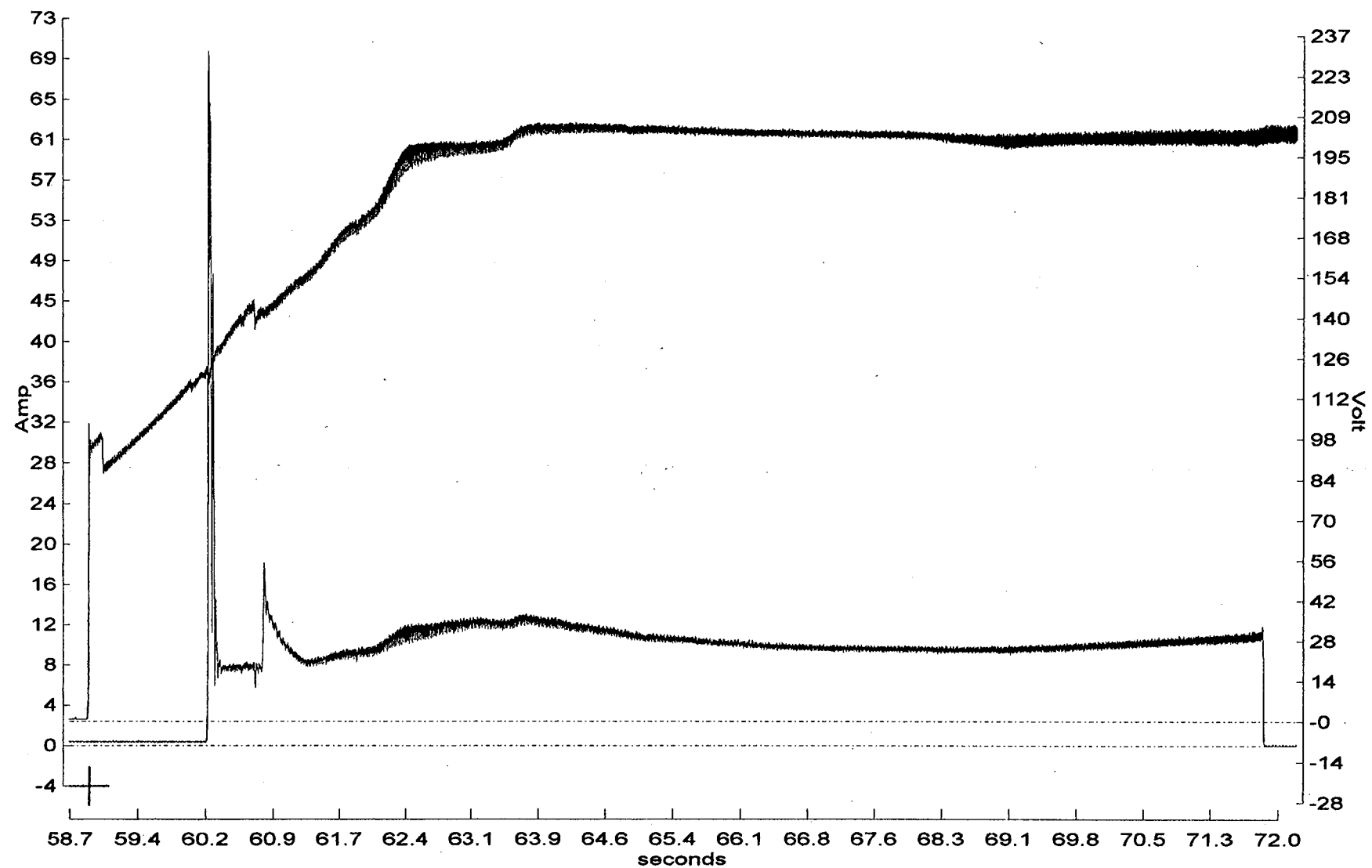
3LP-017

ES Test # 3

Full Stroke Total Real Power

Figure 4.3.9.3-3: Test 3, 3LP-17 Full Stroke Total Real Power (KW)

<1> M... Test: Ocone 3 3BS002 1-4-97 10:17a 132.3 ES 3



Cursor coordinates = 58.9seconds, -4.05Amp

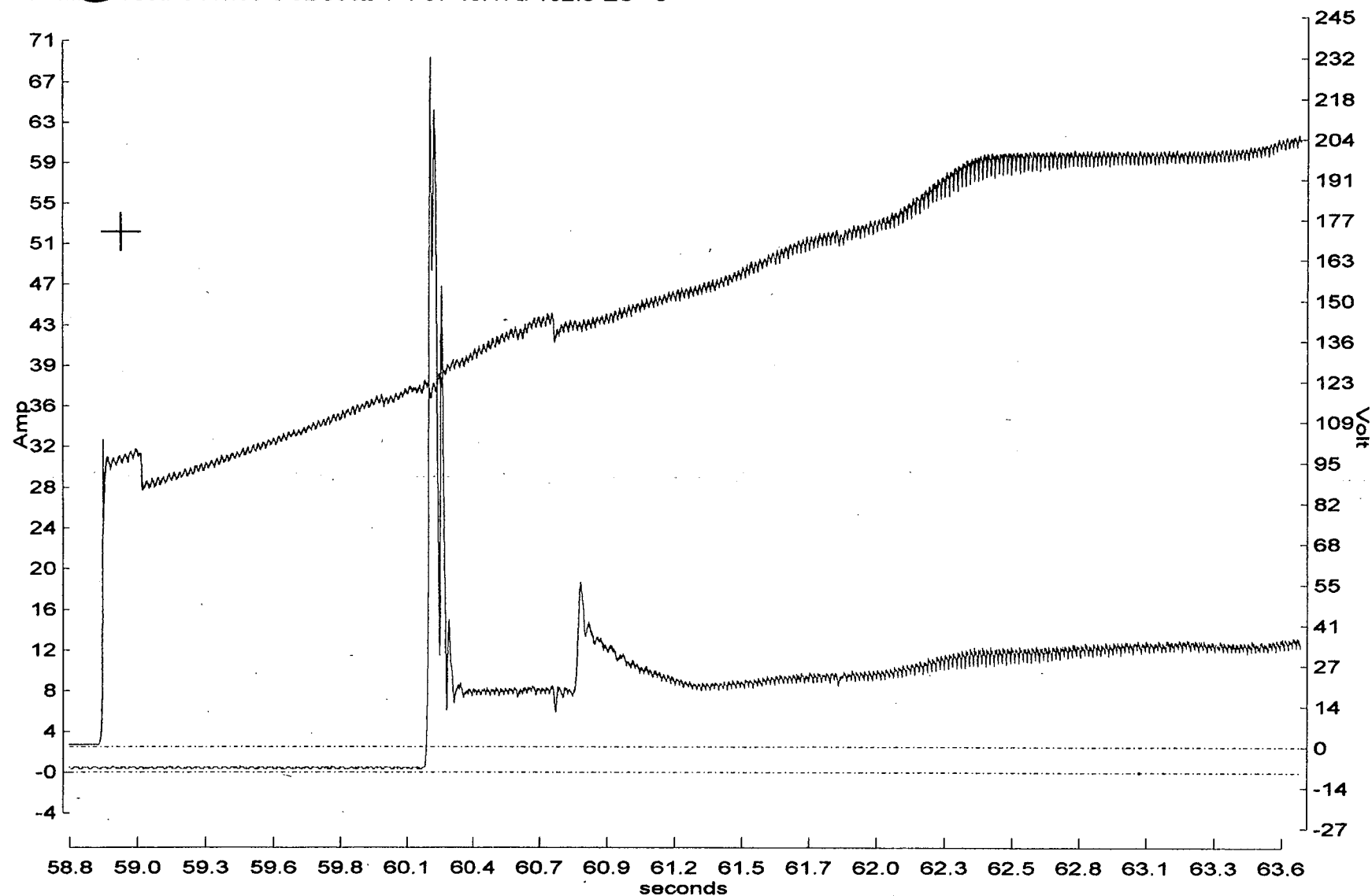
— Vab-rms — Ia-rms

3BS-002

ES Test # 3

Full Stroke Voltage and Current

Figure 4.3.9.4-1: Test 3, 3BS-2 Full Stroke Voltage and Current



Cursor coordinates = 59seconds, 52.5Amp

— Vab-rms — Ia-rms

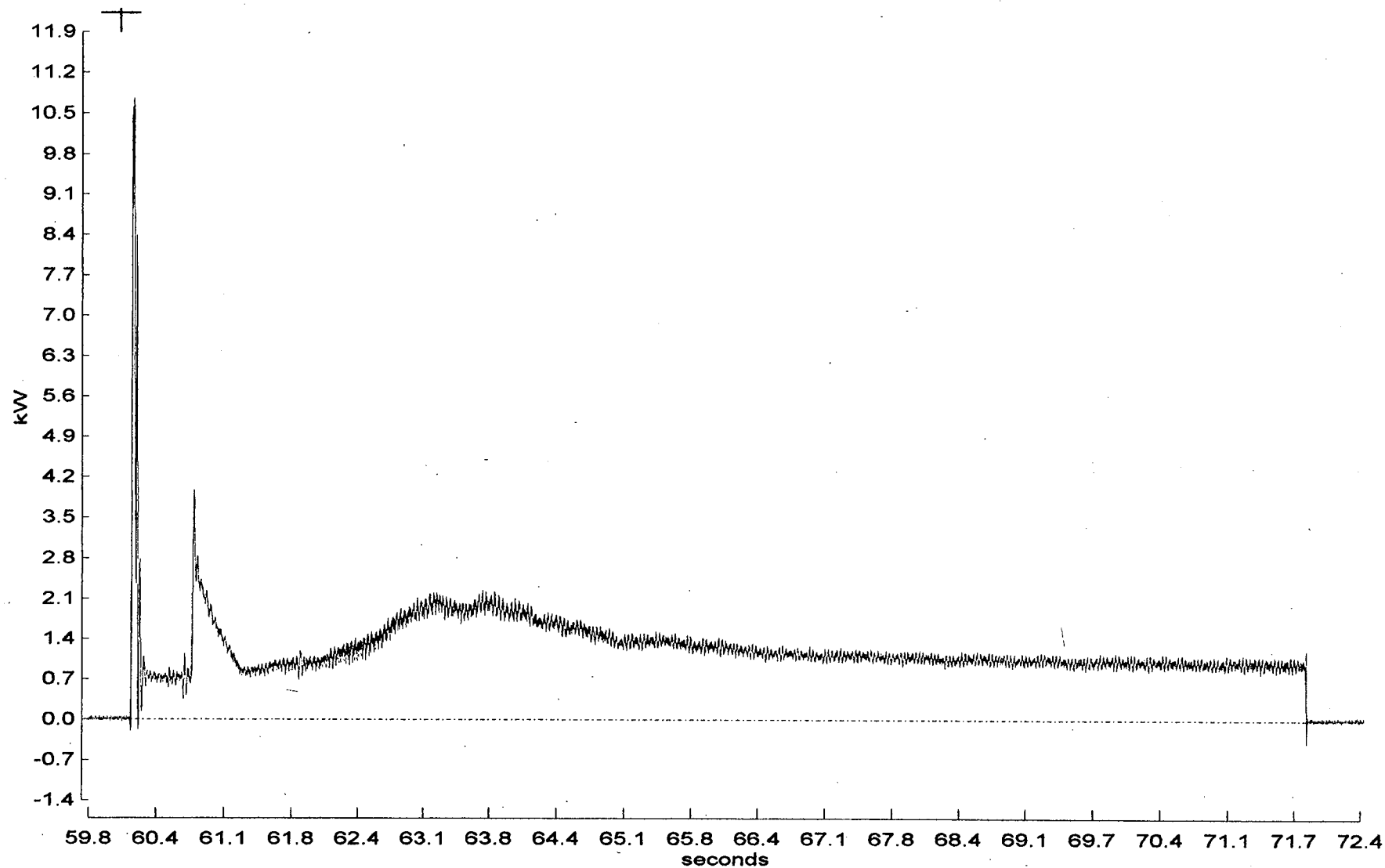
3BS-002

ES Test # 3

Inrush Voltage and Current

Figure 4.3.9.4-2: Test 3, 3BS-2 Inrush Voltage and Current

<1> M M Test: Ocone 3 3BS002 1-4-97 10:17a 132.3 ES 3



Cursor coordinates = 60.1seconds, 12.3kW

TRP

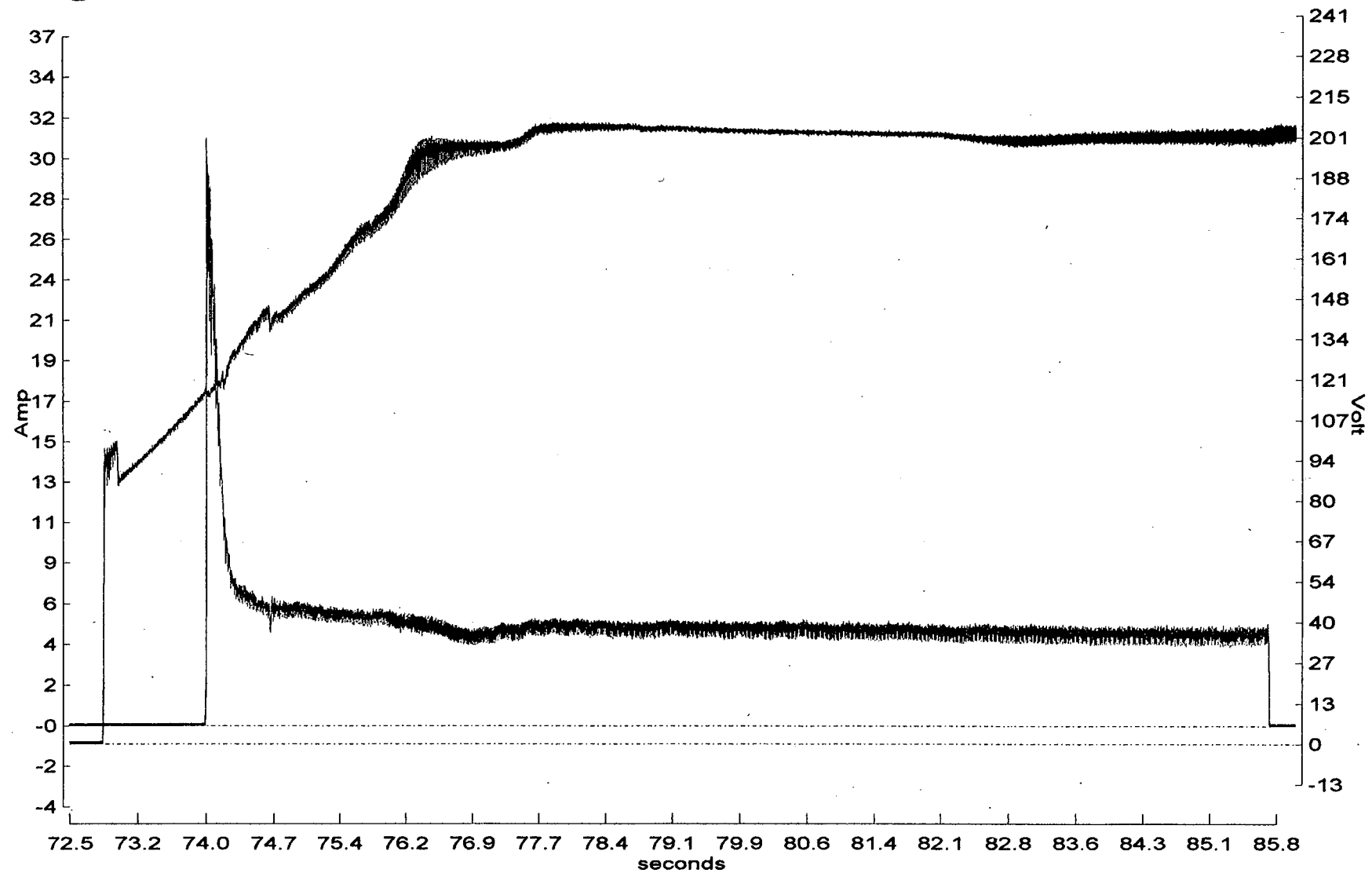
3BS-002

ES Test # 3

Full Stroke Total Real Power

Figure 4.3.9.4-3: Test 3, 3BS-2 Full Stroke Total Real Power (KW)

<1> Test: Ocone 3 3HP27 1-4-97 10:35a 132.8 ES 3



Cursor coordinates = 89.2seconds, 397Amp

— Vab-rms — Ia-rms

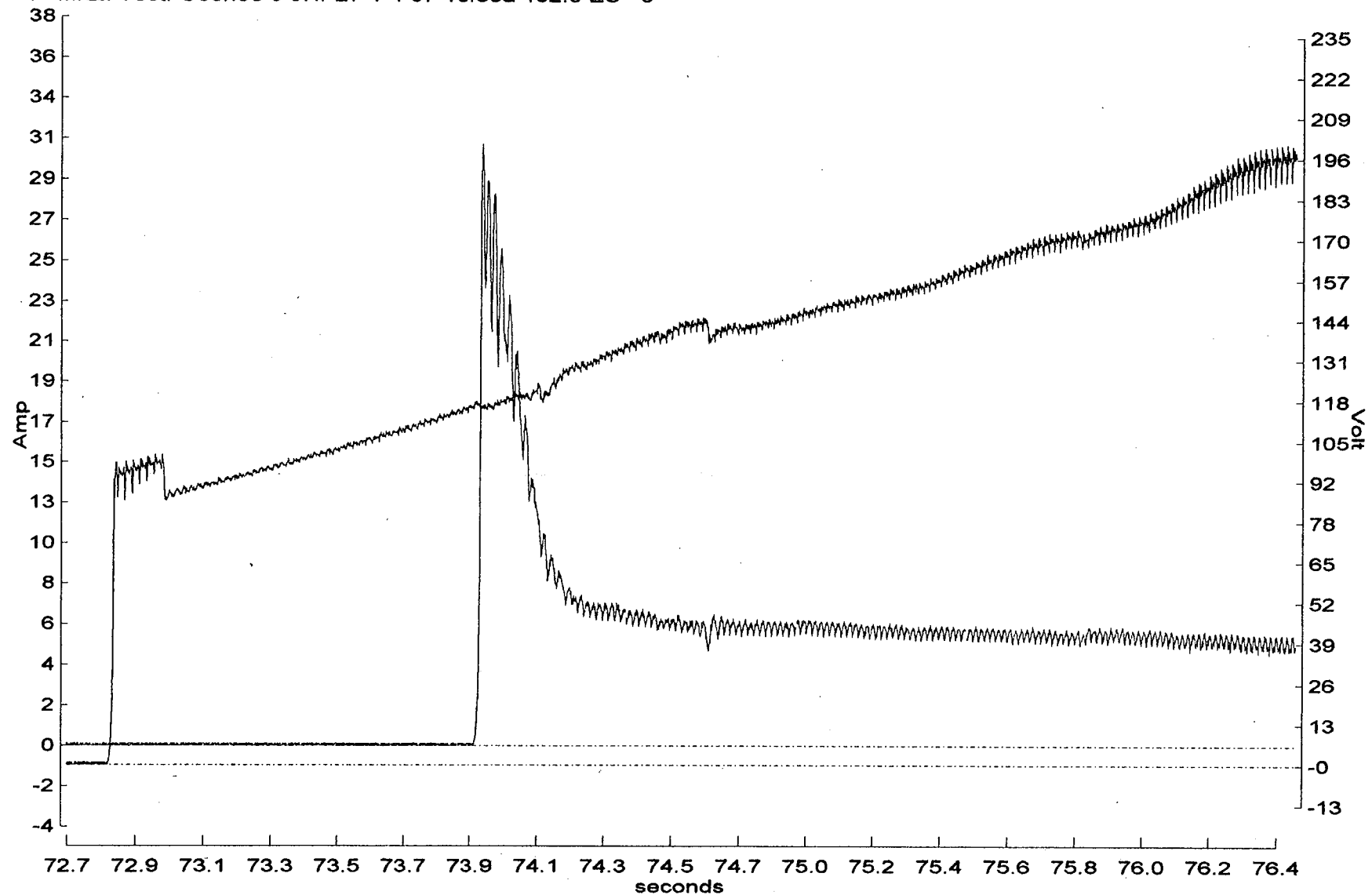
3HP-027

ES Test # 3

Full Stroke Voltage and Current

Figure 4.3.9.5-1: Test 3, 3HP-27 Full Stroke Voltage and Current

<1> Min Test: Ocone 3 3HP27 1-4-97 10:35a 132.8 ES 3



Cursor coordinates = 50.6seconds, 20.8Amp

— Vab-rms — Ia-rms

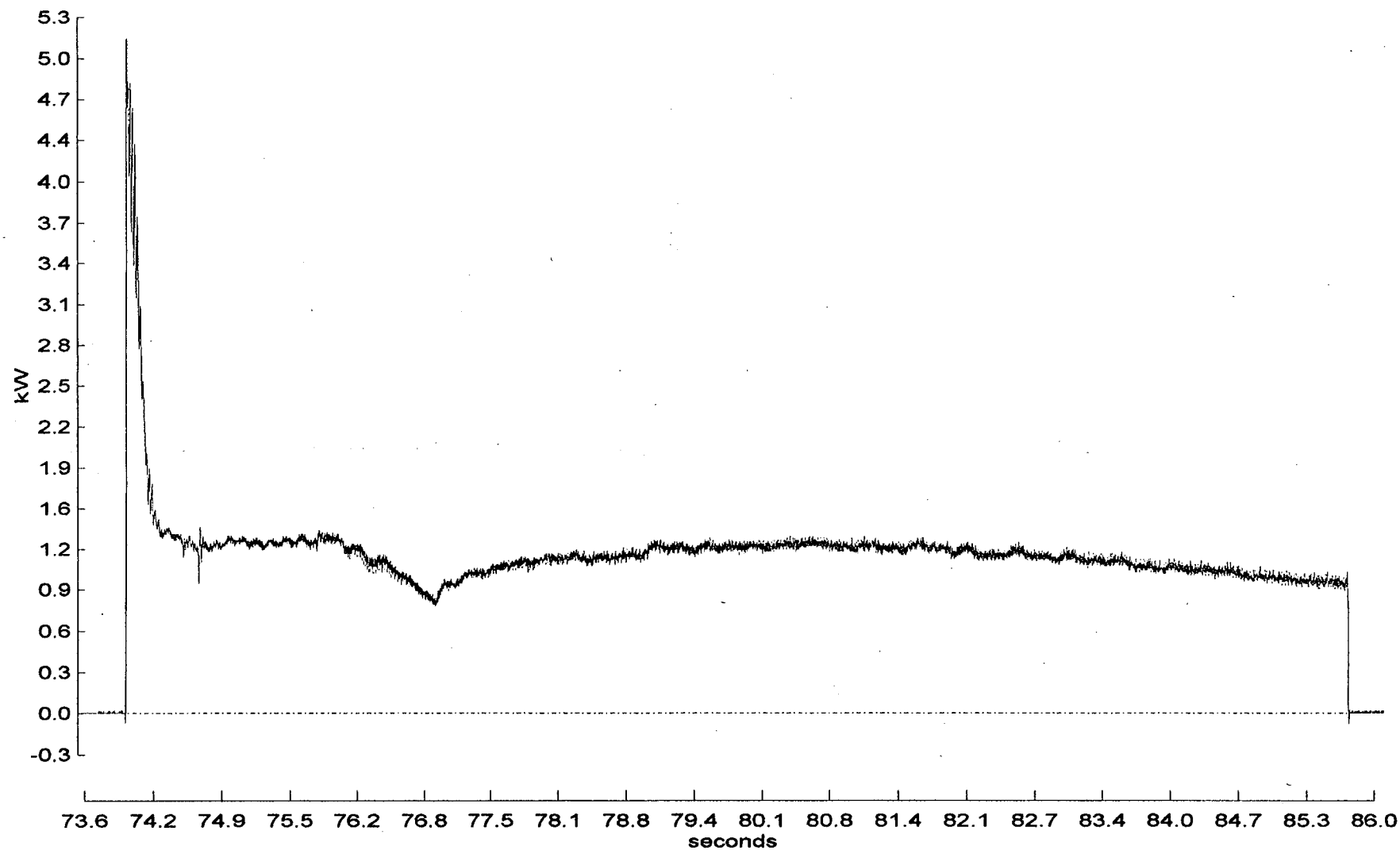
3HP-027

ES Test # 3

Inrush Voltage and Current

Figure 4.3.9.5-2: Test 3, 3HP-27 Inrush Voltage and Current

<1> M... Test: Ocone 3 3HP27 1-4-97 10:35a 132.8 ES 3



Cursor coordinates = 75seconds, 14.6kW

TRP

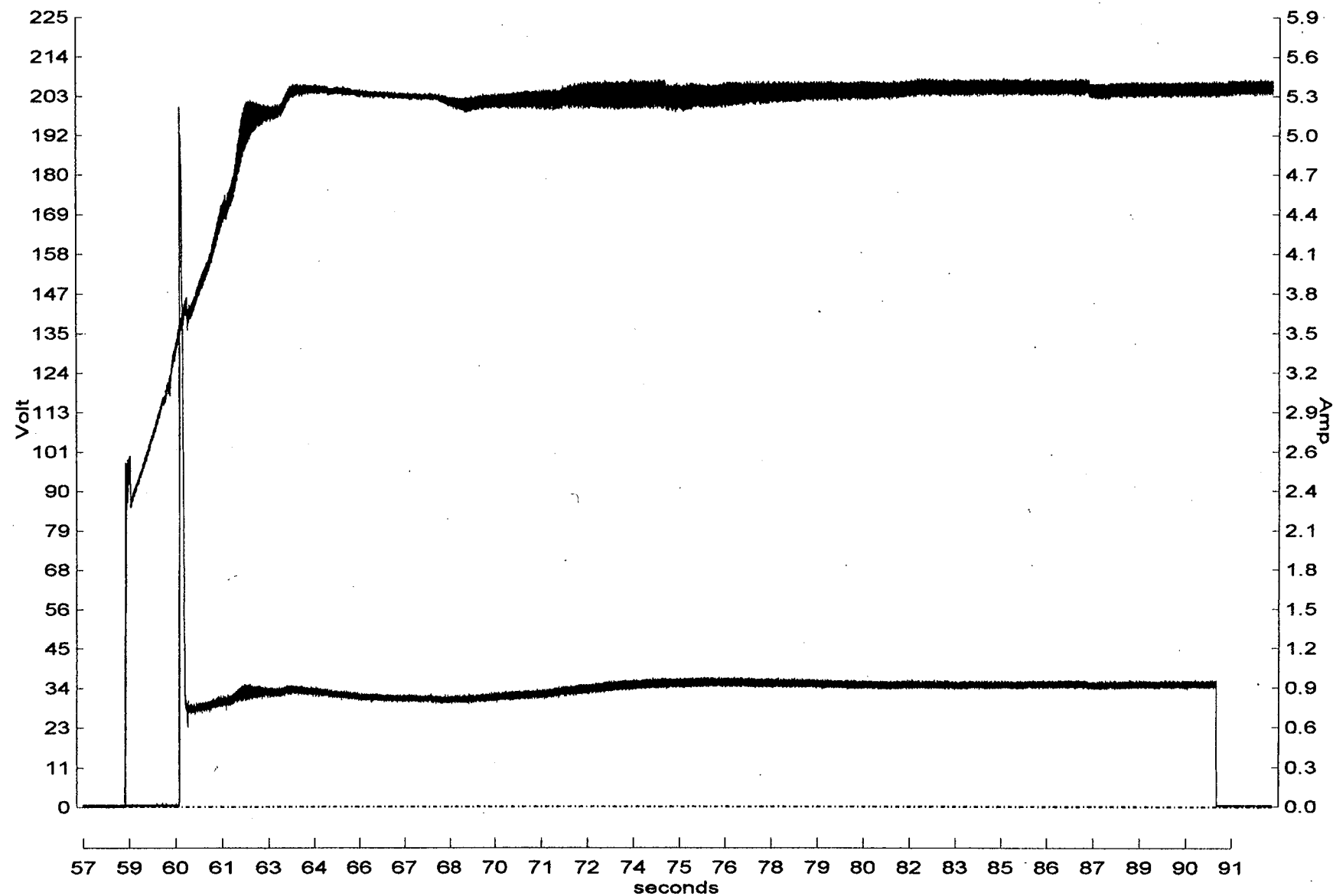
3HP-027

ES Test # 3

Full Stroke Total Real Power

Figure 4.3.9.5-3: Test 3, 3HP-27 Full Stroke Total Real Power (KW)

<1> M Test: Ocone 3 3LPS024 1-4-97 10:17a 151.3 ES 3



Cursor coordinates = 86.7seconds, 54.2Volt

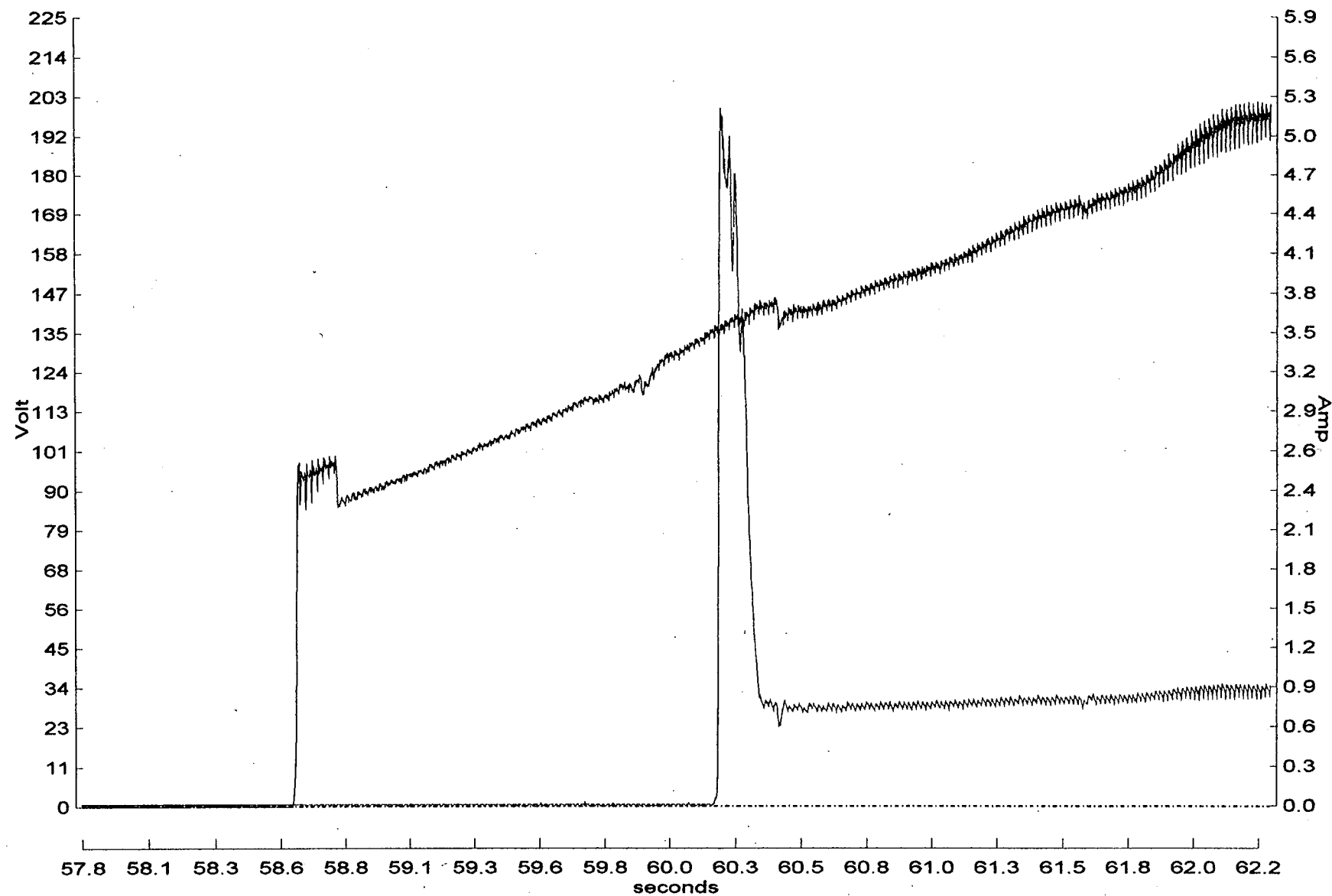
— Vab-rms — Ia-rms

3LPSW-024

ES Test # 3

Full Stroke Voltage and Current

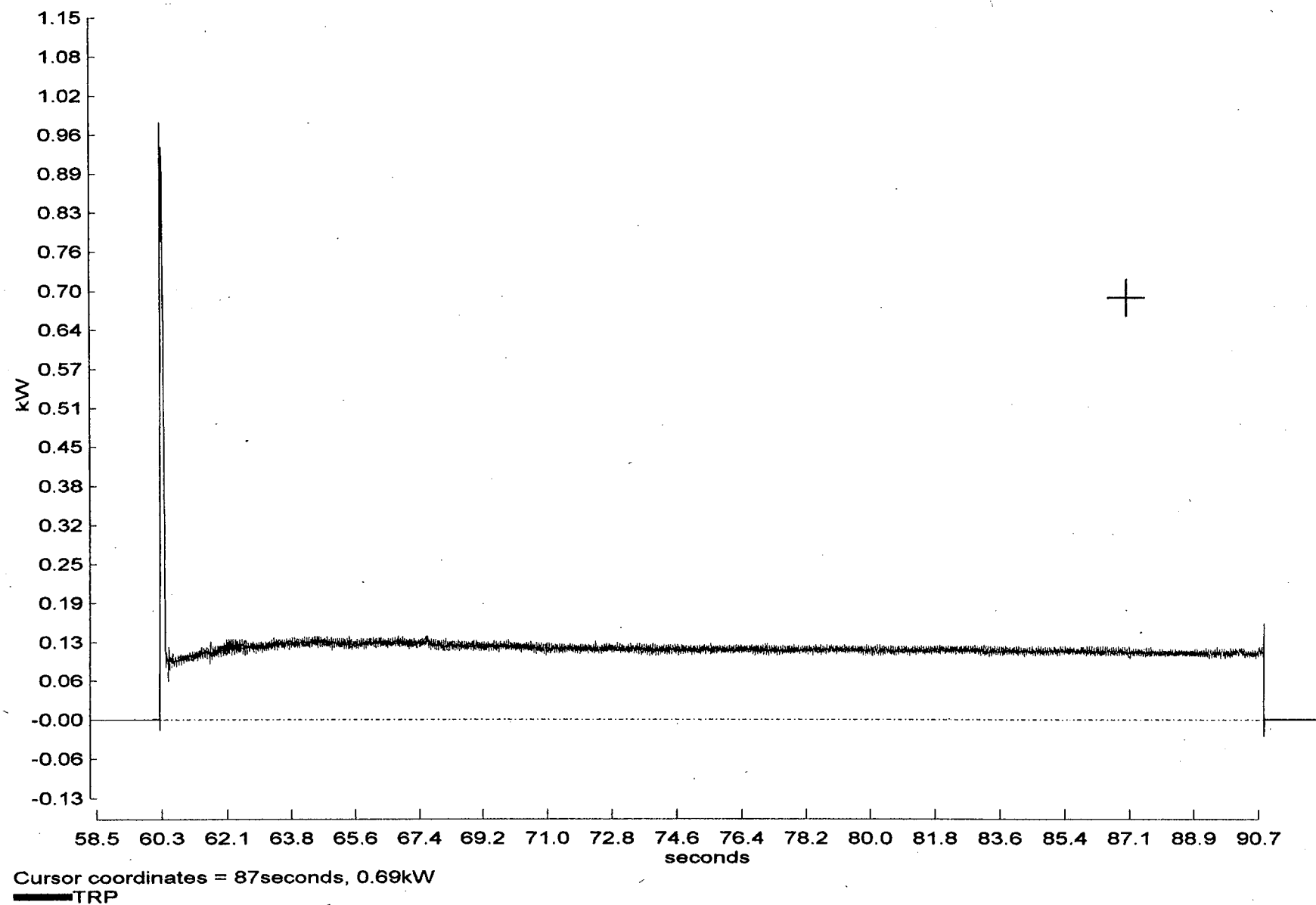
Figure 4.3.9.6-1: Test 3, 3LPSW-24 Full Stroke Voltage and Current



Cursor coordinates = 61.6seconds, 117Volt
 — Vab-rms — Ia-rms

3LPSW-024
 ES Test # 3
 Inrush Voltage and Current

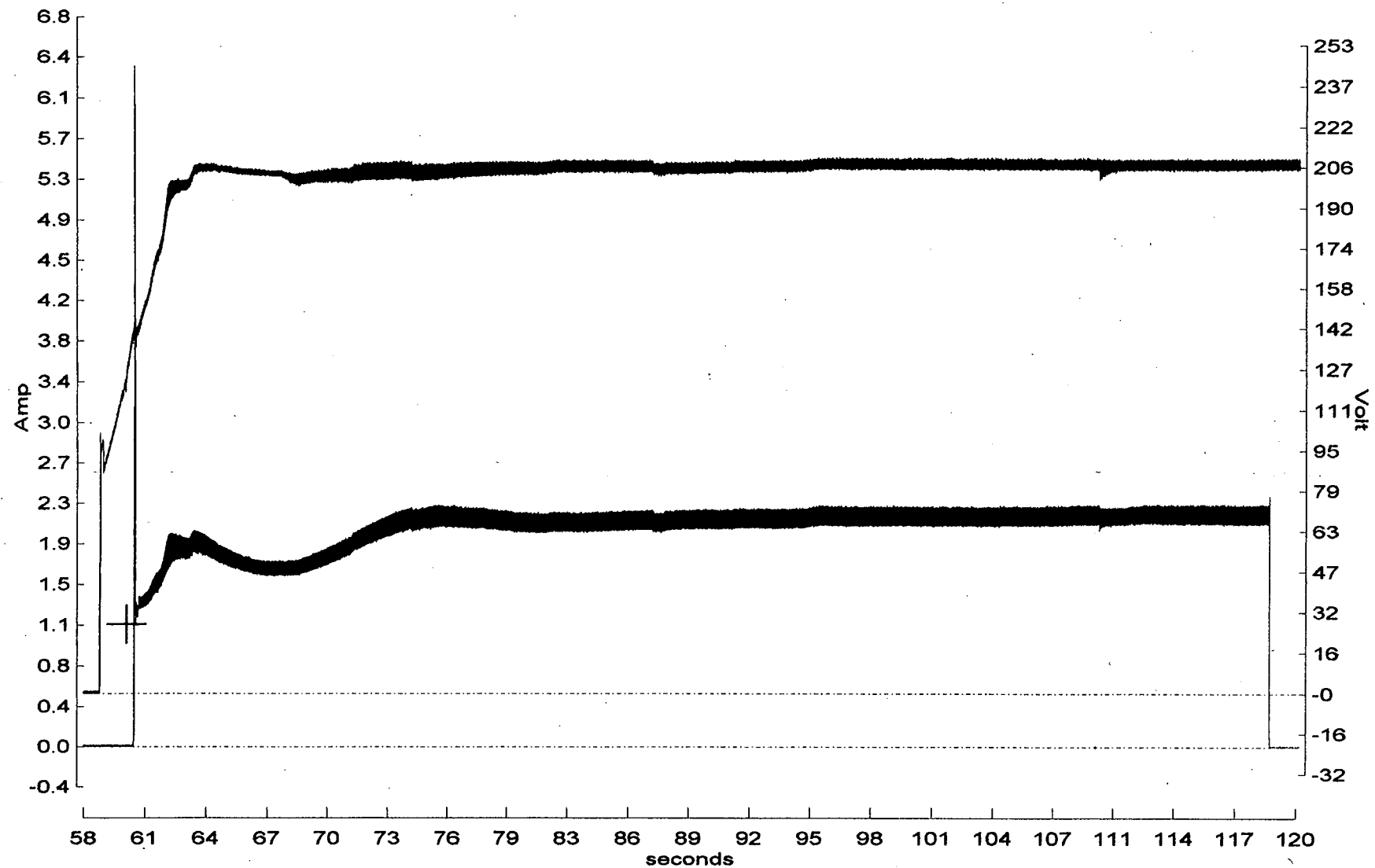
Figure 4.3.9.6-2: Test 3, 3LPSW-24 Inrush Voltage and Current



3LPSW-024
ES Test # 3
Full Stroke Total Real Power

Figure 4.3.9.6-3: Test 3, 3LPSW-24 Full Stroke Total Real Power (KW)

<1> M Test: Ocone 3 3PR019 1-4-97 10:16a 179.3 ES 3



Cursor coordinates = 59.8seconds, 1.14Amp

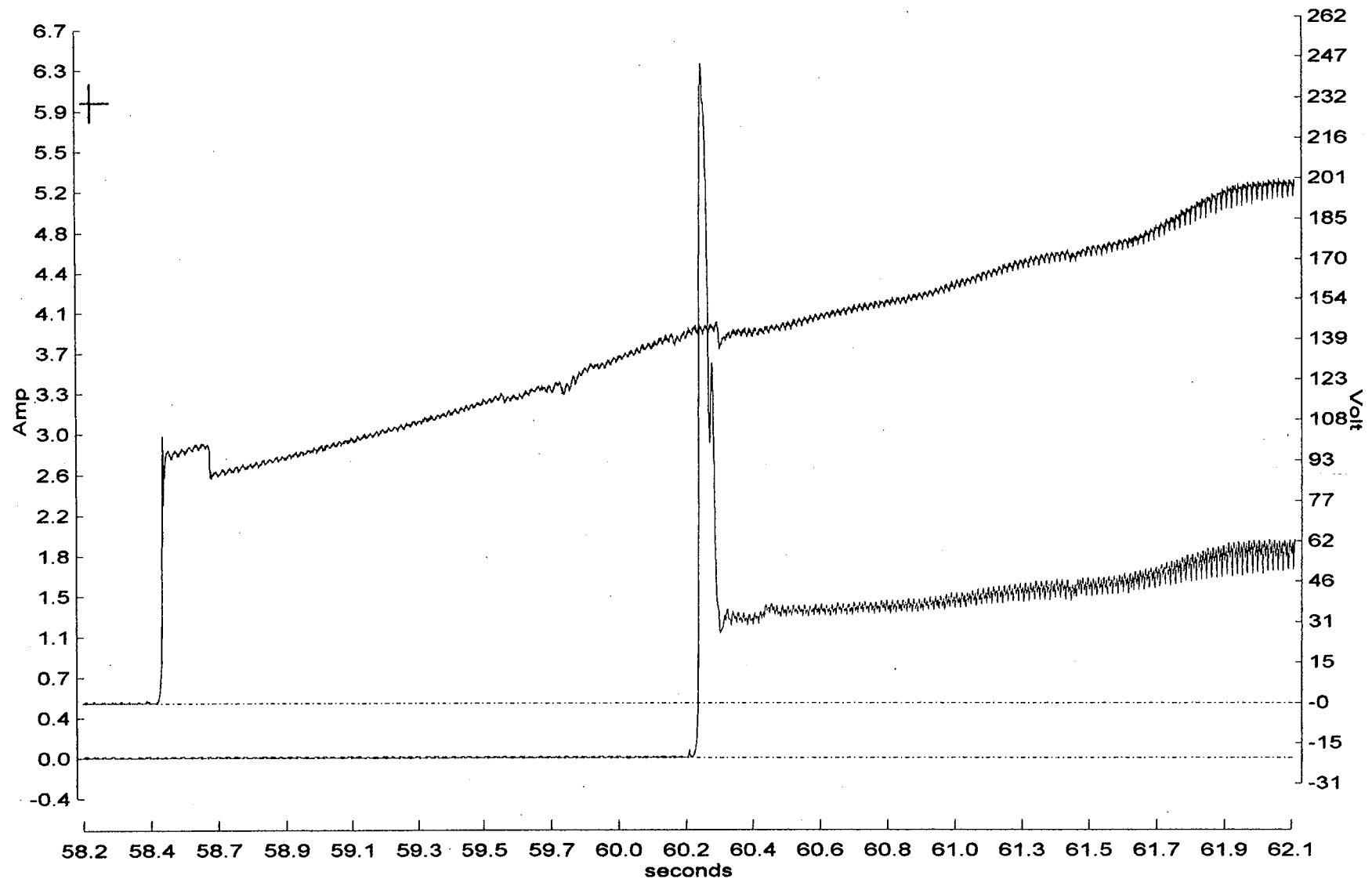
— V_{ab-rms} — I_{a-rms}

3PR-019

ES Test # 3

Full Stroke Voltage and Current

Figure 4.3.9.7-1: Test 3, 3PR-19 Full Stroke Voltage and Current

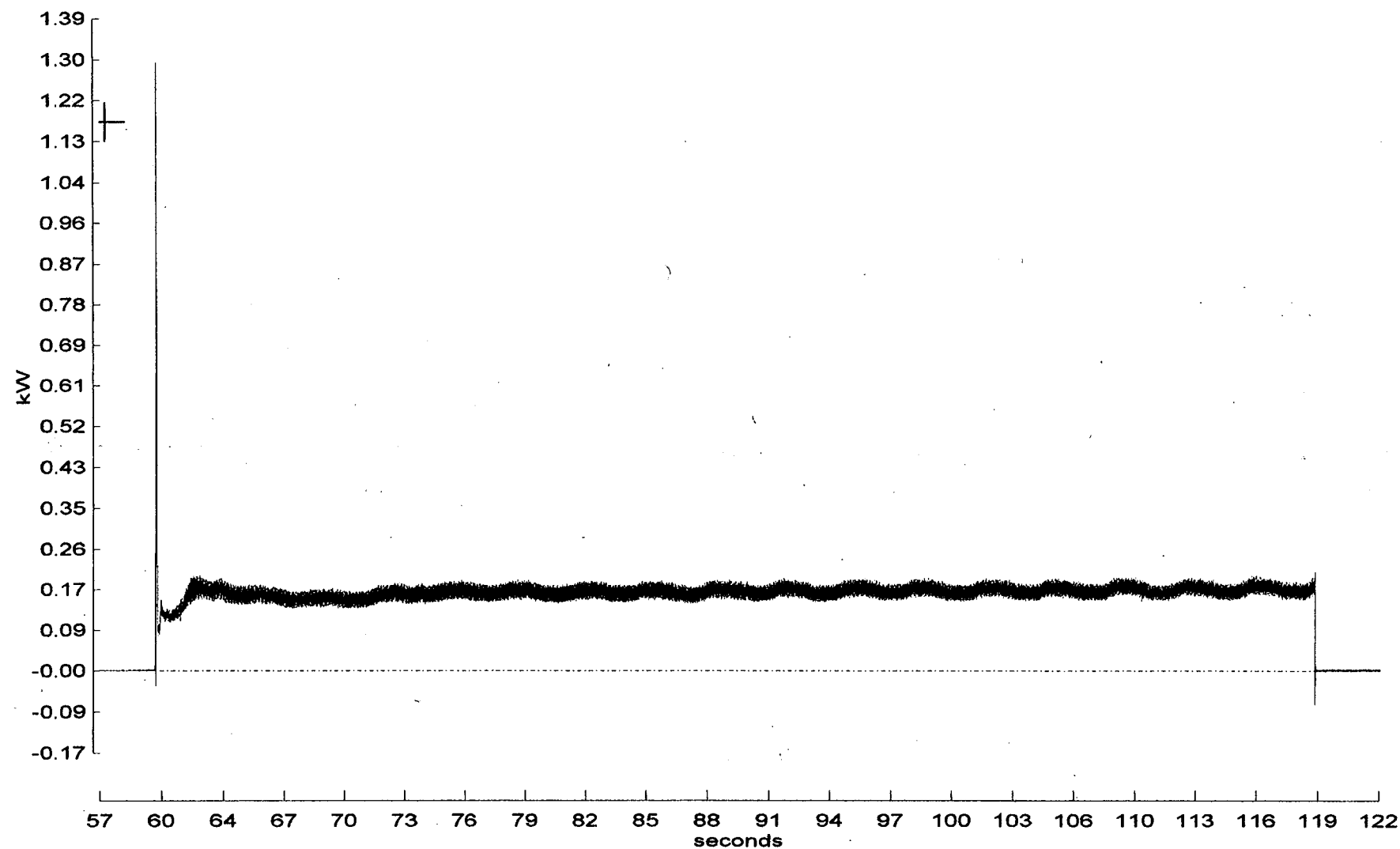


Cursor coordinates = 58.2seconds, 5.99Amp

— Vab-rms — Ia-rms

3PR-019
ES Test # 3
Inrush Voltage and Current

Figure 4.3.9.7-2: Test 3, 3PR-19 Inrush Voltage and Current



Cursor coordinates = 57.7seconds, 1.17kW

— TRP

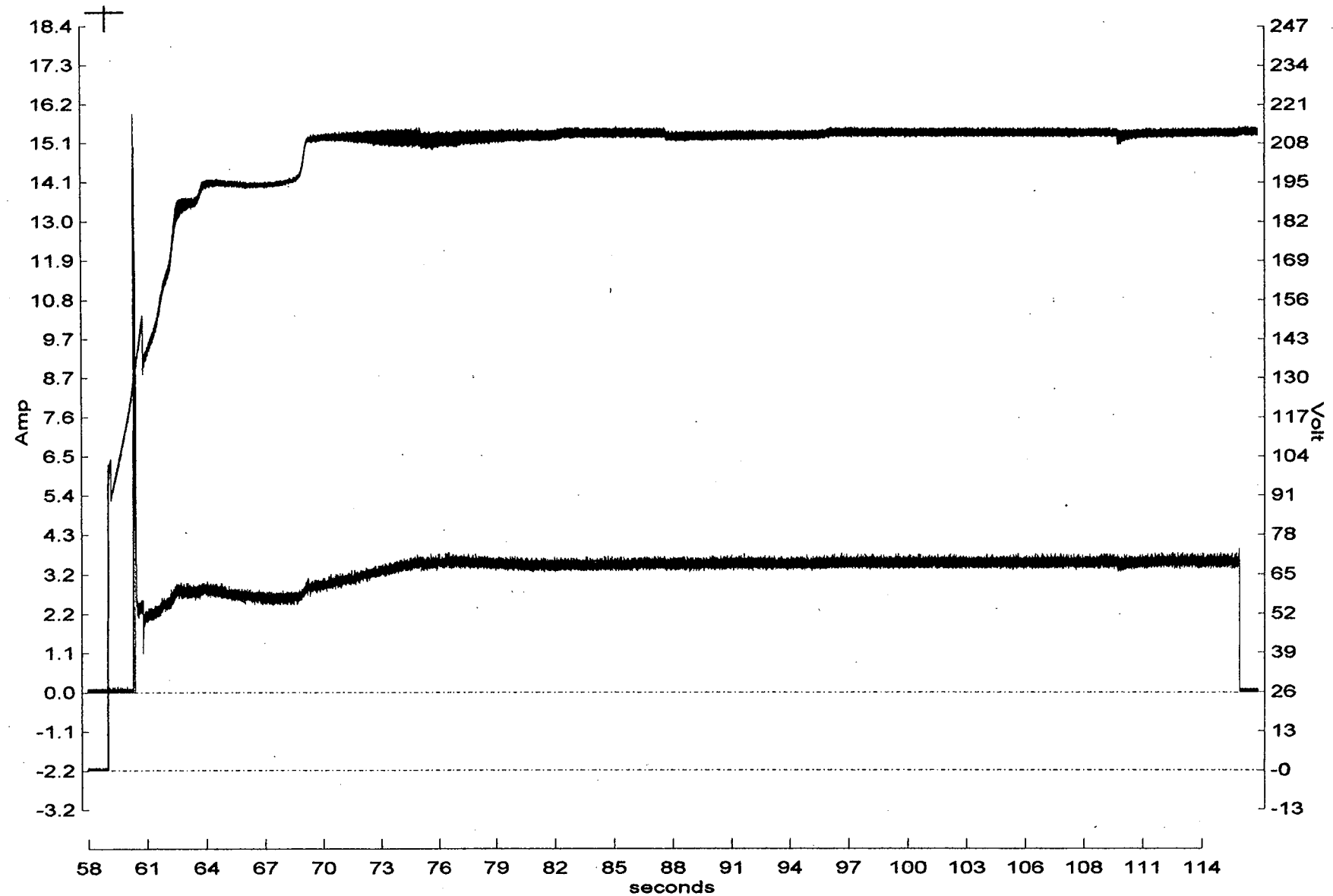
3PR-019

ES Test # 3

Full Stroke Total Real Power

Figure 4.3.9.7-3: Test 3, 3PR-19 Full Stroke Total Real Power (KW)

<1> MFM Test: Ocone 3 3LPS6 1-4-97 10:21a 176.8 ES 3



Cursor coordinates = 58.8seconds, 18.8Amp

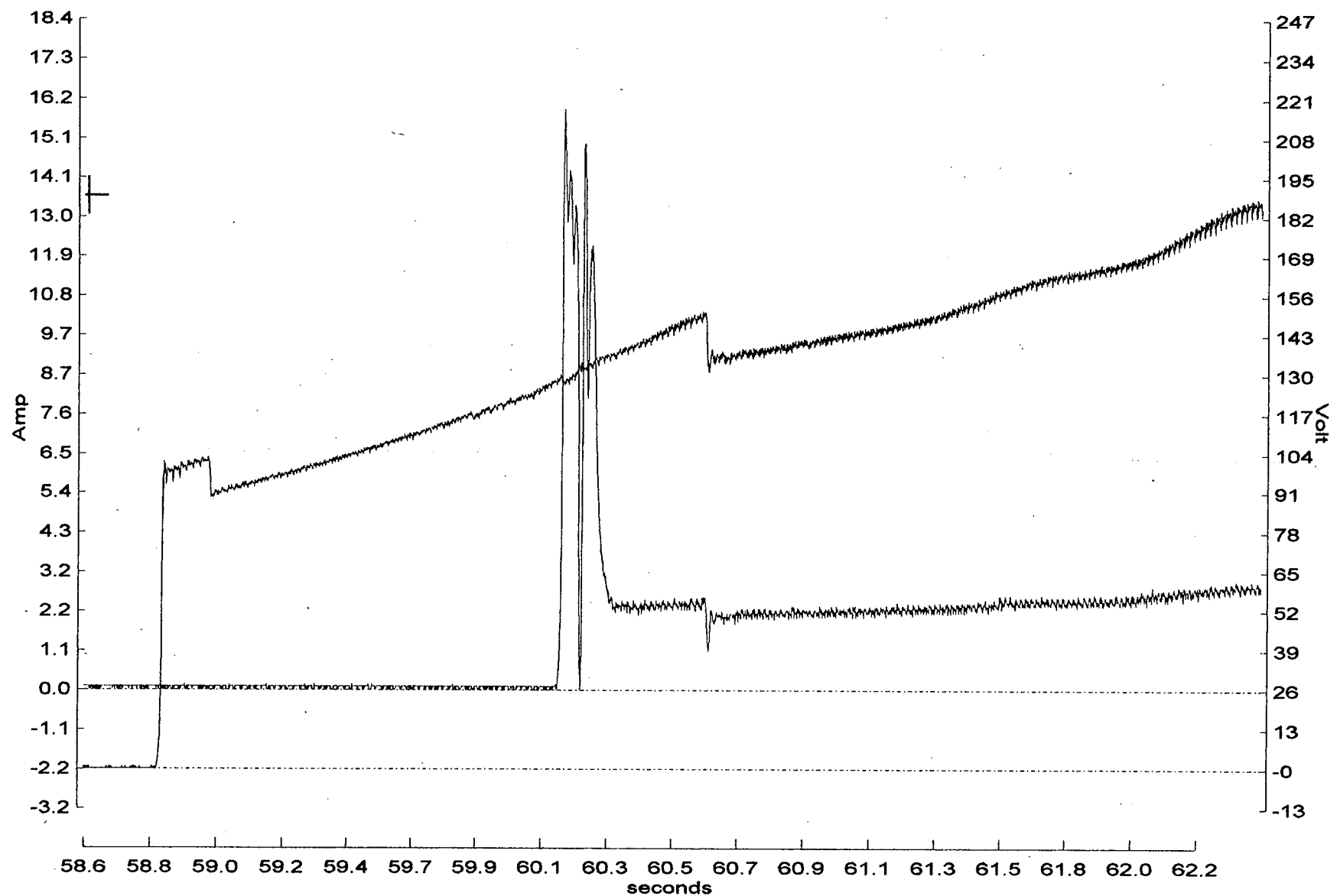
— V_{ab-rms} — I_{a-rms}

3LPSW-006

ES Test # 3

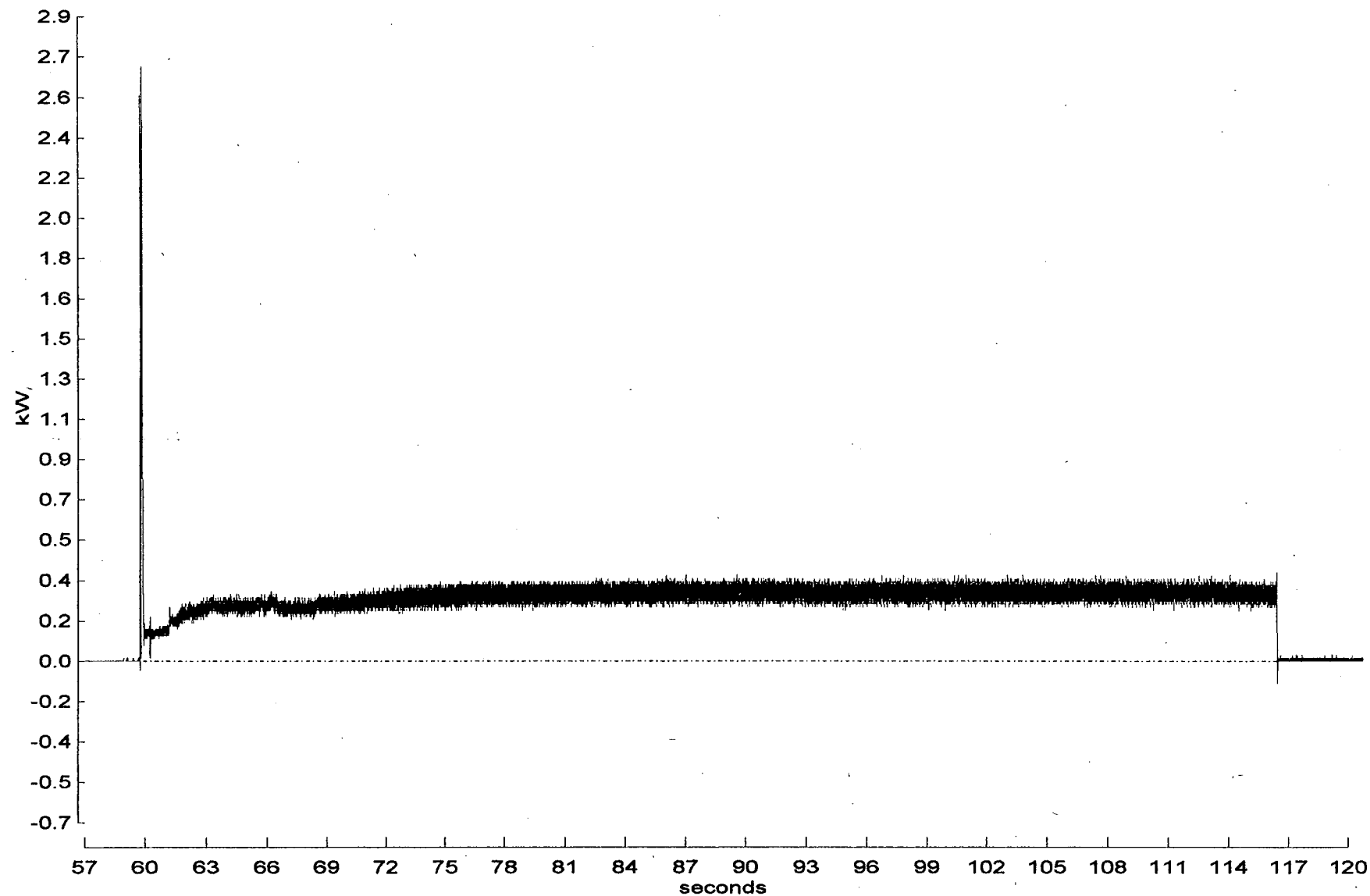
Full Stroke Voltage and Current

Figure 4.3.9.8-1: Test 3, 3LPSW-6 Full Stroke Voltage and Current



3LPSW-006
 ES Test # 3
 Inrush Voltage and Current

Figure 4.3.9.8-2: Test 3, 3LPSW-6 Inrush Voltage and Current



Cursor coordinates = 61.1seconds, 10.7kW

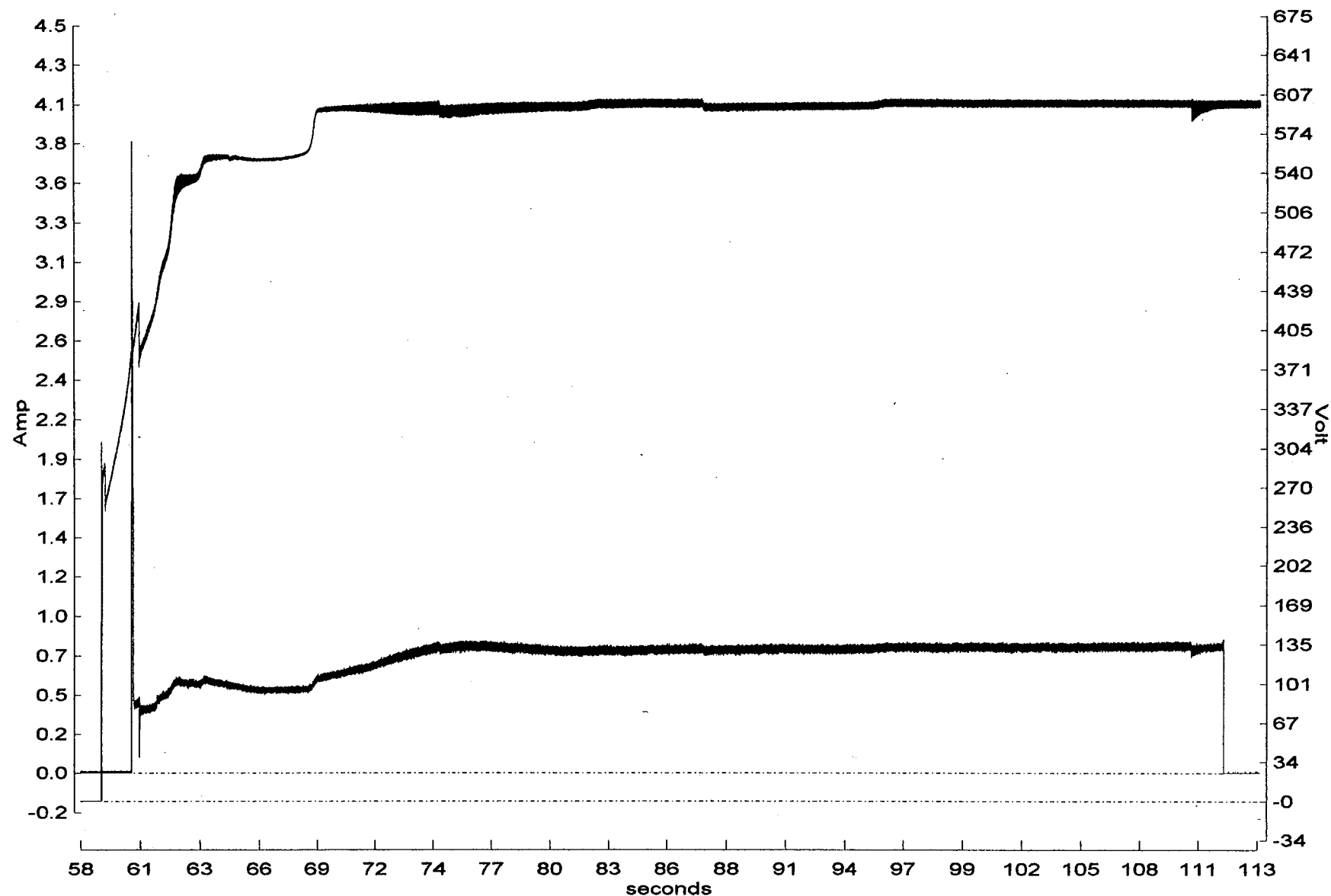
TRP

3LPSW-006

ES Test # 3

Full Stroke Total Real Power

Figure 4.3.9.8-3: Test 3, 3LPSW-6 Full Stroke Total Real Power (KW)



Cursor coordinates = 119seconds, 25Amp

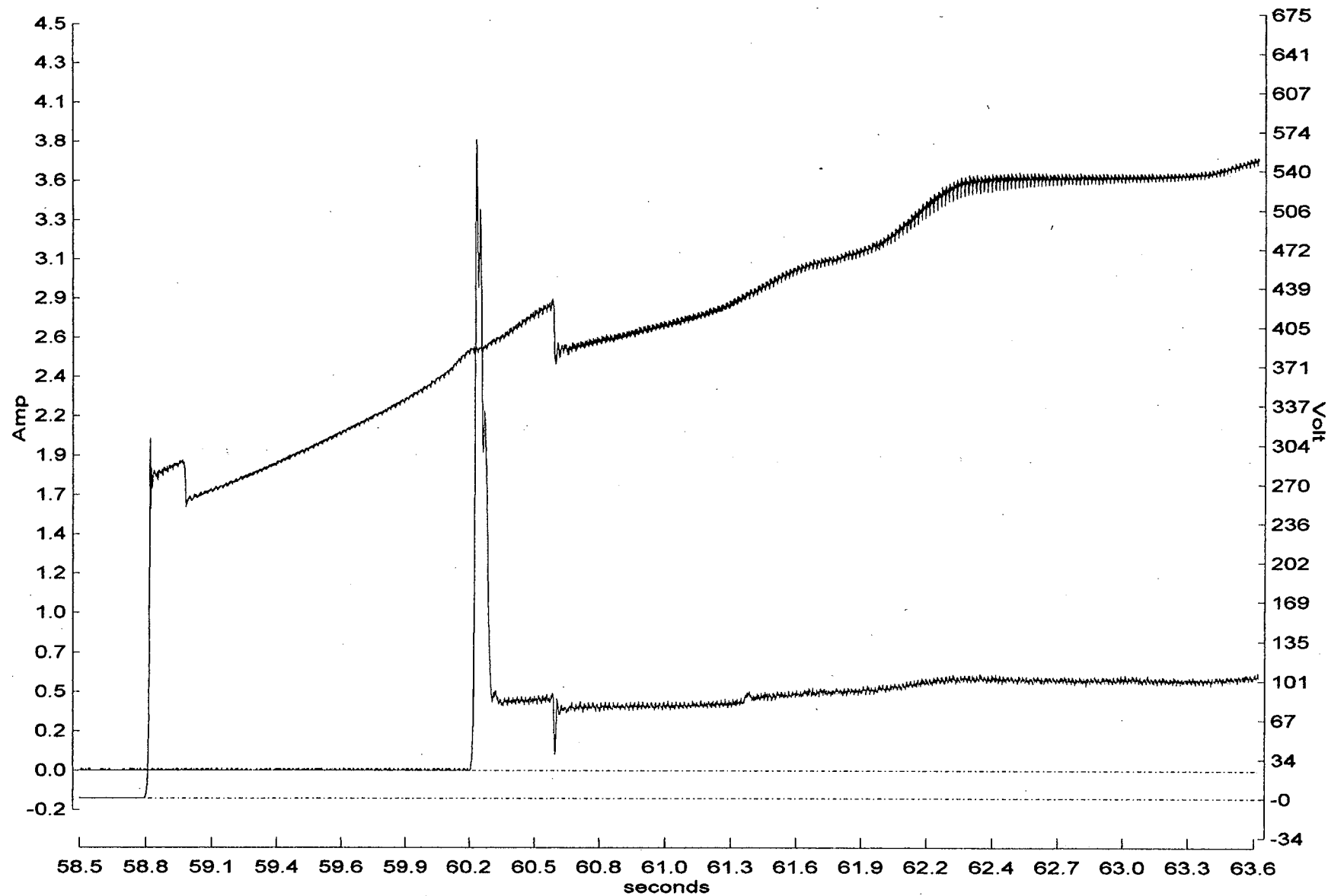
— Vab-rms — Ia-rms

3LPSW-565

ES Test # 3

Full Stroke Voltage and Current

Figure 4.3.9.9-1: Test 3, 3LPSW-565 Full Stroke Voltage and Current



Cursor coordinates = 111seconds, 24.8Amp

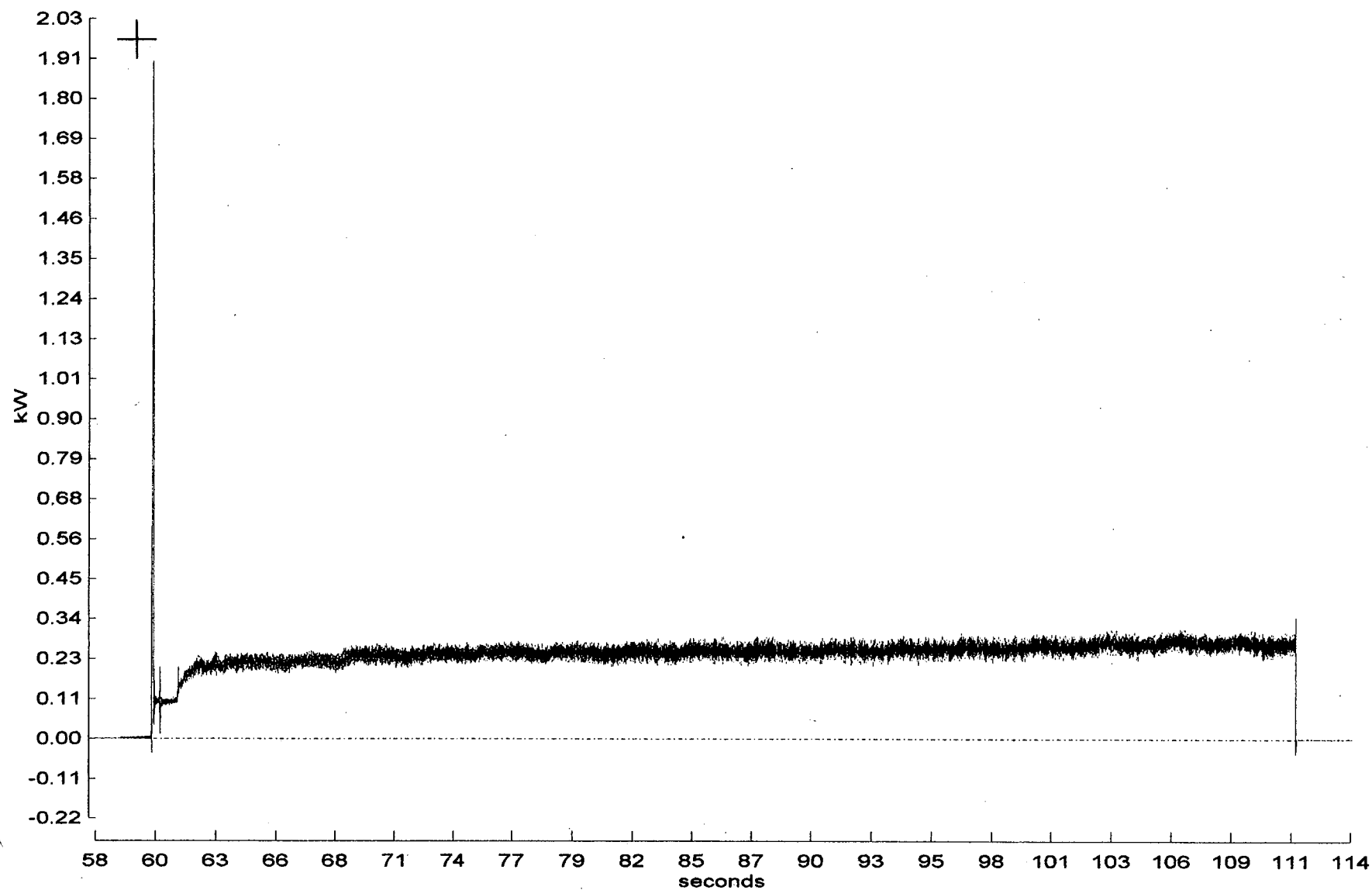
— Vab-rms — Ia-rms

3LPSW-565

ES Test # 3

Inrush Voltage and Current

Figure 4.3.9.9-2: Test 3, 3LPSW-565 Inrush Voltage and Current

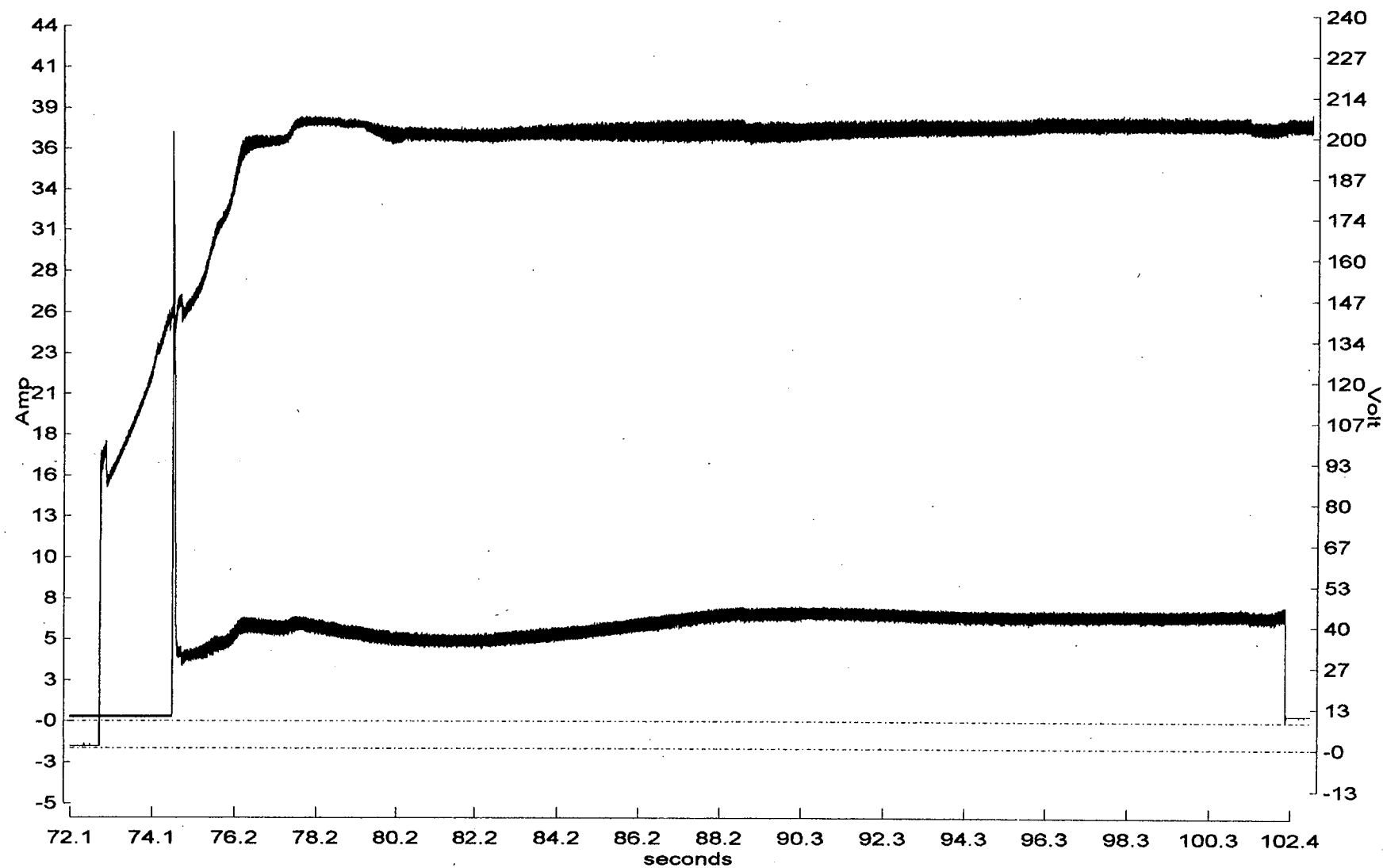


Cursor coordinates = 59.5seconds, 1.97kW

— TRP

3LPSW-565
ES Test # 3
Full Stroke Total Real Power

Figure 4.3.9.9-3: Test 3, 3LPSW-565 Full Stroke Total Real Power (KW)



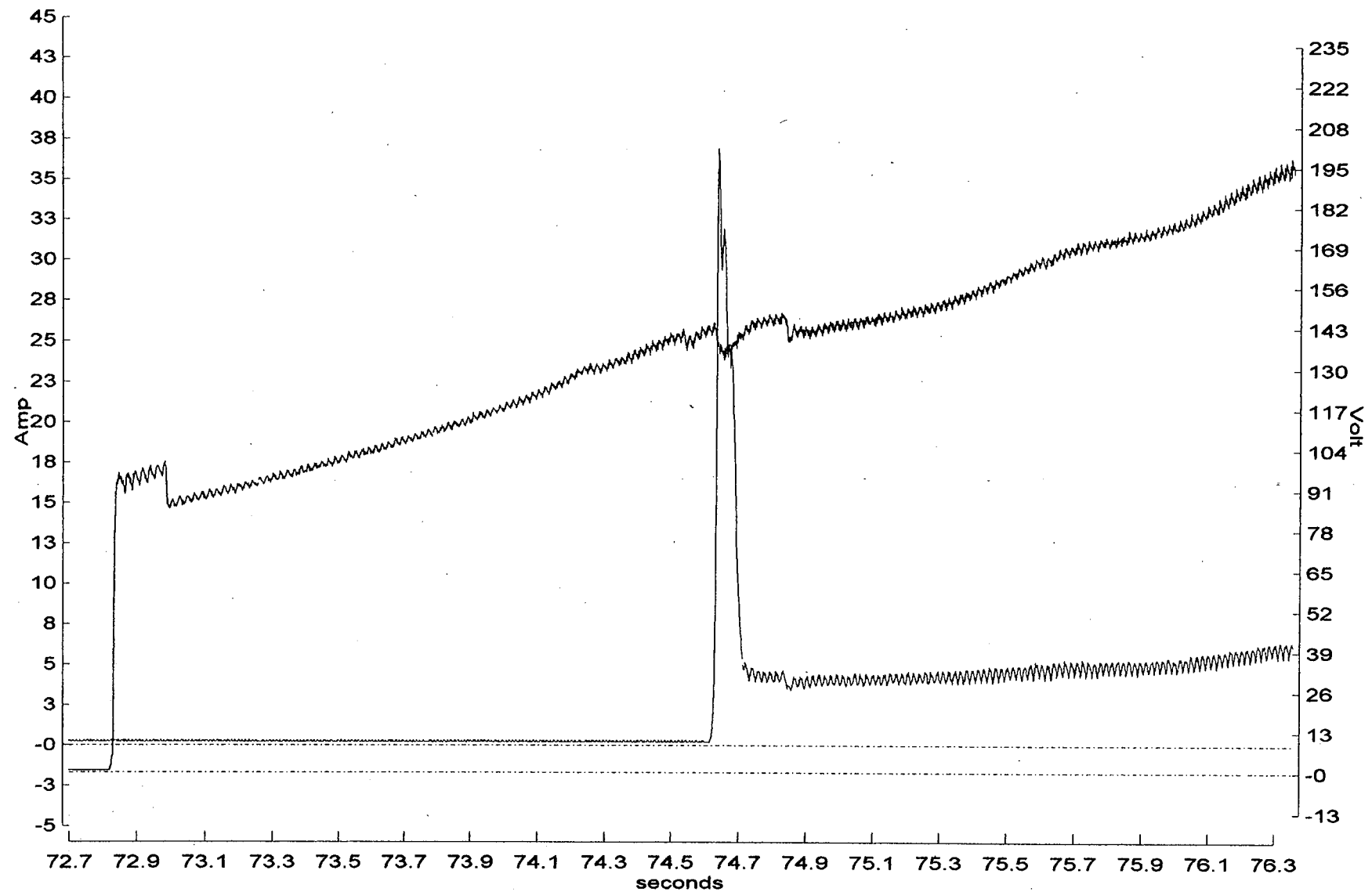
Cursor coordinates = 79.3seconds, 76.1Amp

— Vab-rms — Ia-rms

3HP-004
ES Test # 3
Full Stroke Voltage and Current

Figure 4.3.9-10-1: Test 3, 3HP-4 Full Stroke Voltage and Current

<1> MP-M Test: Ocone 3 3HP004 1-4-97 10:18a 148.8 ES 3



Cursor coordinates = 75.2seconds, 18.6Amp

— Vab-rms — Ia-rms

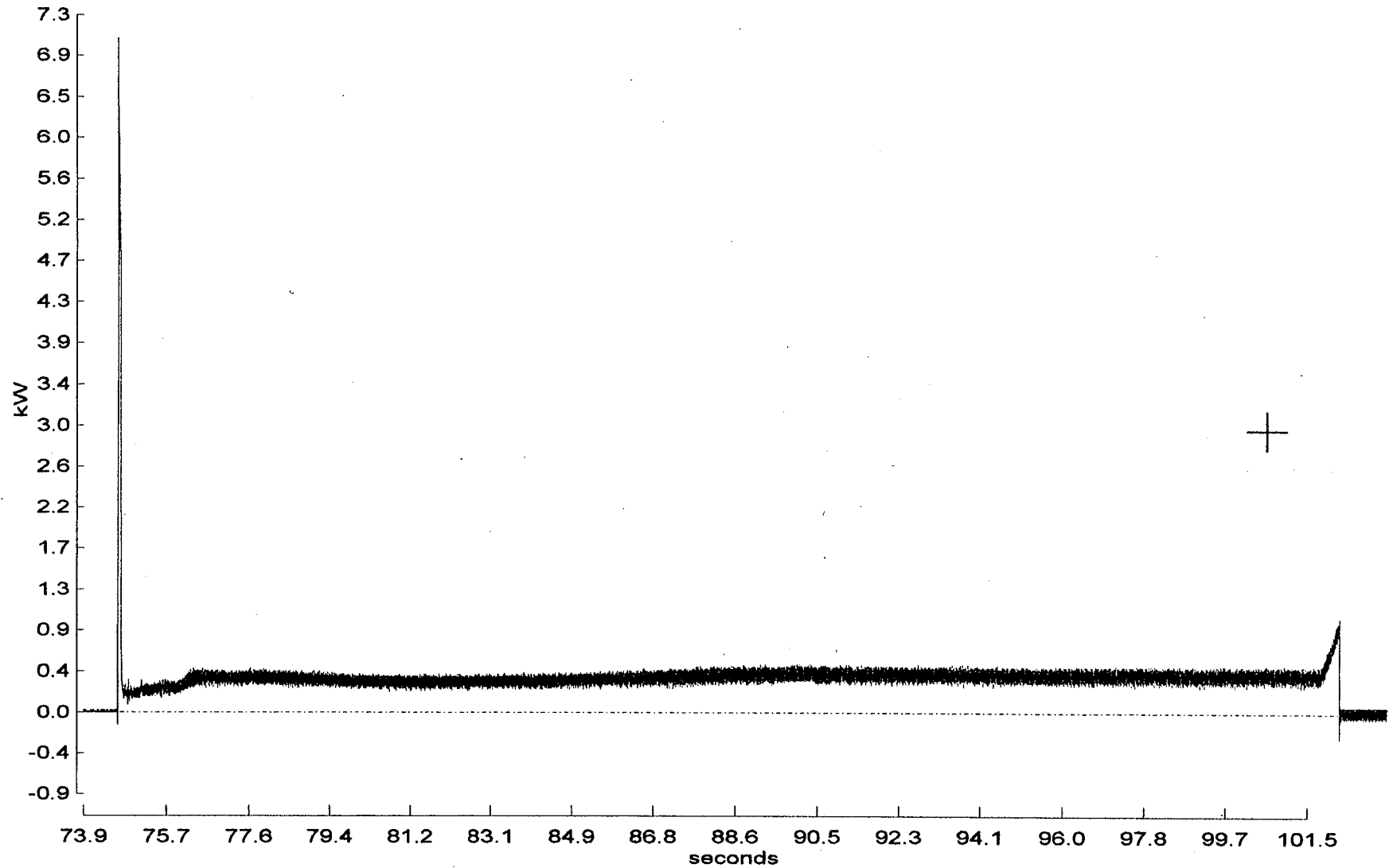
3HP-004

ES Test # 3

Inrush Voltage and Current

Figure 4.3.9.10-2: Test 3, 3HP-4 Inrush Voltage and Current

<1> MP Test: Ocone 3 3HP004 1-4-97 10:18a 148.8 ES 3



Cursor coordinates = 101seconds, 2.98kW

TRP

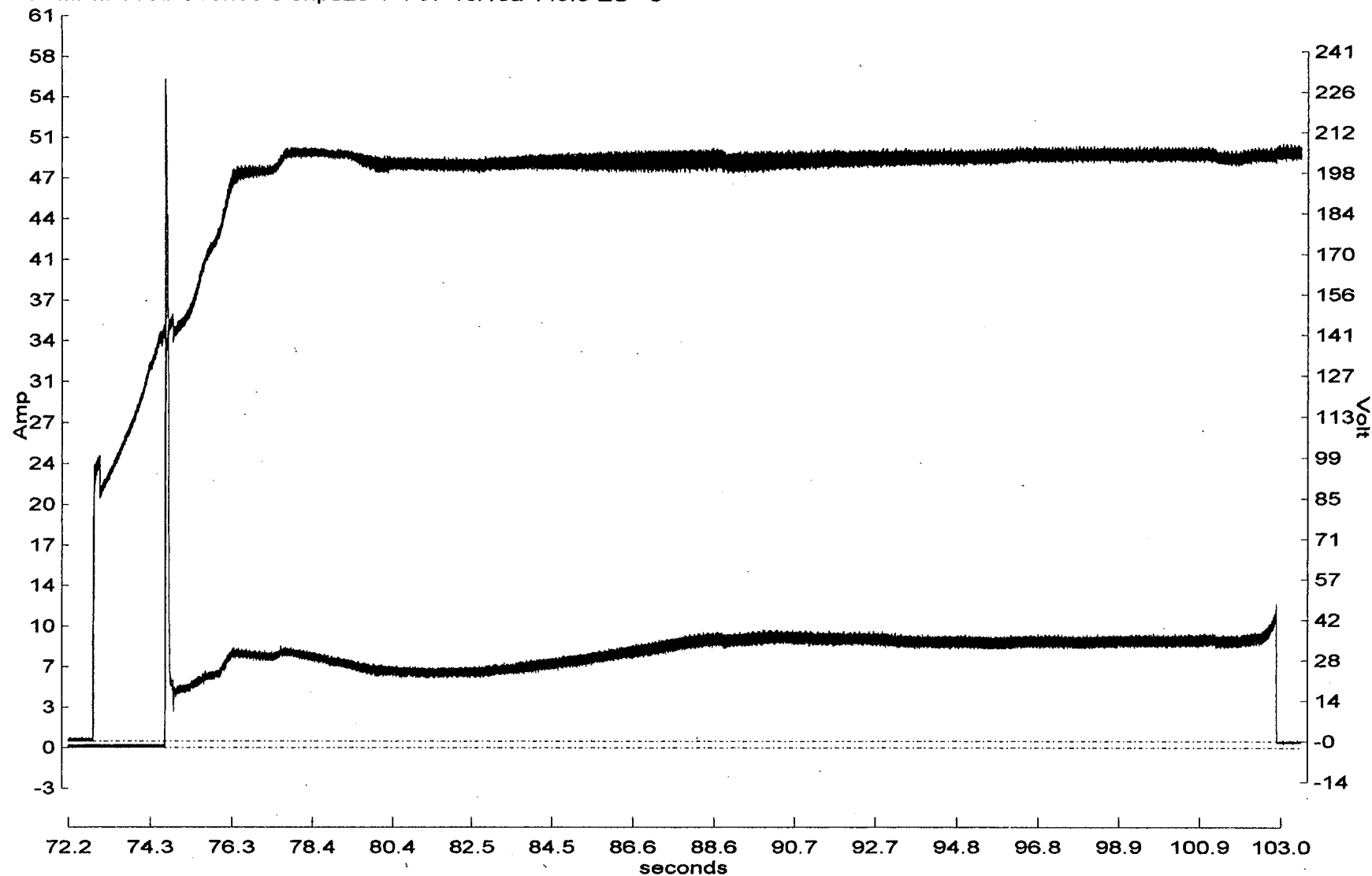
3HP-004

ES Test # 3

Full Stroke Total Real Power

Figure 4.3.9.10-3: Test 3, 3HP-4 Full Stroke Total Real Power (KW)

<1> Min Test: Ocone 3 3hp020 1-4-97 10:16a 149.5 ES 3



Cursor coordinates = 96.1seconds, 404Amp

— Vab-rms — Ia-rms

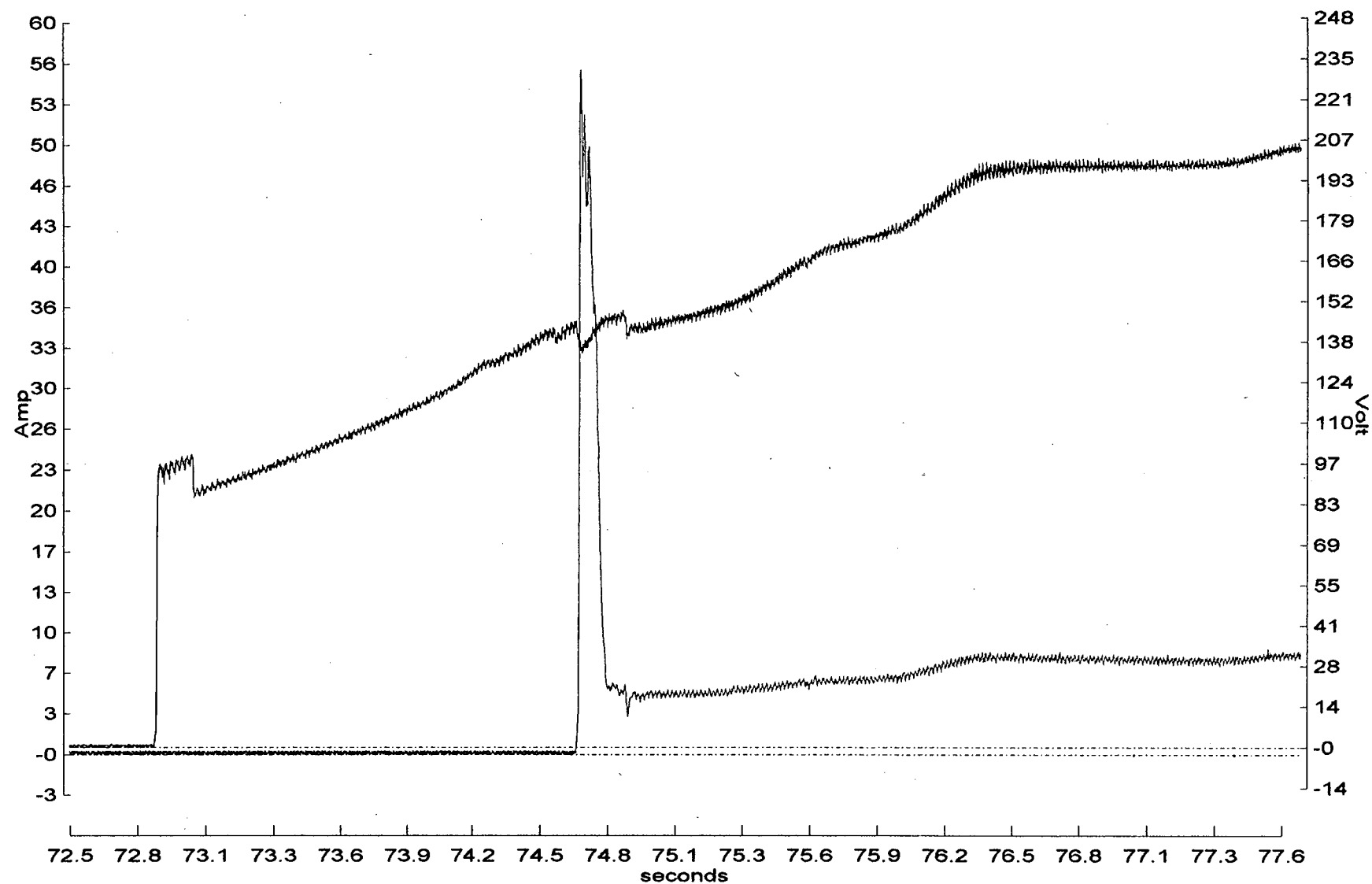
3HP-020

ES Test # 3

Full Stroke Voltage and Current

Figure 4.3.9.11-1: Test 3, 3HP-20 Full Stroke Voltage and Current

<1> Inrush Test: Ocone 3 3hp020 1-4-97 10:16a 149.5 ES 3



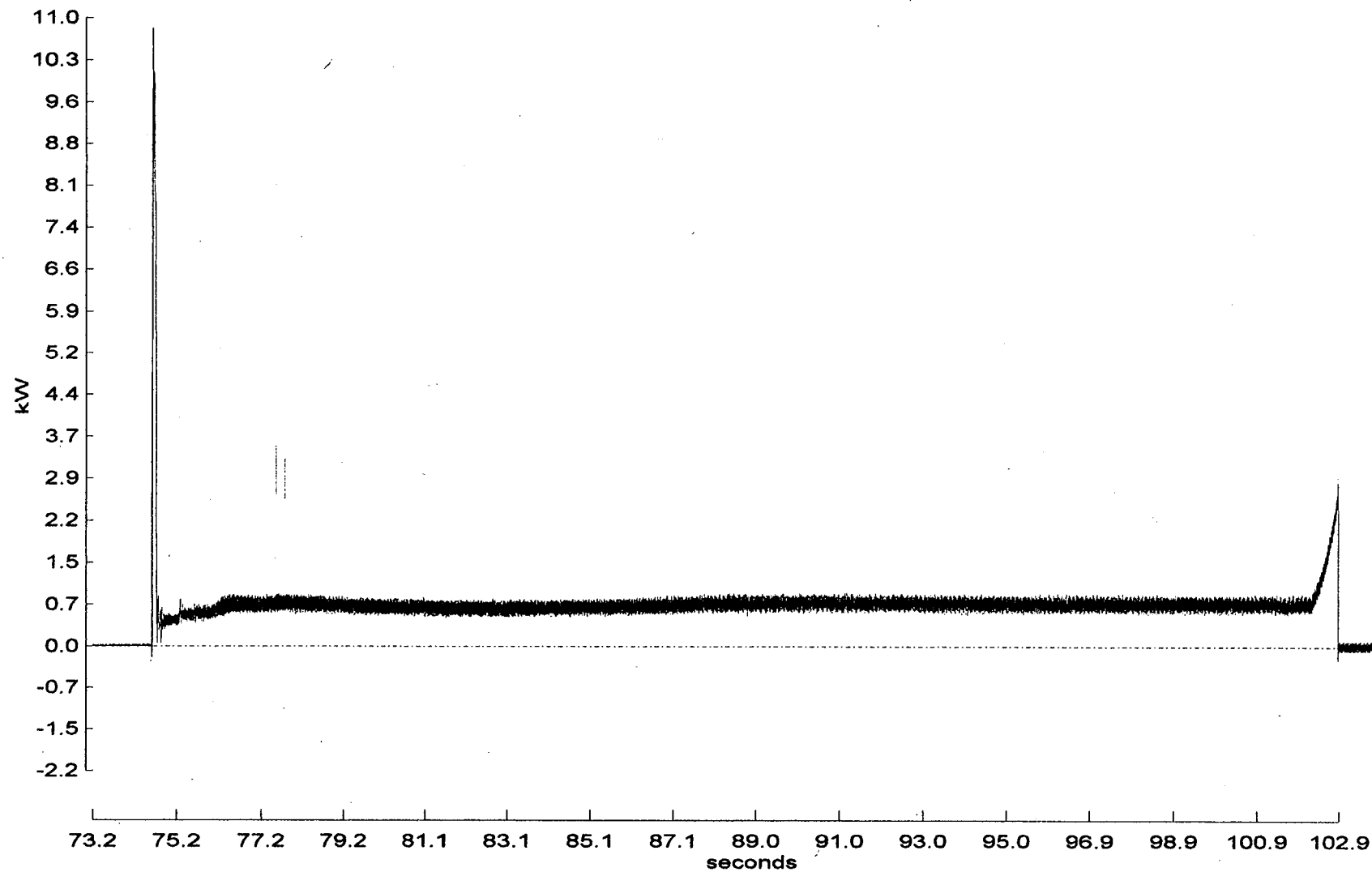
Cursor coordinates = 89.8seconds, 413Amp

— Vab-rms — Ia-rms

3HP-020
ES Test # 3
Inrush Voltage and Current

Figure 4.3.9.11-2: Test 3, 3HP-20 Inrush Voltage and Current

<1> M Test: Oconee 3 3hp020 1-4-97 10:16a 149.5 ES 3



Cursor coordinates = 75.8seconds, 44.4kW

TRP

3HP-020

ES Test # 3

Full Stroke Total Real Power

Figure 4.3.9.11-3: Test 3, 3HP-20 Full Stroke Total Real Power (KW)

Appendix 4 - Test 4, Figures of Results

APPENDIX 4: Figures for Test 4

FIGURE	Page
Figure 4.4.1-1: Test 4, Keowee Voltage and Current.....	4-3
Figure 4.4.1-2: Test 4, Keowee Voltage.....	4-4
Figure 4.4.1-3, Test 4, Keowee KVA.....	4-5
Figure 4.4.1-4: Test 4, Keowee KW.....	4-6
Figure 4.4.1-5: Test 4, Keowee Frequency and Current.....	4-7
Figure 4.4.1-6: Test 4, Keowee Frequency.....	4-8
Figure 4.4.2-1: Test 4, Unit 1 MFB Voltage and Current	4-9
Figure 4.4.2-2: Test 4, Unit 1 MFB KVA and KW.....	4-10
Figure 4.4.2-3: Test 4, Standby Bus Voltage and Unit 3 MFB Current	4-11
Figure 4.4.2-4: Test 4, Unit 3 MFB KVA and KW	4-12
Figure 4.4.3-1: Test 4, EFW 3B Voltage and Current.....	4-13
Figure 4.4.3-2: Test 4, EFW 3B KVA and KW	4-14
Figure 4.4.3-3: Test 4, HPI 3B Voltage and Current.....	4-15
Figure 4.4.3-4: Test 4, HPI 3B KVA and KW	4-16
Figure 4.4.3-5: Test 4, EFW 1A Voltage and Current.....	4-17
Figure 4.4.3-6: Test 4, EFW 1A KVA and KW	4-18
Figure 4.4.3-7; Test 4, LPSW 3B Voltage and Current.....	4-19
Figure 4.4.3-8: Test 4, LPSW 3B KVA and KW	4-20
Figure 4.4.3-9: Test 4, LPI 3B Voltage and Current	4-21
Figure 4.4.3-10: Test 4, LPI 3B KVA and KW.....	4-22
Figure 4.4.3-11: Test 4, RBS 3B Voltage and Current.....	4-23
Figure 4.4.3-12: Test 4, RBS 3B KVA and KW	4-24
Figure 4.4.4-1: Test 4, RBCF 3B Voltage and Current	4-25
Figure 4.4.4-2: Test 4, RBCF 3B KVA and KW.....	4-26
Figure 4.4.5-1: Test 4, 1X5 Voltage and Current.....	4-27
Figure 4.4.5-2: Test 4, 1X5 KVA and KW.....	4-28
Figure 4.4.5-3: Test 4, 1X6 Voltage and Current.....	4-29
Figure 4.4.5-4: Test 4, 1X6 KVA and KW.....	4-30
Figure 4.4.5-5: Test 4, 3X5 Voltage and Current.....	4-31
Figure 4.4.5-6: Test 4, 3X5 KVA and KW.....	4-32
Figure 4.4.5-7: Test 4, 3X6 Voltage and Current.....	4-33
Figure 4.4.5-8: Test 4, 3X6 KVA and KW.....	4-34
Figure 4.4.5-9: Test 4, 3X8 Voltage and Current.....	4-35
Figure 4.4.5-10: Test 4, 3X8 KVA and KW.....	4-36
Figure 4.4.5-11: Test 4, 3X9 Voltage and Current.....	4-37
Figure 4.4.5-12: Test 4, 3X9 KVA and KW.....	4-38
Figure 4.4.5-13: Test 4, CX Primary Voltage and Current.....	4-39
Figure 4.4.5-14: Test 4, CX Primary KVA and KW	4-40
Figure 4.4.6-1: Test 4, 600V 3XS1 Voltage and Current.....	4-41
Figure 4.4.6-2: Test 4, 600V 3XS1 KVA and KW.....	4-42
Figure 4.4.6-3: Test 4, 600V 3XS2 Voltage and Current.....	4-43
Figure 4.4.6-4: Test 4, 600V 3XS2 KVA and KW.....	4-44
Figure 4.4.6-5: Test 4, 600V 3XS3 Voltage and Current.....	4-45
Figure 4.4.6-6: Test 4, 600V 3XS3 KVA and KW.....	4-46
Figure 4.4.7-1: Test 4, 208V 3XS1 Voltage and Current.....	4-47
Figure 4.4.7-2: Test 4, 208V 3XS1 Voltage and Current.....	4-48
Figure 4.4.7-3: Test 4, 208V 3XS2 Voltage and Current.....	4-49
Figure 4.4.7-4: Test 4, 208V 3XS2 KVA and KW.....	4-50
Figure 4.4.7-5: Test 4, 208V 3XS3 Voltage and Current.....	4-51
Figure 4.4.7-6: Test 4, 208V 3XS3 KVA and KW.....	4-52

Figure 4.4.8-1: Test 4, Battery Charger 3CA Voltage and Current.....	4-53
Figure 4.4.9.1-1: Test 4, 3HP-24 Full Stroke Voltage and Current.....	4-54
Figure 4.4.9.1-2: Test 4, 3HP-24 Inrush Voltage and Current	4-55
Figure 4.4.9.1-3: Test 4, 3HP-24 Full Stroke Total Real Power (KW)	4-56
Figure 4.4.9.2-1: Test 4, 3HP-26 Full Stroke Voltage and Current.....	4-57
Figure 4.4.9.2-2: Test 4, 3HP-26 Inrush Voltage and Current	4-58
Figure 4.4.9.2-3: Test 4, 3HP-26 Full Stroke Total Real Power (KW)	4-59
Figure 4.4.9.3-1: Test 4, 3LP-17 Full Stroke Voltage and Current.....	4-60
Figure 4.4.9.3-2: Test 4, 3LP-17 Inrush Voltage and Current.....	4-61
Figure 4.4.9.3-3: Test 4, 3LP-17 Full Stroke Total Real Power (KW).....	4-62
Figure 4.4.9.4-1: Test 4, 3BS-2 Full Stroke Voltage and Current.....	4-63
Figure 4.4.9.4-2: Test 4, 3BS-2 Inrush Voltage and Current.....	4-64
Figure 4.4.9.4-3: Test 4, 3BS-2 Full Stroke Total Real Power (KW)	4-65
Figure 4.4.9.5-1: Test 4, 3HP-27 Full Stroke Voltage and Current.....	4-66
Figure 4.4.9.5-2: Test 4, 3HP-27 Inrush Voltage and Current	4-67
Figure 4.4.9.5-3: Test 4, 3HP-27 Full Stroke Total Real Power (KW).....	4-68
Figure 4.4.9.6-1: Test 4, 3LPSW-24 Full Stroke Voltage and Current	4-69
Figure 4.4.9.6-2: Test 4, 3LPSW-24 Inrush Voltage and Current.....	4-70
Figure 4.4.9.6-3: Test 4, 3LPSW-24 Full Stroke Total Real Power (KW).....	4-71
Figure 4.4.9.7-1: Test 4, 3PR-19 Full Stroke Voltage and Current.....	4-72
Figure 4.4.9.7-2: Test 4, 3PR-19 Inrush Voltage and Current.....	4-73
Figure 4.4.9.7-3: Test 4, 3PR-19 Full Stroke Total Real Power (KW)	4-74
Figure 4.4.9.8-1: Test 4, 3LPSW-6 Full Stroke Voltage and Current	4-75
Figure 4.4.9.8-2: Test 4, 3LPSW-6 Inrush Voltage and Current.....	4-76
Figure 4.4.9.8-3: Test 4, 3LPSW-6 Full Stroke Total Real Power (KW).....	4-77
Figure 4.4.9.9-1: Test 4, 3LPSW-565 Full Stroke Voltage and Current	4-78
Figure 4.4.9.9-2: Test 4, 3LPSW-565 Inrush Voltage and Current.....	4-79
Figure 4.4.9.9-3: Test 4, 3LPSW-565 Full Stroke Total Real Power (KW).....	4-80
Figure 4.4.9.10-1: Test 4, 3HP-4 Full Stroke Voltage and Current.....	4-81
Figure 4.4.9.10-2: Test 4, 3HP-4 Inrush Voltage and Current	4-82
Figure 4.4.9.10-3: Test 4, 3HP-4 Full Stroke Total Real Power (KW)	4-83
Figure 4.4.9.11-1: Test 4, 3HP-20 Full Stroke Voltage and Current.....	4-84
Figure 4.4.9.11-2: Test 4, 3HP-20 Inrush Voltage and Current	4-85
Figure 4.4.9.11-3: Test 4, 3HP-20 Full Stroke Total Real Power (KW)	4-86

Figure 4.4.1-1: Test4, Keowee Voltage and Current

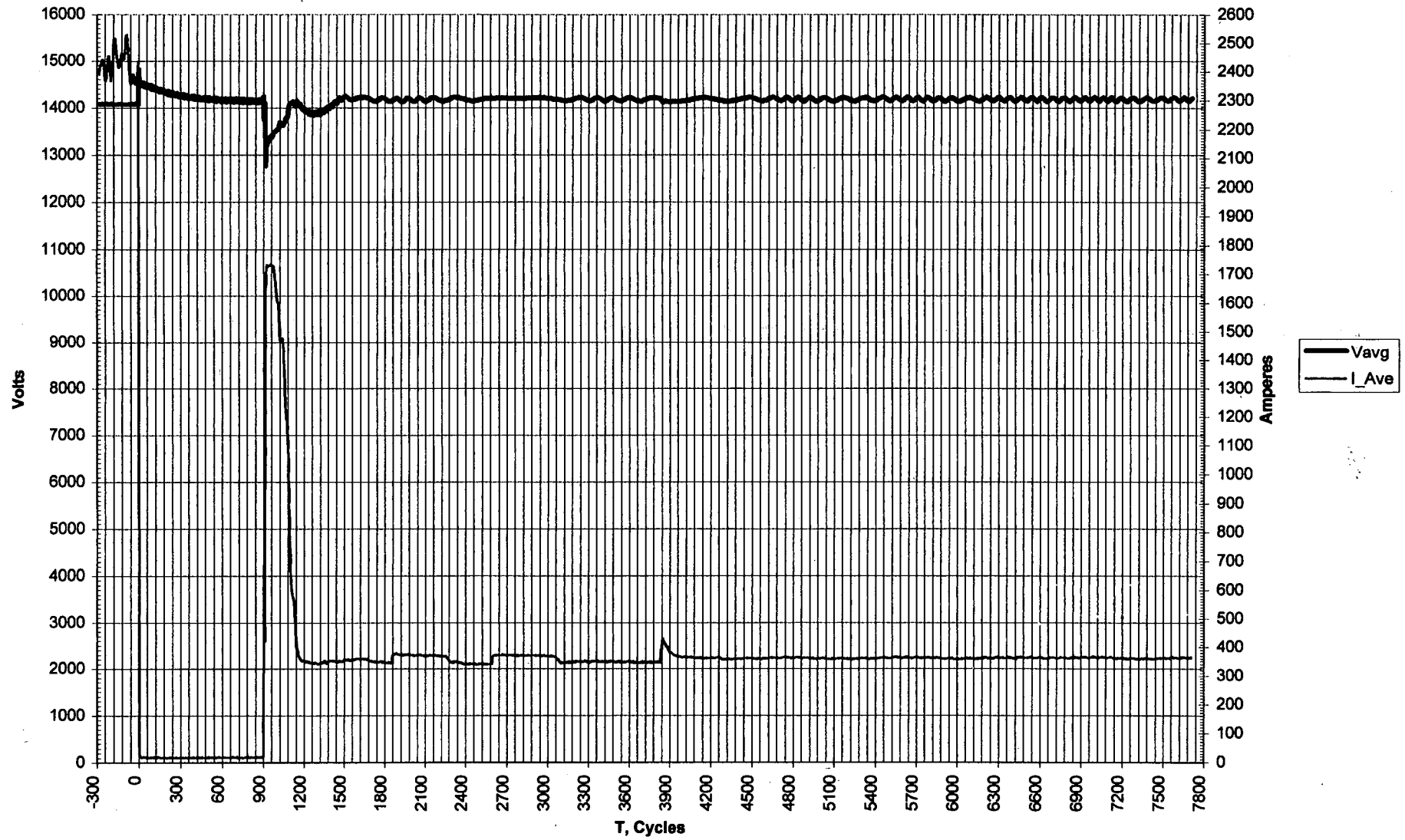


Figure 4.4.1-2: Test4, Keowee Voltage

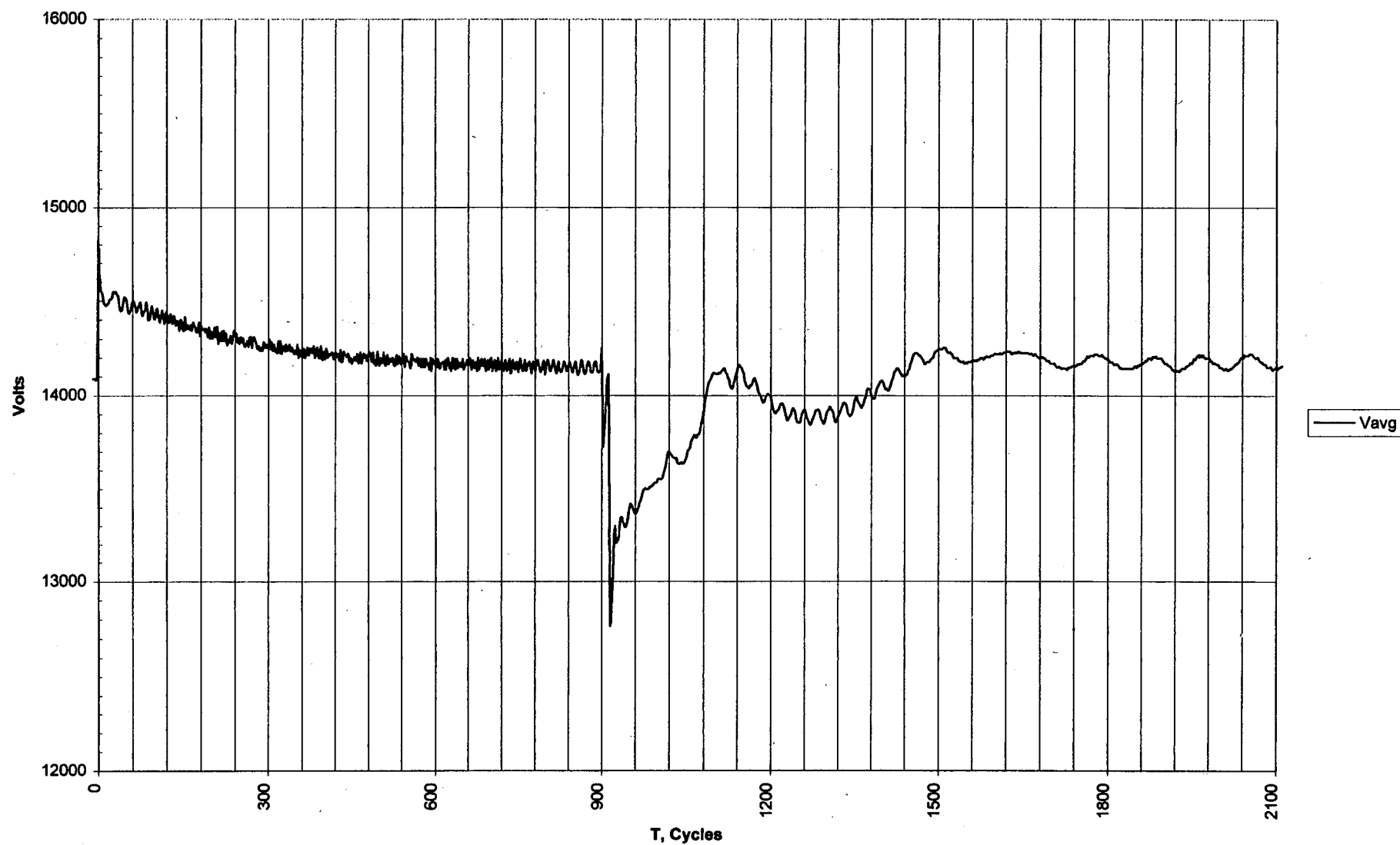


Figure 4.4.1-3, Test4, Keowee KVA

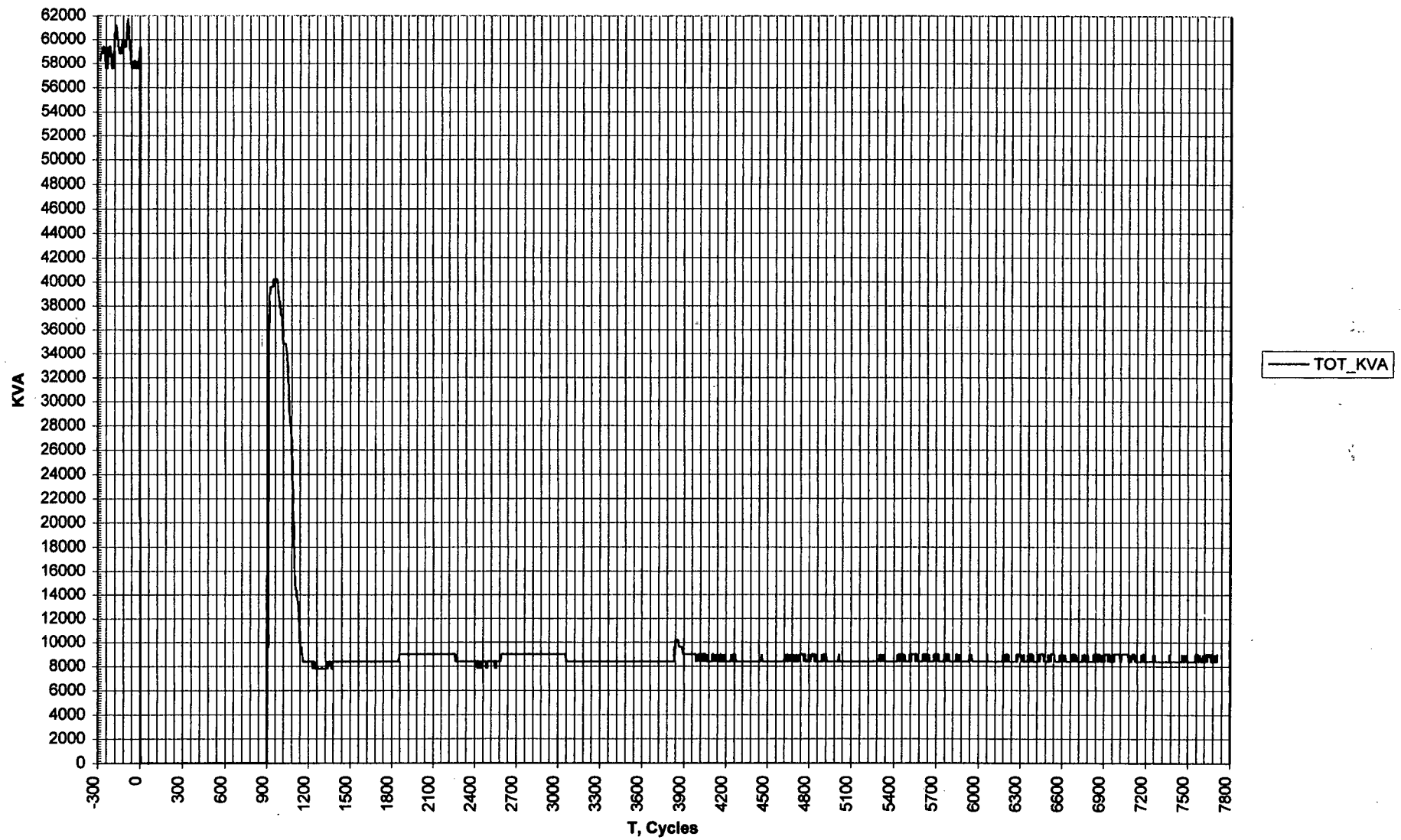


Figure 4.4.1-4: Test4, Keowee KW

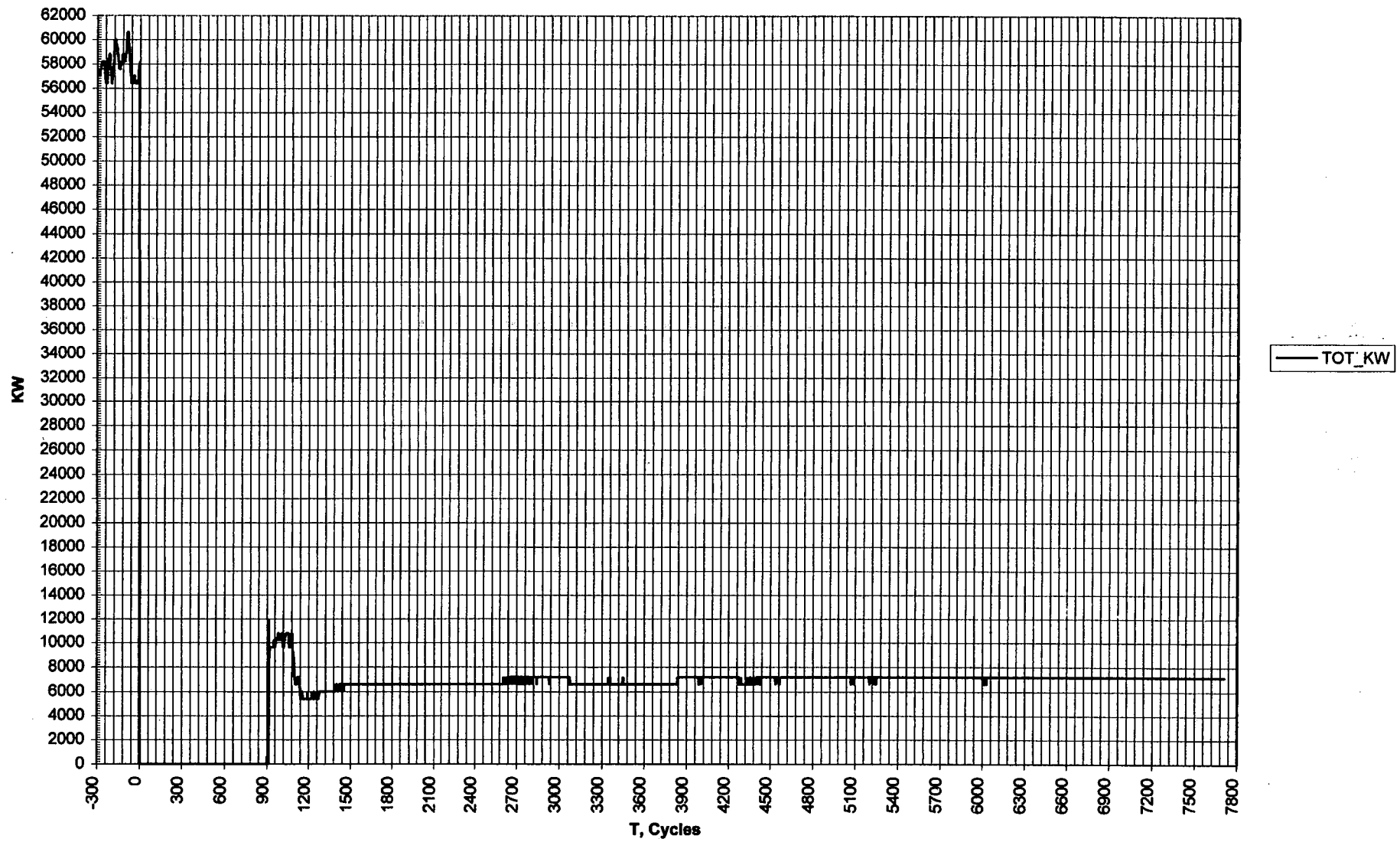


Figure 4.4.1-5: Test4, Keowee Frequency and Current

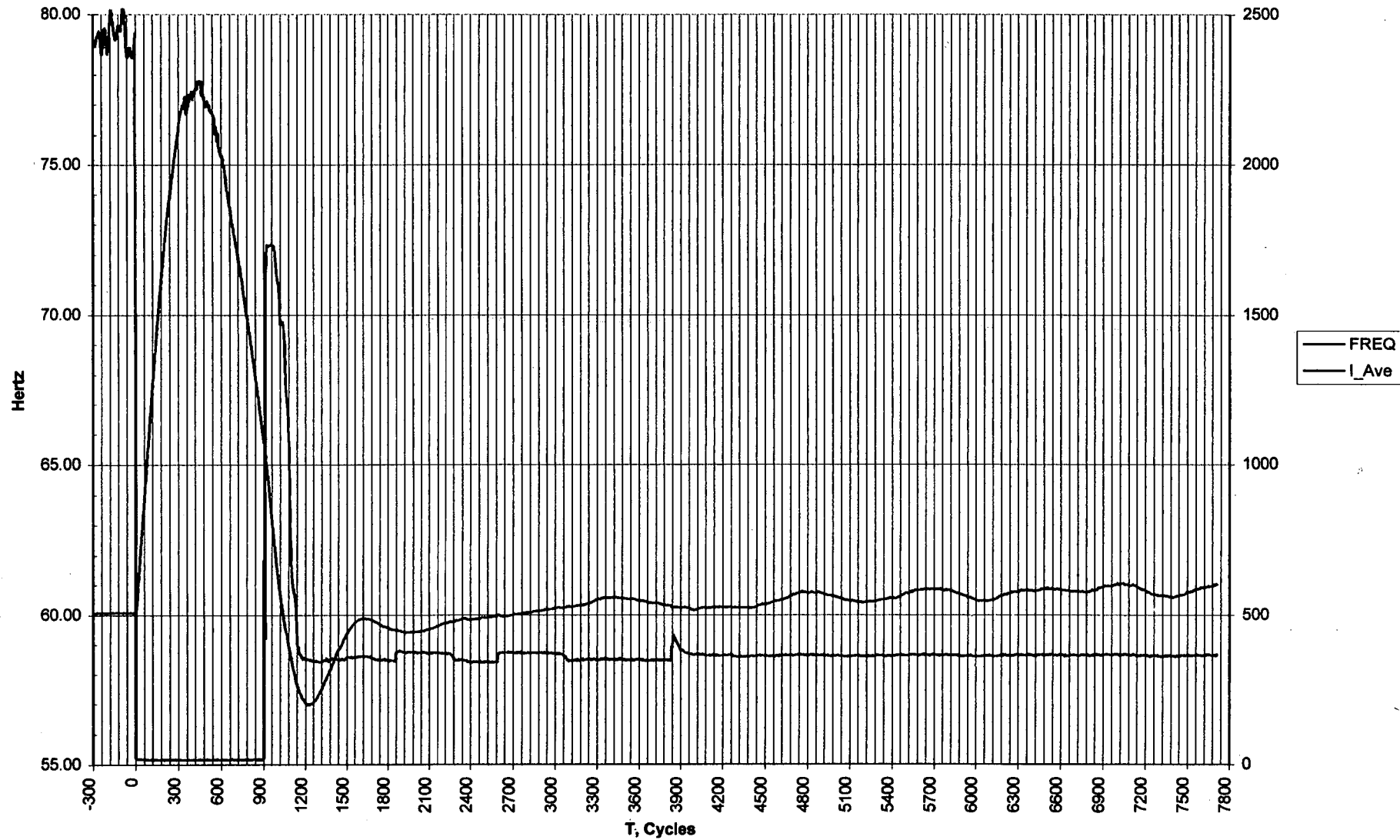


Figure 4.4.1-6: Test4, Keowee Frequency

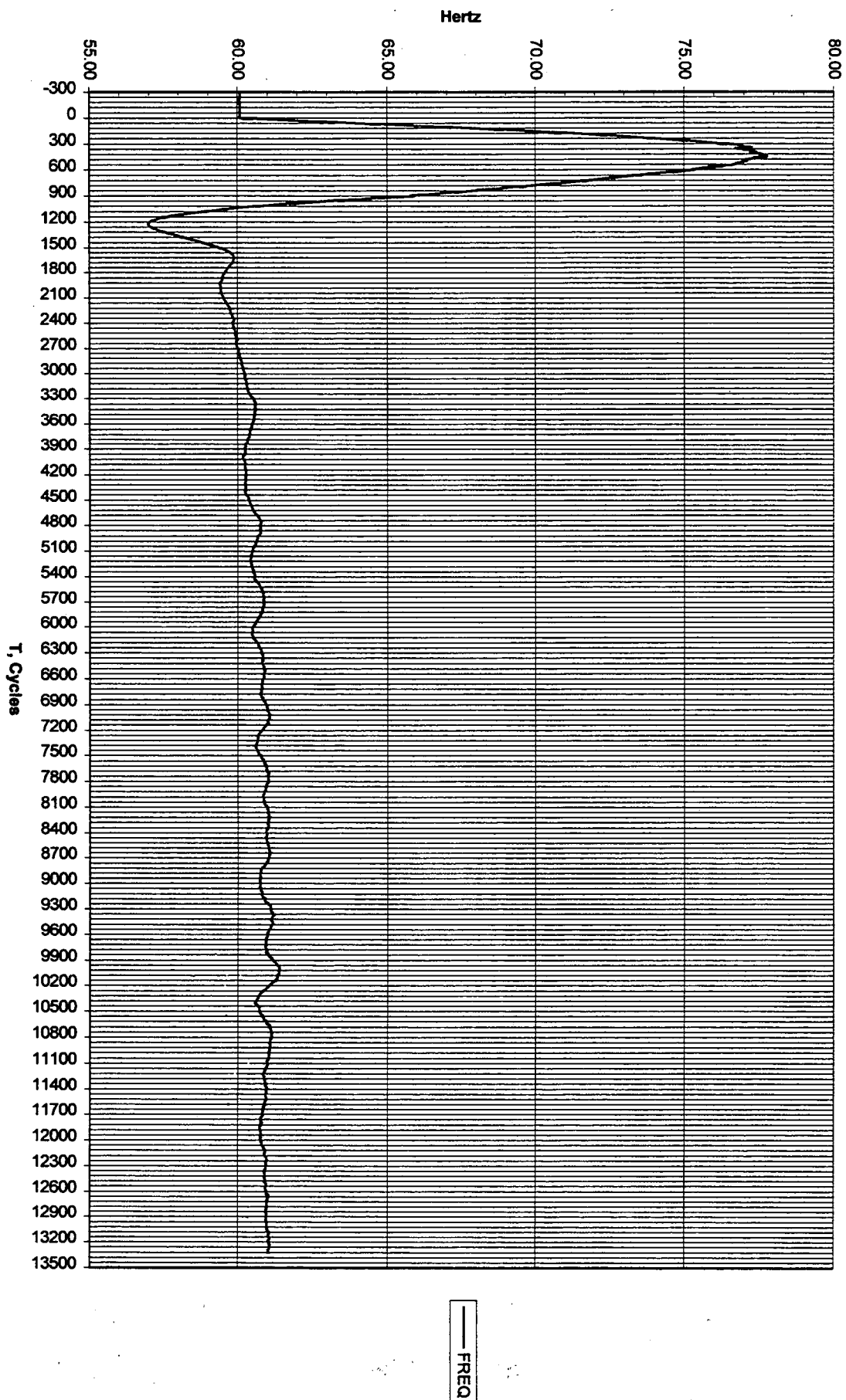


Figure 4.4.2-1: Test4, Unit 1 MFB Voltage and Current

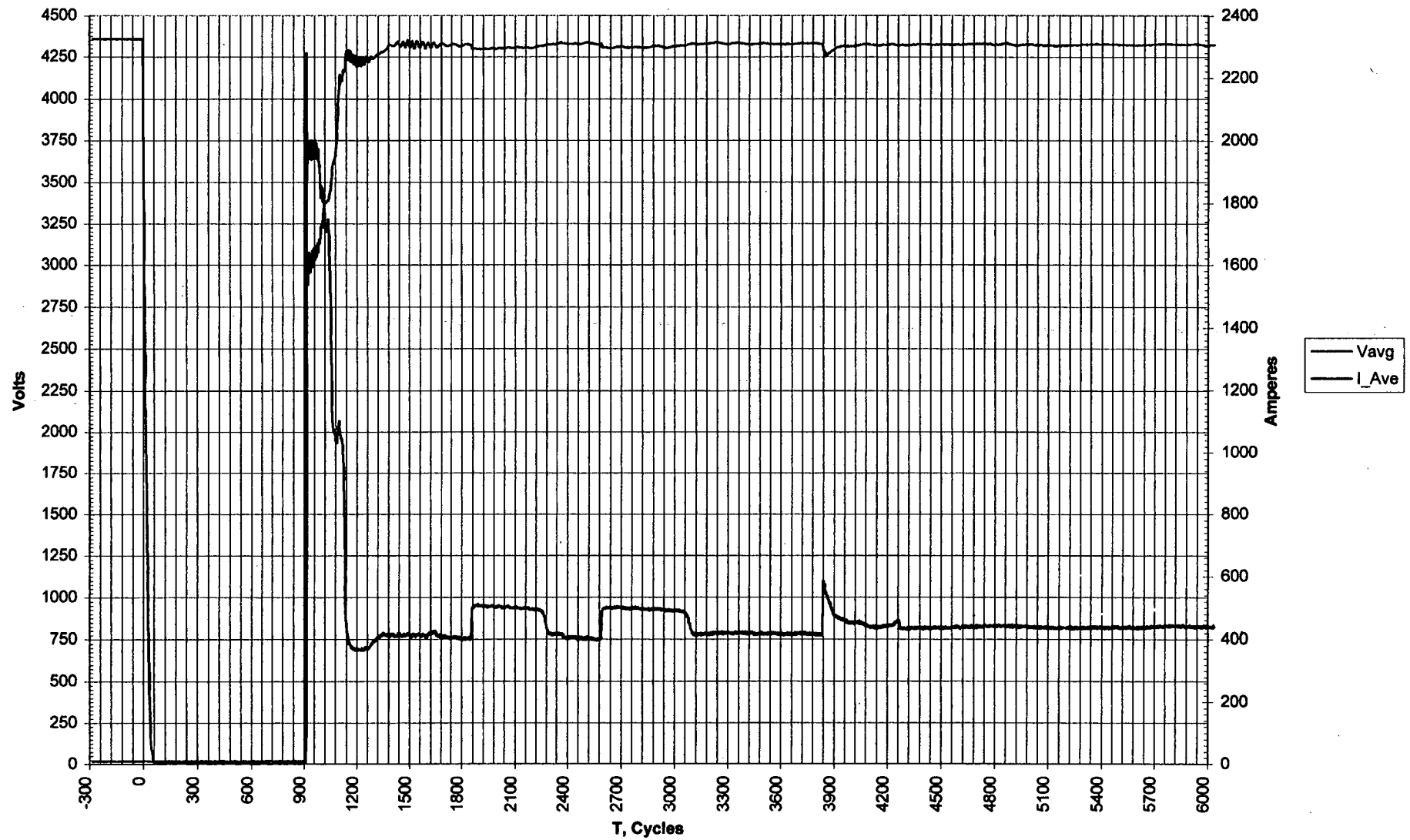


Figure 4.4.2-2: Test4, Unit 1 MFB KVA and KW



Figure 4.4.2-3: Test4, Standby Bus Voltage and Unit 3 MFB Current

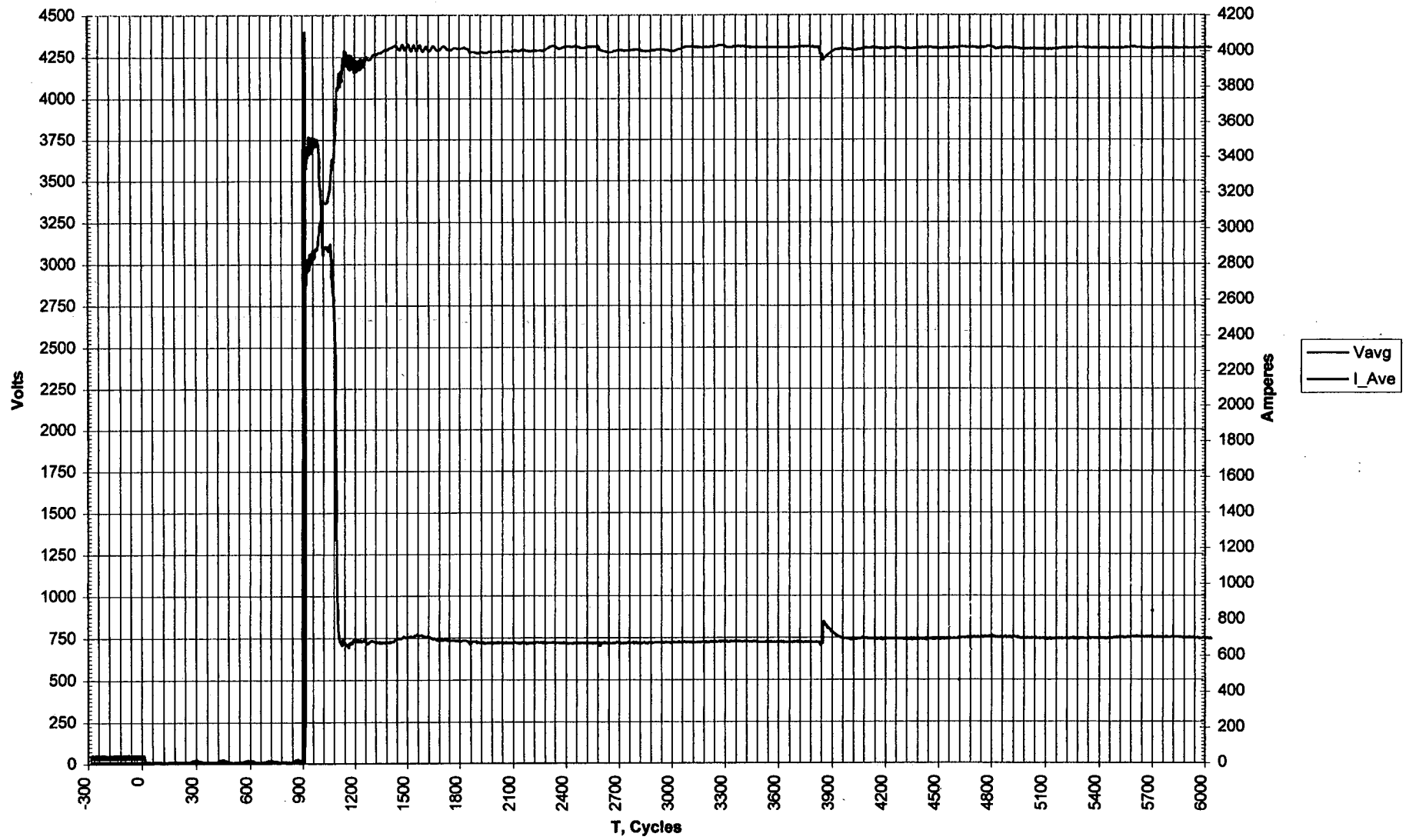


Figure 4.4.2-4: Test4, Unit 3 MFB KVA and KW

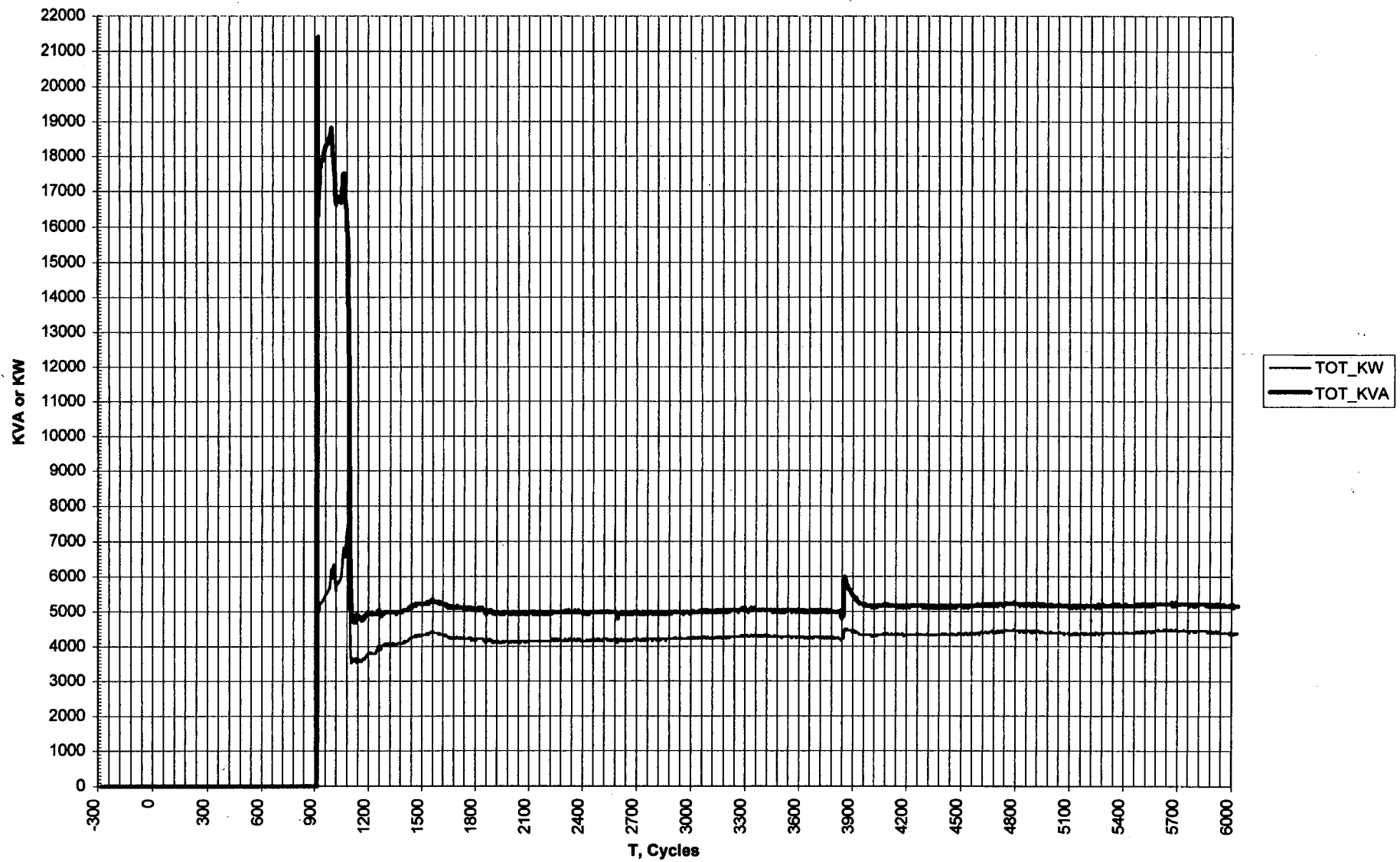


Figure 4.4.3-1: Test4, EFW 3B Voltage and Current

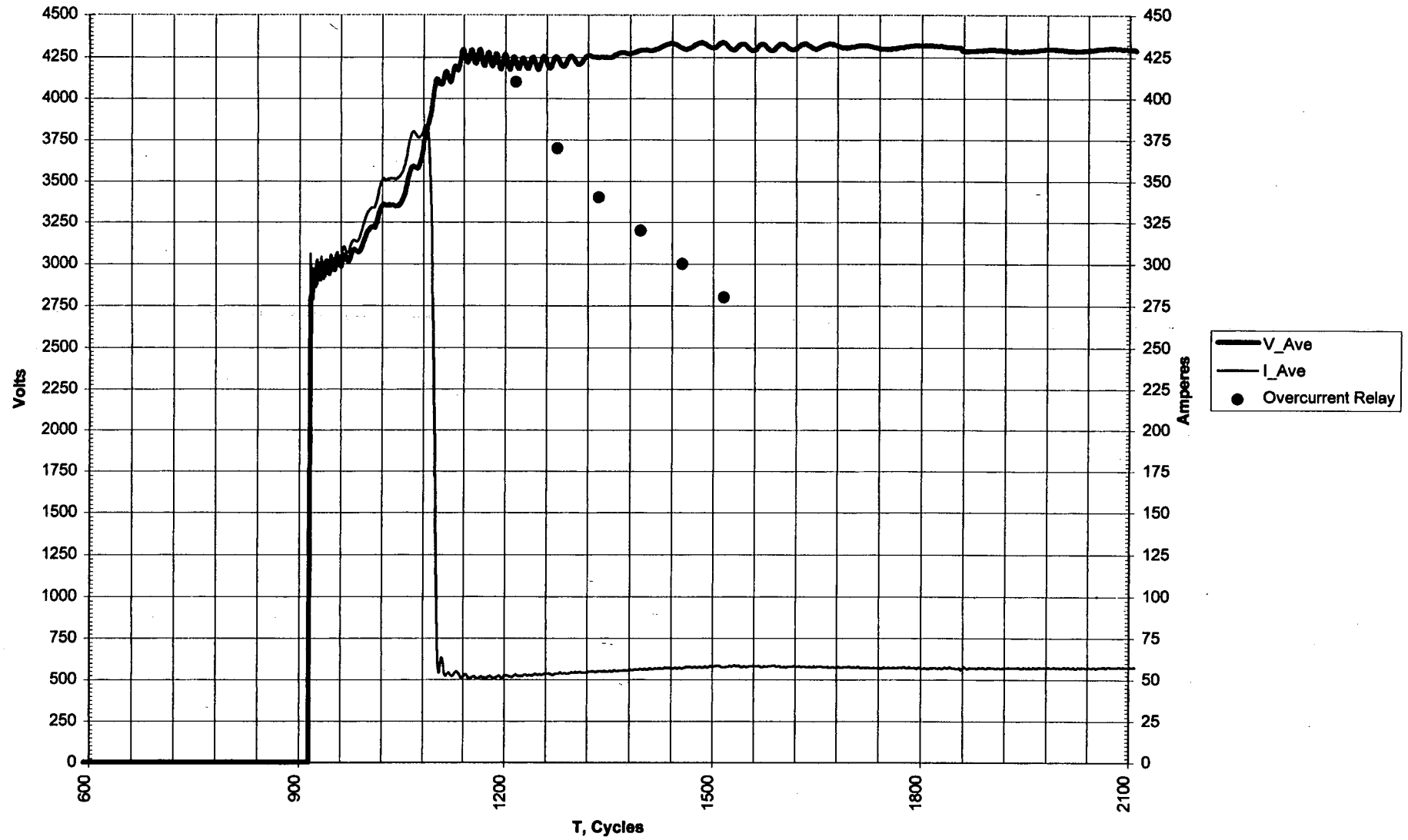


Figure 4.4.3-2: Test4, EFW 3B KVA and KW

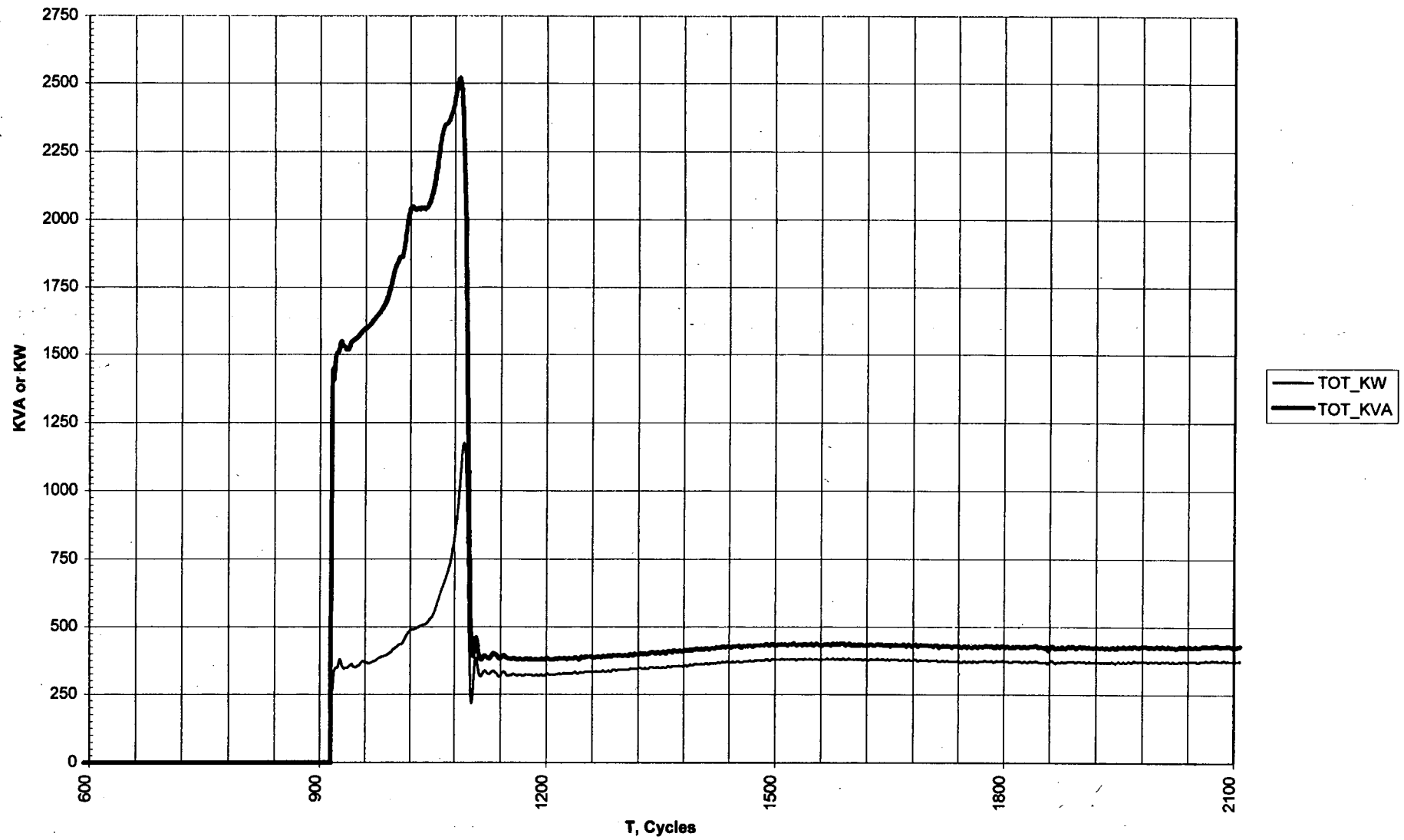


Figure 4.4.3-3: Test4, HPI 3B Voltage and Current

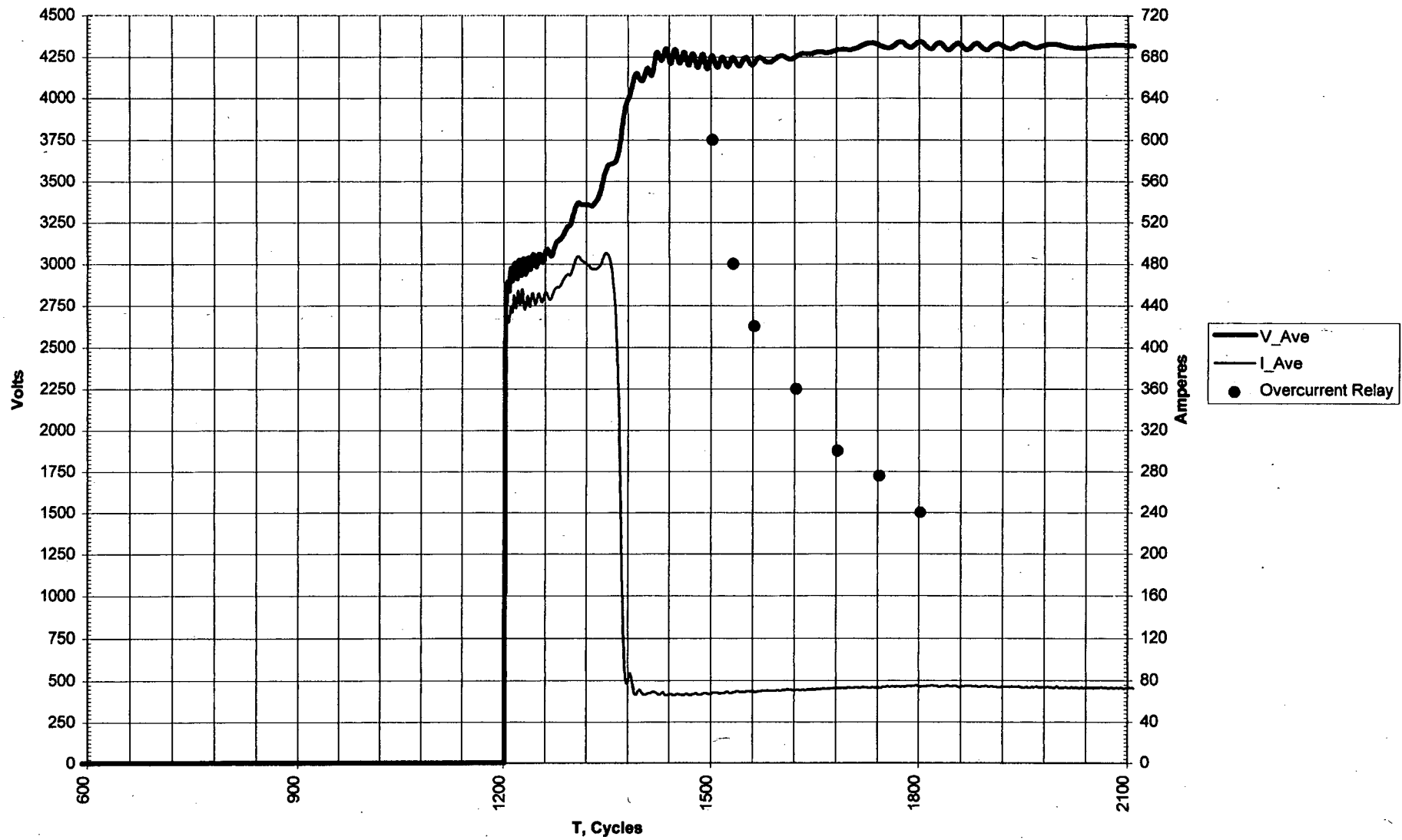


Figure 4.4.3-4: Test4, HPI 3B KVA and KW

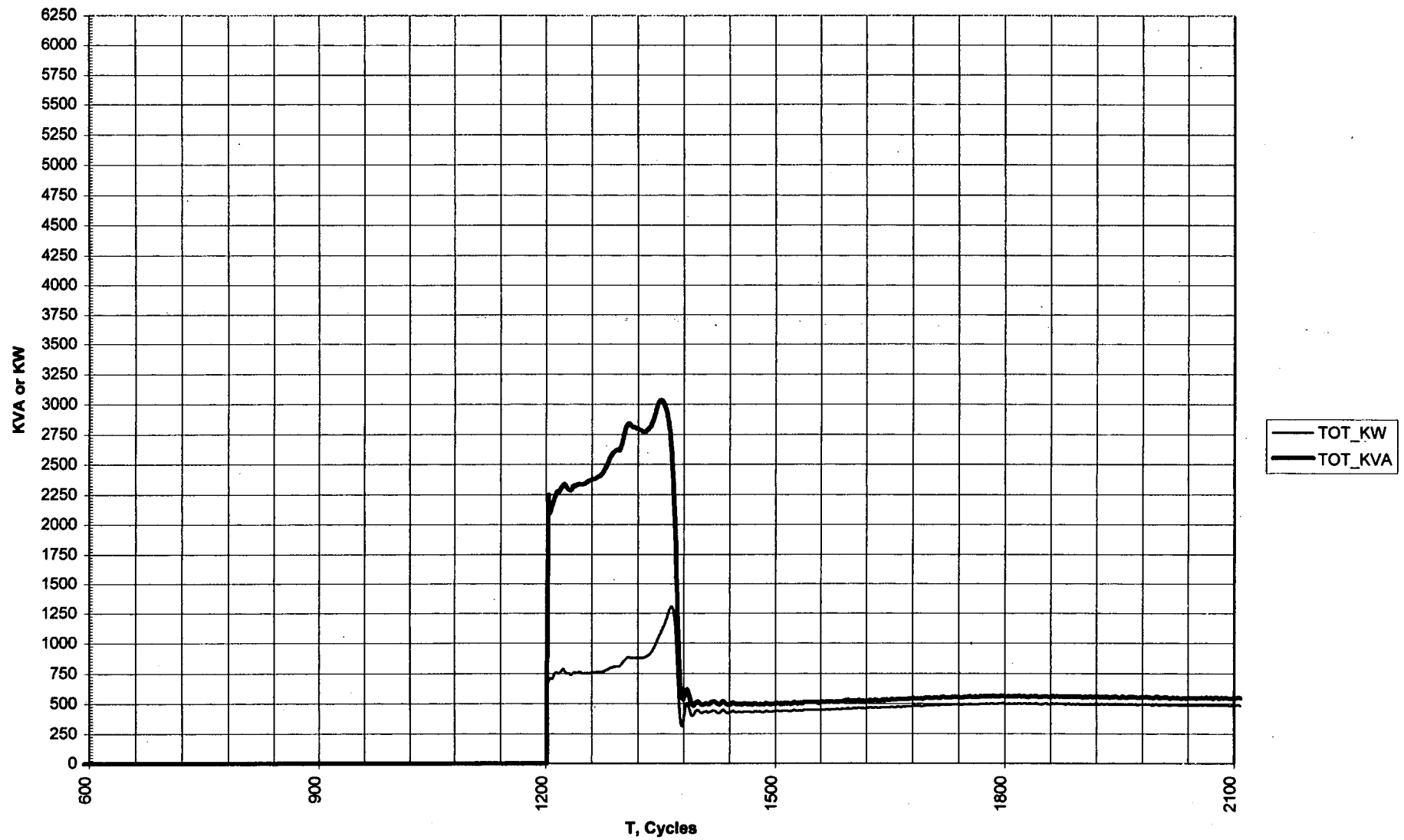


Figure 4.4.3-5: Test4, EFW 1A Voltage and Current

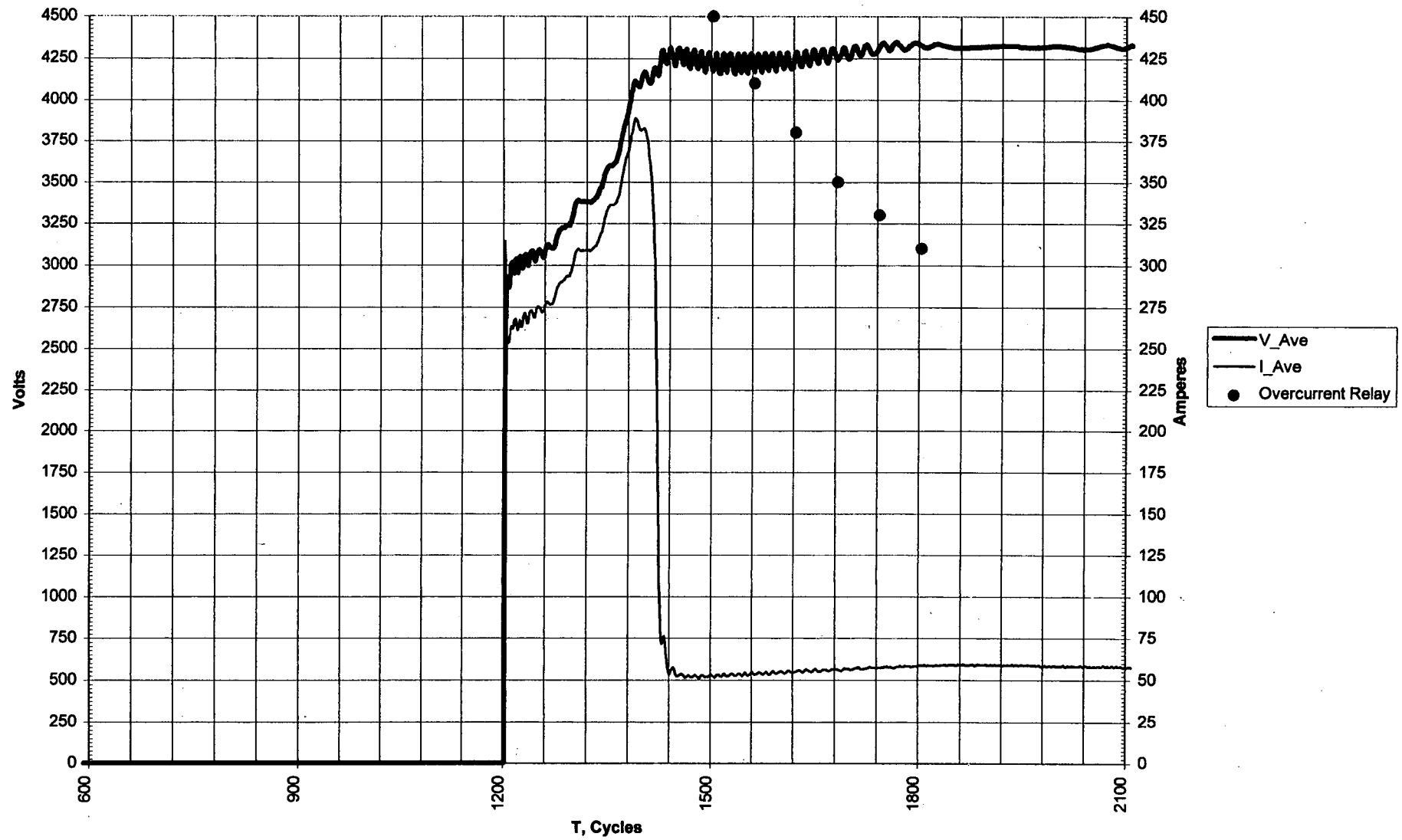


Figure 4.4.3-6: Test4, EFW 1A KVA and KW

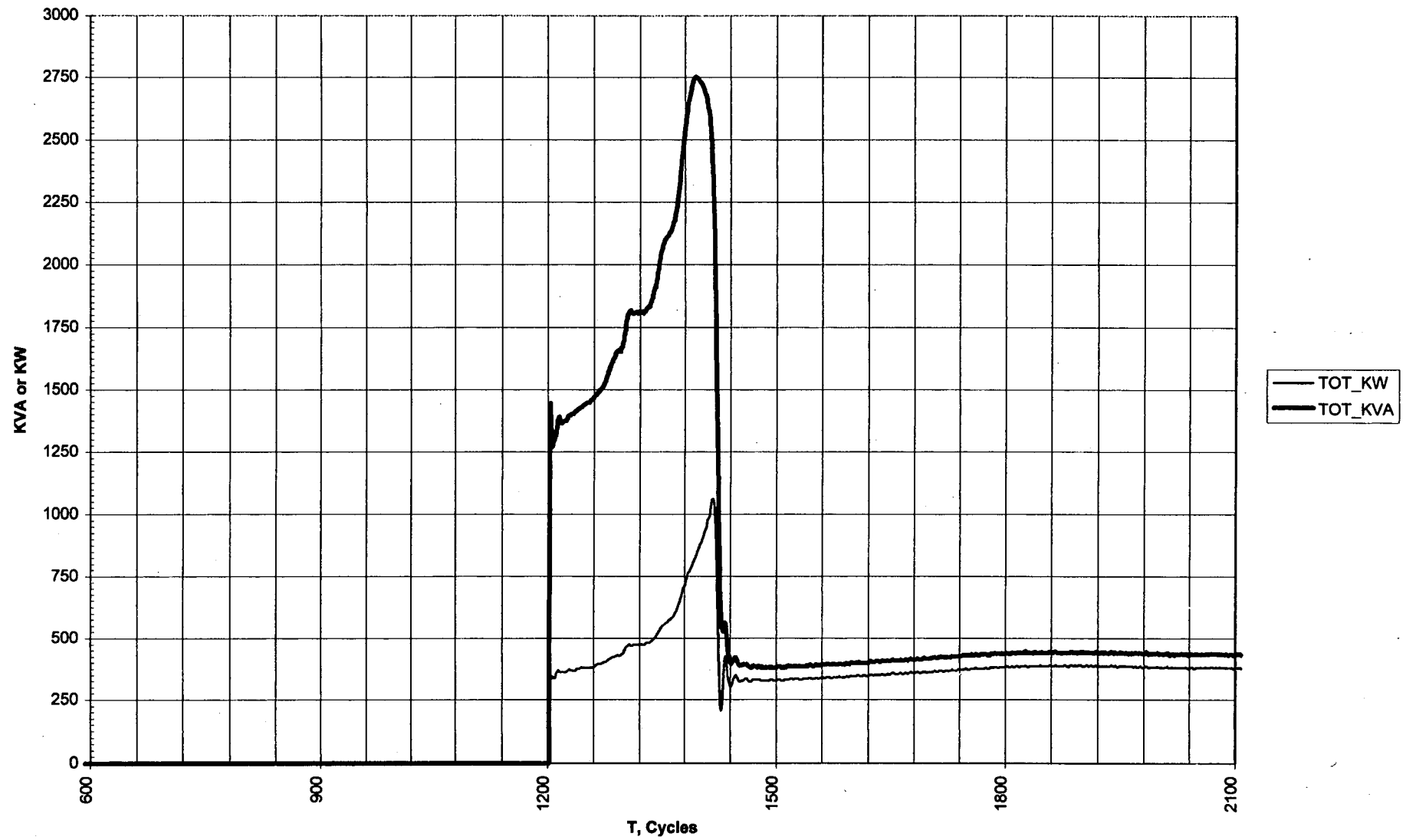


Figure 4.4.3-7; Test4, LPSW 3B Voltage and Current

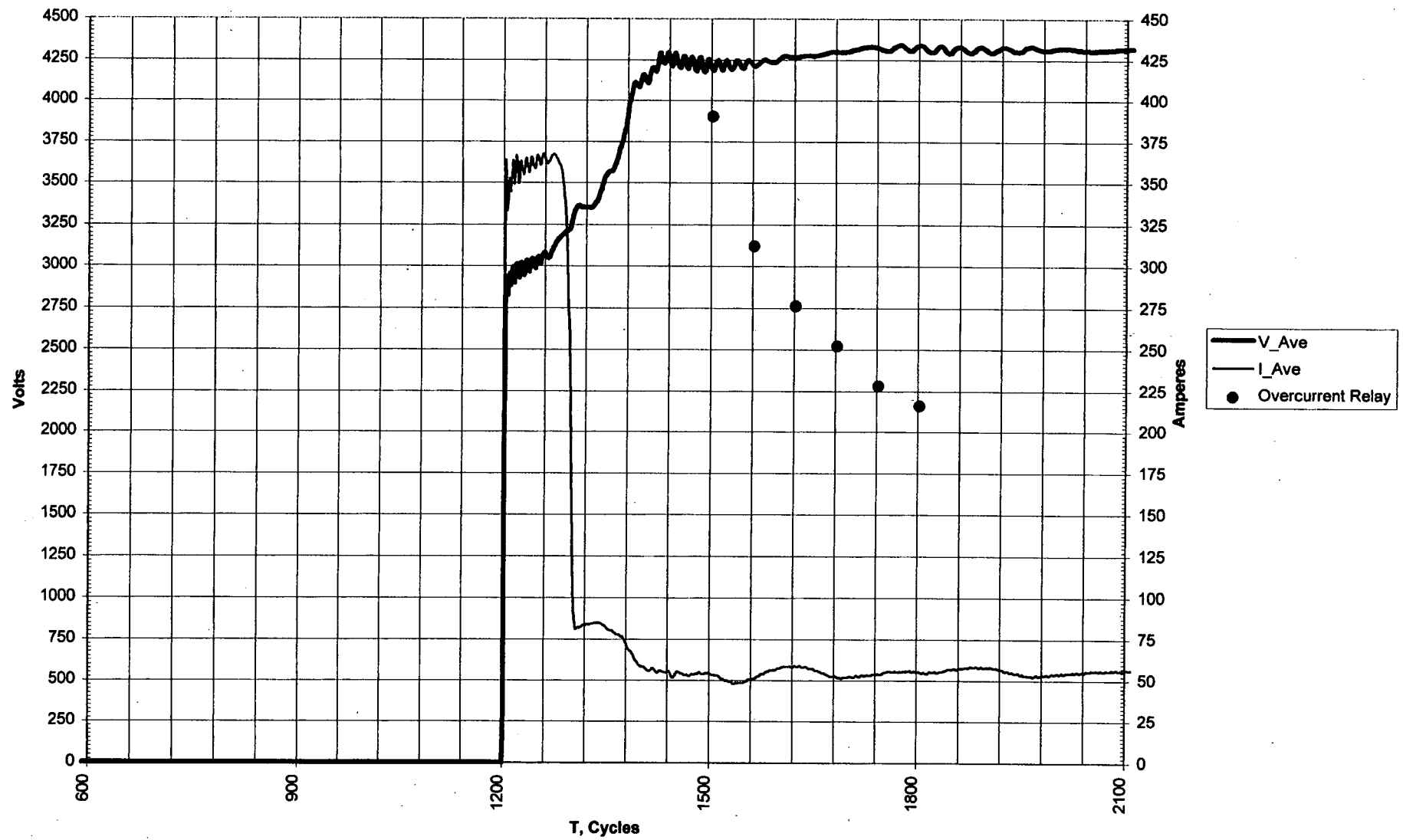


Figure 4.4.3-8: Test4, LPSW 3B KVA and KW

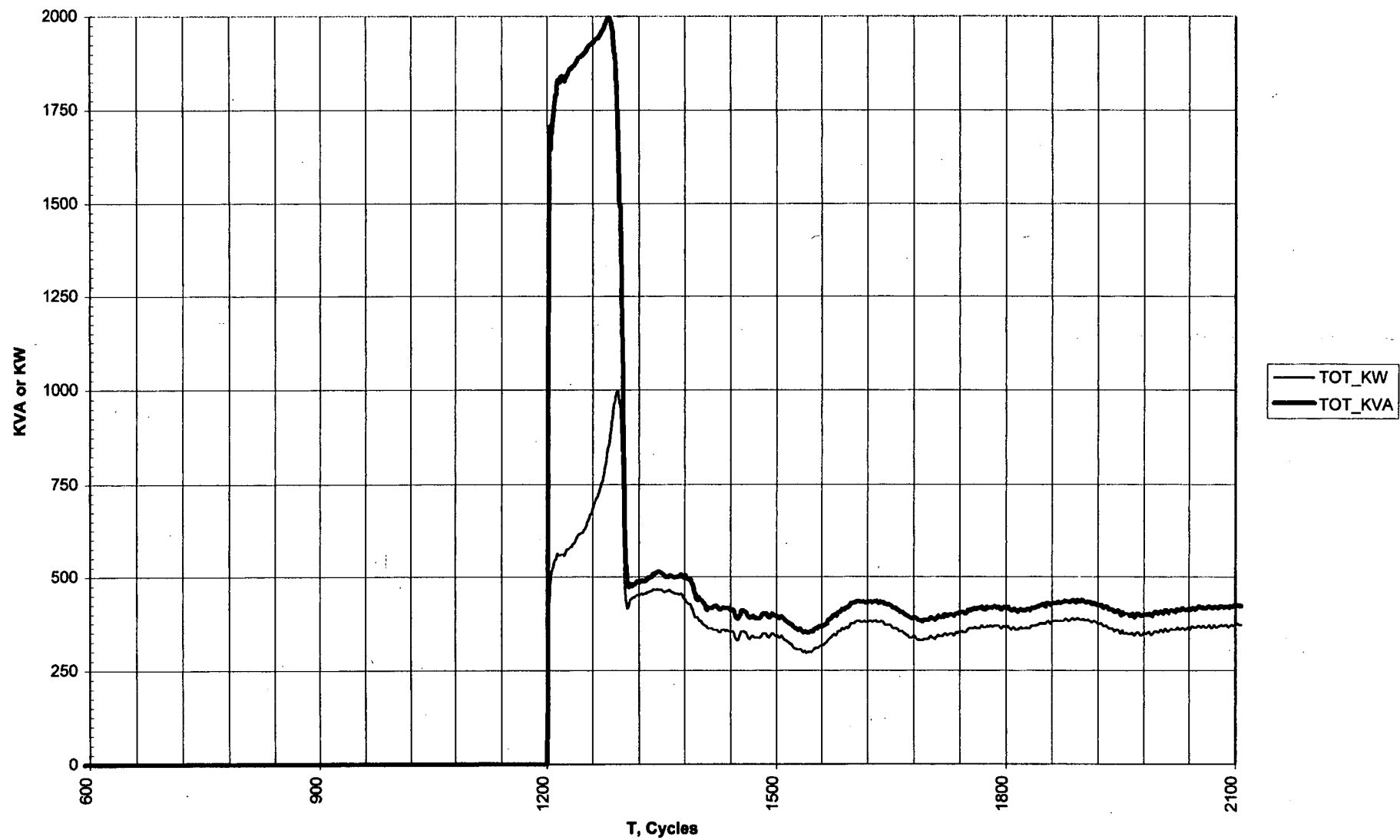


Figure 4.4.3-9: Test4, LPI 3B Voltage and Current

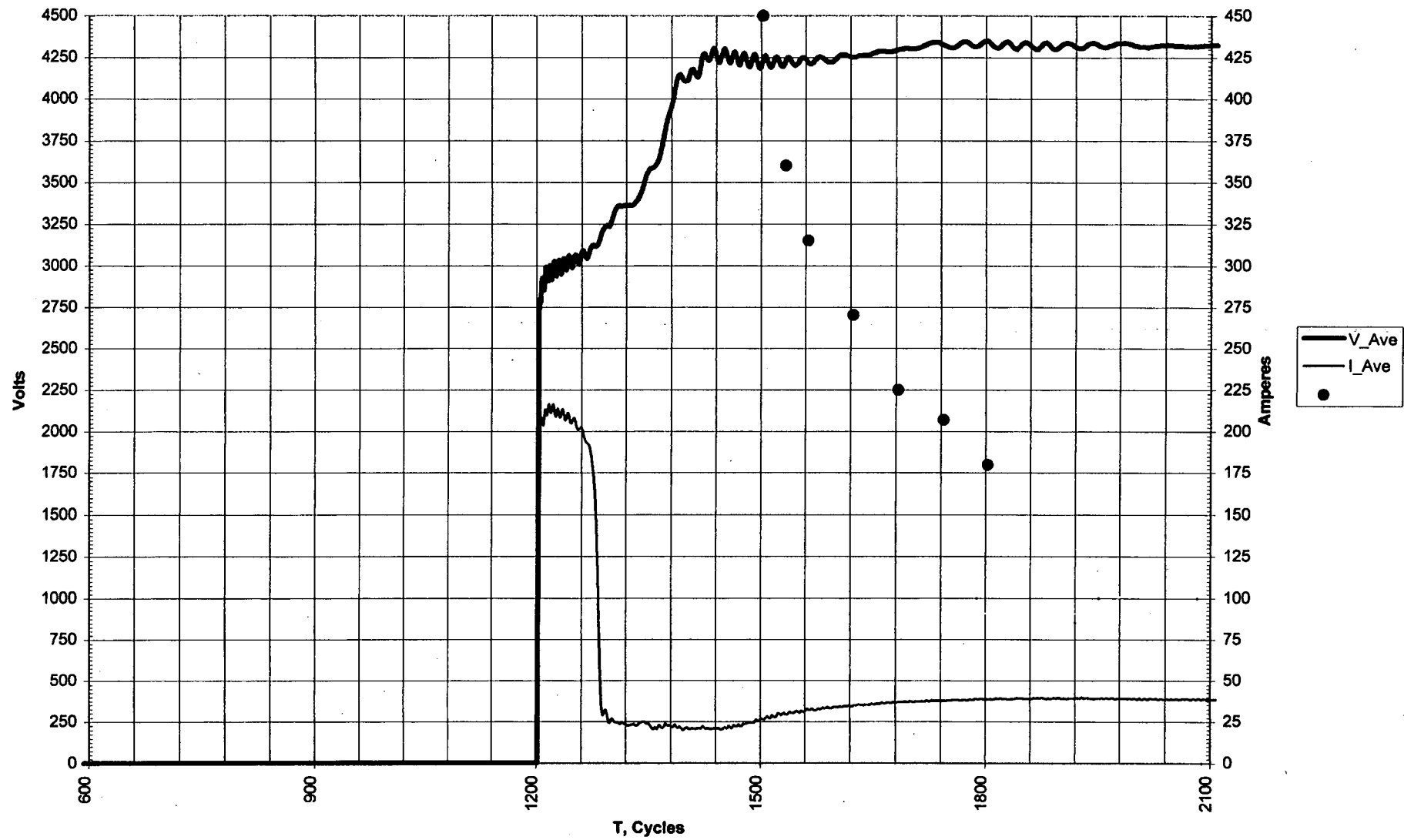


Figure 4.4.3-10: Test4, LPI 3B KVA and KW

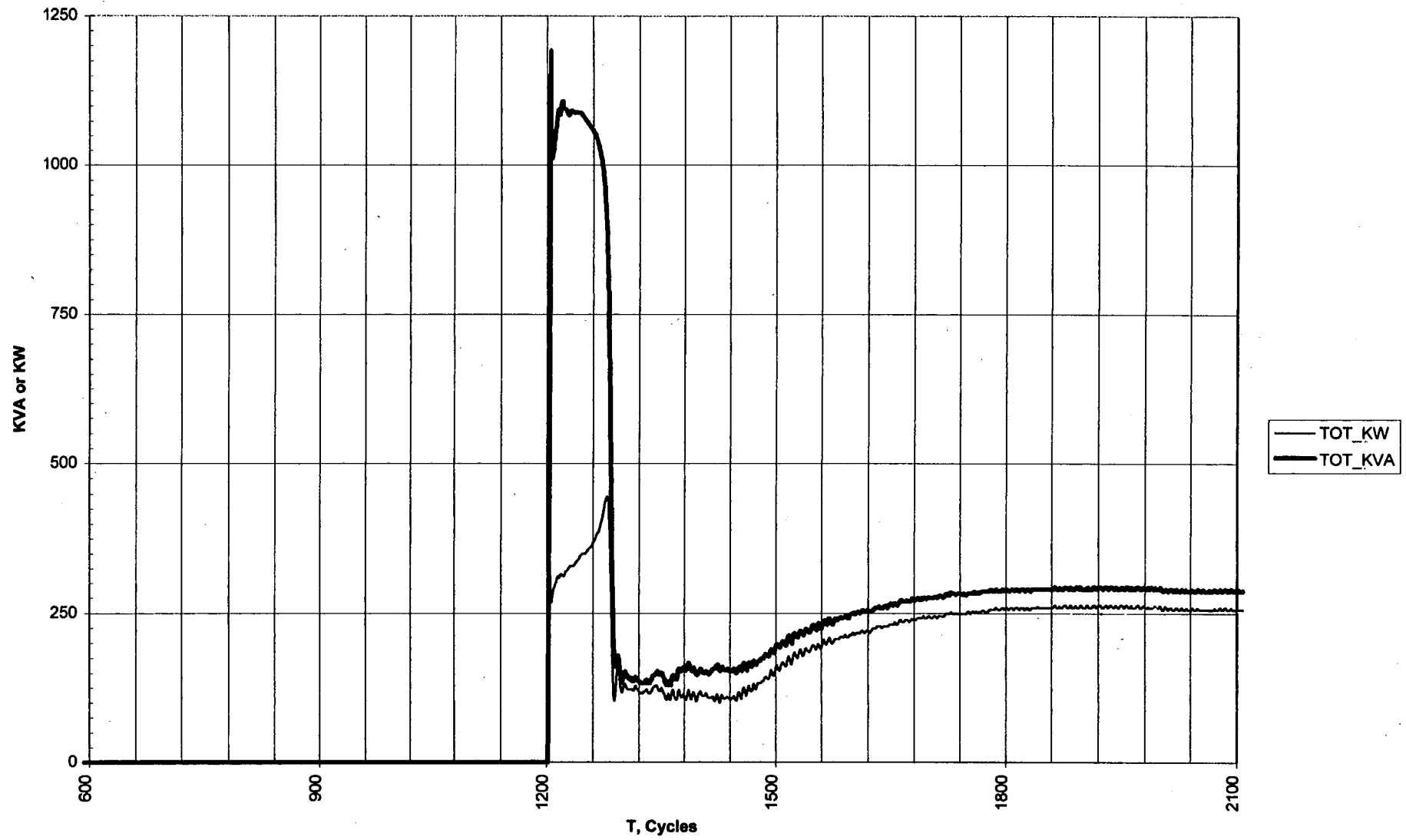


Figure 4.4.3-11: Test4, RBS 3B Voltage and Current

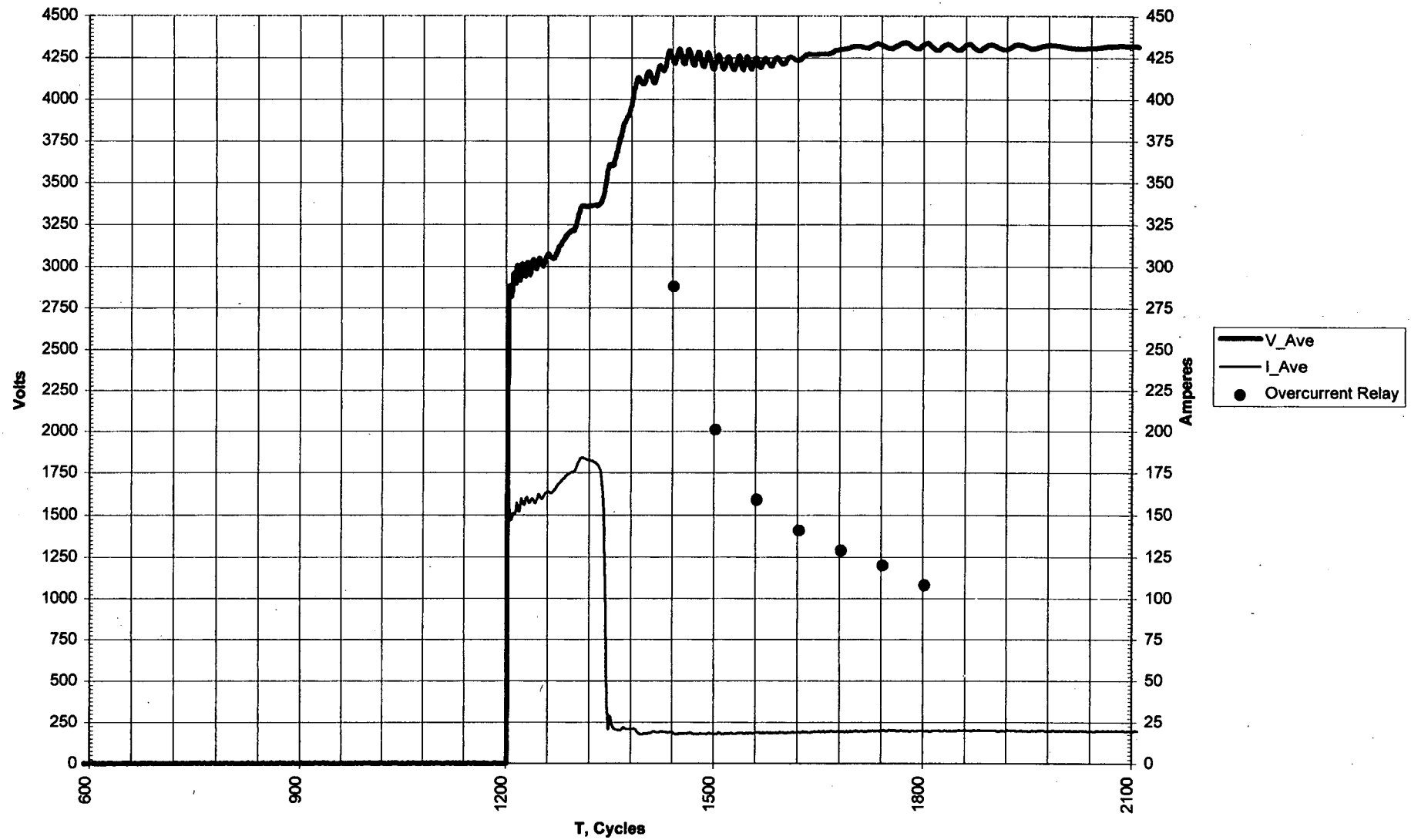


Figure 4.4.3-12: Test4, RBS 3B KVA and KW

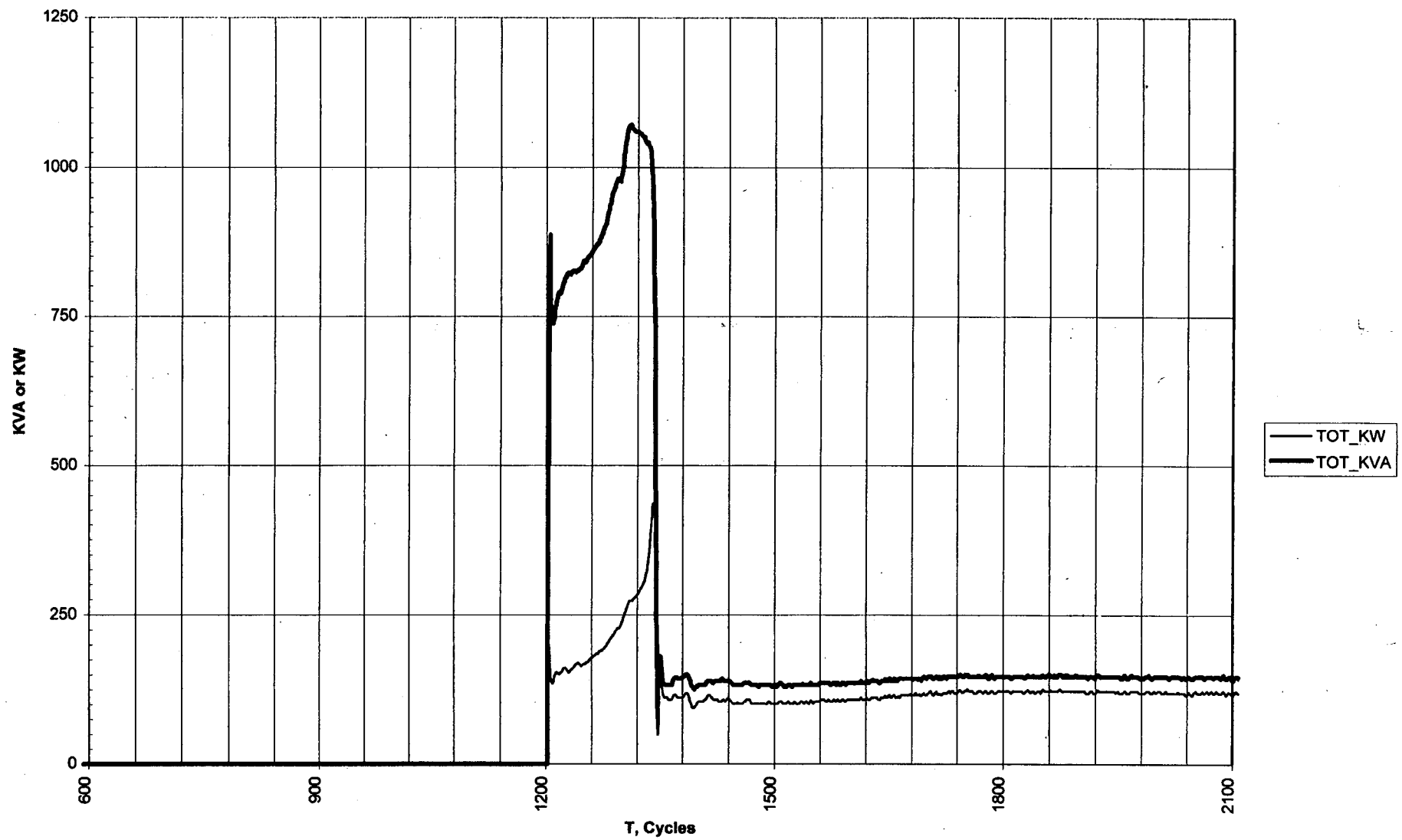


Figure 4.4.4-1: Test4, RBCF 3B Voltage and Current

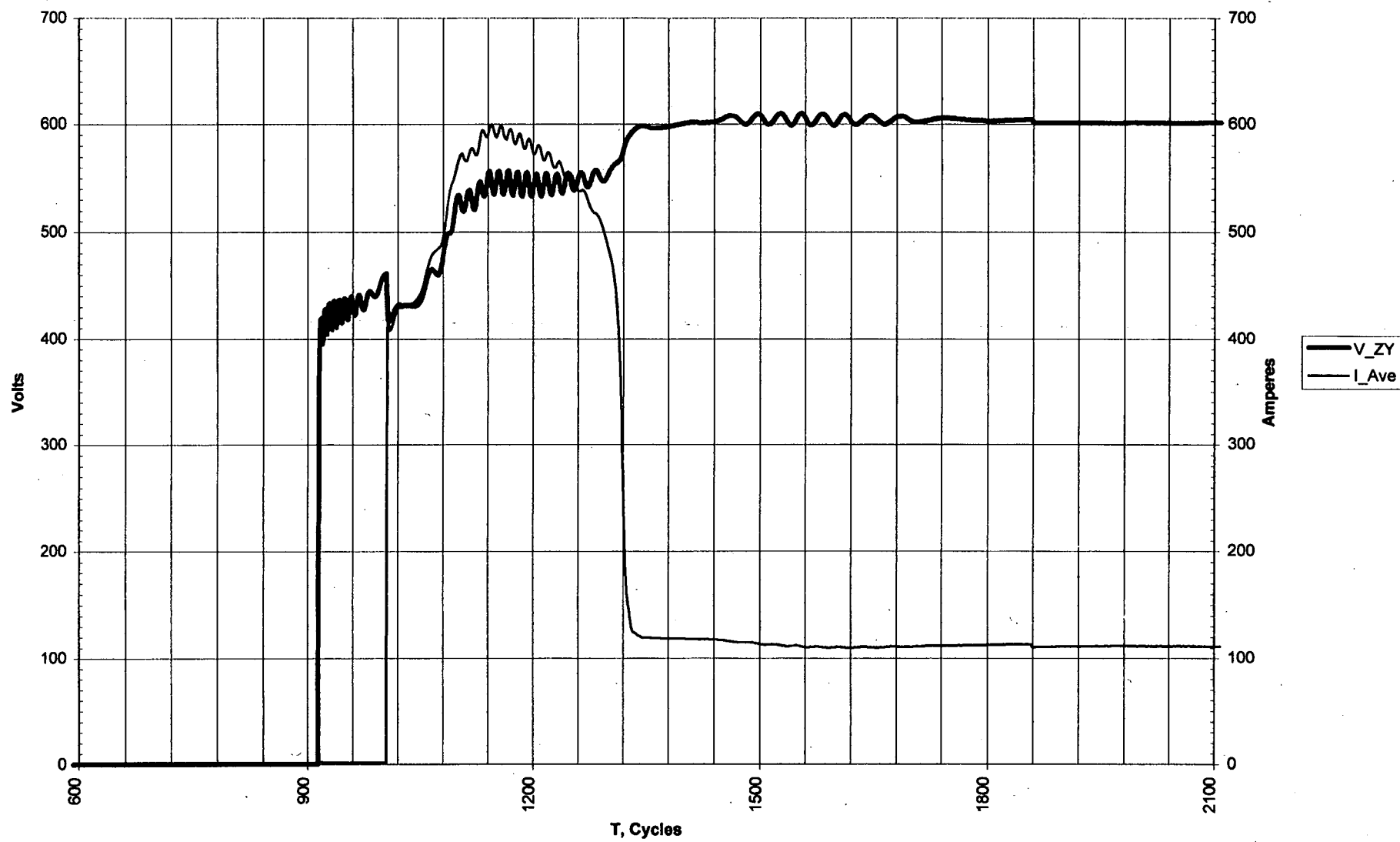


Figure 4.4.4-2: Test4, RBCF 3B KVA and KW

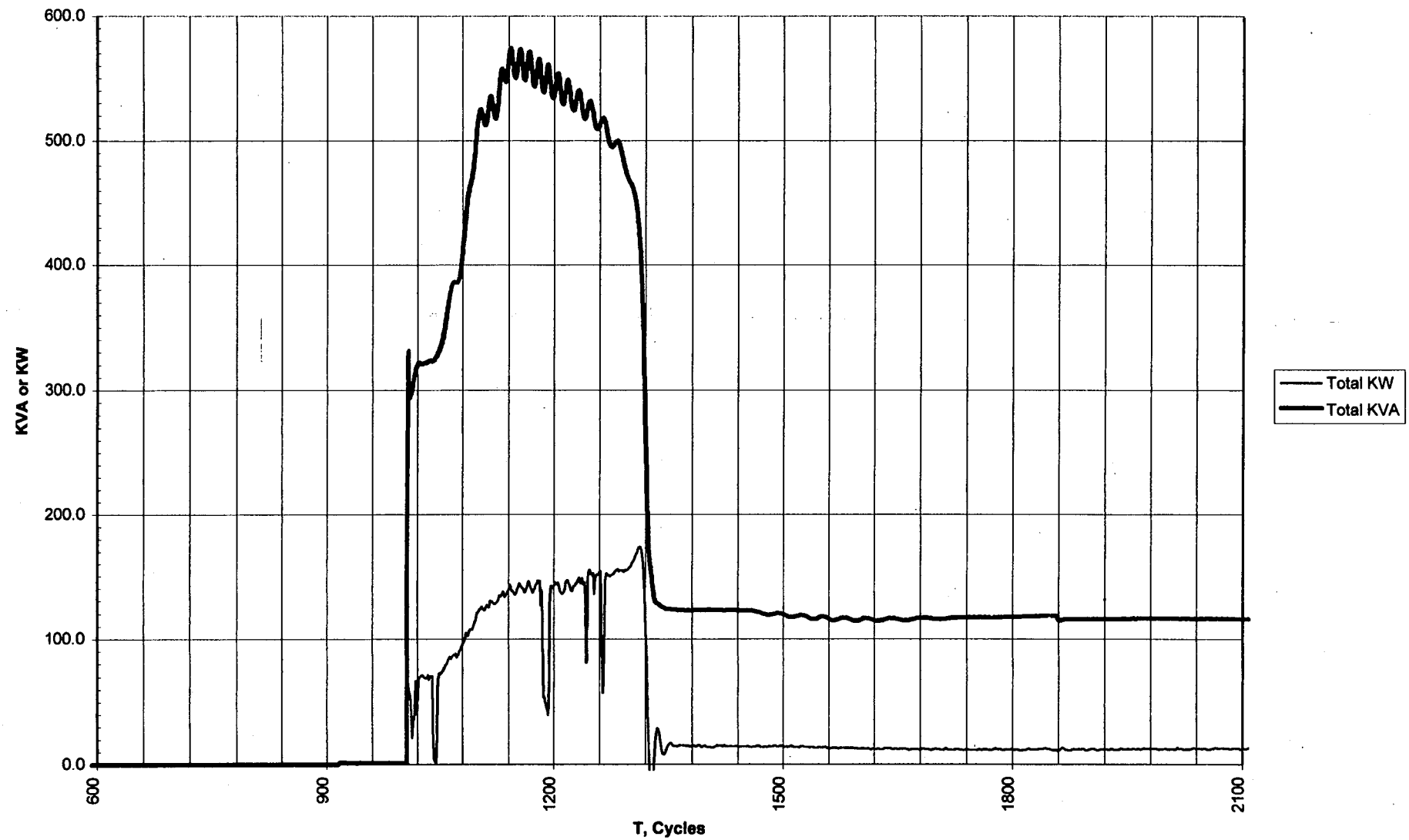


Figure 4.4.5-1: Test4, 1X5 Voltage and Current

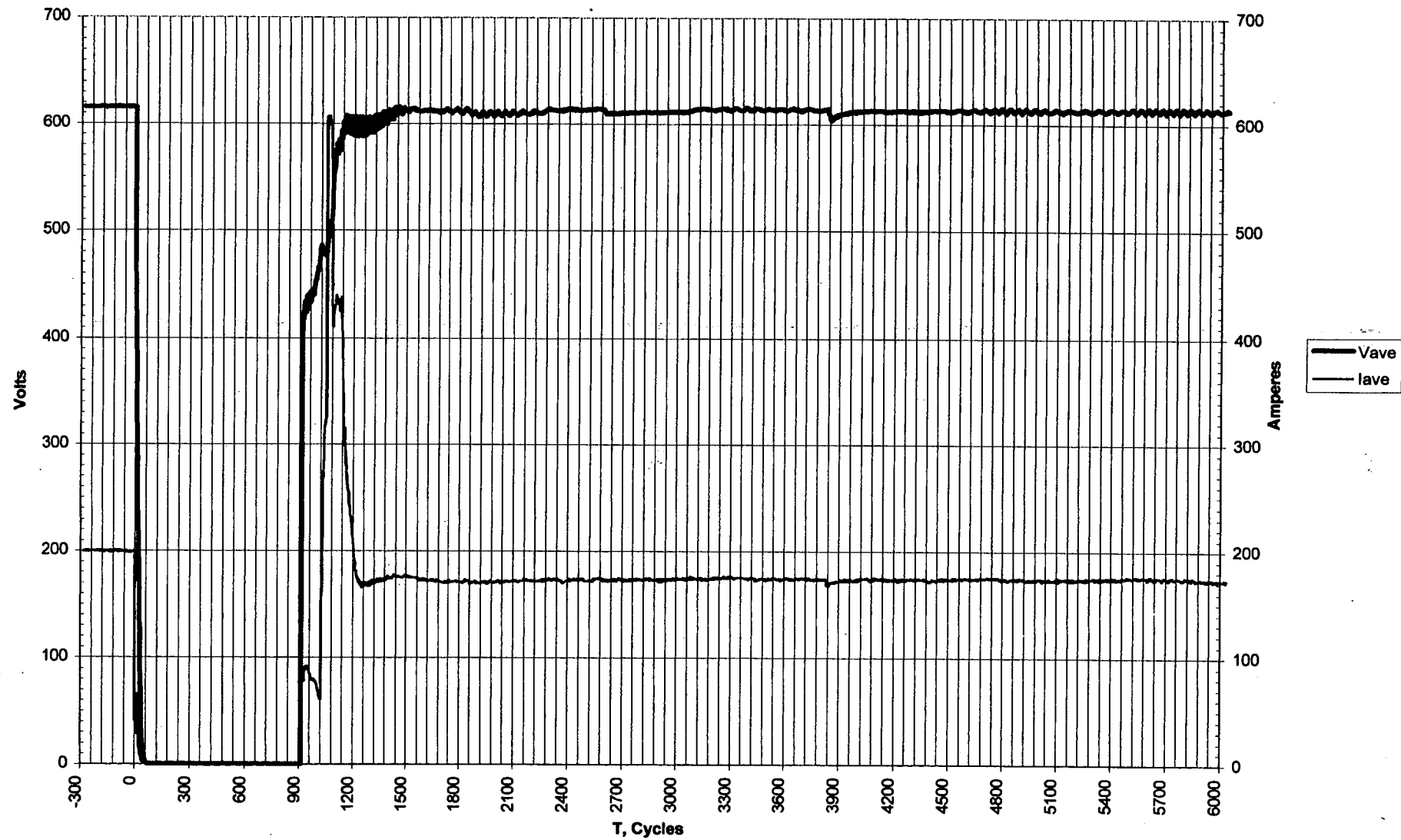


Figure 4.4.5-2: Test4, 1X5 KVA and KW

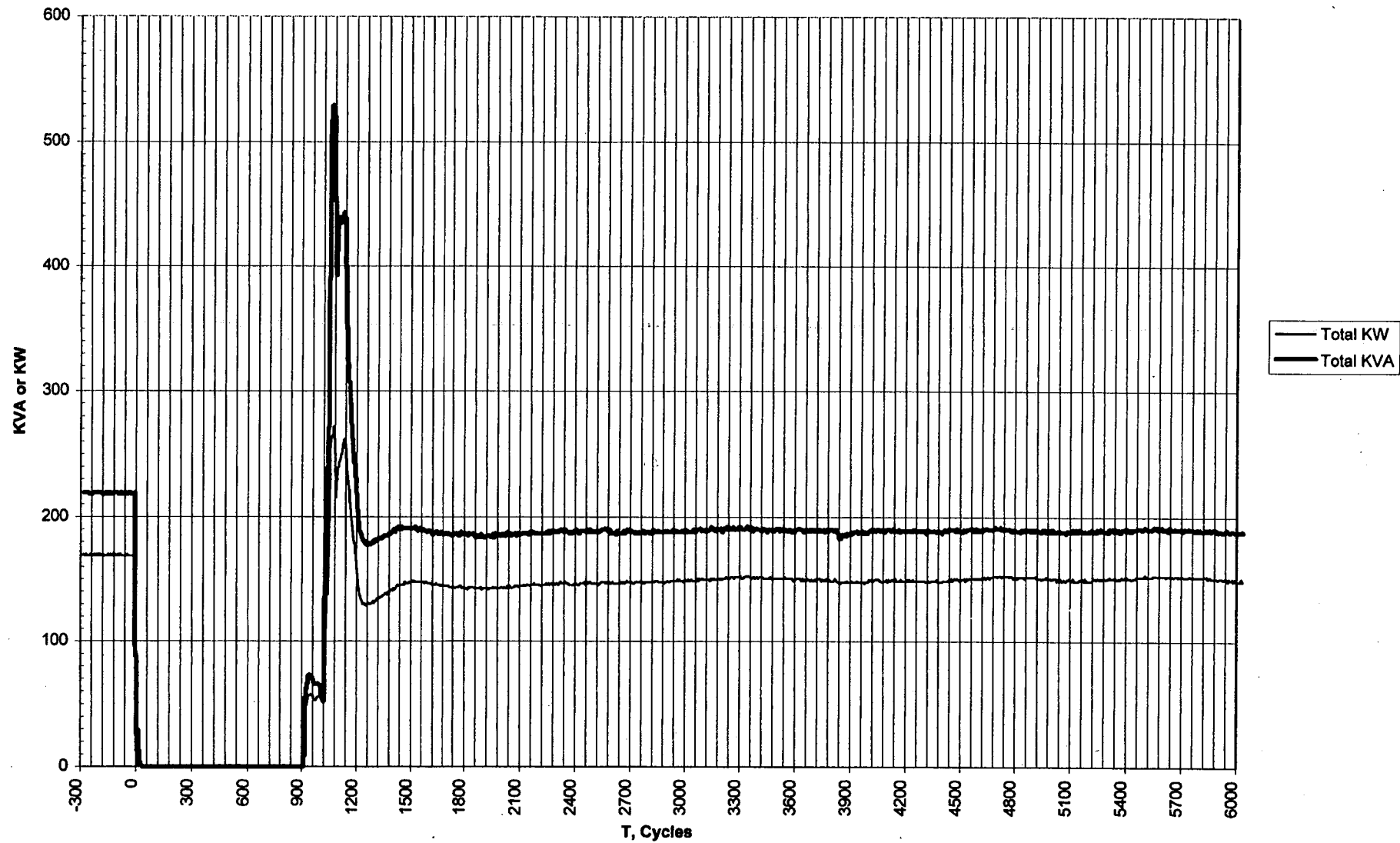


Figure 4.4.5-3: Test4, 1X6 Voltage and Current

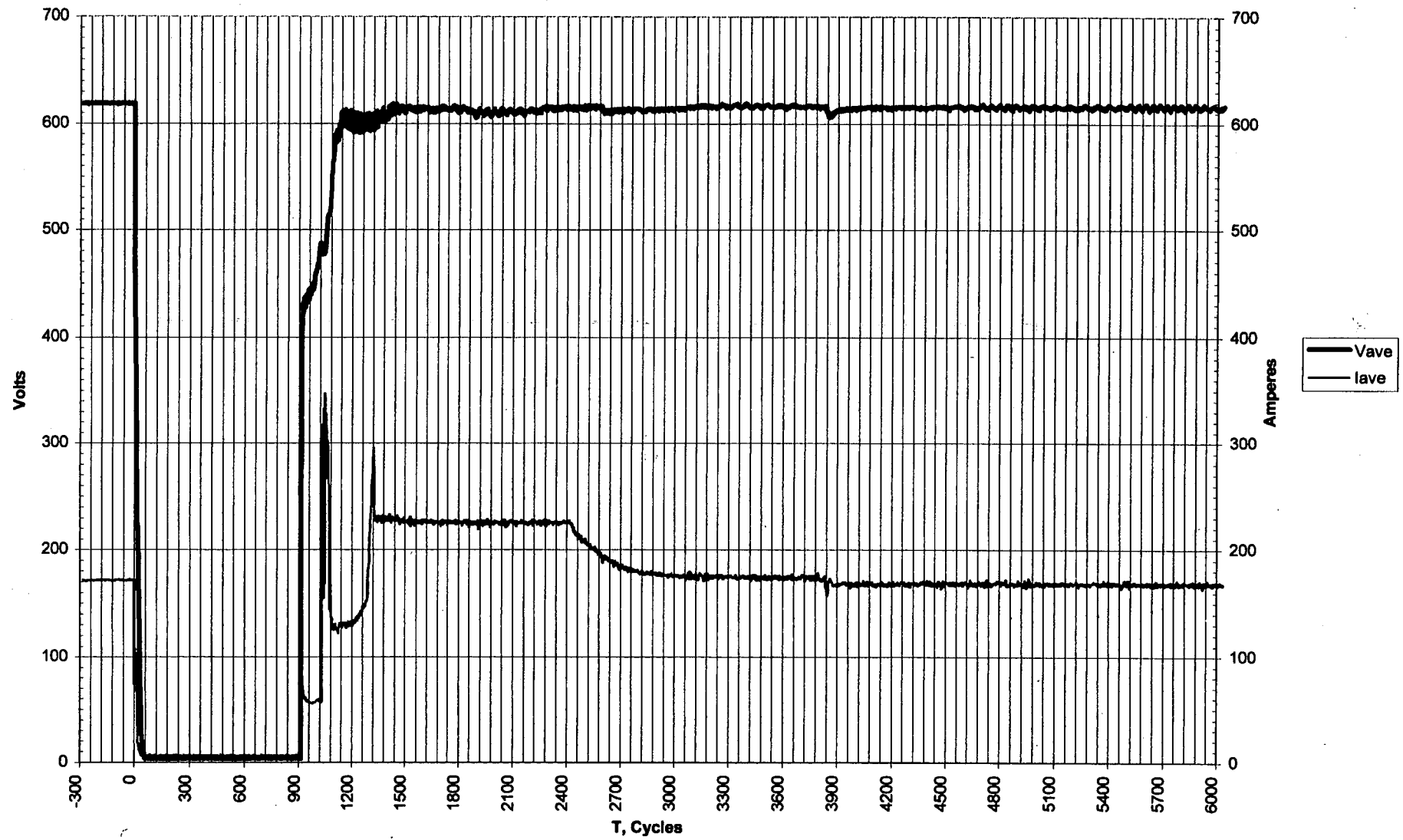


Figure 4.4.5-4: Test4, 1X6 KVA and KW

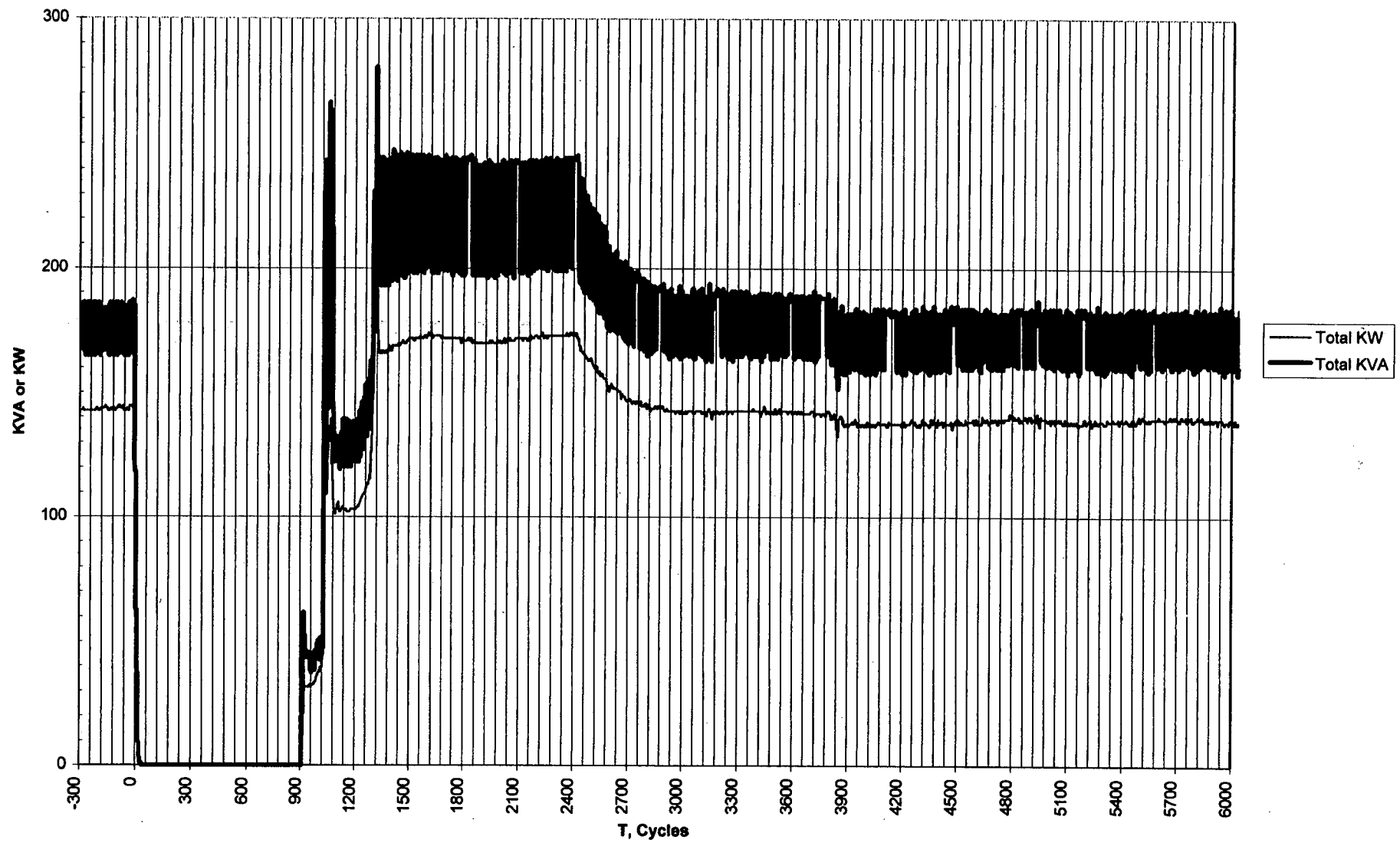


Figure 4.4.5-5: Test4, 3X5 Voltage and Current

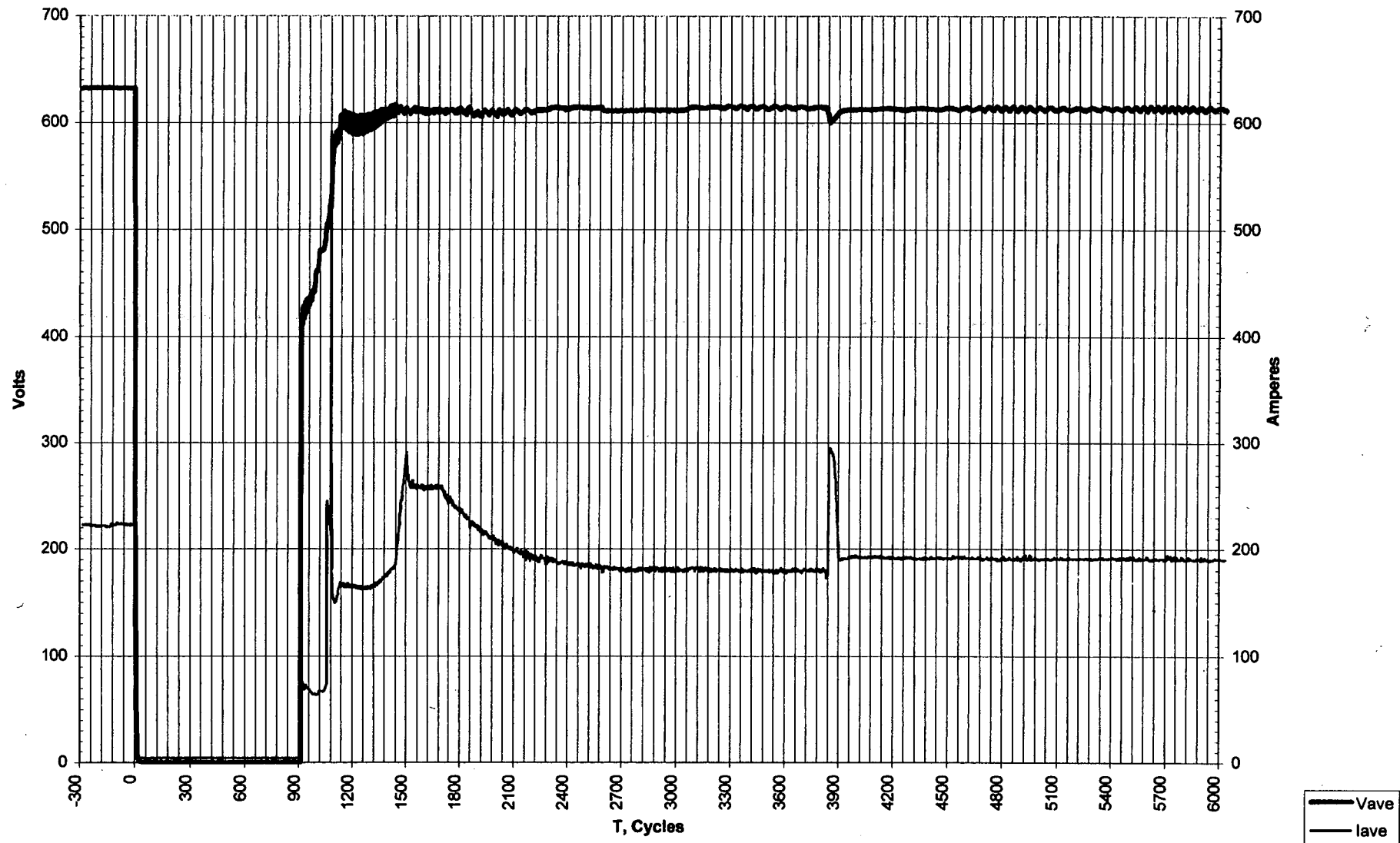


Figure 4.4.5-6: Test4, 3X5 KVA and KW



Figure 4.4.5-7: Test4, 3X6 Voltage and Current

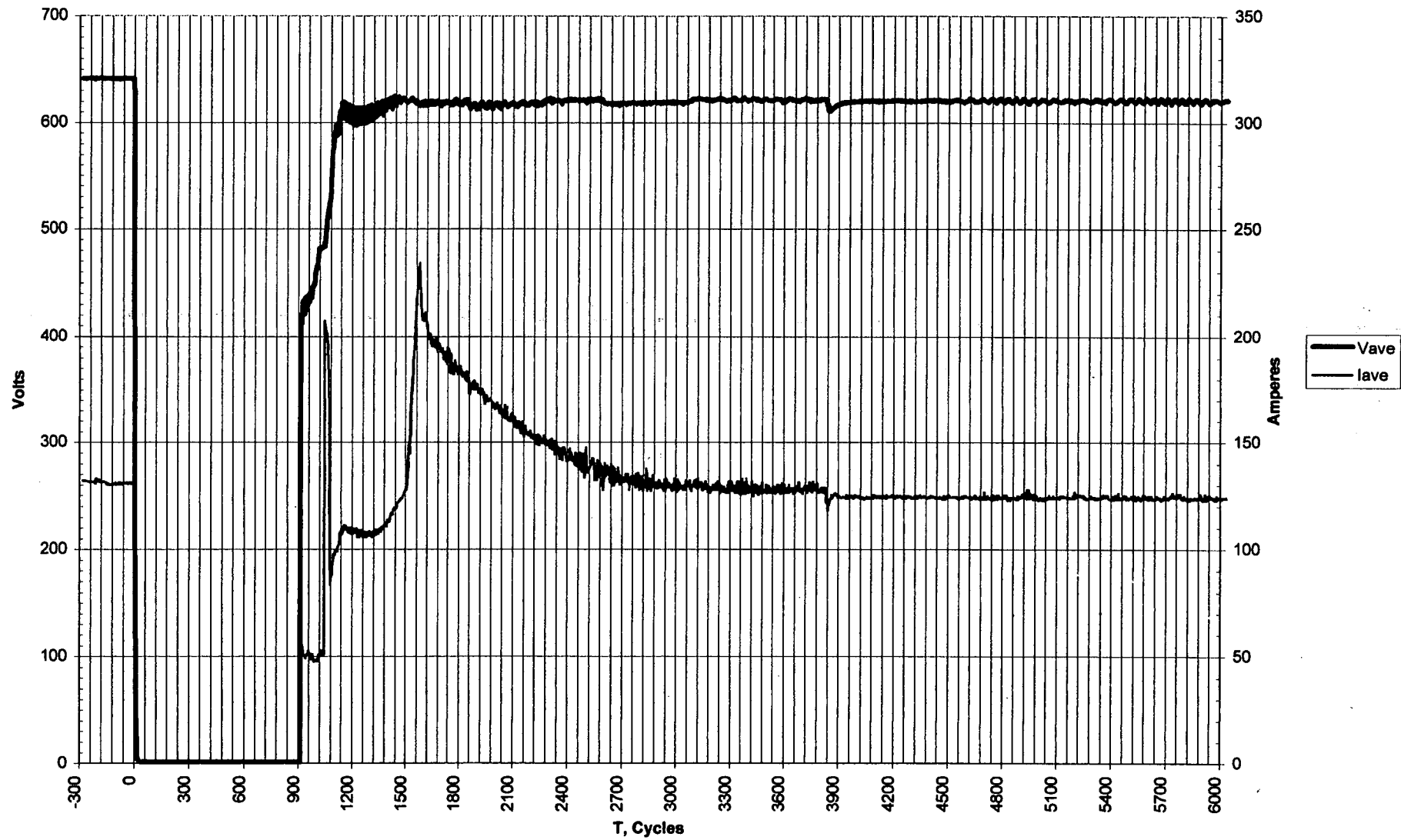


Figure 4.4.5-8: Test4, 3X6 KVA and KW

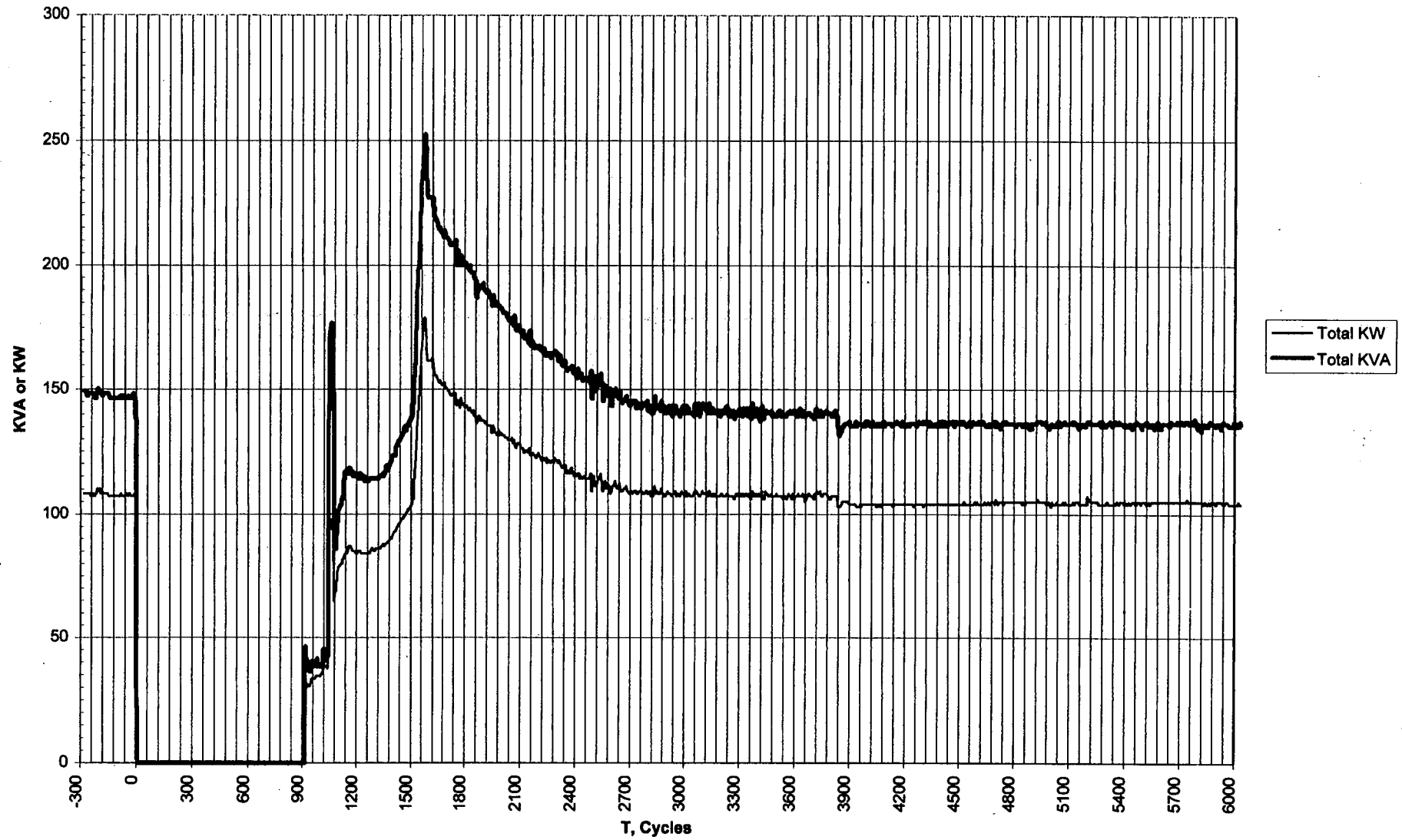


Figure 4.4.5-9: Test4, 3X8 Voltage and Current

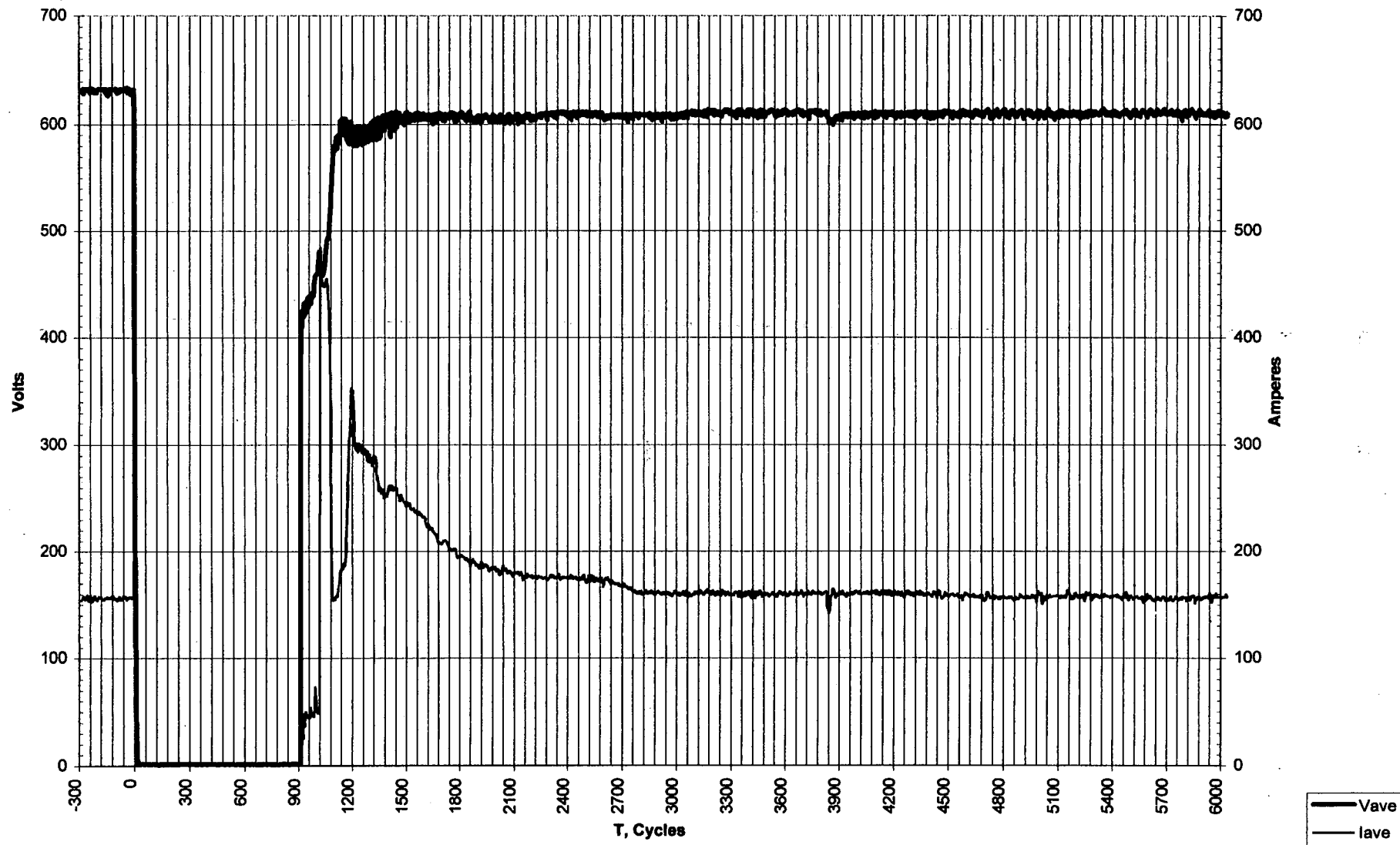


Figure 4.4.5-10:, Test4, 3X8 KVA and KW

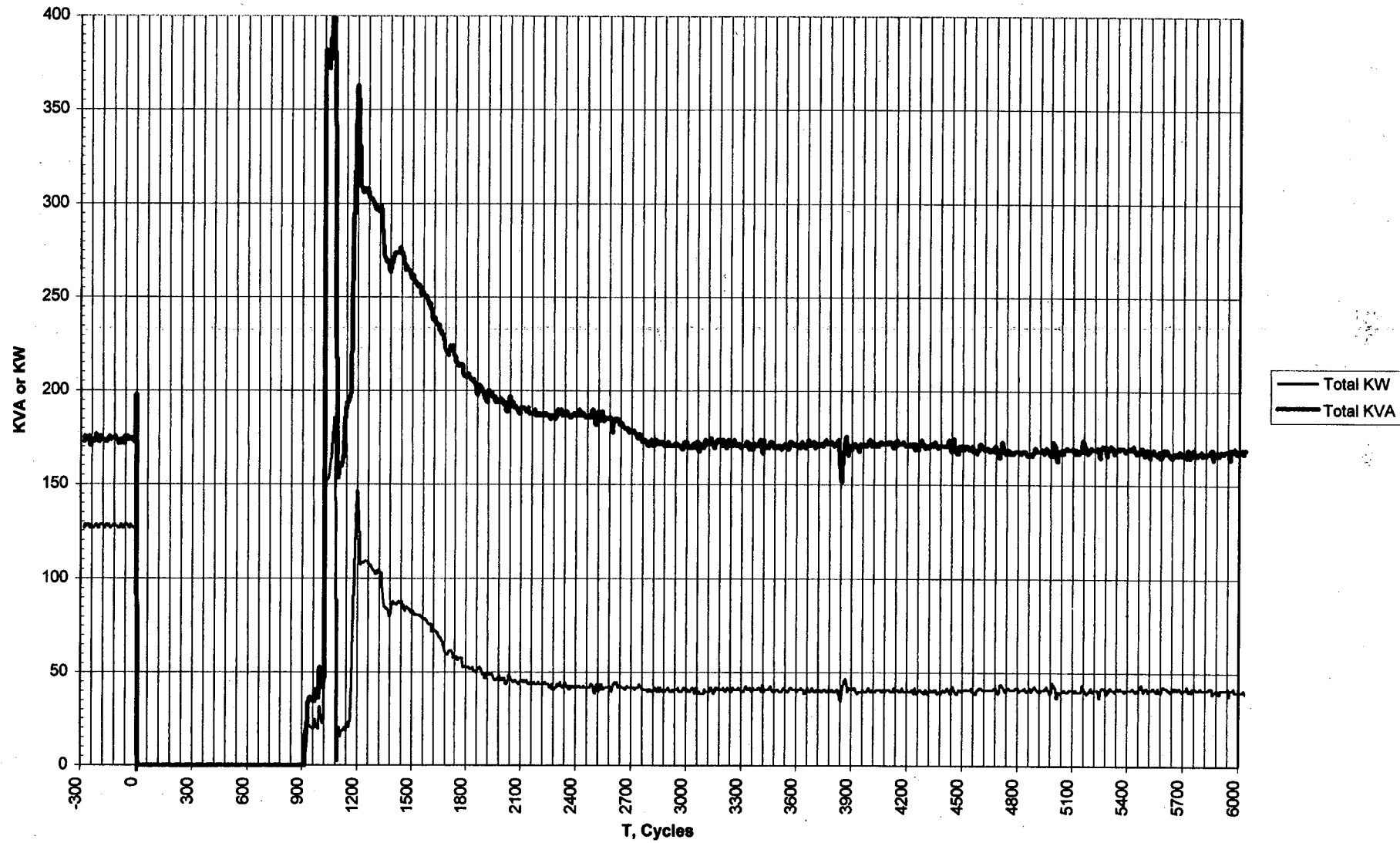


Figure 4.4.5-11: Test4, 3X9 Voltage and Current

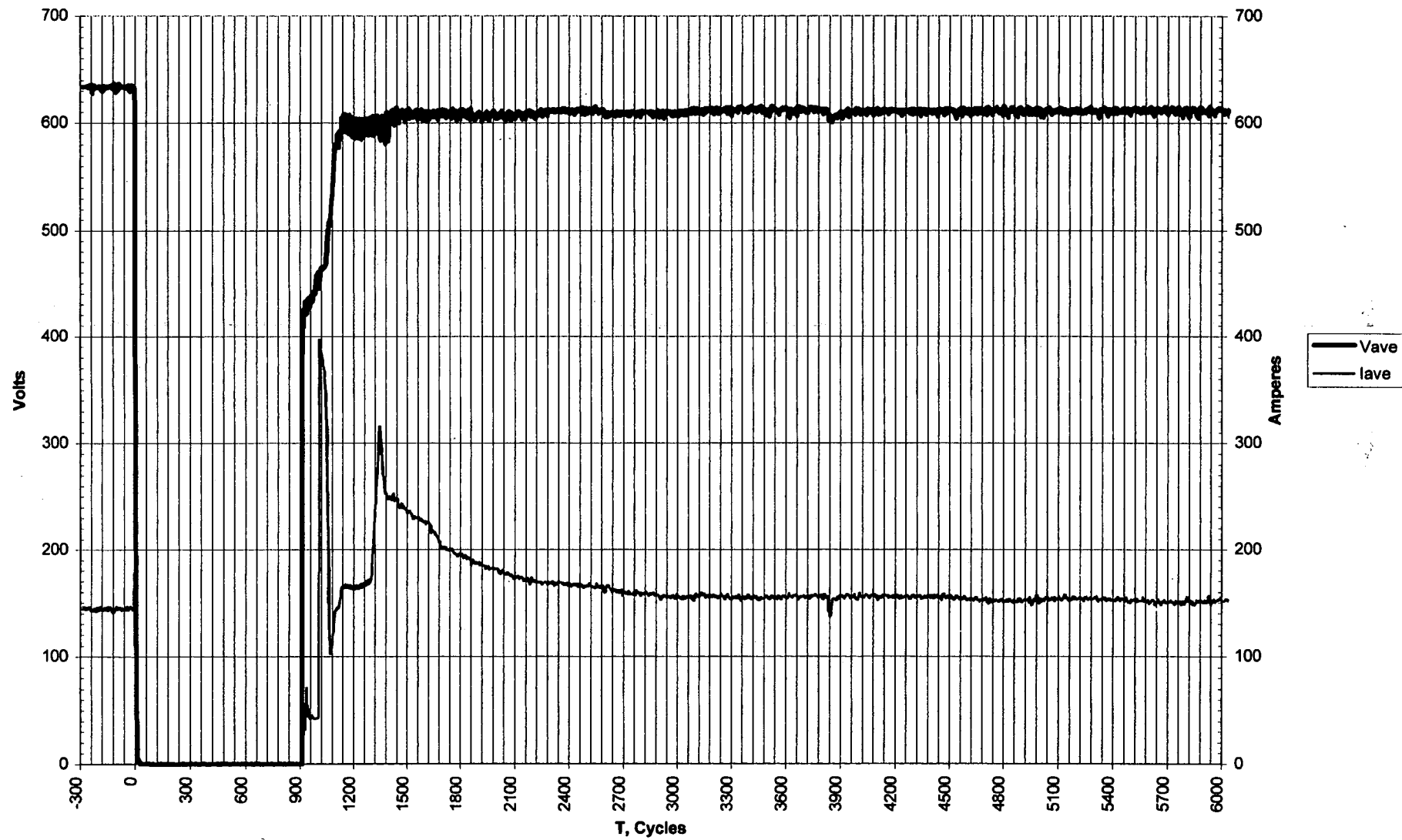


Figure 4.4.5-12: Test4, 3X9 KVA and KW

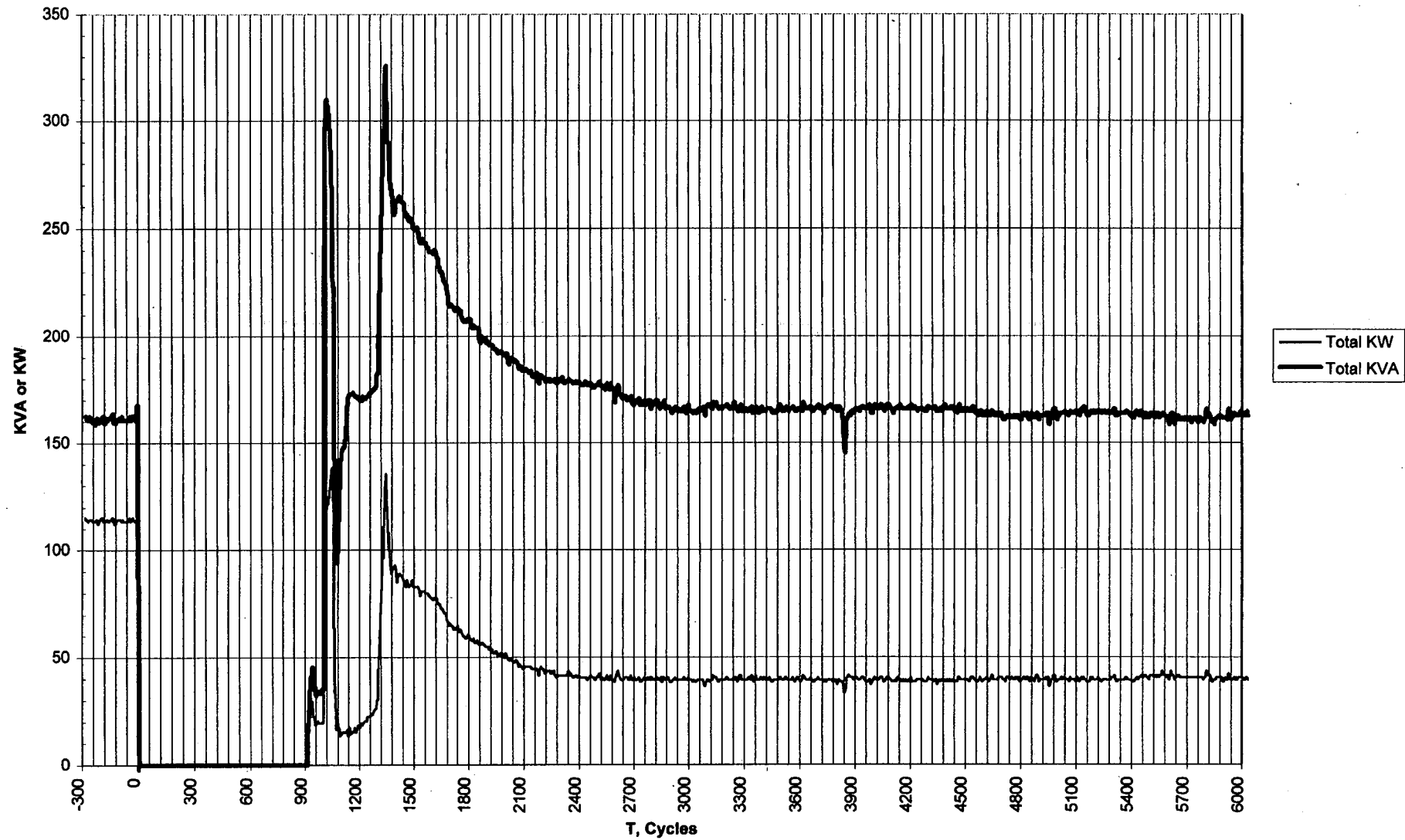


Figure 4.4.5-13: Test4, CX Primary Voltage and Current



Figure 4.4.5-14: Test4, CX Primary KVA and KW

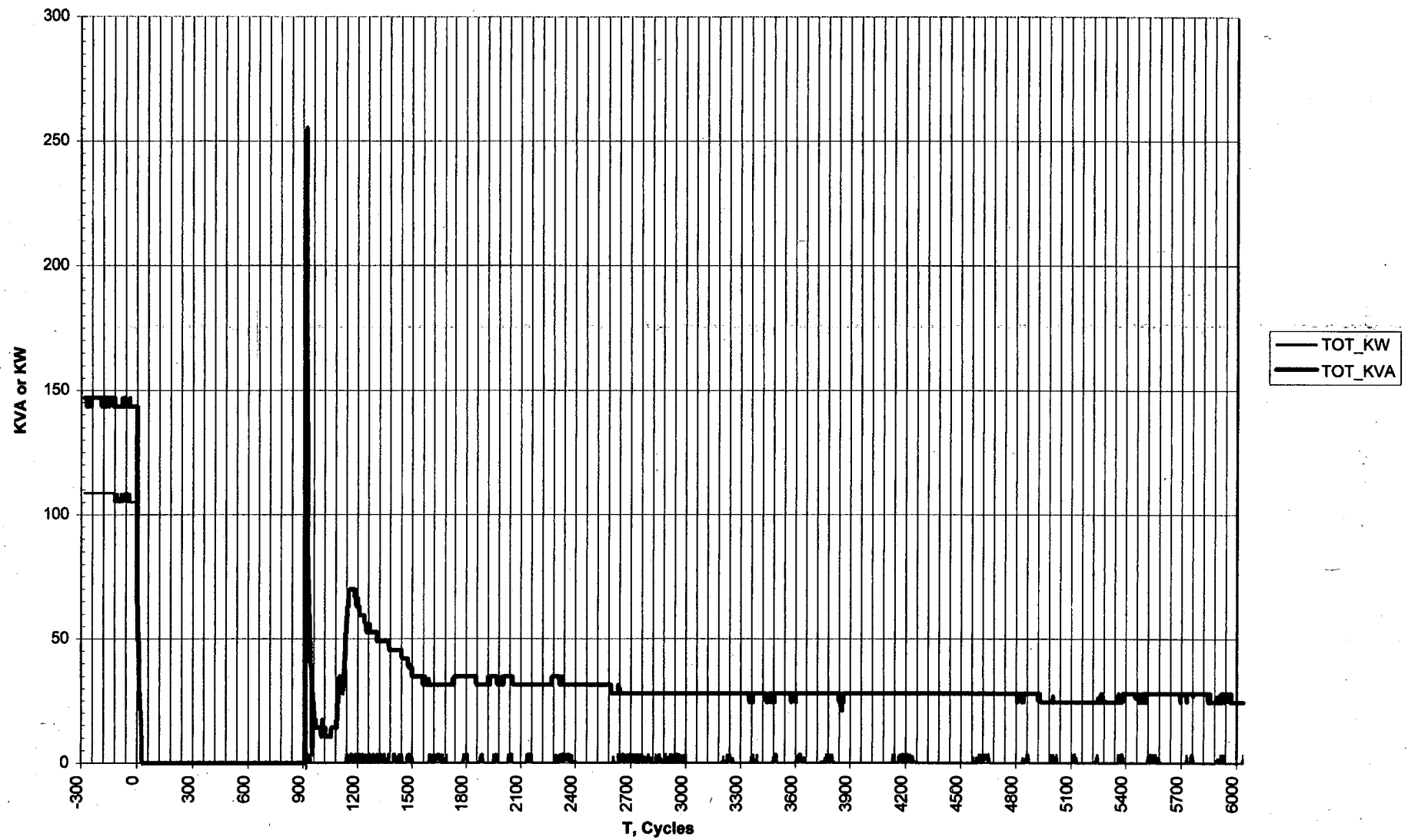


Figure 4.4.6-1: Test4, 600V 3XS1 Voltage and Current

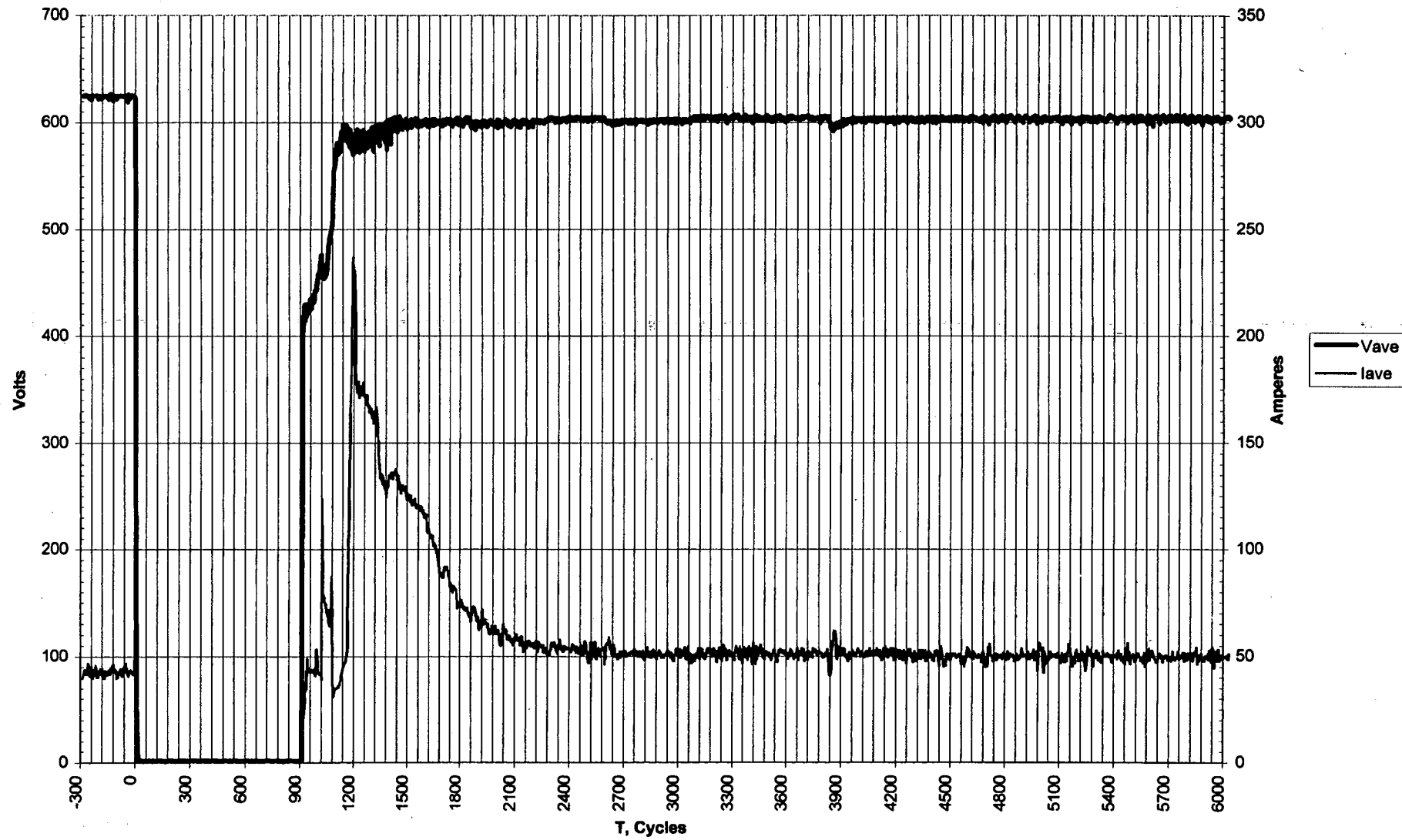


Figure 4.4.6-2: Test4, 600V 3XS1 KVA and KW

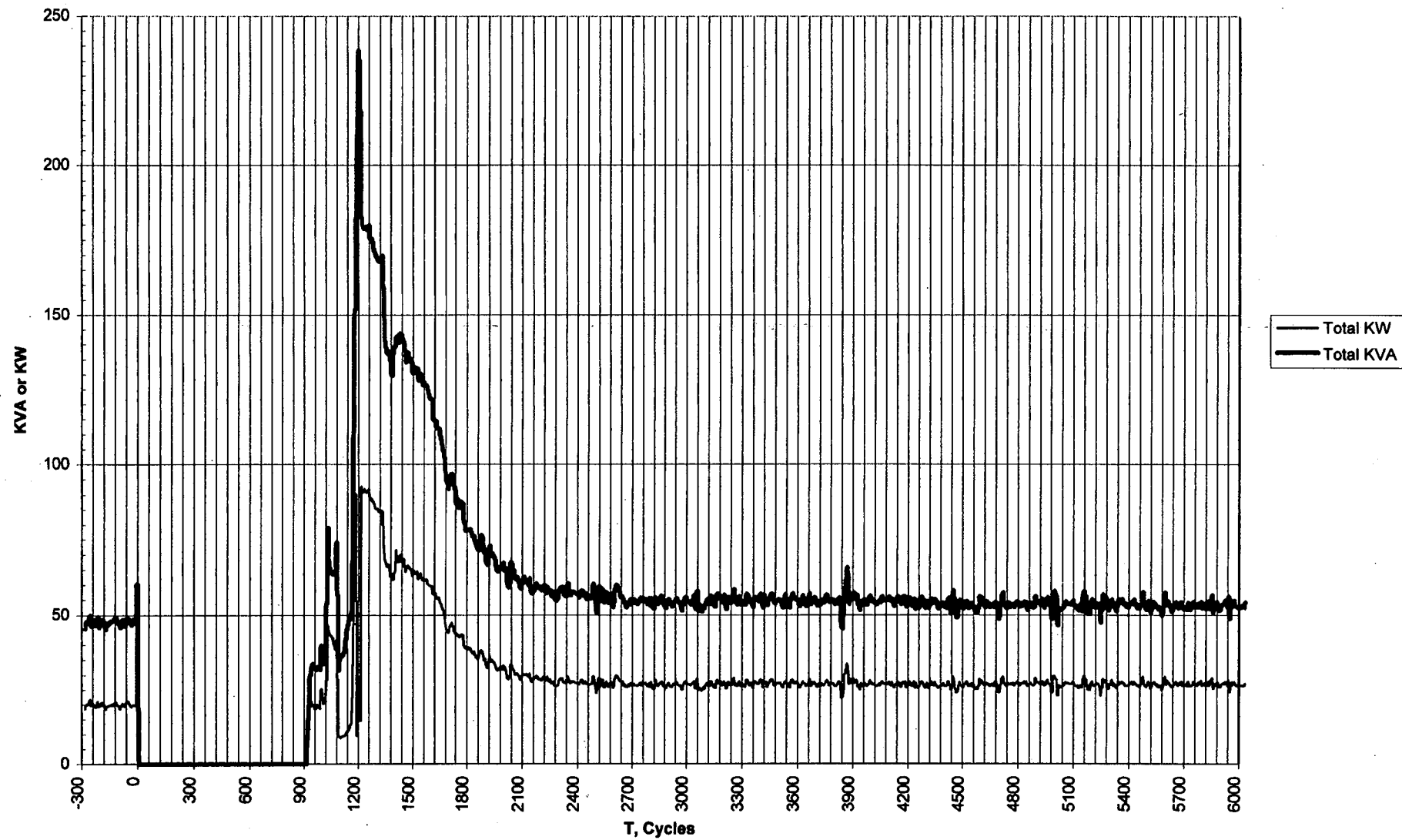


Figure 4.4.6-3: Test4, 600V 3XS2 Voltage and Current



Figure 4.4.6-4: Test4, 600V 3XS2 KVA and KW

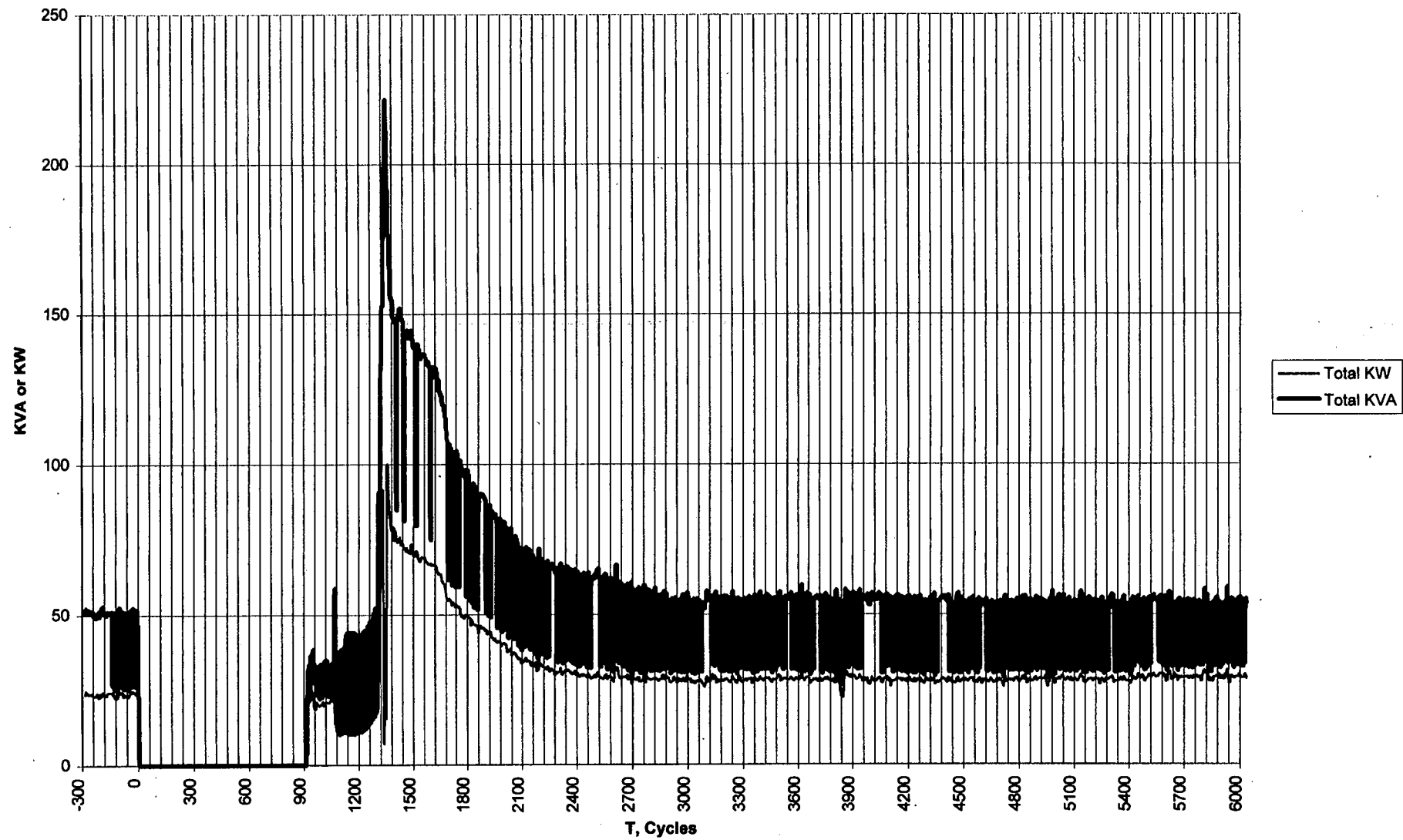


Figure 4.4.6-5: Test4, 600V 3XS3 Voltage and Current

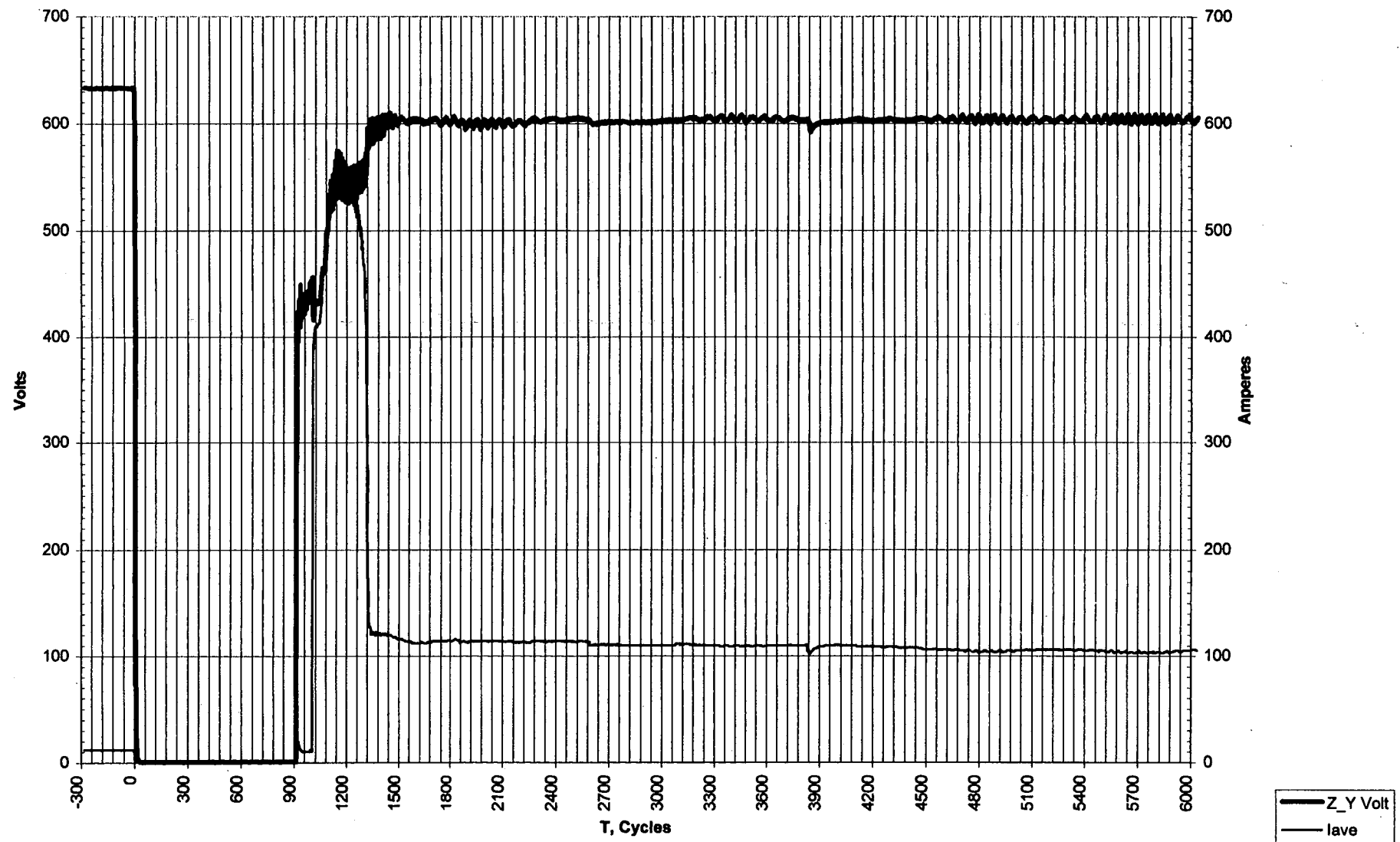


Figure 4.4.6-6: Test4, 600V 3XS3 KVA and KW

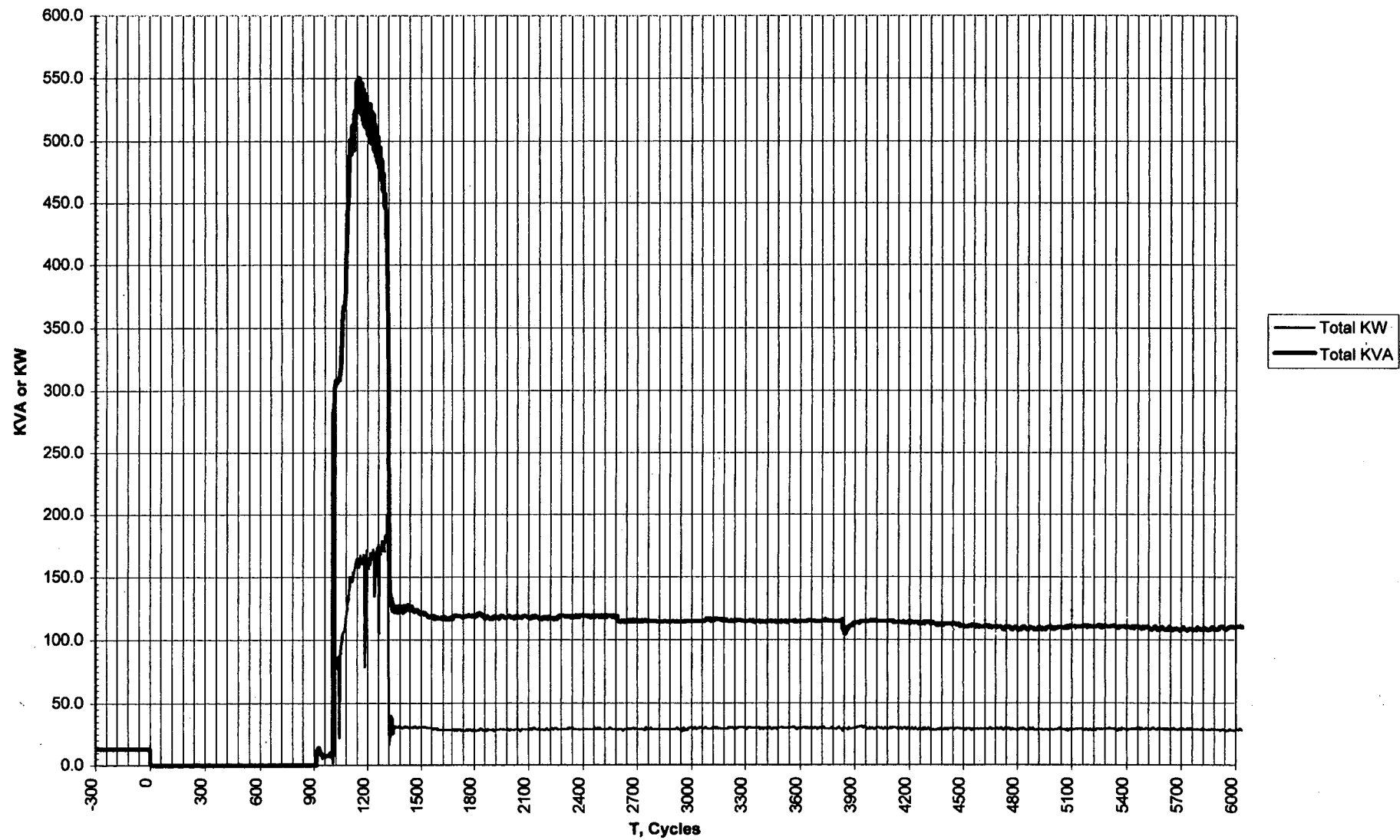


Figure 4.4.7-1: Test4, 208V 3XS1 Voltage and Current

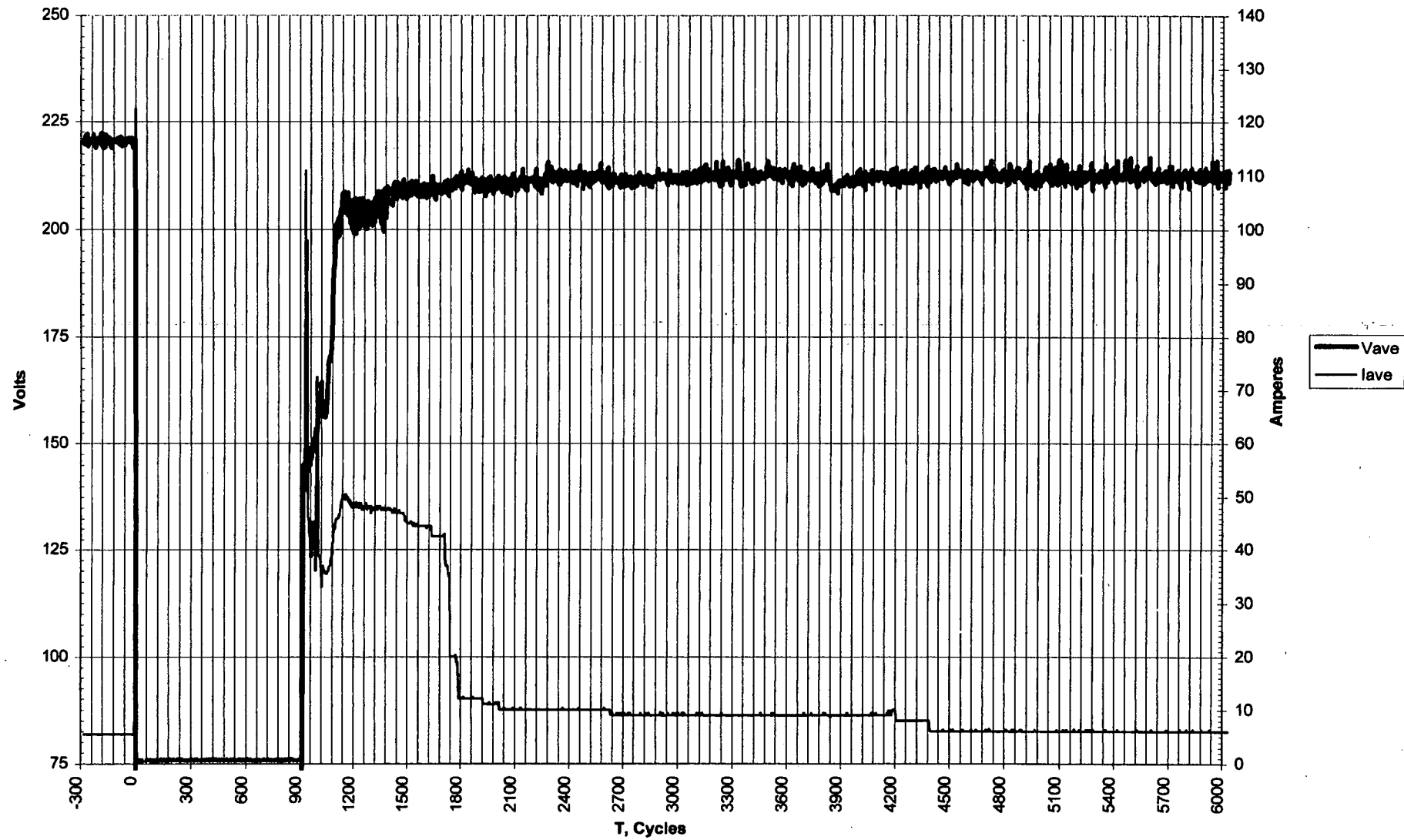


Figure 4.4.7-2: Test4, 208V 3XS1 Voltage and Current

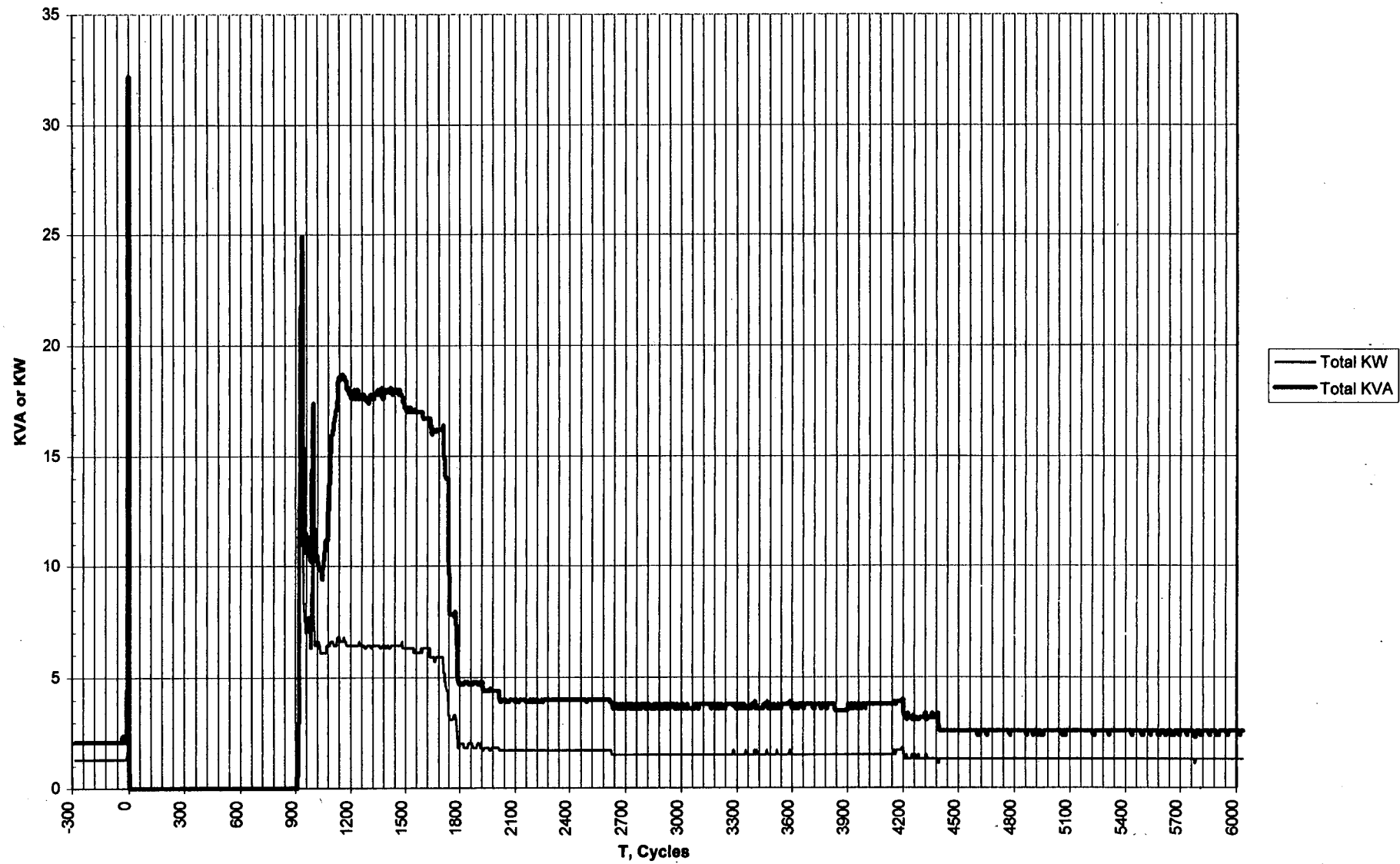


Figure 4.4.7-3: Test4, 208V 3XS2 Voltage and Current

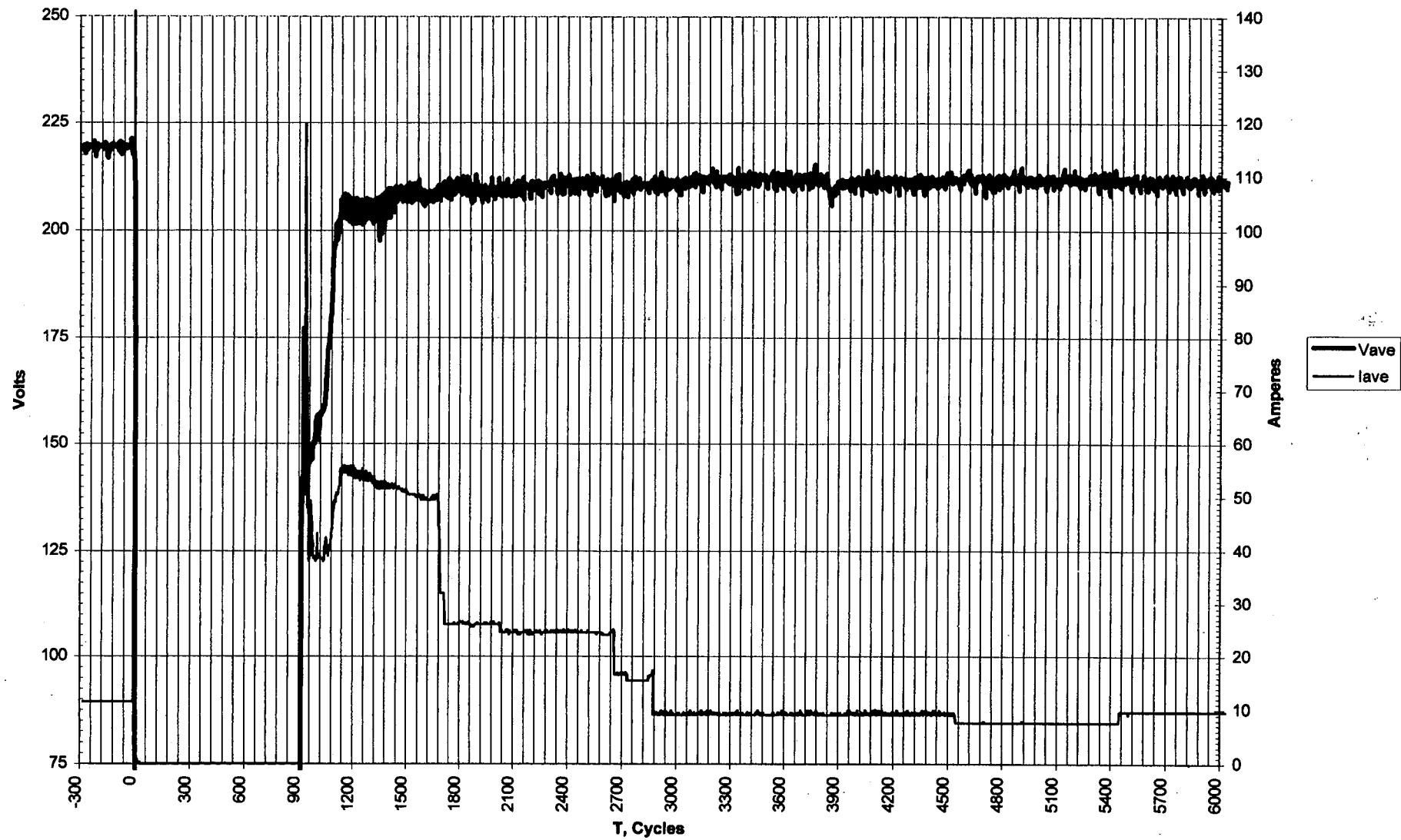


Figure 4.4.7-4: Test4, 208V 3XS2 KVA and KW

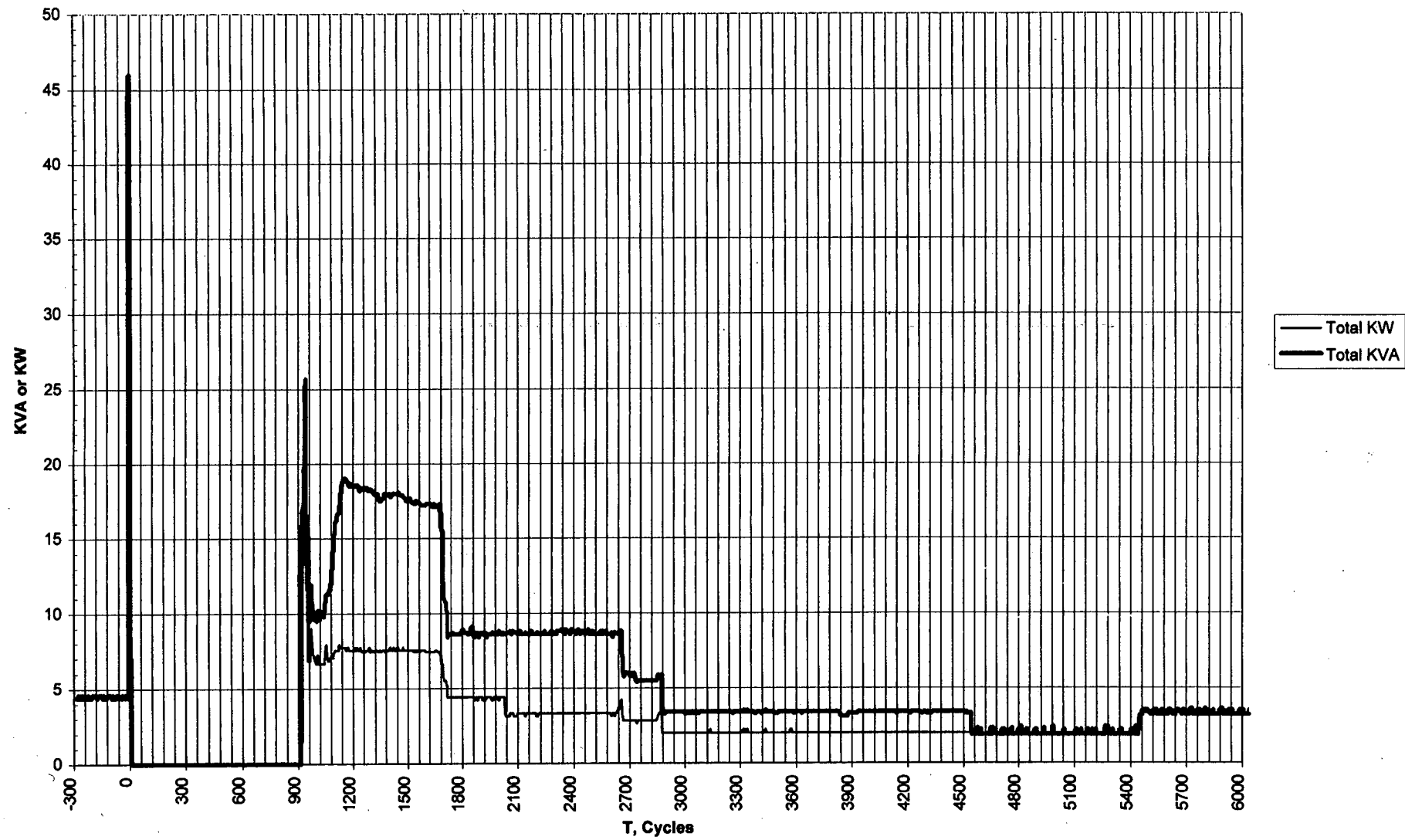


Figure 4.4.7-5: Test4, 208V 3XS3 Voltage and Current

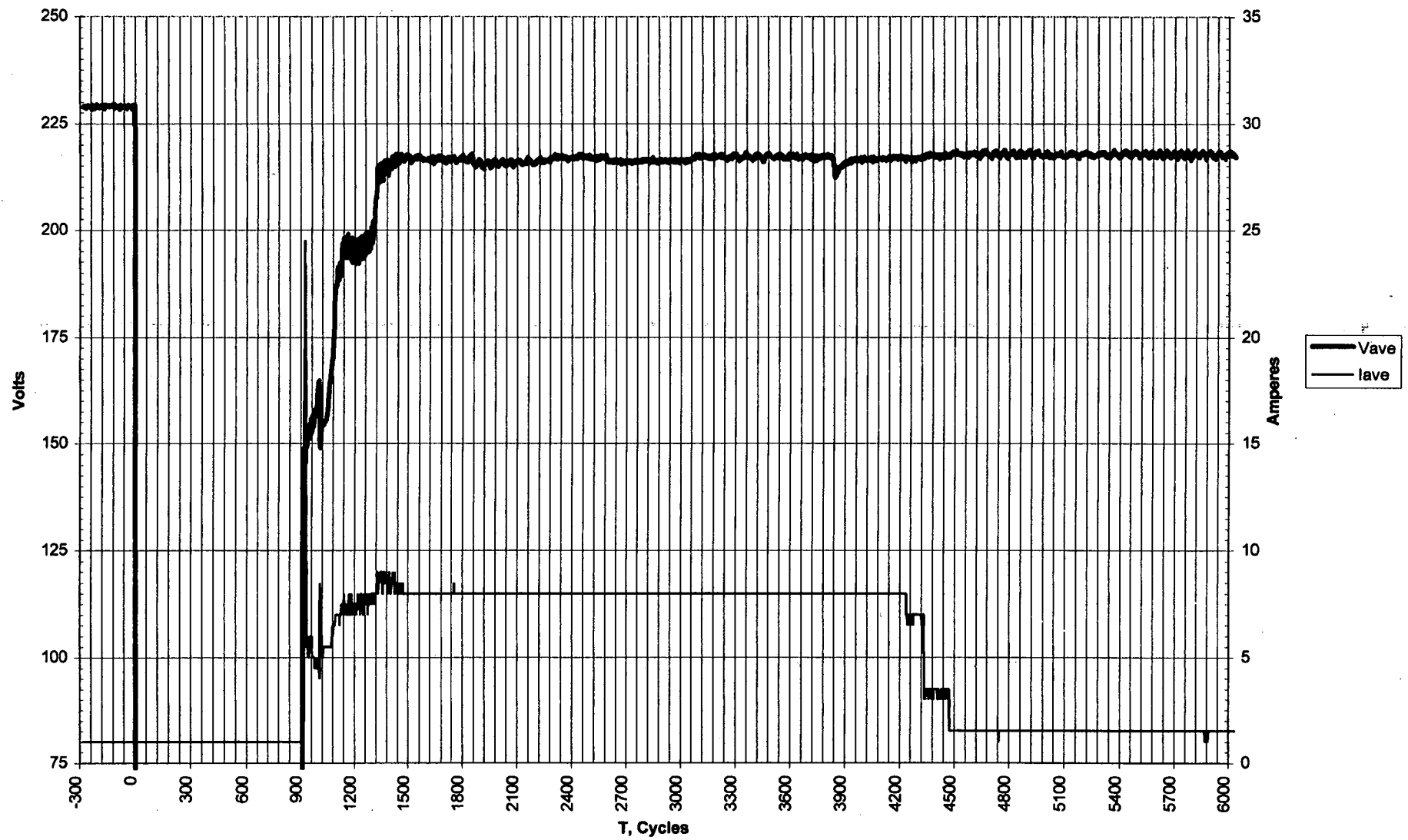


Figure 4.4.7-6: Test4, 208V 3XS3 KVA and KW

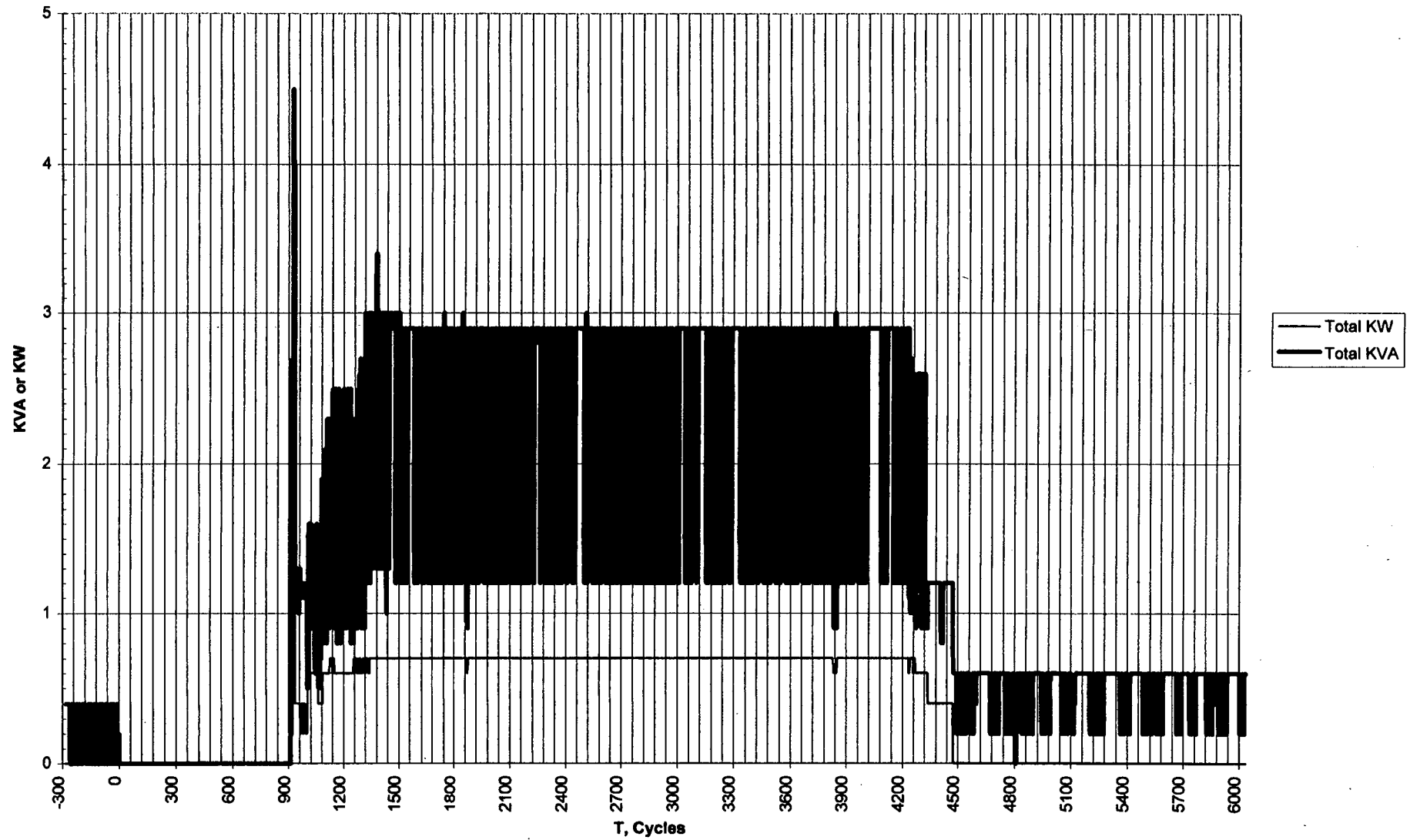
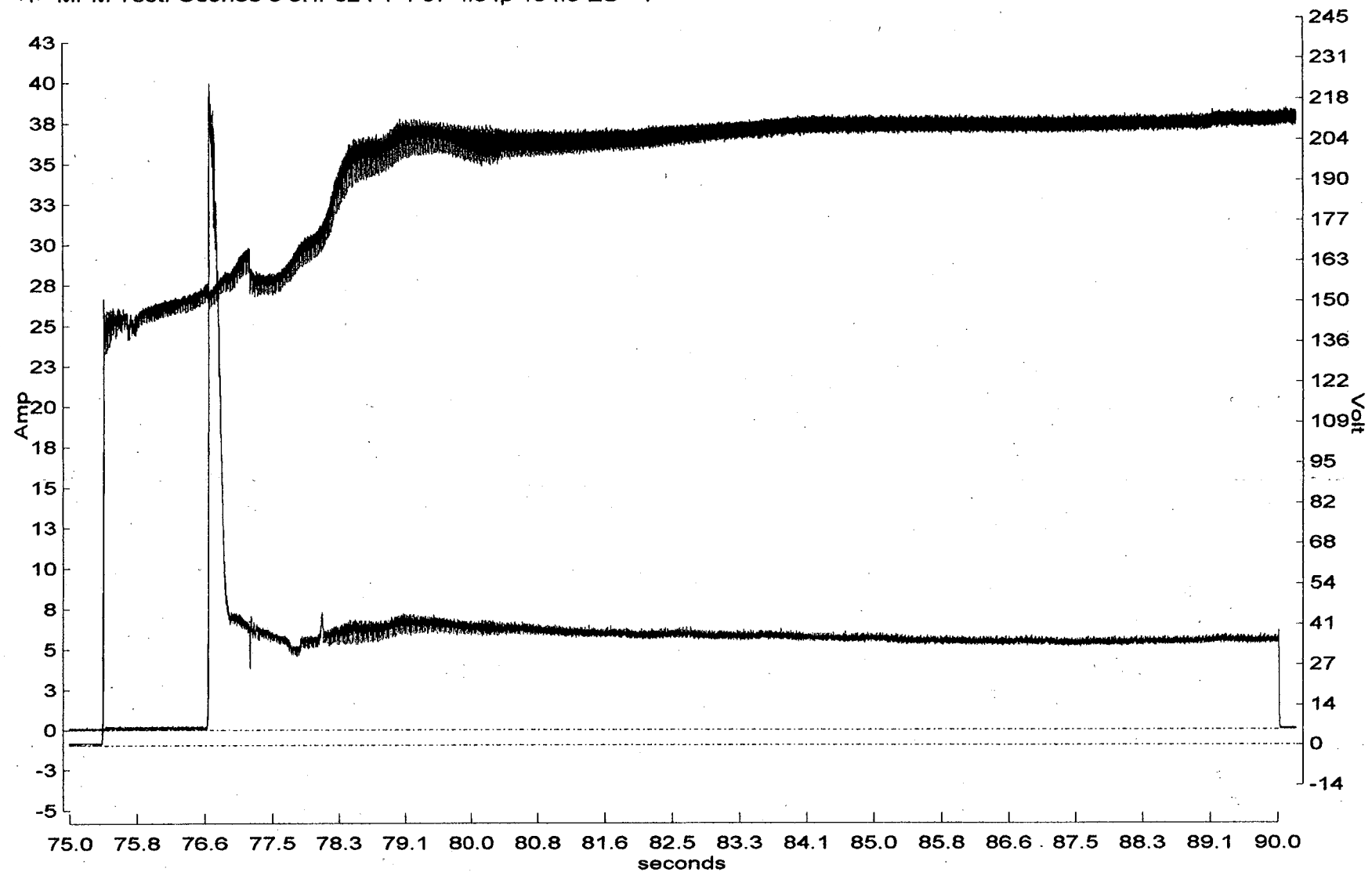


Figure 4.4.8-1: Test4, Battery Charger 3CA Voltage and Current





Cursor coordinates = 9.03seconds, 122Amp

— Vab-rms — Ia-rms

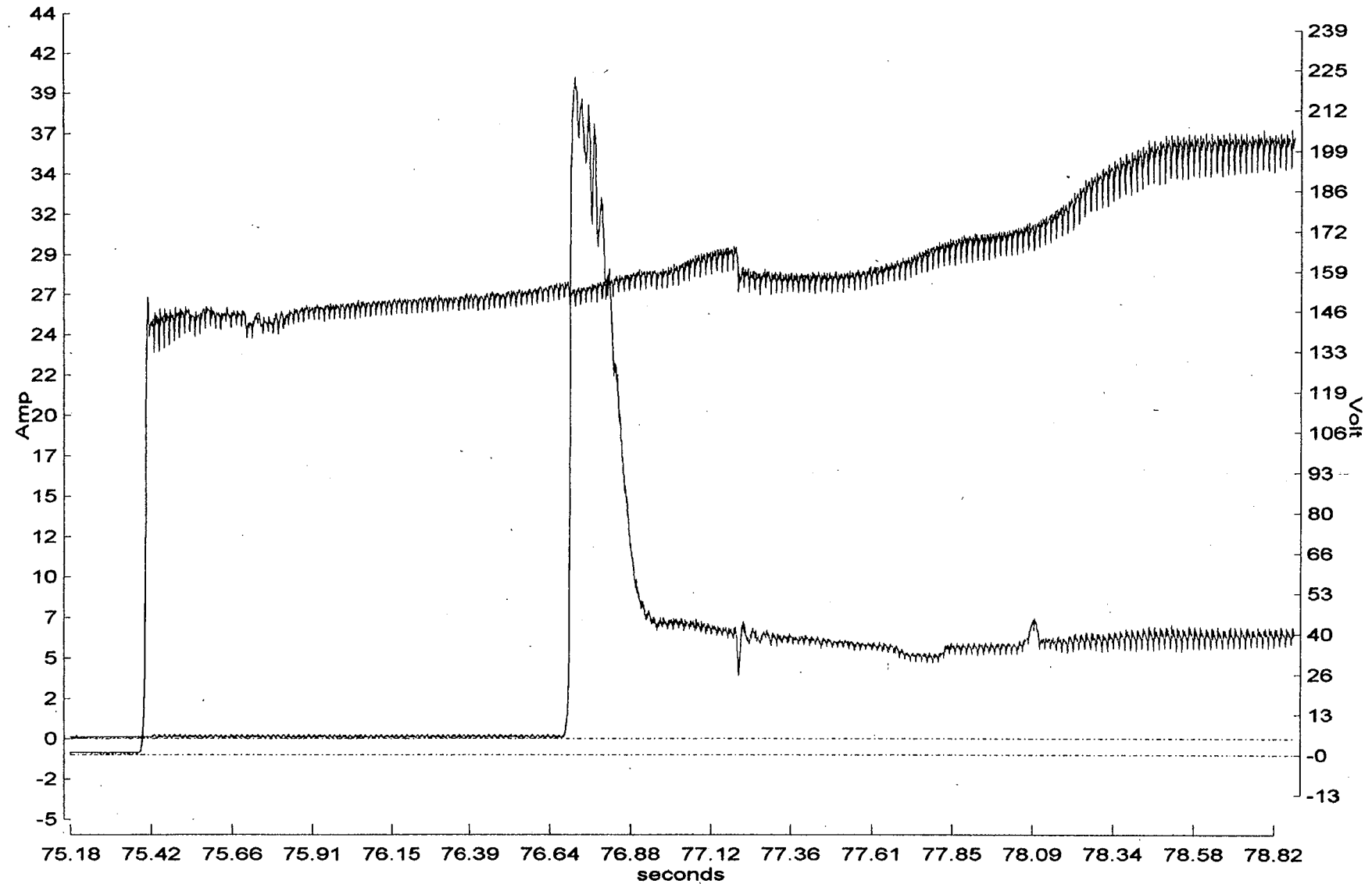
3HP-024

ES Test # 4

Full Stroke Voltage and Current

Figure 4.4.9.1-1: Test 4, 3HP-24 Full Stroke Voltage and Current

<1> Mr. Test: Ocone 3 3HP024 1-4-97 4:34p 134.3 ES 4



Cursor coordinates = 72seconds, 444Amp

— Vab-rms — Ia-rms

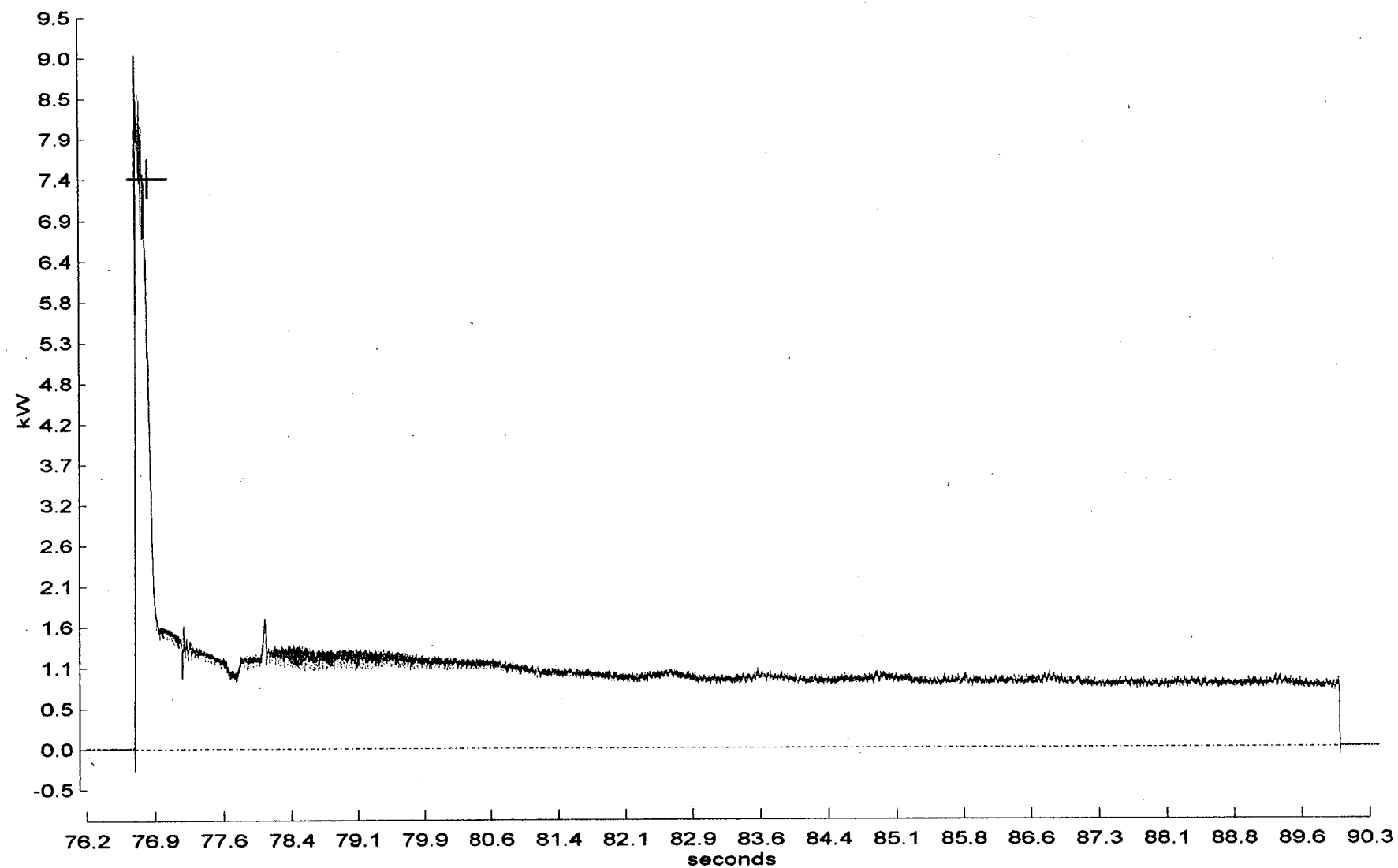
3HP-024

ES Test # 4

Inrush Voltage and Current

Figure 4.4.9.1-2: Test 4, 3HP-24 Inrush Voltage and Current

<1> MP Test: Ocone 3 3HP024 1-4-97 4:34p 134.3 ES 4



Cursor coordinates = 76.8seconds, 7.43kW

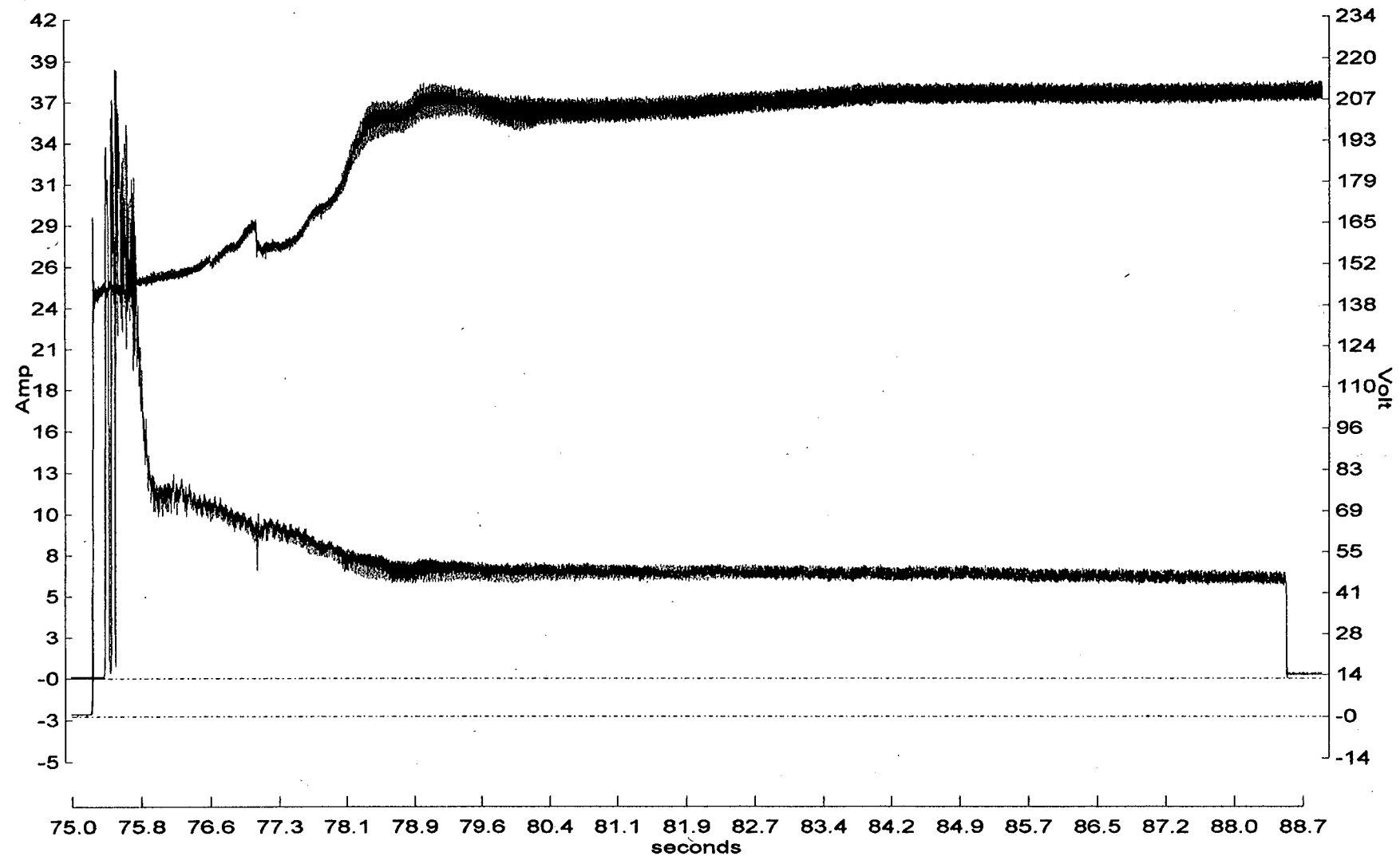
— TRP

3HP-024

ES Test # 4

Full Stroke Total Real Power

Figure 4.4.9.1-3: Test 4, 3HP-24 Full Stroke Total Real Power (KW)



Cursor coordinates = 85.8seconds, 303Amp

— V_{ab-rms} — I_{a-rms}

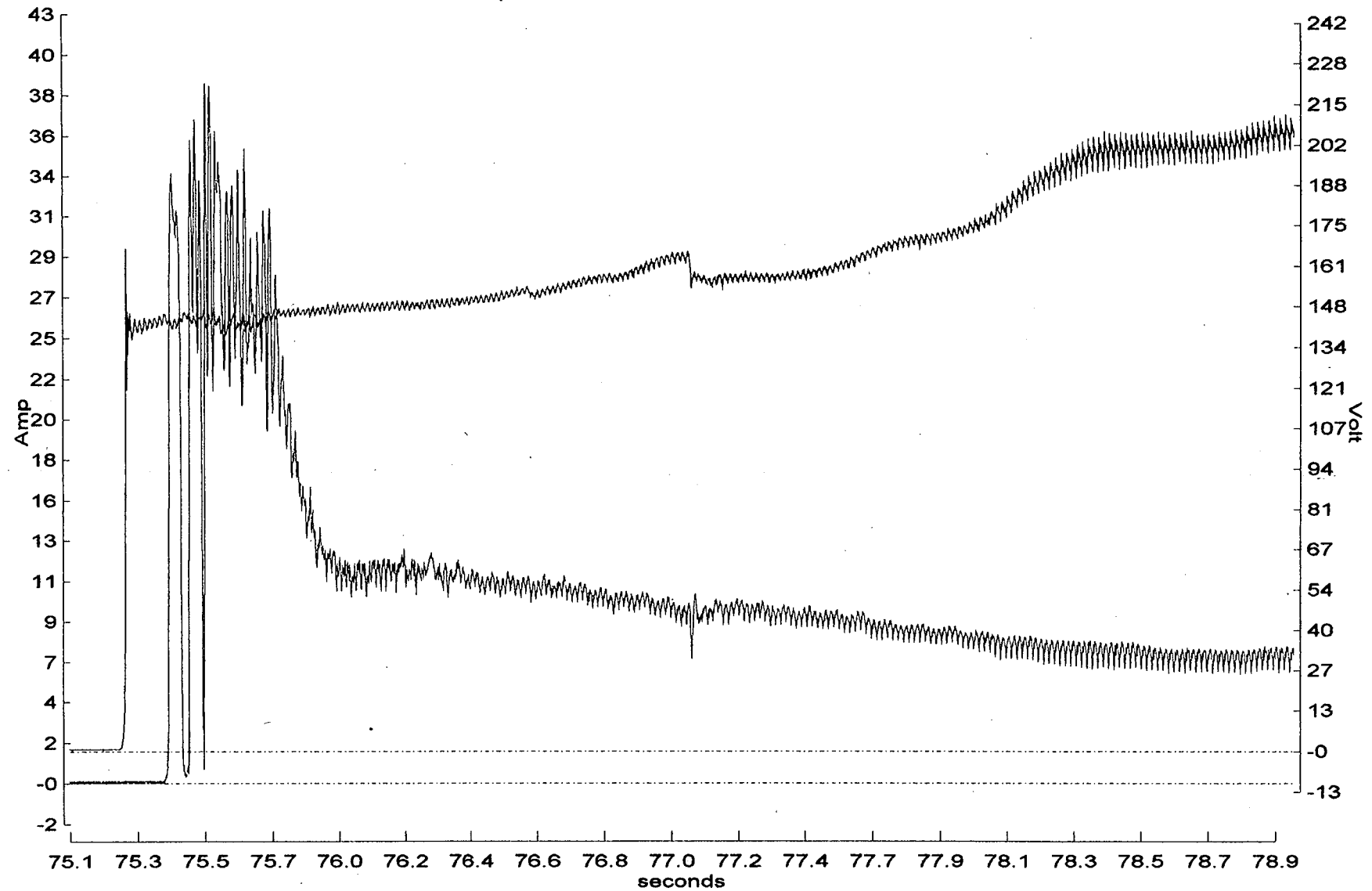
3HP-026

ES Test # 4

Full Stroke Voltage and Current

Figure 4.4.9.2-1: Test 4, 3HP-26 Full Stroke Voltage and Current

<1> M Test: Ocone 3 3HP026 1-4-97 4:34p 134.3 ES 4

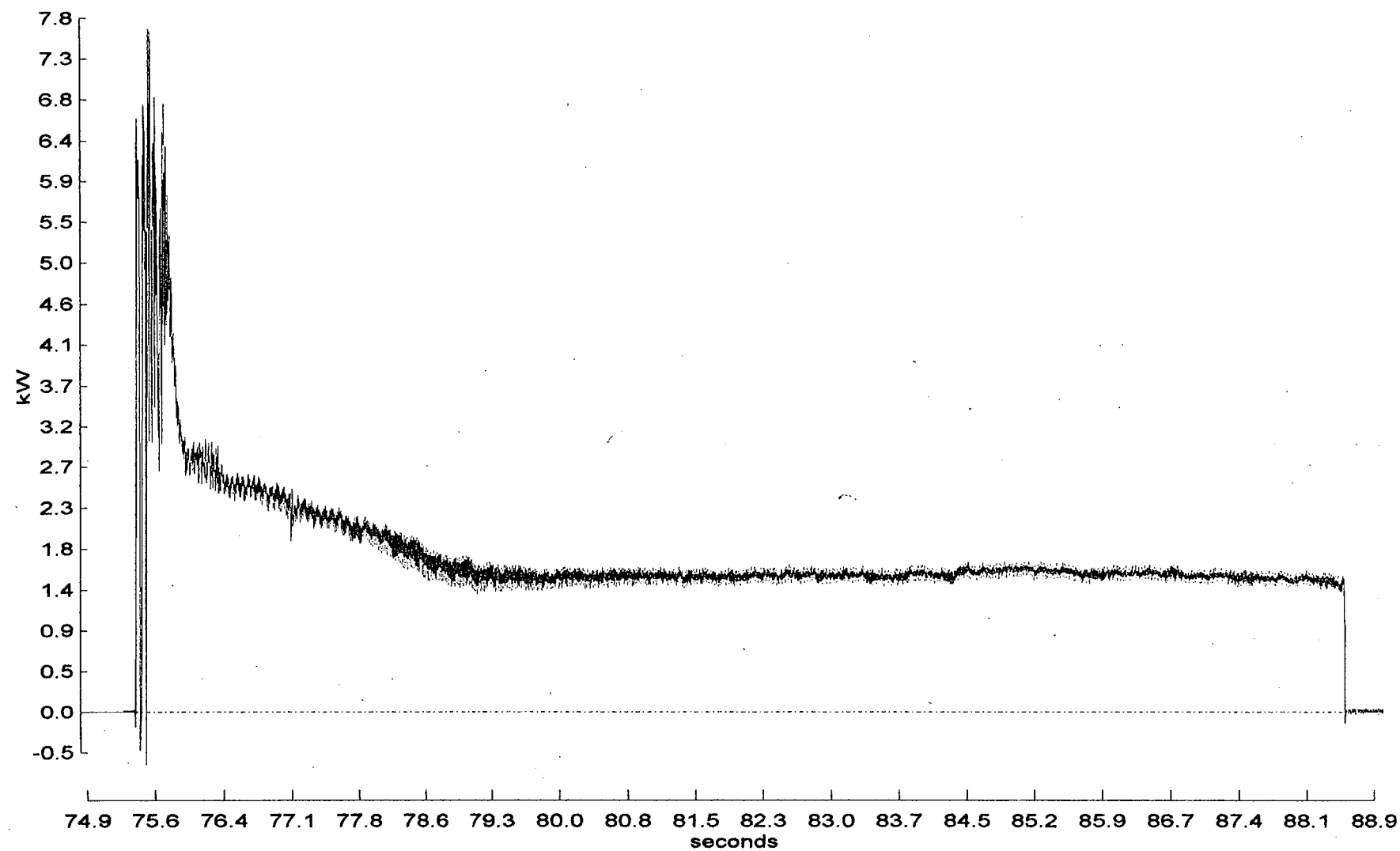


Cursor coordinates = 88.1seconds, 306Amp

— Vab-rms — Ia-rms

3HP-026
ES Test # 4
Inrush Voltage and Current

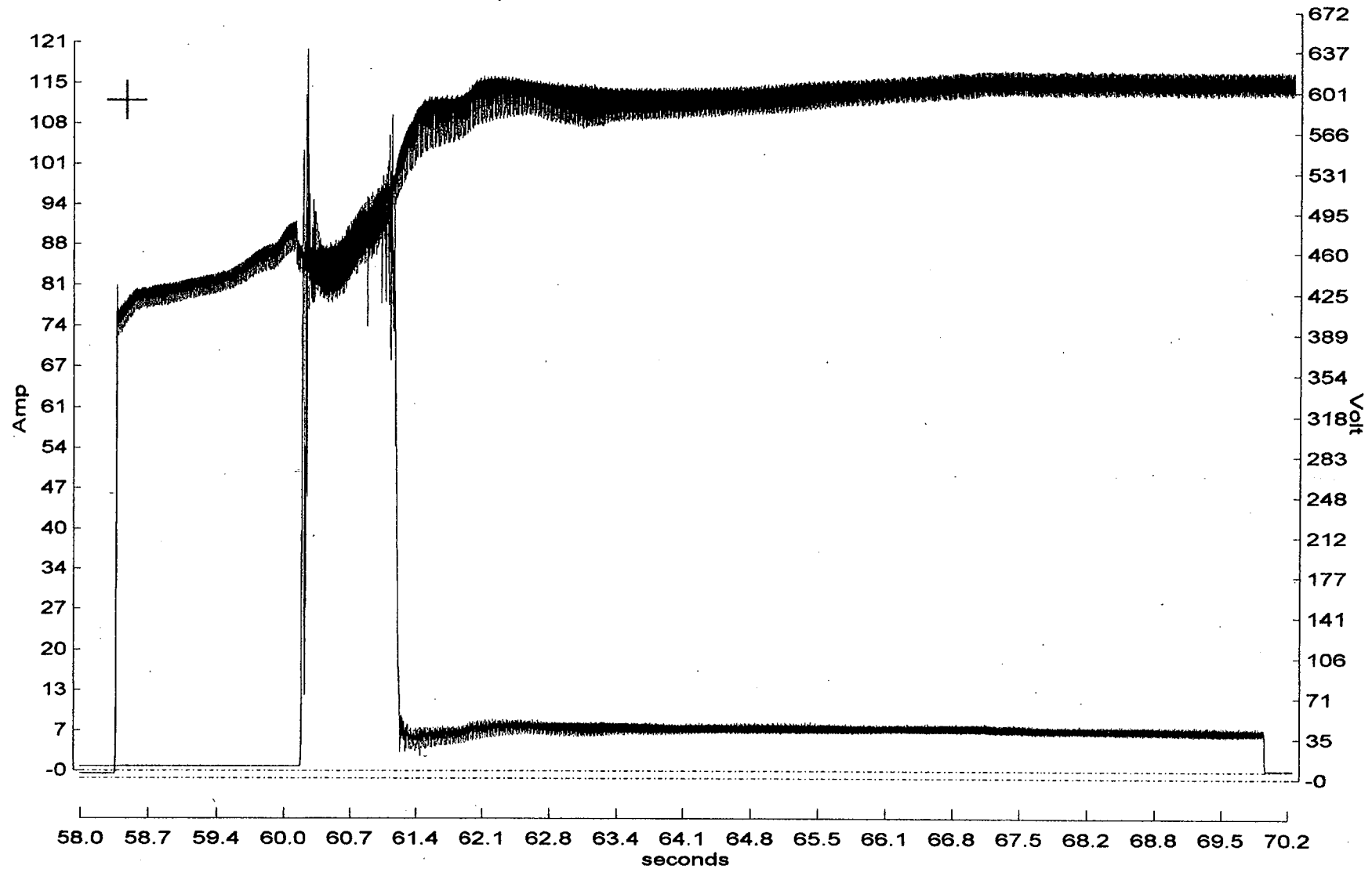
Figure 4.4.9.2-2: Test 4, 3HP-26 Inrush Voltage and Current



Cursor coordinates = 77.8seconds, 23kW
TRP

3HP-026
ES Test # 4
Full Stroke Total Real Power

Figure 4.4.9.2-3: Test 4, 3HP-26 Full Stroke Total Real Power (KW)



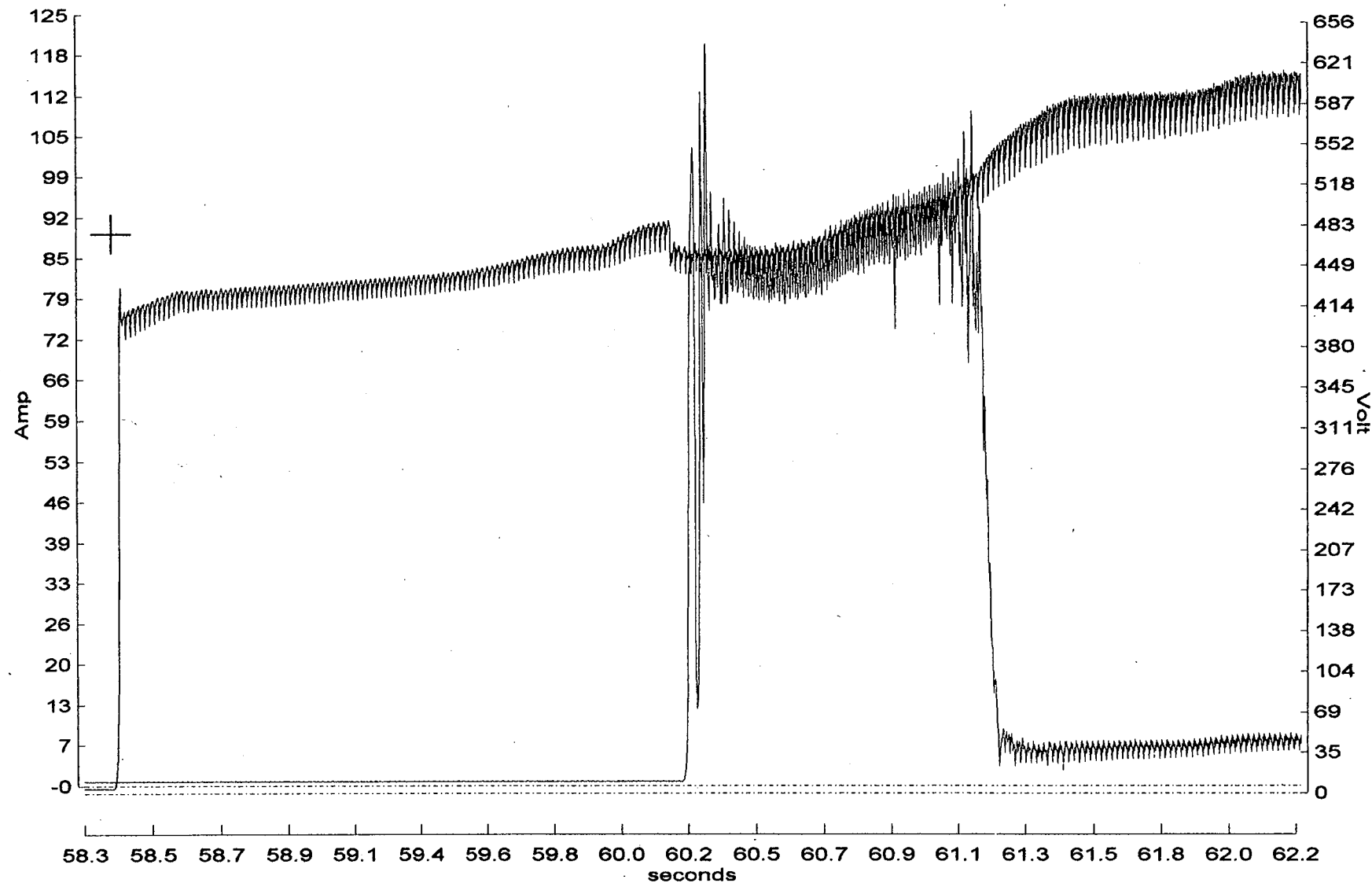
Cursor coordinates = 58.5seconds, 112Amp

— Vab-rms — Ia-rms

3LP-017
ES Test # 4
Full Stroke Voltage and Current

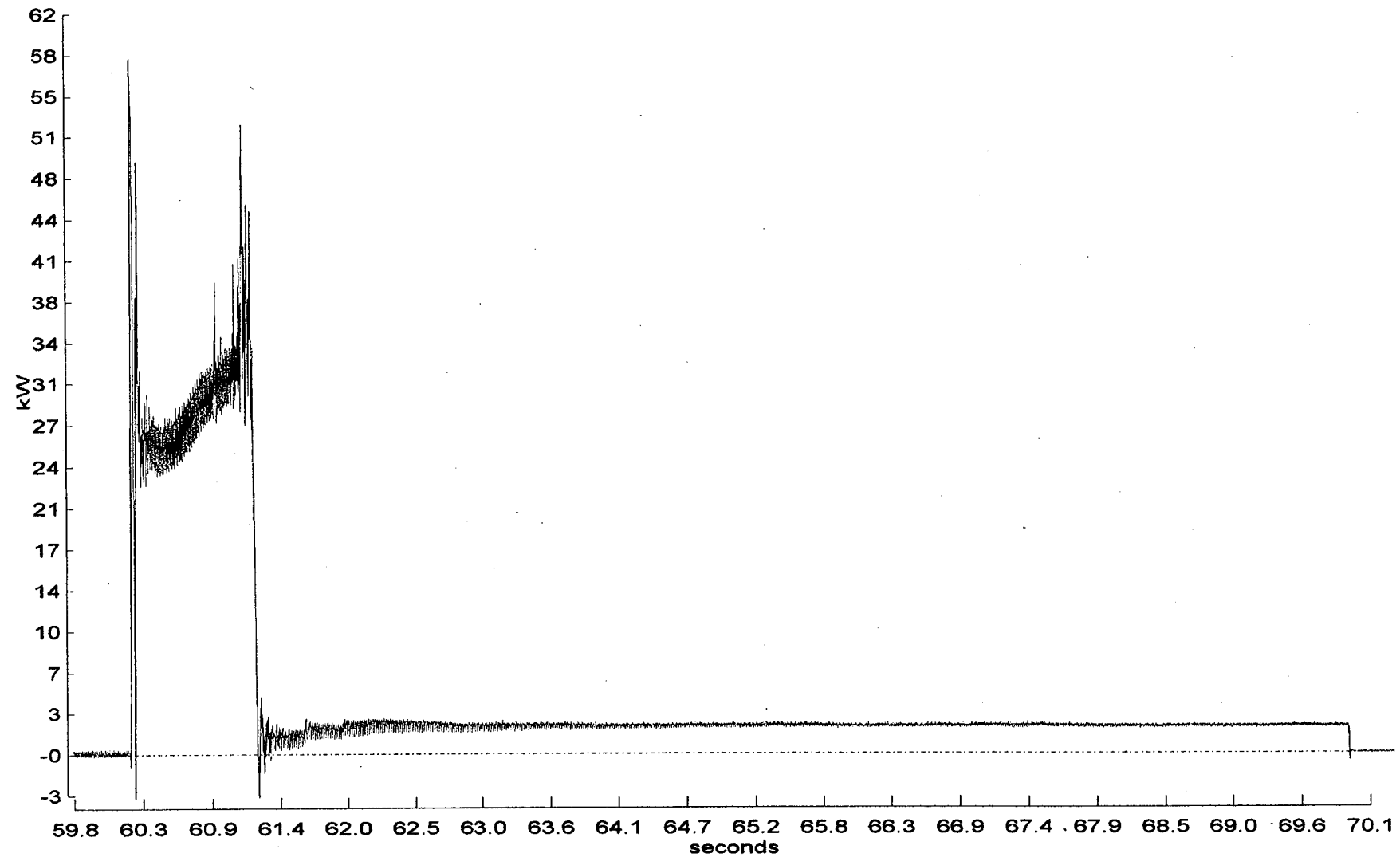
Figure 4.4.9.3-1: Test 4, 3HP-17 Full Stroke Voltage and Current

<1> Test: Ocone 3 3LP017 1-4-97 4:36p 130.5 4 ES



3LP-017
ES Test # 4
Inrush Voltage and Current

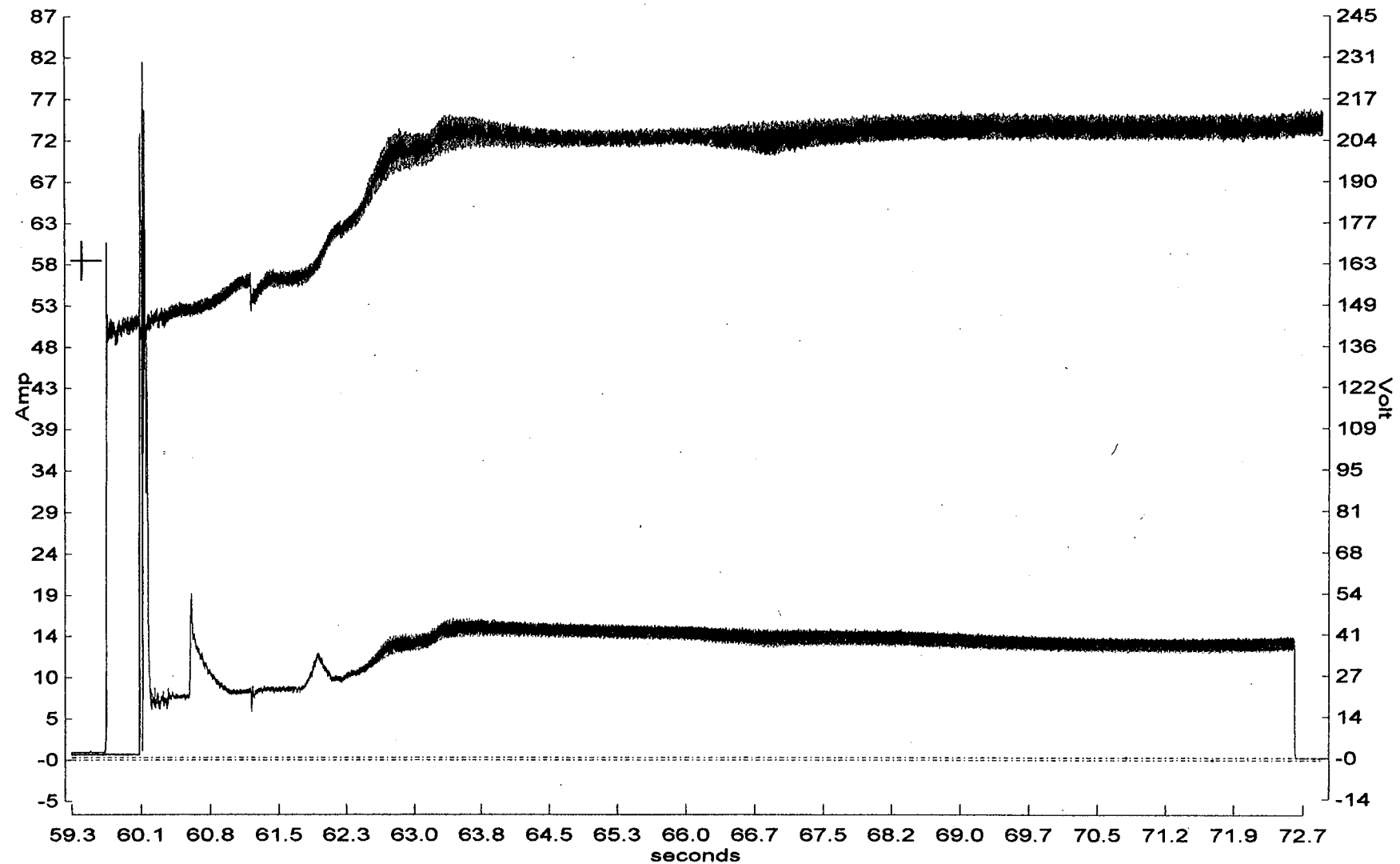
Figure 4.4.9.3-2: Test 4, 3LP-17 Inrush Voltage and Current



Cursor coordinates = 60.8seconds, 117kW
— TRP

3LP-017
ES Test # 4
Full Stroke Total Real Power

Figure 4.4.9.3-3: Test 4, 3LP-17 Full Stroke Total Real Power (KW)



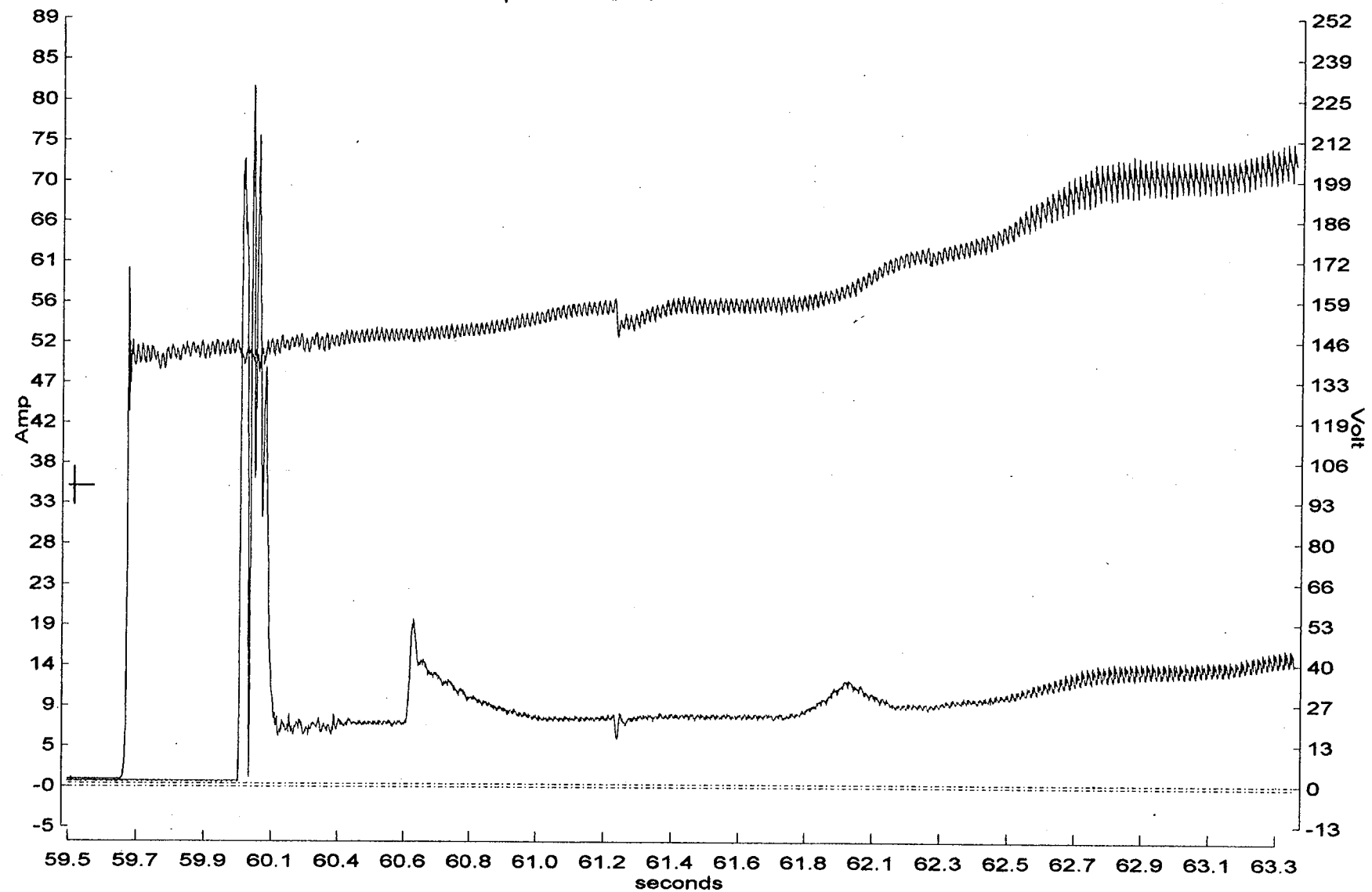
Cursor coordinates = 59.4seconds, 58.3Amp

— Vab-rms — Ia-rms

3BS-002
ES Test # 4
Full Stroke Voltage and Current

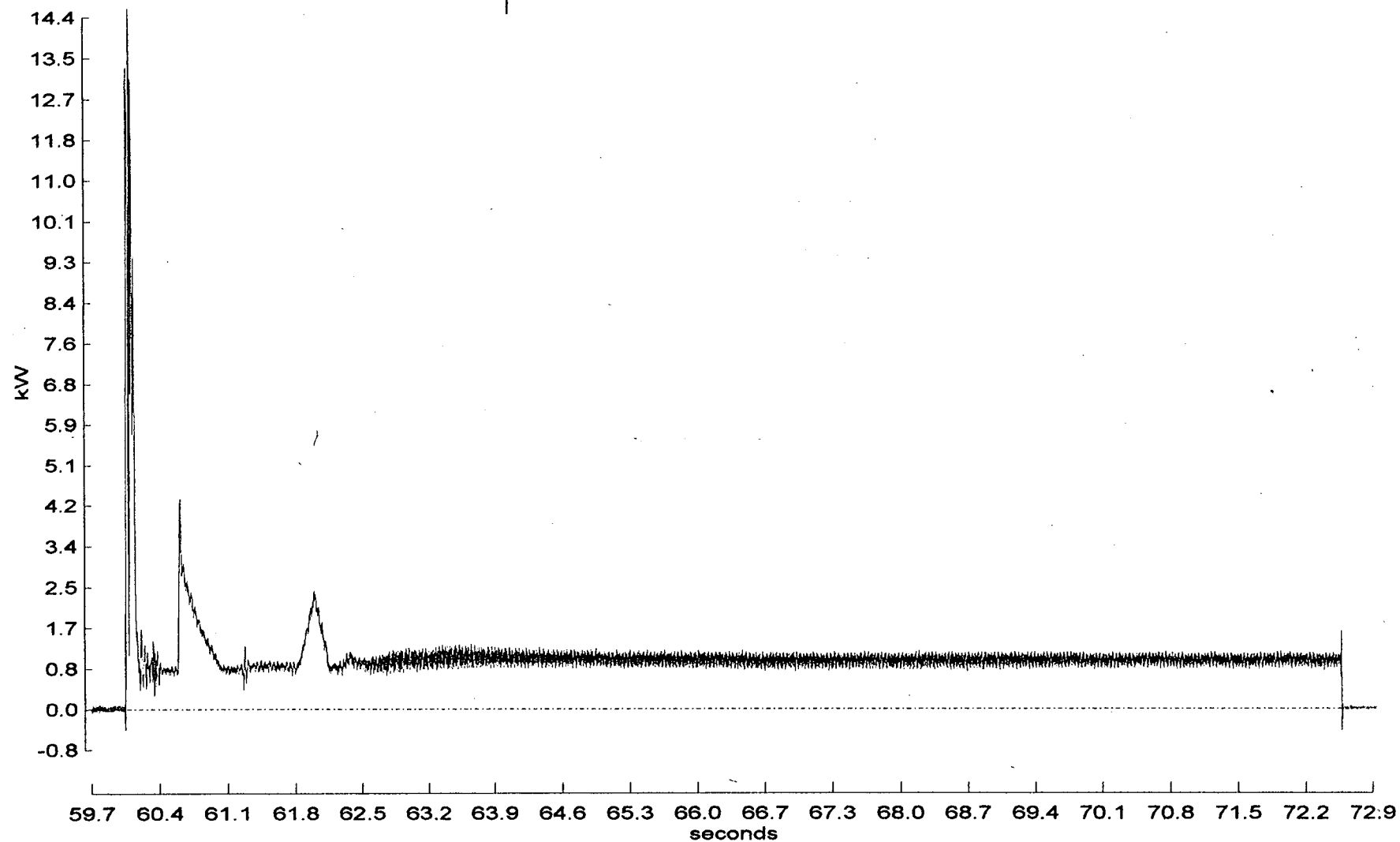
Figure 4.4.9.4-1: Test 4, 3BS-2 Full Stroke Voltage and Current

<1> M Test: Ocone 3 3BS002 1-4-97 4:34p 133.3 ES 4



3BS-002
ES Test # 4
Inrush Voltage and Current

Figure 4.4.9.4-2: Test 4, 3BS-2 Inrush Voltage and Current

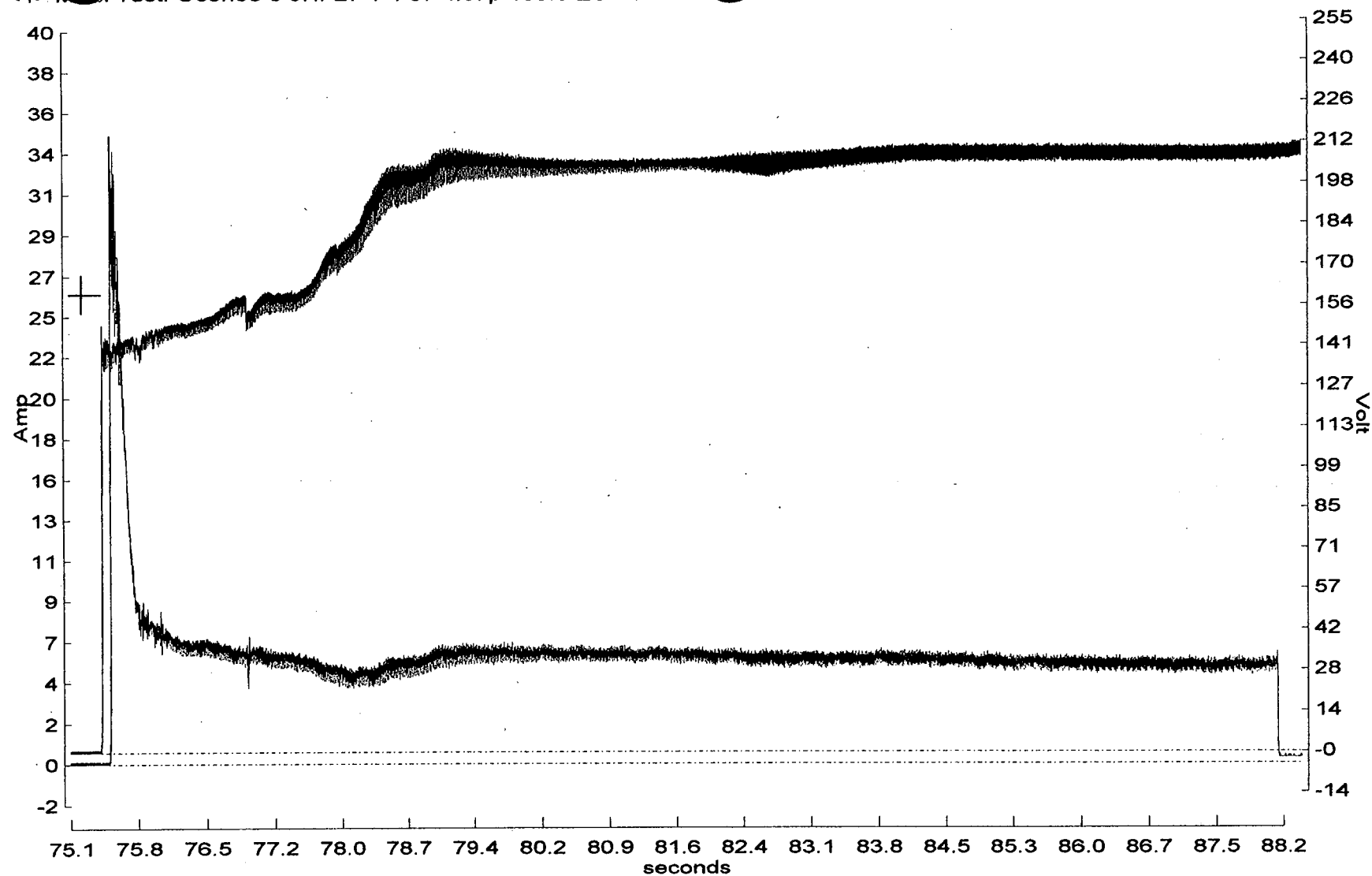


Cursor coordinates = 64seconds, 14.8kW
TRP

3BS-002
ES Test # 4
Full Stroke Total Real Power

Figure 4.4.9.4-3: Test 4, 3BS-2 Full Stroke Total Real Power (KW)

<1> Test: Ocone 3 3HP27 1-4-97 4:37p 133.5 ES 4



Cursor coordinates = 75.2seconds, 25.8Amp

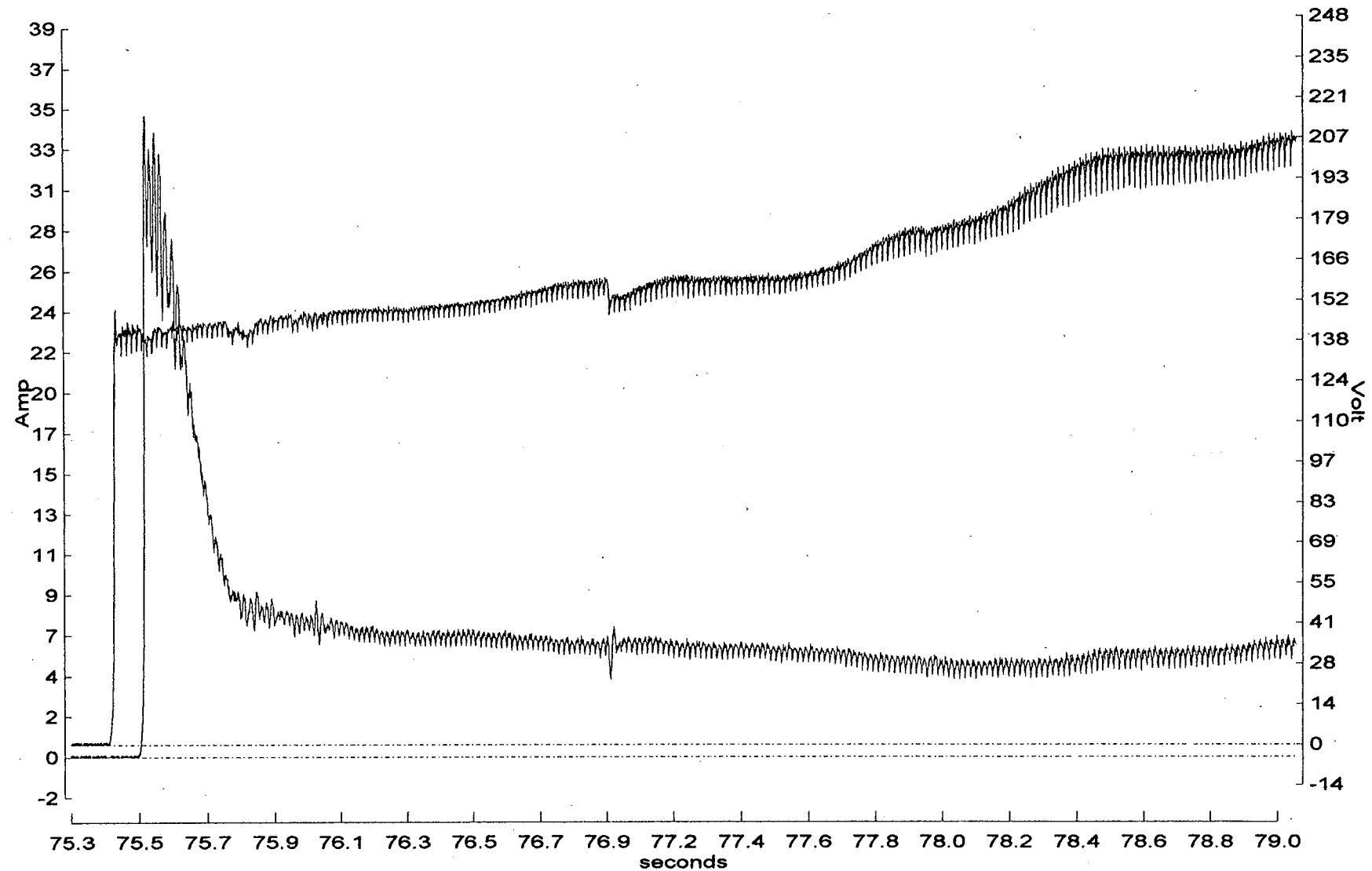
— Vab-rms — Ia-rms

3HP-027

ES Test # 4

Full Stroke Voltage and Current

Figure 4.4.9.5-1: Test 4, 3HP-27 Full Stroke Voltage and Current



Cursor coordinates = 82seconds, 376Amp

— Vab-rms — Ia-rms

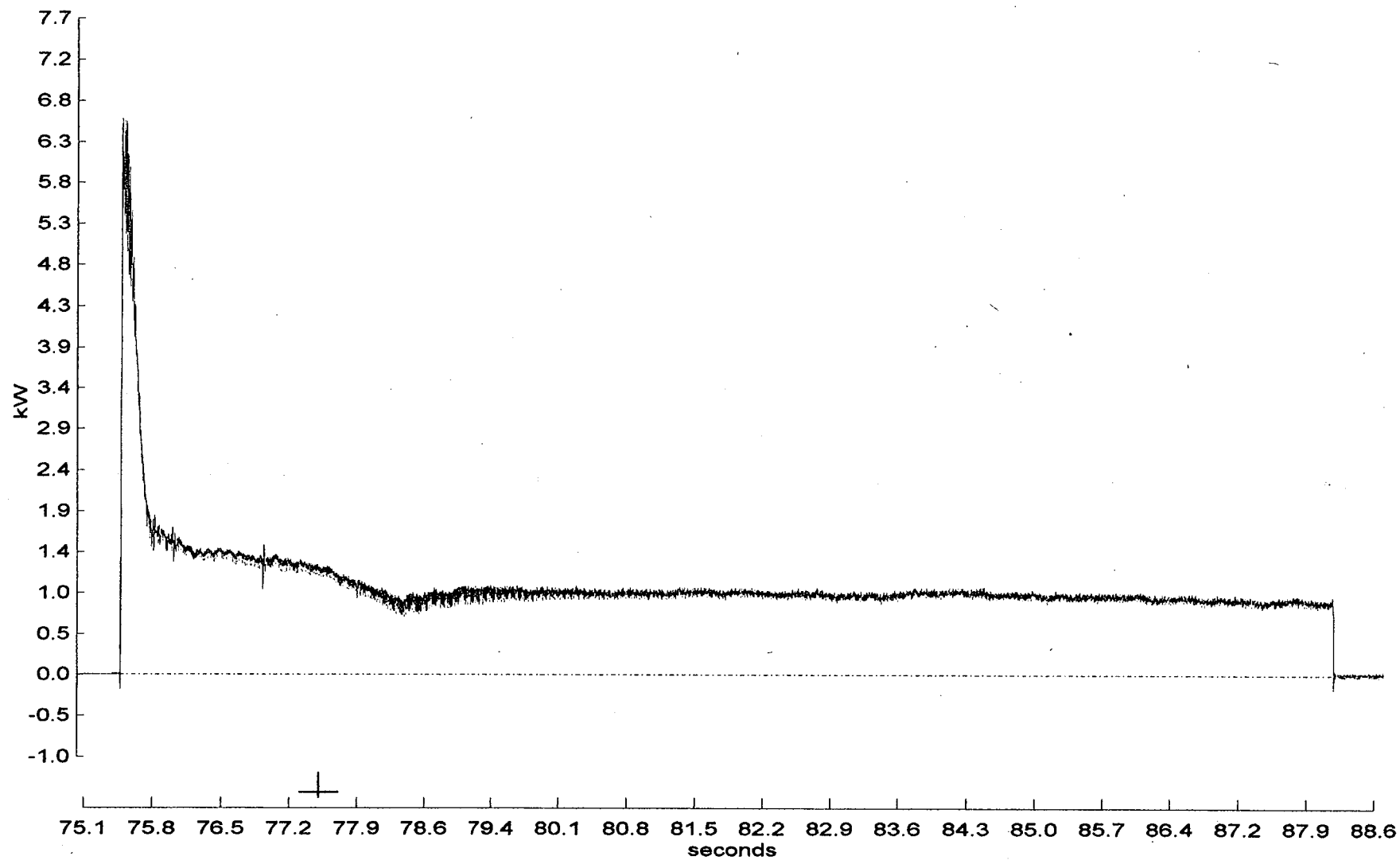
3HP-027

ES Test # 4

Inrush Voltage and Current

Figure 4.4.9.5-2: Test 4, 3HP-27 Inrush Voltage and Current

<1> Test: Ocone 3 3HP27 1-4-97 4:37p 133.5 ES 4



Cursor coordinates = 77.5seconds, -1.37kW

TRP

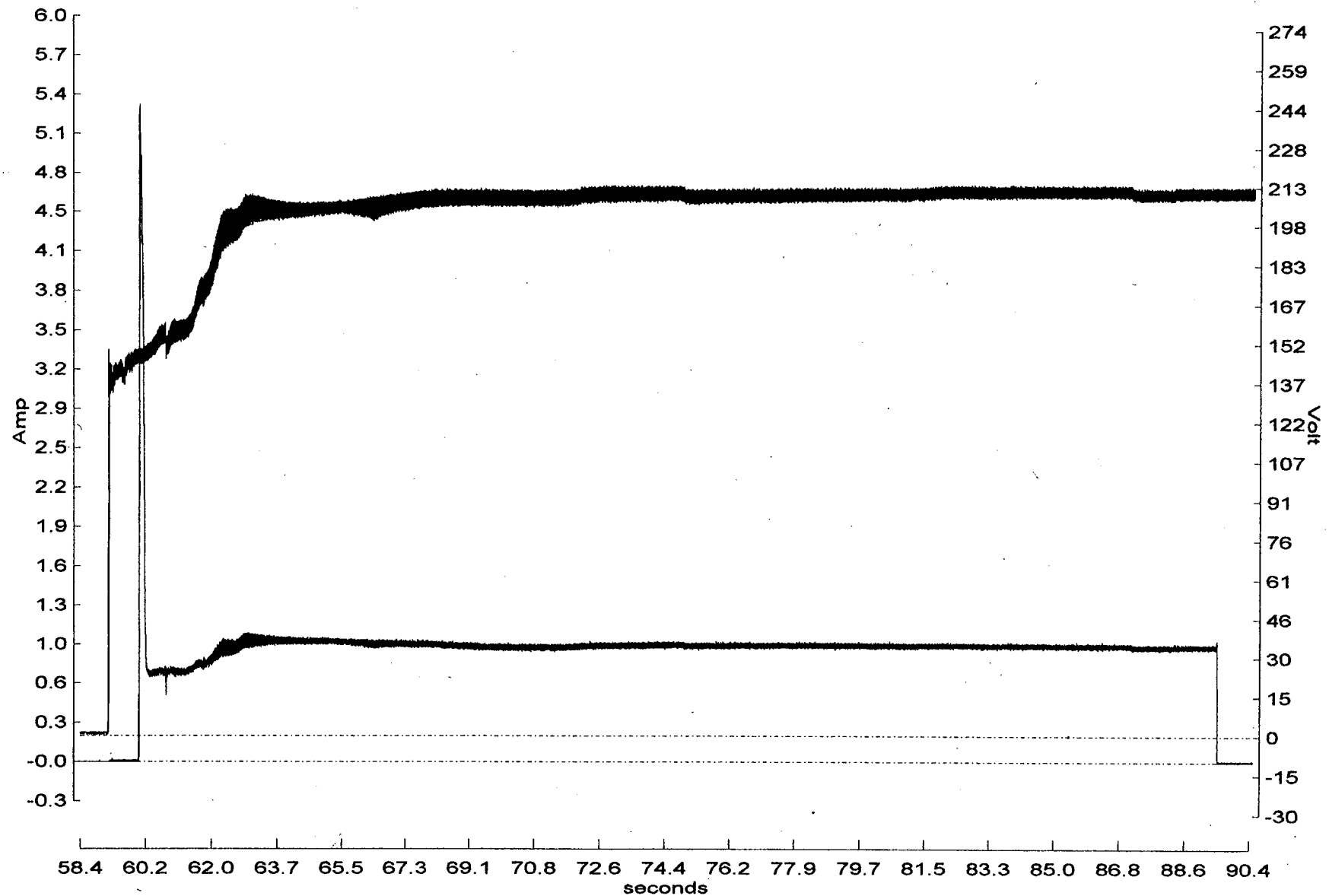
3HP-027

ES Test # 4

Full Stroke Total Real Power

Figure 4.4.9.5-3: Test 4, 3HP-27 Full Stroke Total Real Power (KW)

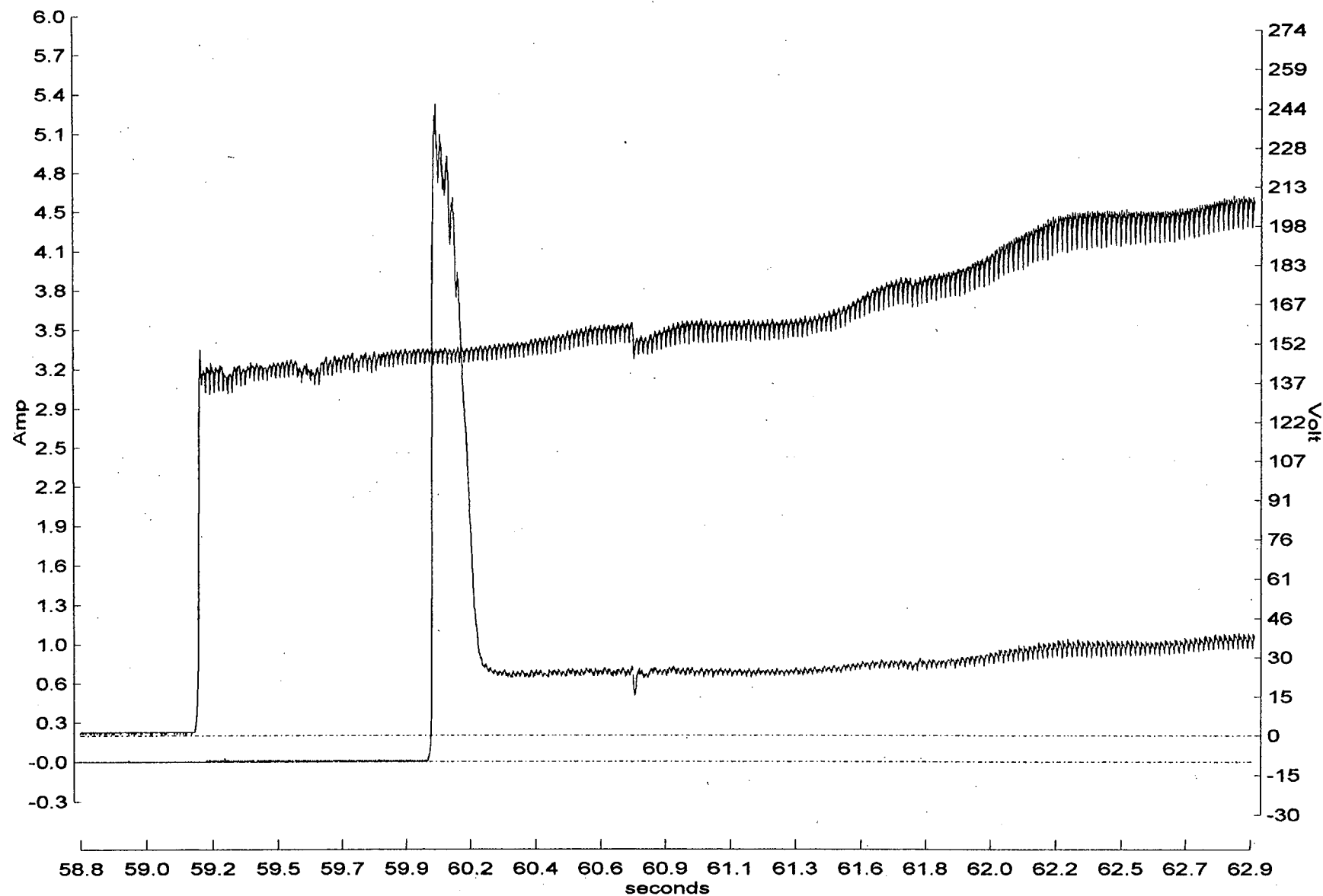
<1> Test: Ocone 3 3LPS024 1-4-97 4:34p 150.0 ES 4



Cursor coordinates = 85.6seconds, 3.54Amp
Vab-rms Ia-rms

3LPSW-024
ES Test # 4
Full Stroke Voltage and Current

Figure 4.4.9.6-1: Test 4, 3LPSW-24 Full Stroke Voltage and Current

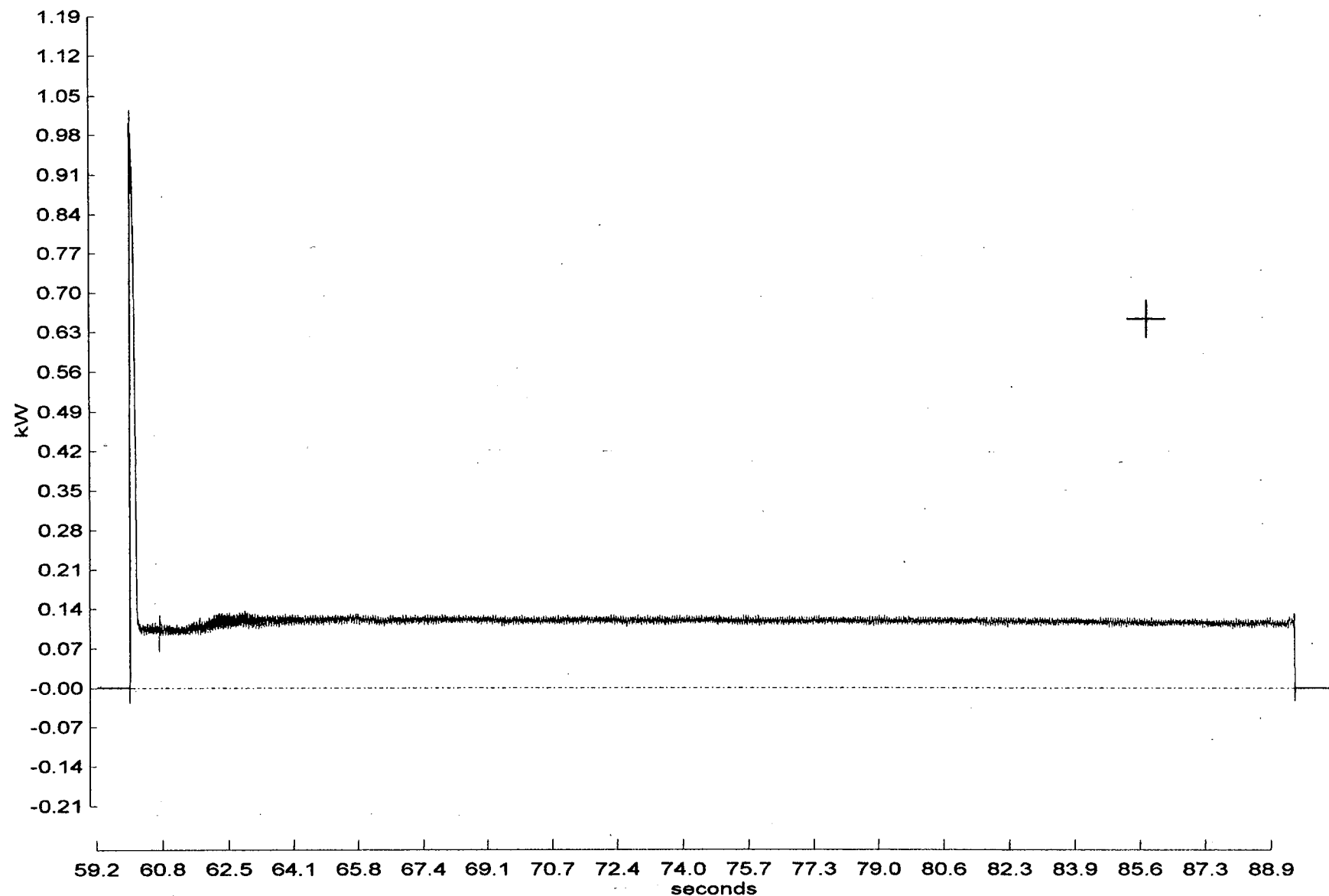


Cursor coordinates = 62.2seconds, 3.37Amp
——Vab-rms——Ia-rms

3LPSW-024
ES Test # 4
Inrush Voltage and Current

Figure 4.4.9.6-2: Test 4, 3LPSW-24 Inrush Voltage and Current

<1> M Test: Ocone 3 3LPS024 1-4-97 4:34p 150.0 ES 4



Cursor coordinates = 85.7seconds, 0.651kW

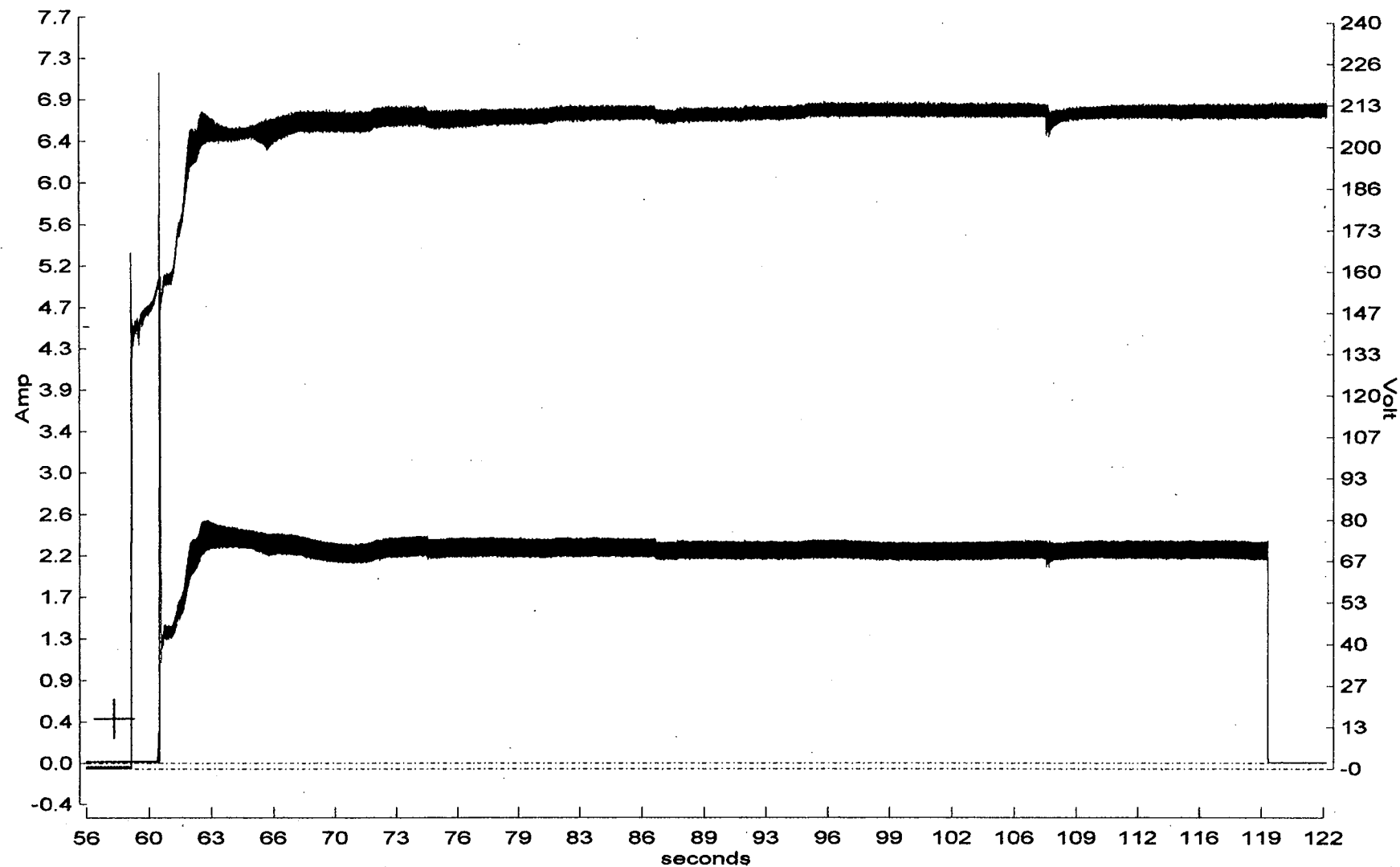
— TRP

3LPSW-024

ES Test # 4

Full Stroke Total Real Power

Figure 4.4.9.6-3: Test 4, 3LPSW-24 Full Stroke Total Real Power (KW)



Cursor coordinates = 125seconds, 28.5Amp

— Vab-rms — Ia-rms

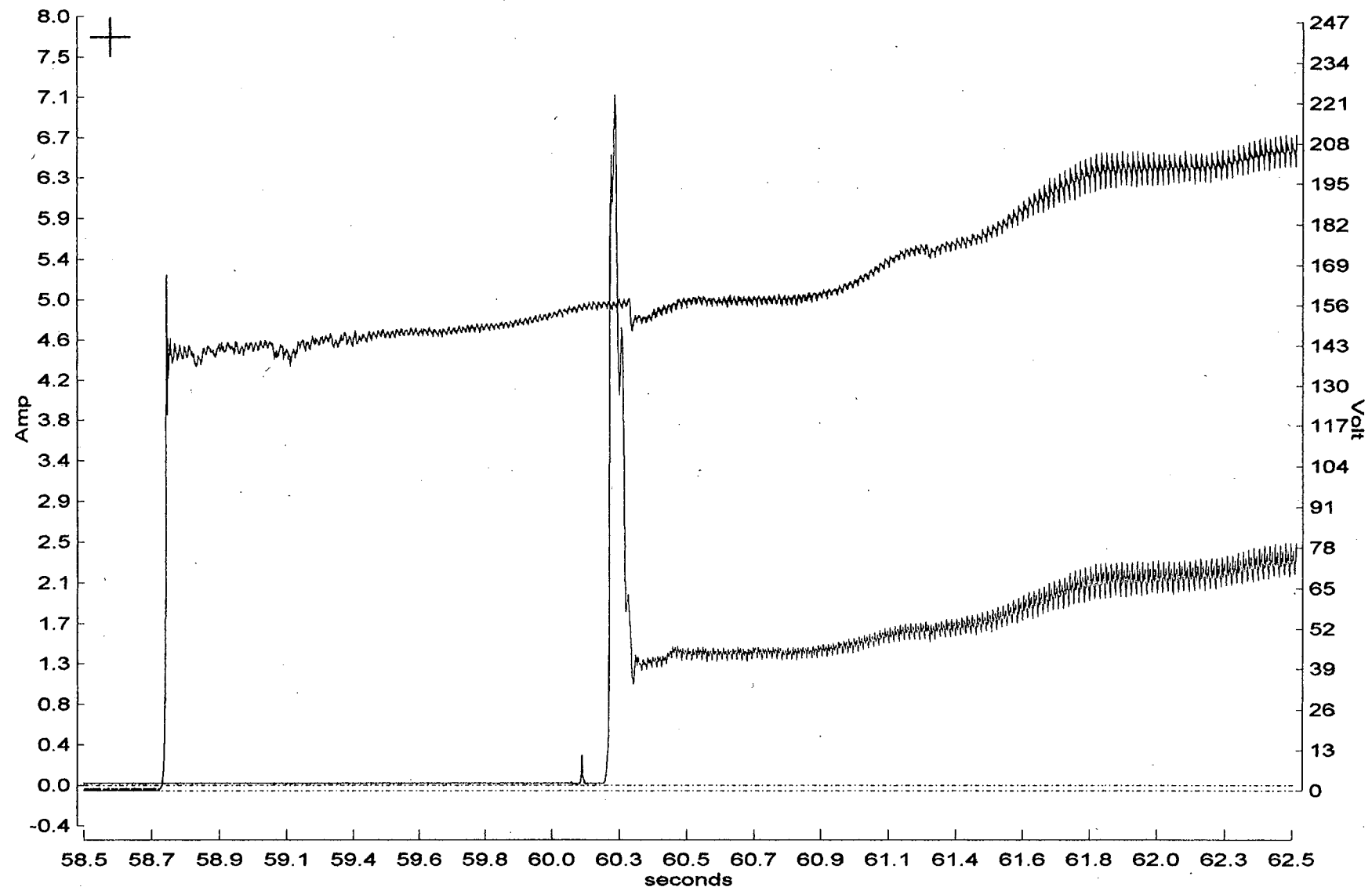
3PR-019

ES Test # 4

Full Stroke Voltage and Current

Figure 4.4.9.7-1: Test 4, 3PR-19 Full Stroke Voltage and Current

<1> Test: Ocone 3 3PR019 1-4-97 4:33p 180.0 ES 4



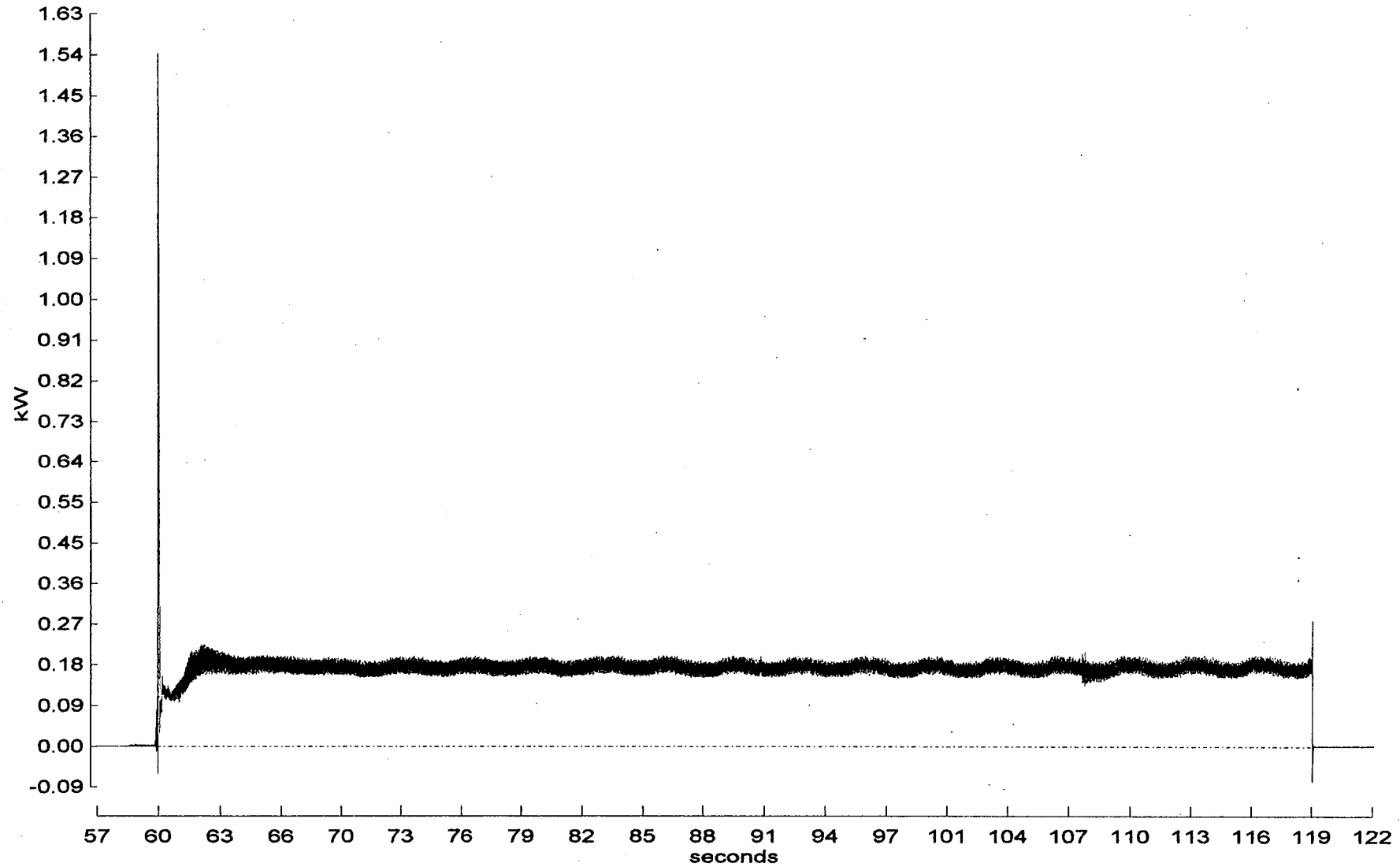
Cursor coordinates = 58.6seconds, 7.74Amp

— Vab-rms — Ia-rms

3PR-019
ES Test # 4
Inrush Voltage and Current

Figure 4.4.9.7-2: Test 4, 3PR-19 Inrush Voltage and Current

<1> Test: Ocone 3 3PR019 1-4-97 4:33p 180.0 ES 4



Cursor coordinates = 61.1seconds, 4.21kW

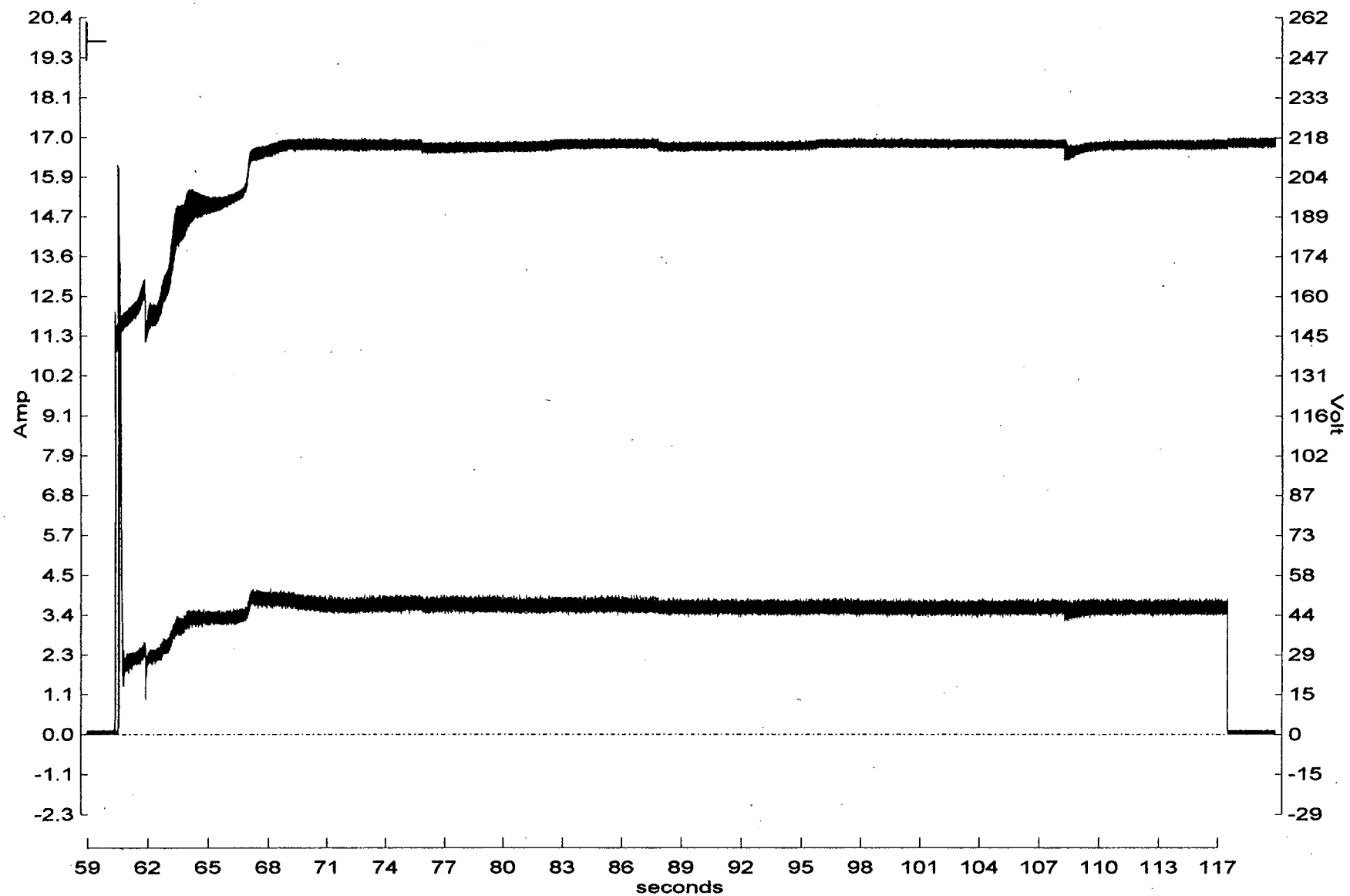
TRP

3PR-019

ES Test # 4

Full Stroke Total Real Power

Figure 4.4.9.7-3: Test 4, 3PR-19 Full Stroke Total Real Power (KW)



Cursor coordinates = 58.6seconds, 19.7Amp

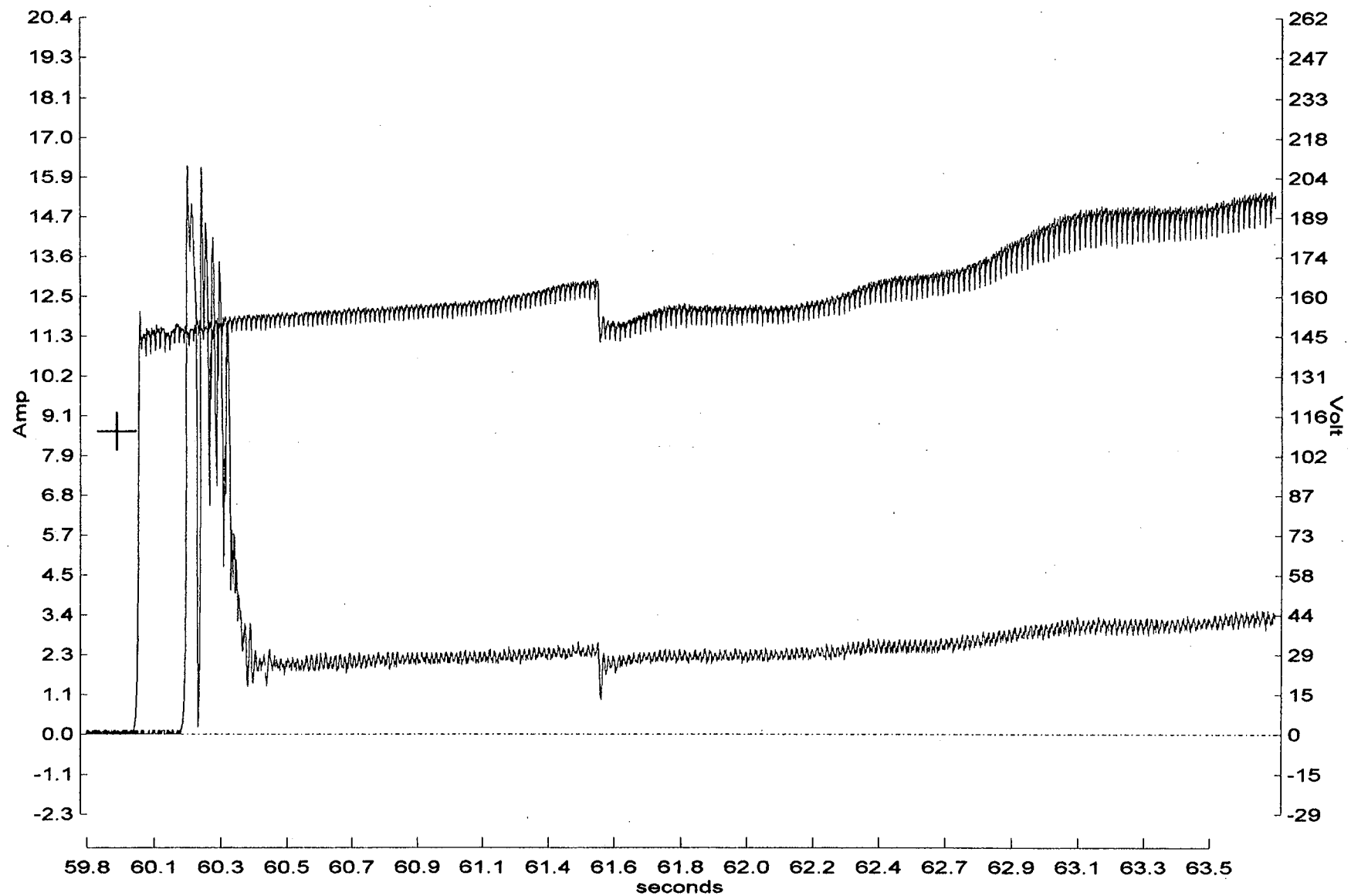
— Vab-rms — Ia-rms

3LPSW-006

ES Test # 4

Full Stroke Voltage and Current

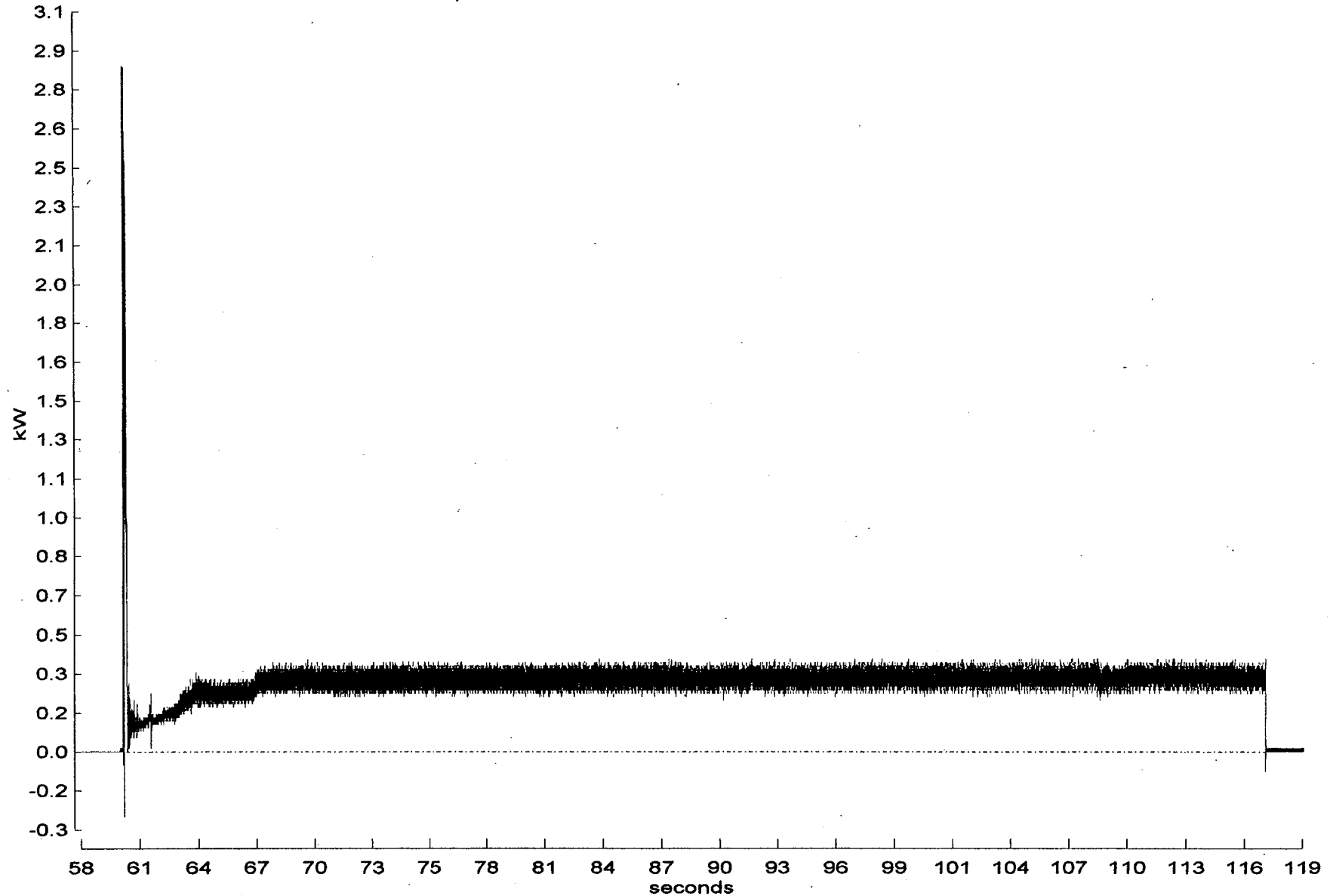
Figure 4.4.9.8-1: Test 4, 3LPSW-6 Full Stroke Voltage and Current



3LPSW-006
ES Test # 4
Inrush Voltage and Current

Figure 4.4.9.8-2: Test 4, 3LPSW-6 Inrush Voltage and Current

<1> Test: Ocone 3 3LPS6 1-4-97 4:36p 177.3 ES 4



Cursor coordinates = 62.3seconds, 20.4kW

TRP

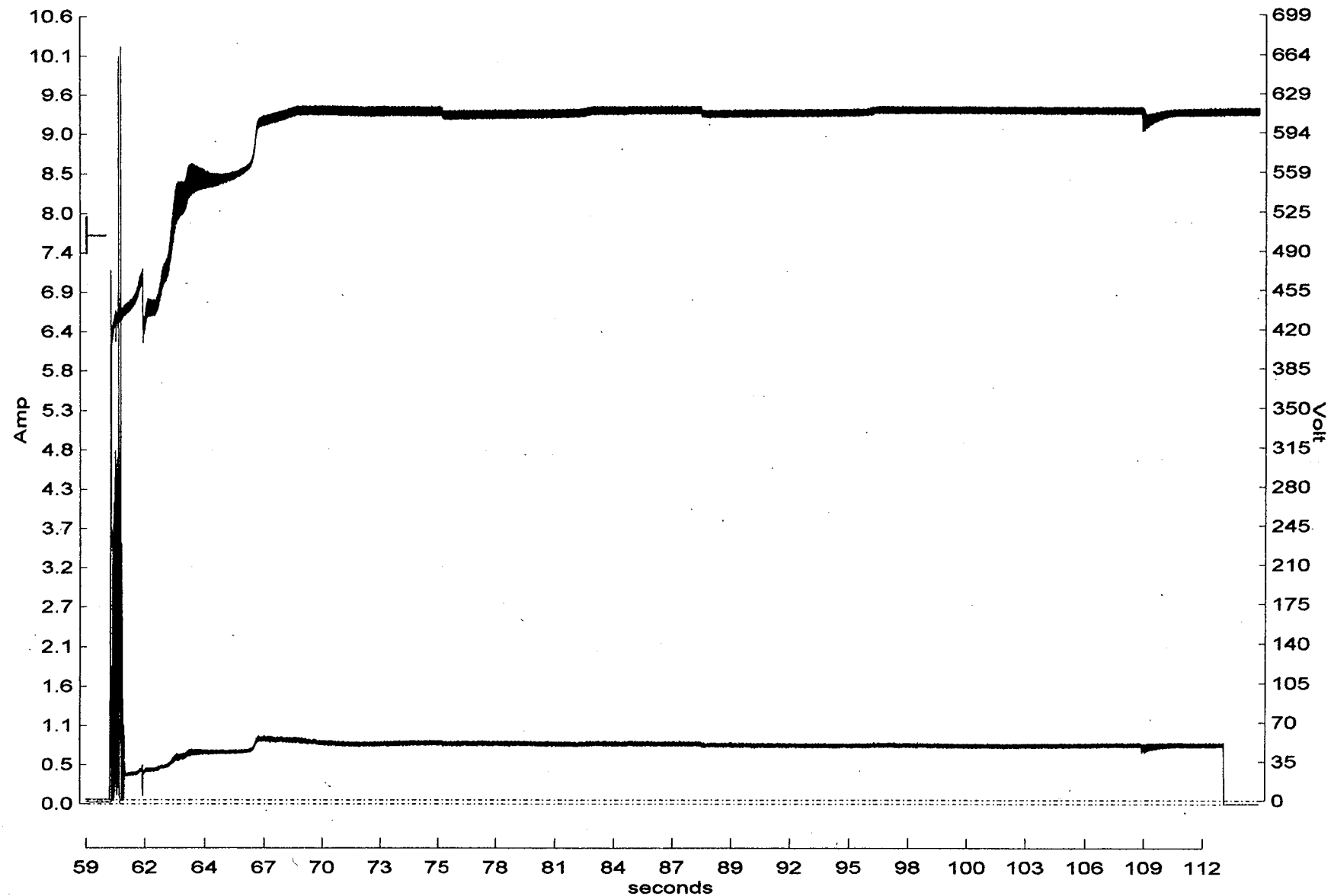
3LPSW-006

ES Test # 4

Full Stroke Total Real Power

Figure 4.4.9.8-3: Test 4, 3LPSW-6 Full Stroke Total Real Power (KW)

<1> M Test: Ocone 3 3LPS565 1-5-97 4:34a 173.0 ES 4



Cursor coordinates = 58.8seconds, 7.68Amp

— Vab-rms — Ia-rms

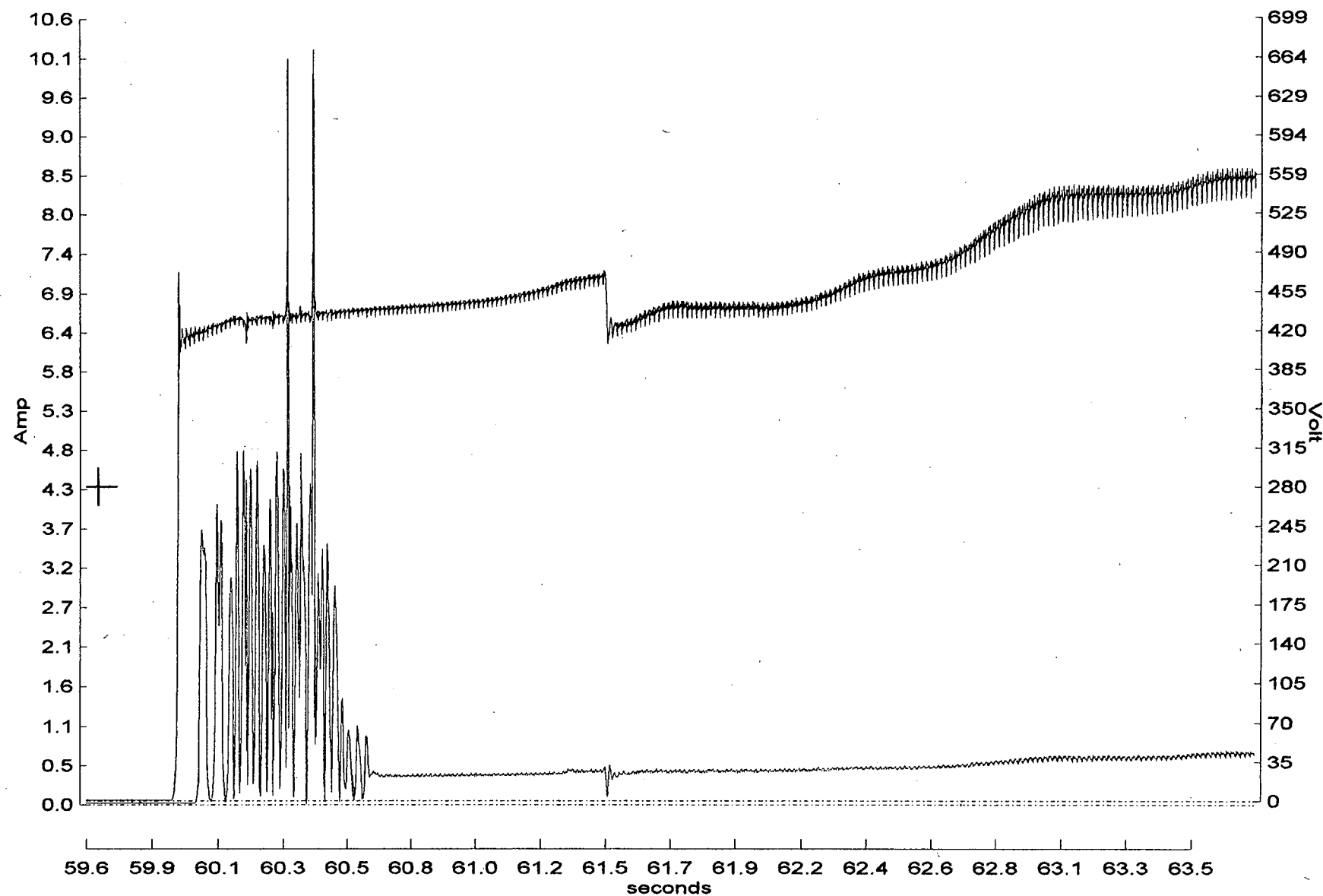
3LPSW-565

ES Test # 4

Full Stroke Voltage and Current

Figure 4.4.9.9-1: Test 4, 3LPSW-565 Full Stroke Voltage and Current

<1> M Test: Ocone 3 3LPS565 1-5-97 4:34a 173.0 ES 4



Cursor coordinates = 59.7seconds, 4.29Amp

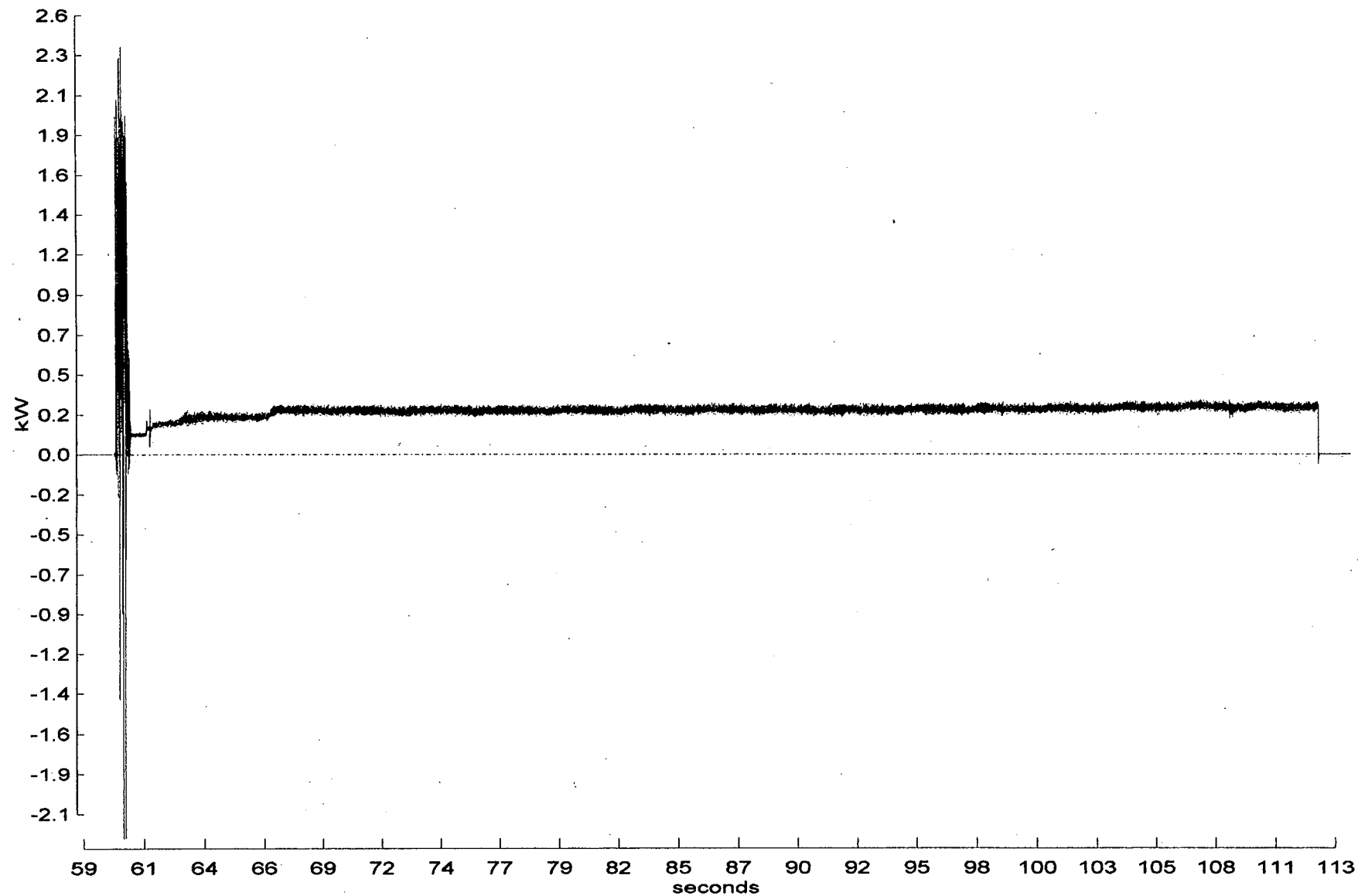
— Vab-rms — Ia-rms

3LPSW-565

ES Test # 4

Inrush Voltage and Current

Figure 4.4.9.9-2: Test 4, 3LPSW-565 Inrush Voltage and Current

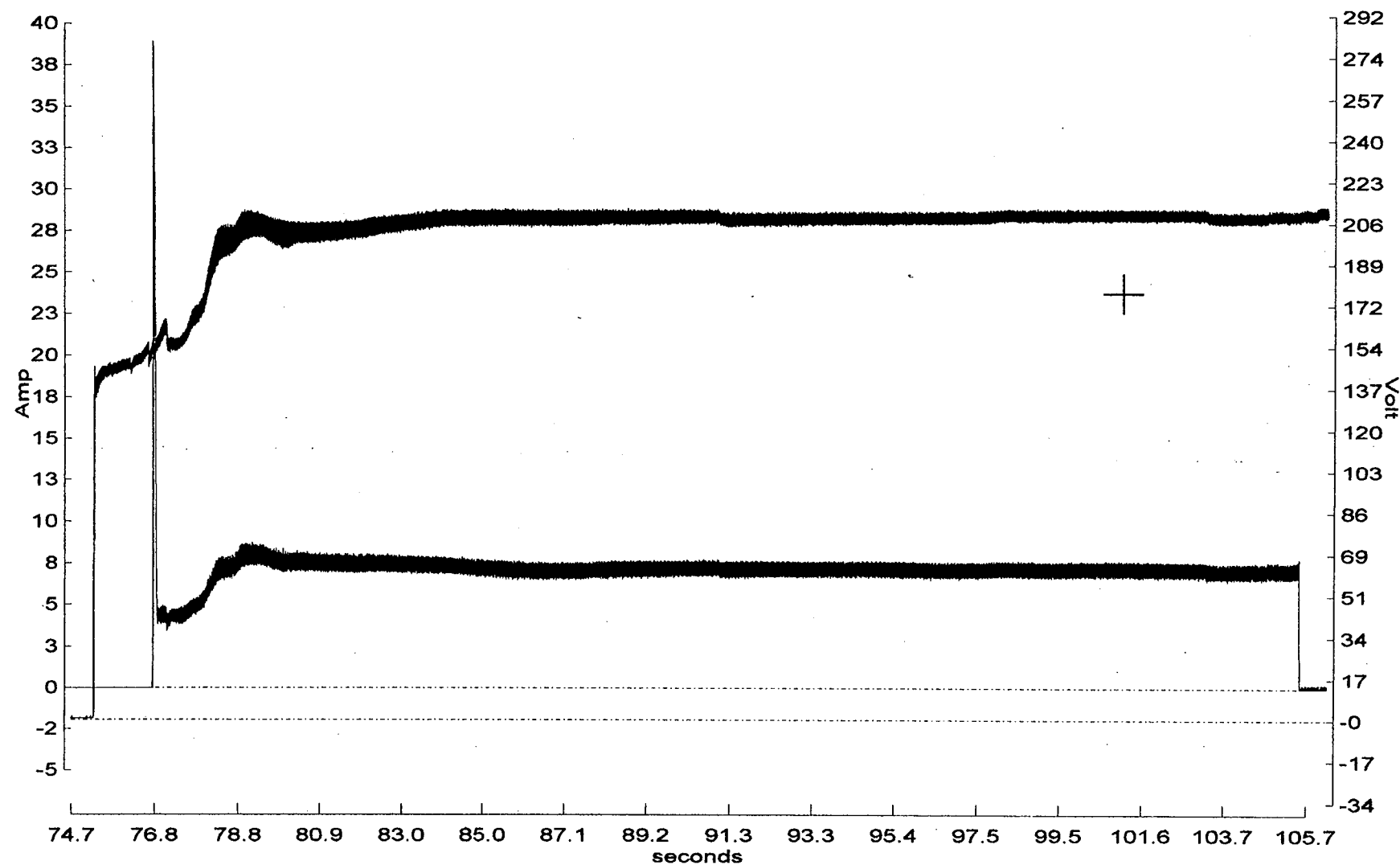


Cursor coordinates = 62.5seconds, 7.08kW

TRP

3LPSW-565
ES Test # 4
Full Stroke Total Real Power

Figure 4.4.9.9-3: Test 4, 3LPSW-565 Full Stroke Total Real Power (KW)



Cursor coordinates = 101seconds, 23.9Amp

— Vab-rms — Ia-rms

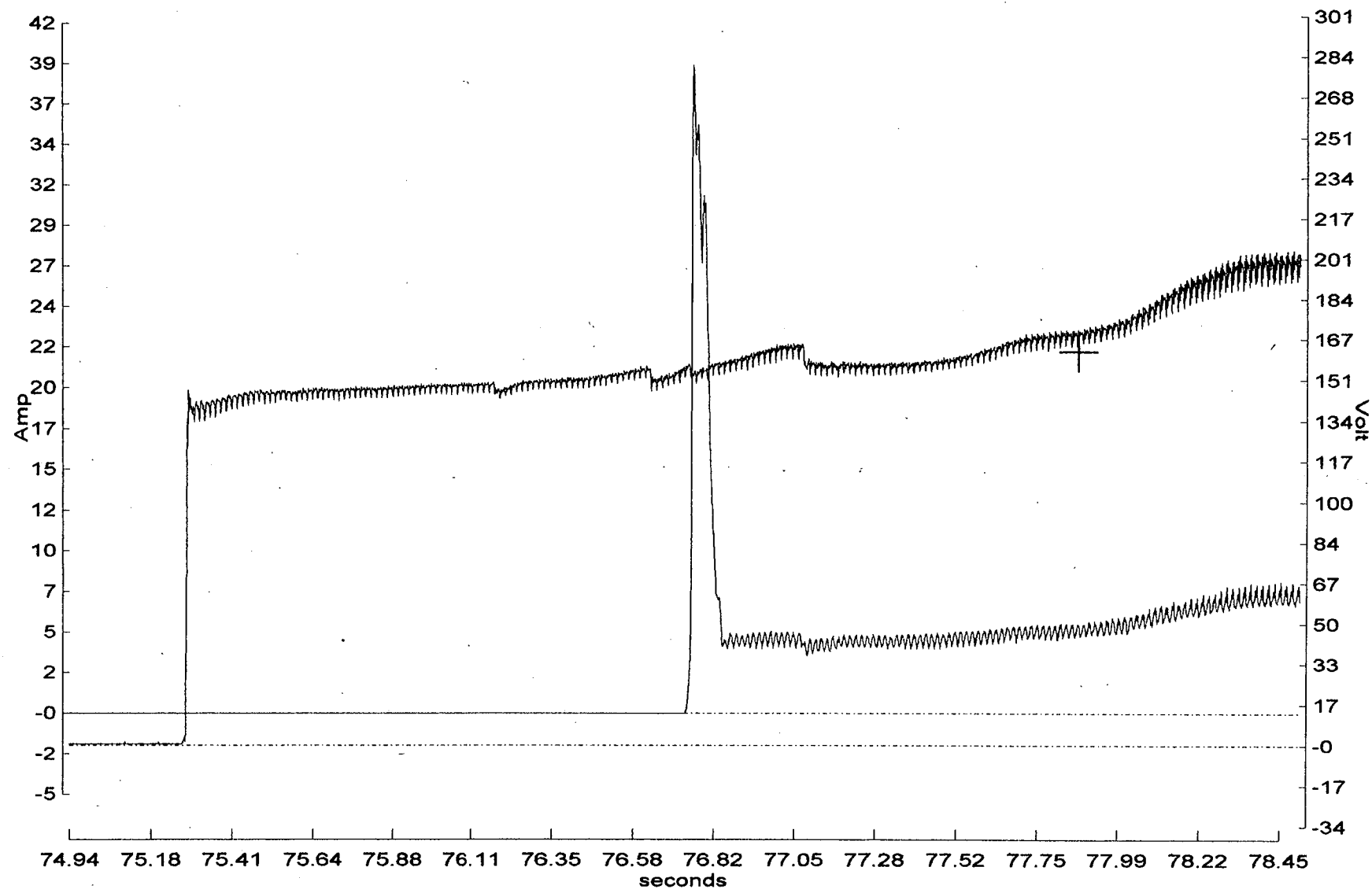
3HP-004

ES Test # 4

Full Stroke Voltage and Current

Figure 4.4.9.10-1: Test 4, 3HP-4 Full Stroke Voltage and Current

<1> Test: Ocone 3 3HP004 1-4-97 4:34p 149.8 ES 4



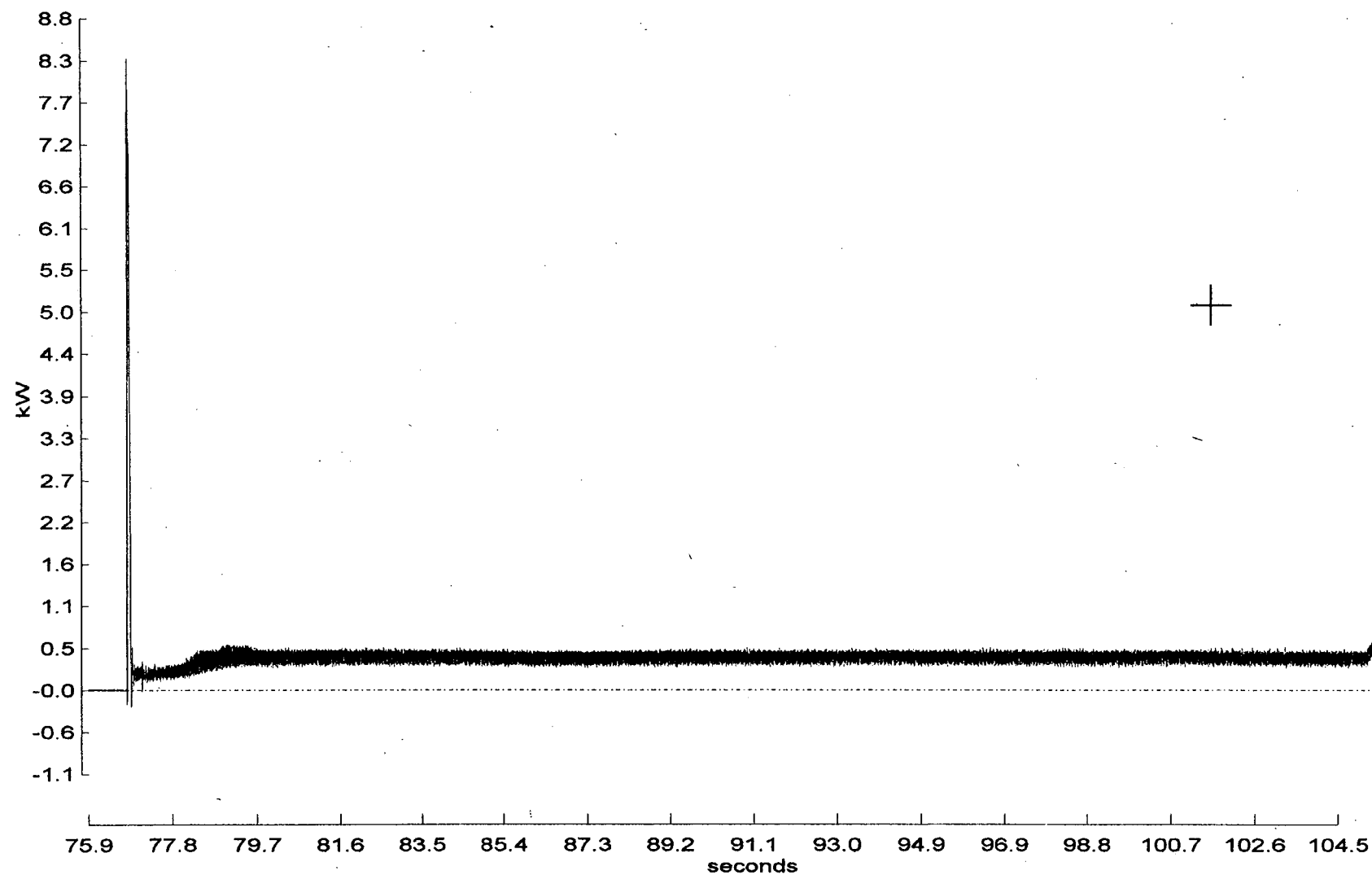
Cursor coordinates = 77.9seconds, 21.8Amp

— Vab-rms — ia-rms

3HP-004
ES Test # 4
Inrush Voltage and Current

Figure 4.4.9.10-2: Test 4, 3HP-4 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3HP004 1-4-97 4:34p 149.8 ES 4



Cursor coordinates = 102seconds, 5.05kW

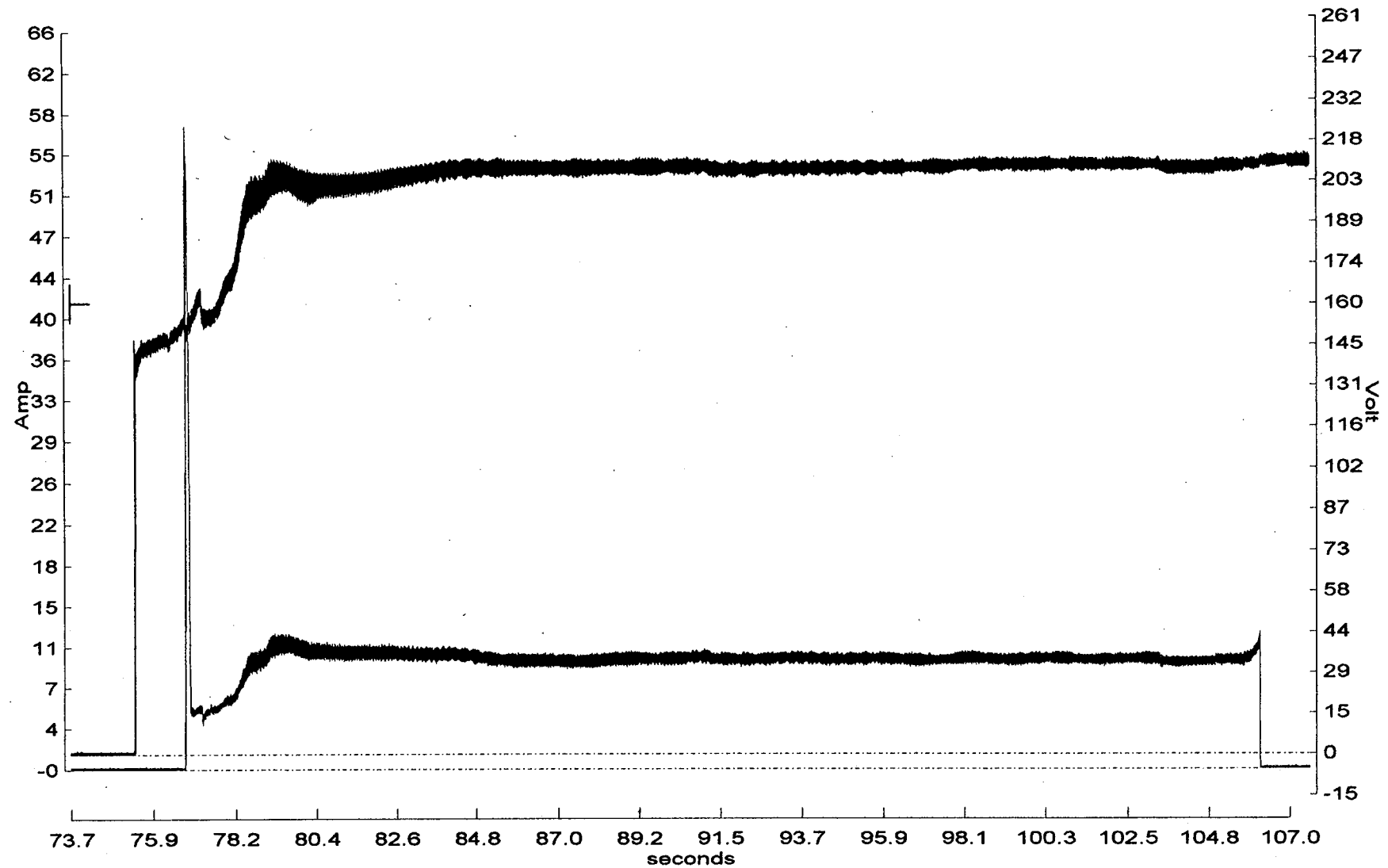
TRP

3HP-004

ES Test # 4

Full Stroke Total Real Power

Figure 4.4.9.10-3: Test 4, 3HP-4 Full Stroke Total Real Power (KW)



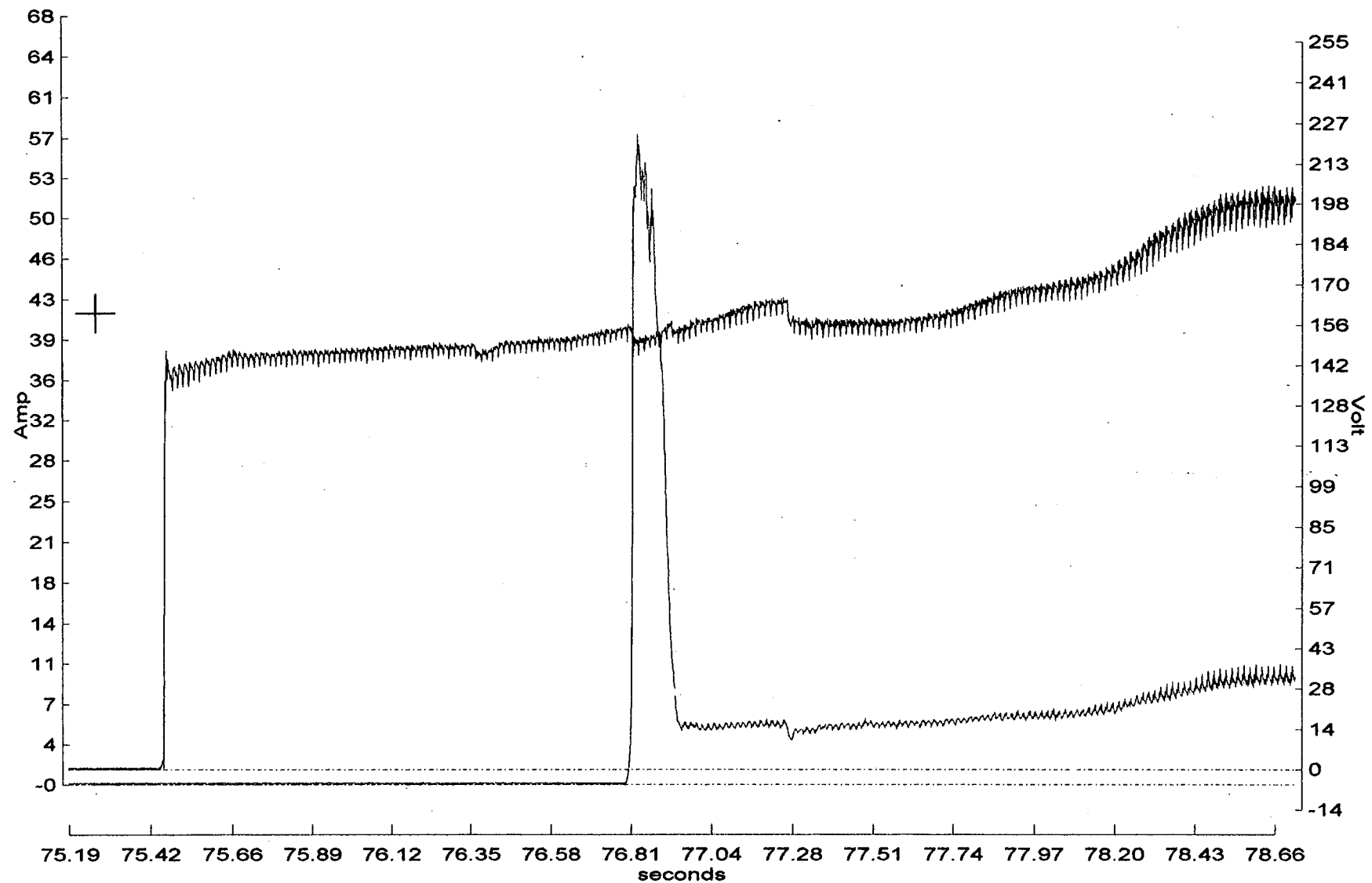
Cursor coordinates = 73.7seconds, 41.5Amp

— Vab-rms — Ia-rms

3HP-020
ES Test # 4
Full Stroke Voltage and Current

Figure 4.4.9.11-1: Test 4, 3HP-20 Full Stroke Voltage and Current

<1> M Test: Ocone 3 3hp020 1-4-97 4:32p 150.5 ES 4



Cursor coordinates = 75.3seconds, 41.5Amp

— Vab-rms — Ia-rms

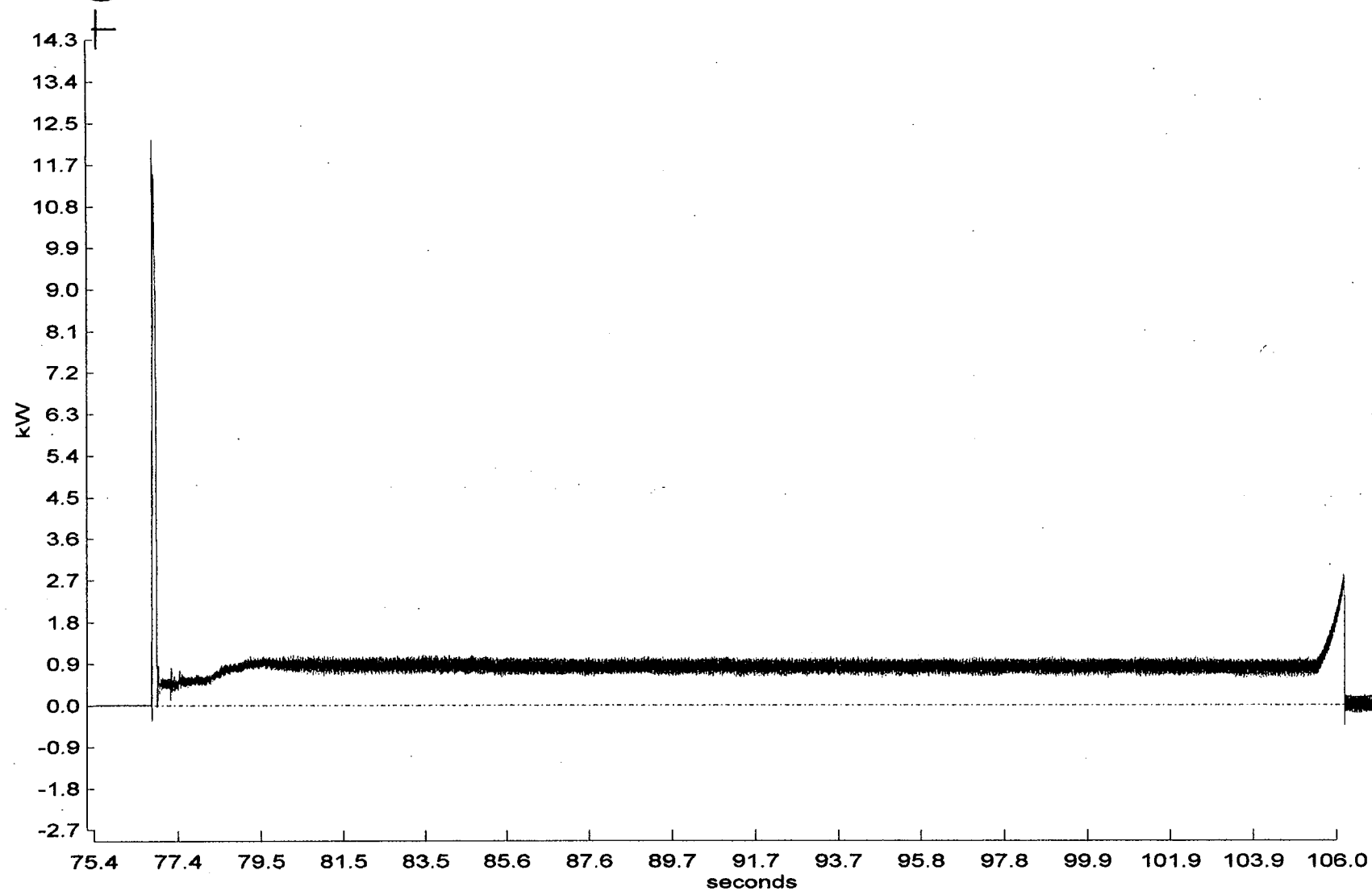
3HP-020

ES Test # 4

Inrush Voltage and Current

Figure 4.4.9.11-2: Test 4, 3HP-20 Inrush Voltage and Current

<1> M Test: Ocone 3 3hp020 1-4-97 4:32p 150.5 ES 4



Cursor coordinates = 75.5seconds, 14.6kW

TRP

3HP-020

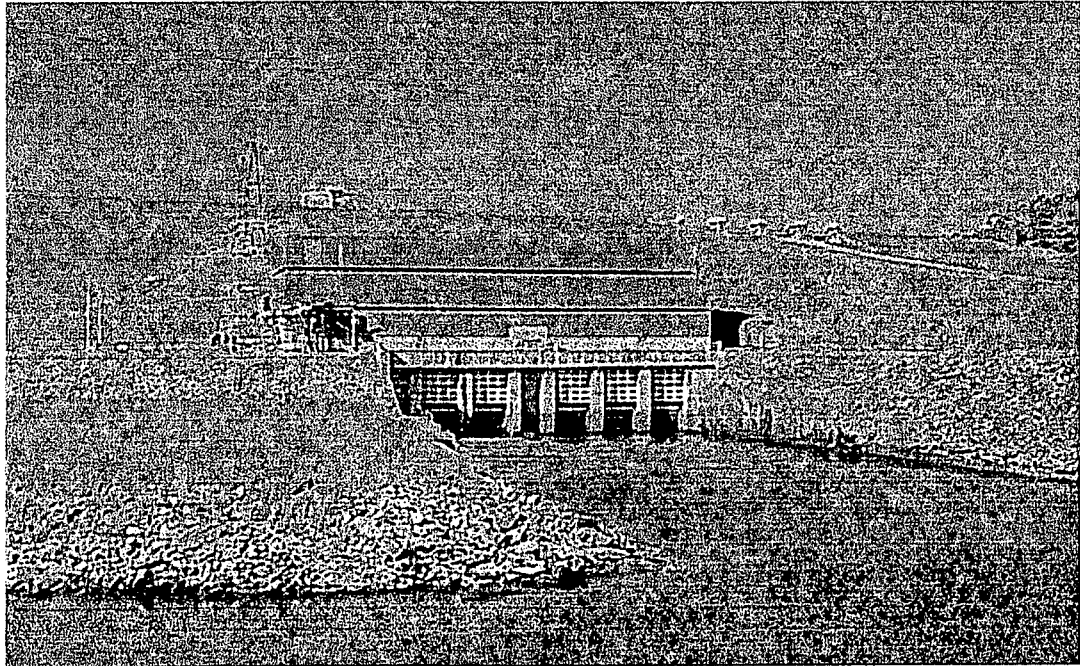
ES Test # 4

Full Stroke Total Real Power

Figure 4.4.9.11-3: Test 4, 3HP-20 Full Stroke Total Real Power (KW)

DUKE POWER COMPANY

Oconee Nuclear Station



Emergency Power and Engineered Safeguards Functional Test Report

Volume III

Appendix 5 - Test 5, Figures of Results

APPENDIX 5: Figures for Test 5

FIGURE	Page
Figure 4.5.1-1: Test 5, Keowee Voltage and Current.....	5-3
Figure 4.5.1-2: Test 5, Keowee Voltage.....	5-4
Figure 4.5.1-3, Test 5, Keowee KVA.....	5-5
Figure 4.5.1-4: Test 5, Keowee KW.....	5-6
Figure 4.5.1-5: Test 5, Keowee Frequency and Current.....	5-7
Figure 4.5.2-1: Test 5, Unit 1 MFB Voltage and Current	5-8
Figure 4.5.2-2: Test 5, Unit 1 MFB KVA and KW	5-9
Figure 4.5.2-3: Test 5, Unit 2 MFB Voltage and Current	5-10
Figure 4.5.2-4: Test 5, Unit 2 MFB KVA and KW	5-11
Figure 4.5.2-5: Test 5, Standby Bus Voltage and Unit 3 MFB Current	5-12
Figure 4.5.2-6: Test 5, Unit 3 MFB KVA and KW	5-13
Figure 4.5.3- 1: Test 5, EFW 3B Voltage and Current.....	5-14
Figure 4.5.3- 2: Test 5, EFW 3B KVA and KW	5-15
Figure 4.5.3- 3: Test 5, HPI 3B Voltage and Current.....	5-16
Figure 4.5.3- 4: Test 5, HPI 3B KVA and KW	5-17
Figure 4.5.3- 5: Test 5, EFW 1A Voltage and Current.....	5-18
Figure 4.5.3- 6: Test 5, EFW 1A KVA and KW	5-19
Figure 4.5.3- 7: Test 5, LPSW 3B Voltage and Current.....	5-20
Figure 4.5.3- 8: Test 5, LPSW 3B KVA and KW	5-21
Figure 4.5.3- 9: Test 5, LPI 3B Voltage and Current	5-22
Figure 4.5.3- 10: Test 5, LPI 3B KVA and KW.....	5-23
Figure 4.5.3- 11: Test 5, RBS 3B Voltage and Current.....	5-24
Figure 4.5.3- 12: Test 5, RBS 3B KVA and KW	5-25
Figure 4.5.4- 1: Test 5, RBCF 3B Voltage and Current.....	5-26
Figure 4.5.4- 14: Test 5, RBCF 3B KVA and KW.....	5-27
Figure 4.5.5- 1: Test 5, 1X5 Voltage and Current.....	5-28
Figure 4.5.5- 2: Test 5, 1X5 KVA and KW.....	5-29
Figure 4.5.5- 3: Test 5, 1X6 Voltage and Current.....	5-30
Figure 4.5.5- 4: Test 5, 1X6 KVA and KW.....	5-31
Figure 4.5.5- 5: Test 5, 3X5 Voltage and Current.....	5-32
Figure 4.5.5- 6: Test 5, 3X5 KVA and KW.....	5-33
Figure 4.5.5- 7: Test 5, 3X6 Voltage and Current.....	5-34
Figure 4.5.5- 8: Test 5, 3X6 KVA and KW.....	5-35
Figure 4.5.5- 9: Test 5, 3X8 Voltage and Current	5-36
Figure 4.5.5- 10: Test 5, 3X8 KVA and KW.....	5-37
Figure 4.5.5- 11: Test 5, 3X9 Voltage and Current.....	5-38
Figure 4.5.5- 12: Test 5, 3X9 KVA and KW.....	5-39
Figure 4.5.6- 1: Test 5, 600V 3XS1 Voltage and Current.....	5-40
Figure 4.5.6- 2: Test 5, 600V 3XS1 KVA and KW.....	5-41
Figure 4.5.6- 3: Test 5, 600V 3XS2 Voltage and Current.....	5-42
Figure 4.5.6- 4: Test 5, 600V 3XS2 KVA and KW.....	5-43
Figure 4.5.6- 5: Test 5, 600V 3XS3 Voltage and Current.....	5-44
Figure 4.5.6- 6: Test 5, 600V 3XS3 KVA and KW.....	5-45
Figure 4.5.7- 1: Test 5, 208V 3XS1 Voltage and Current.....	5-46
Figure 4.5.7- 2: Test 5, 208V 3XS1 KVA and KW.....	5-47
Figure 4.5.7- 3: Test 5, 208V 3XS2 Voltage and Current.....	5-48
Figure 4.5.7- 4: Test 5, 208V 3XS2 KVA and KW.....	5-49
Figure 4.5.7- 5: Test 5, 208V 3XS3 Voltage and Current.....	5-50
Figure 4.5.7- 6: Test 5, 208V 3XS3 KVA and KW.....	5-51
Figure 4.5.8-1: Test 5, Battery Charger 3CA Voltage and Current.....	5-52

Figure 4.5.9.1-1: Test 5, 3HP-24 Full Stroke Voltage and Current.....	5-53
Figure 4.5.9.1-2: Test 5, 3HP-24 Inrush Voltage and Current	5-54
Figure 4.5.9.1-3: Test 5, 3HP-24 Full Stroke Total Real Power (KW)	5-55
Figure 4.5.9.2-1: Test 5, 3HP-26 Full Stroke Voltage and Current.....	5-56
Figure 4.5.9.2-2: Test 5, 3HP-26 Inrush Voltage and Current	5-57
Figure 4.5.9.2-3: Test 5, 3HP-26 Full Stroke Total Real Power (KW)	5-58
Figure 4.5.9.3-1: Test 5, 3LP-17 Full Stroke Voltage and Current	5-59
Figure 4.5.9.3-2: Test 5, 3LP-17 Inrush Voltage and Current.....	5-60
Figure 4.5.9.3-3: Test 5, 3LP-17 Full Stroke Total Real Power (KW).....	5-61
Figure 4.5.9.4-1: Test 5, 3BS-2 Full Stroke Voltage and Current	5-62
Figure 4.5.9.4-2: Test 5, 3BS-2 Inrush Voltage and Current.....	5-63
Figure 4.5.9.4-3: Test 5, 3BS-2 Full Stroke Total Real Power (KW)	5-64
Figure 4.5.9.5-1: Test 5, 3HP-27 Full Stroke Voltage and Current.....	5-65
Figure 4.5.9.5-2: Test 5, 3HP-27 Inrush Voltage and Current	5-66
Figure 4.5.9.5-3: Test 5, 3HP-27 Full Stroke Total Real Power (KW)	5-67
Figure 4.5.9.6-1: Test 5, 3LPSW-24 Full Stroke Voltage and Current	5-68
Figure 4.5.9.6-2: Test 5, 3LPSW-24 Inrush Voltage and Current.....	5-69
Figure 4.5.9.6-3: Test 5, 3LPSW-24 Full Stroke Total Real Power (KW).....	5-70
Figure 4.5.9.7-1: Test 5, 3PR-19 Full Stroke Voltage and Current.....	5-71
Figure 4.5.9.7-2: Test 5, 3PR-19 Inrush Voltage and Current.....	5-72
Figure 4.5.9.7-3: Test 5, 3PR-19 Full Stroke Total Real Power (KW)	5-73
Figure 4.5.9.8-1: Test 5, 3LPSW-6 Full Stroke Voltage and Current	5-74
Figure 4.5.9.8-2: Test 5, 3LPSW-6 Inrush Voltage and Current.....	5-75
Figure 4.5.9.8-3: Test 5, 3LPSW-6 Full Stroke Total Real Power (KW).....	5-76
Figure 4.5.9.9-1: Test 5, 3LPSW-565 Full Stroke Voltage and Current	5-77
Figure 4.5.9.9-2: Test 5, 3LPSW-565 Inrush Voltage and Current.....	5-78
Figure 4.5.9.9-3: Test 5, 3LPSW-565 Full Stroke Total Real Power (KW).....	5-79
Figure 4.5.9.10-1: Test 5, 3HP-4 Full Stroke Voltage and Current.....	5-80
Figure 4.5.9.10-2: Test 5, 3HP-4 Inrush Voltage and Current	5-81
Figure 4.5.9.10-3: Test 5, 3HP-4 Full Stroke Total Real Power (KW)	5-82
Figure 4.5.9.11-1: Test 5, 3HP-20 Full Stroke Voltage and Current.....	5-83
Figure 4.5.9.11-2: Test 5, 3HP-20 Inrush Voltage and Current	5-84
Figure 4.5.9.11-3: Test 5, 3HP-20 Full Stroke Total Real Power (KW)	5-85

Figure 4.5.1-1: Test5, Keowee Voltage and Current

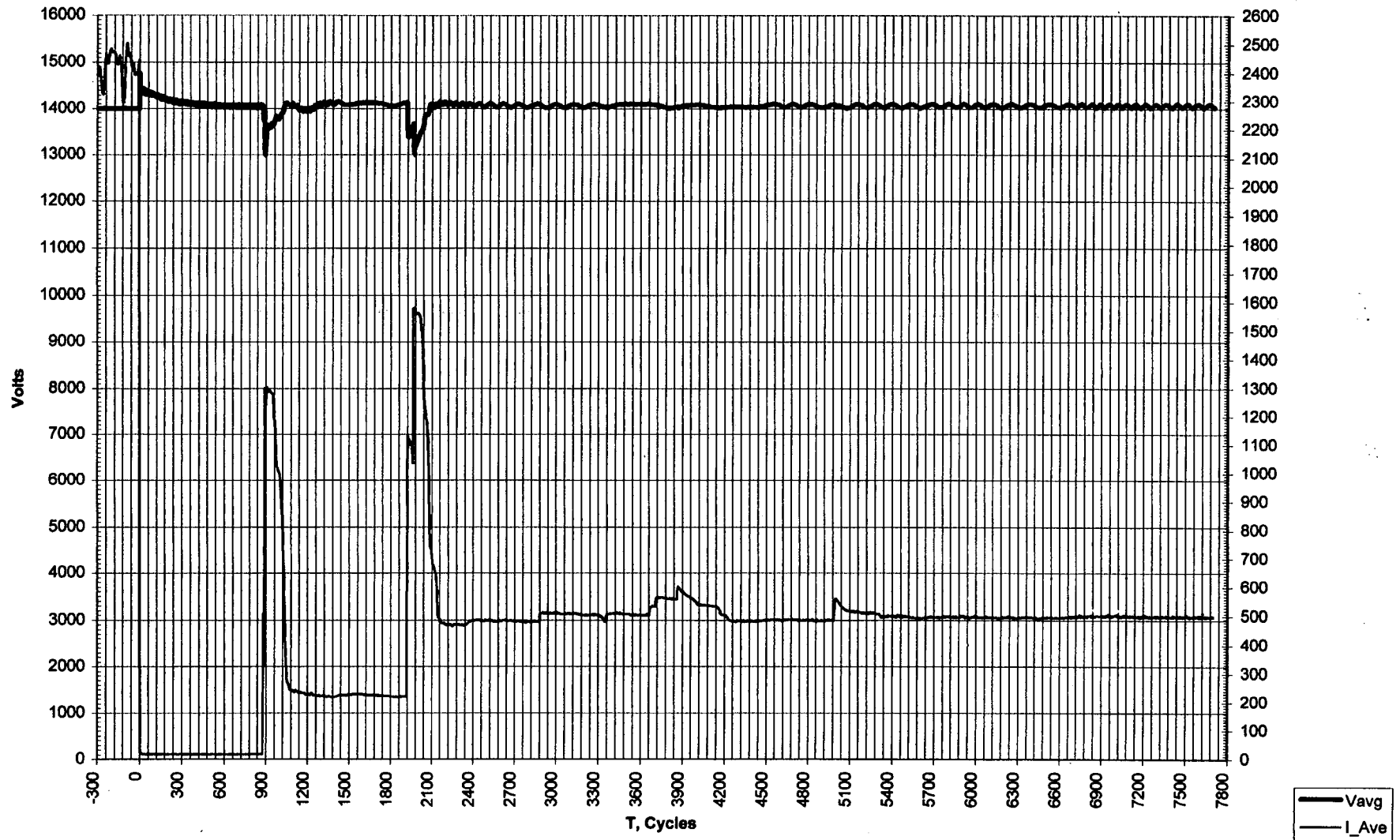


Figure 4.5.1-2: Test5, Keowee Voltage

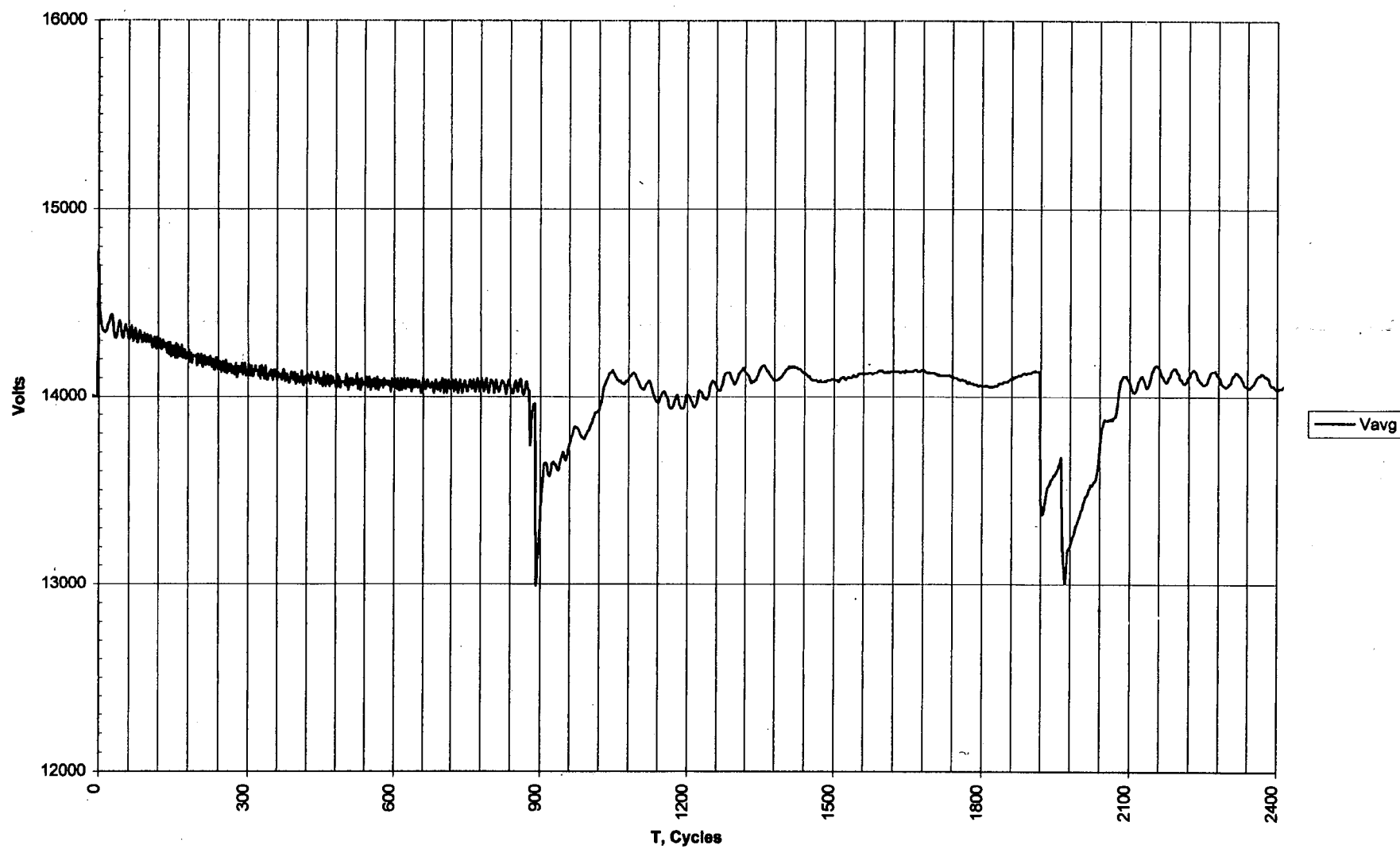


Figure 4.5.1-3, Test5, Keowee KVA

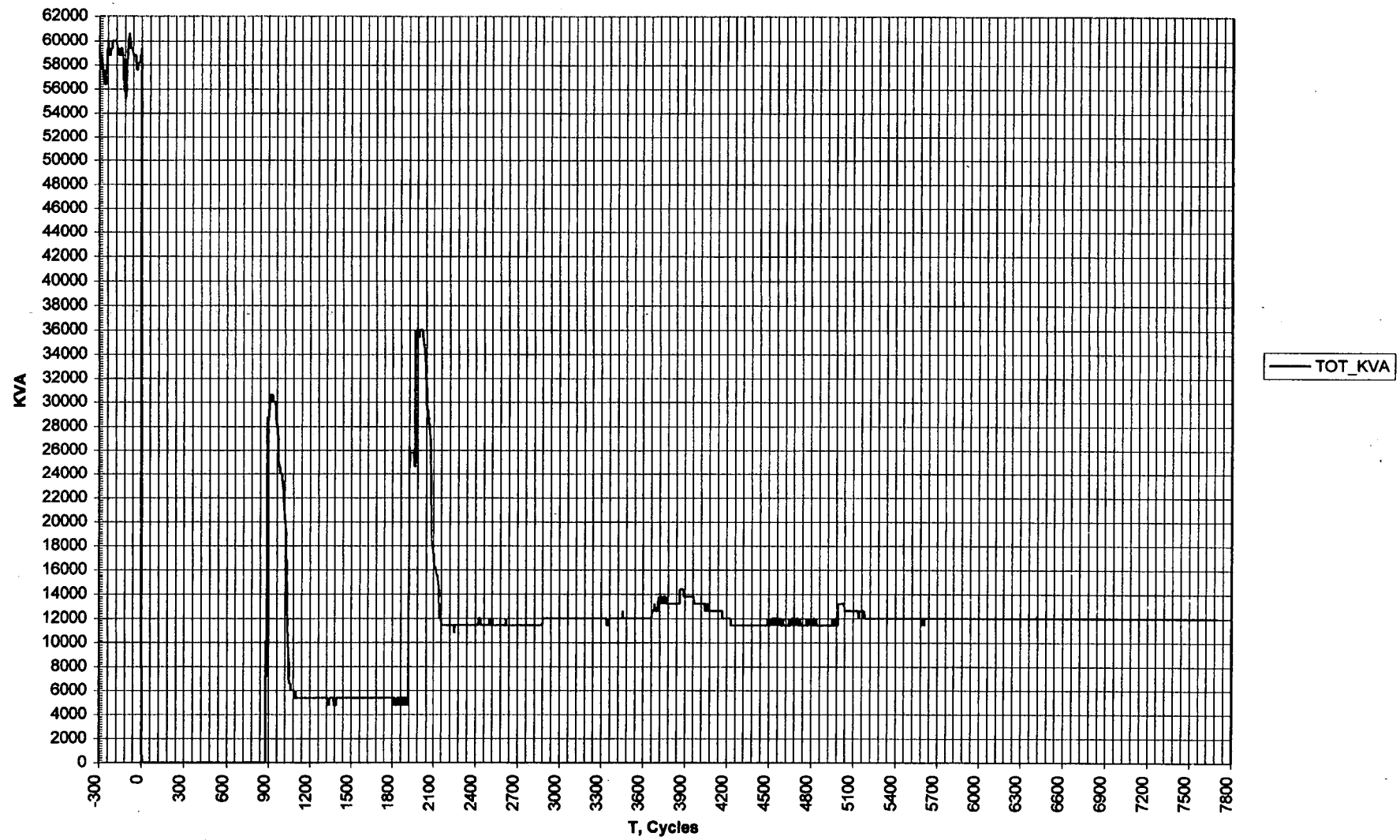


Figure 4.5.1-4: Test5, Keowee KW

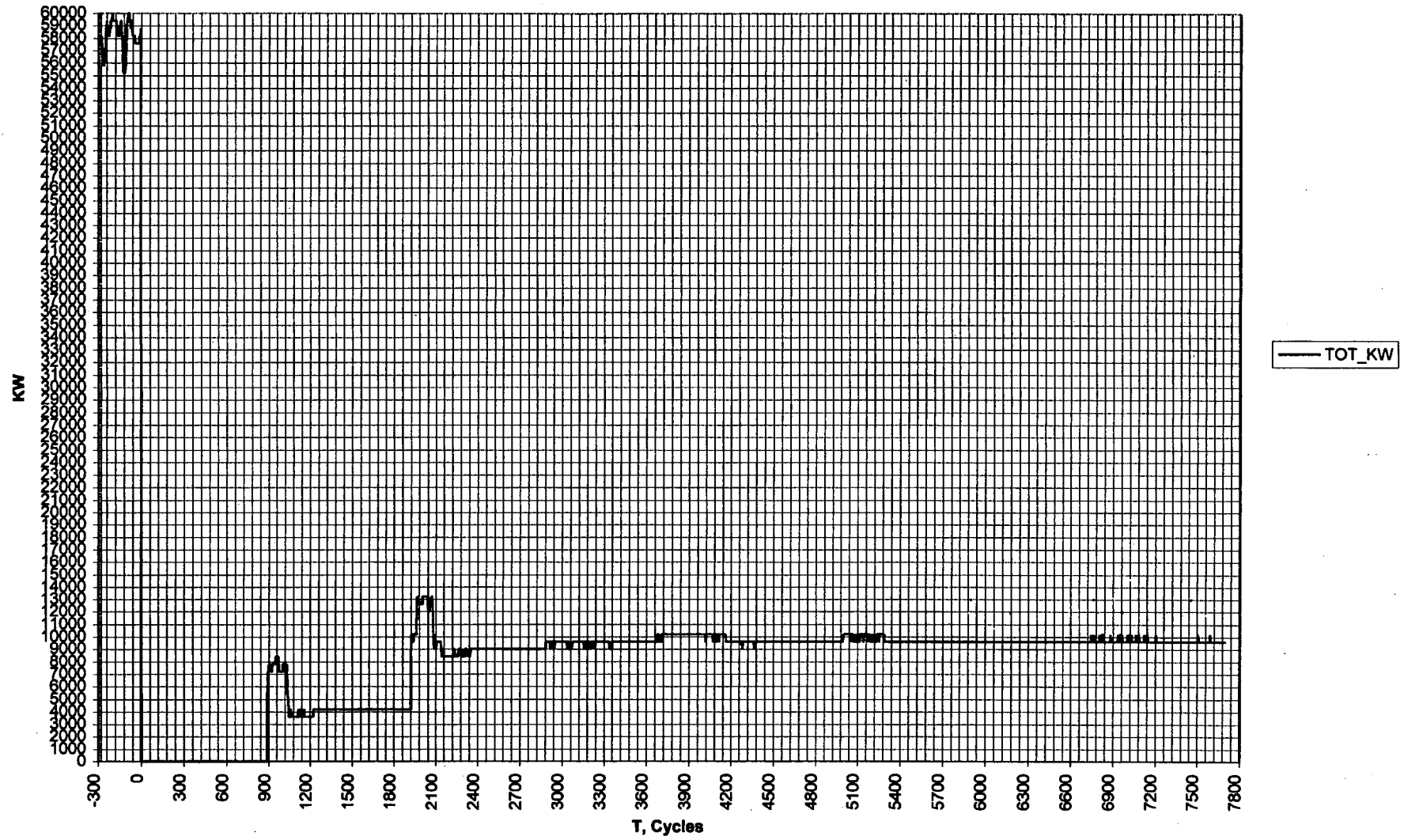


Figure 4.5.1-5: Test5, Keowee Frequency and Current

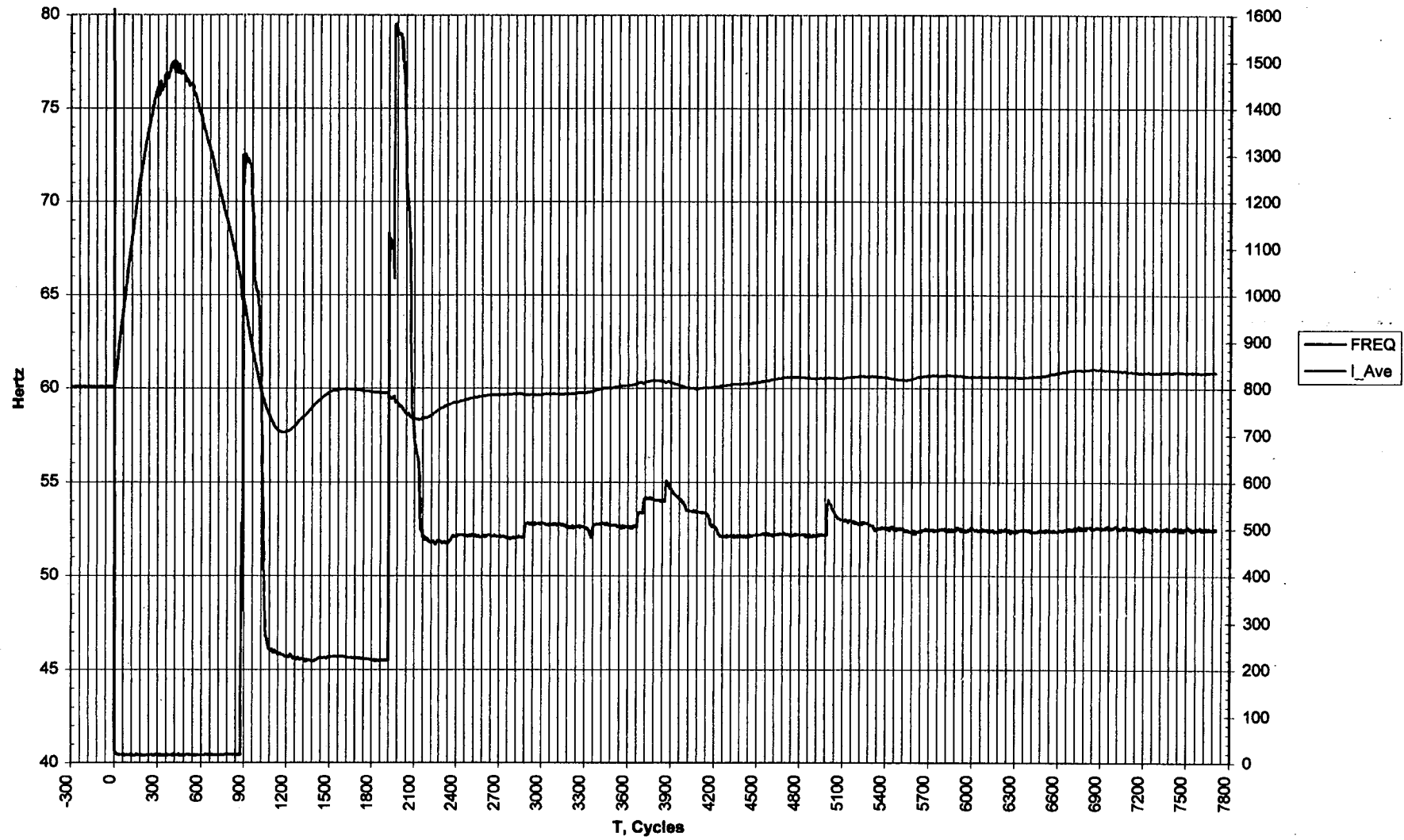


Figure 4.5.2-1: Test5, Unit 1 MFB Voltage and Current



Figure 4.5.2-2: Test5, Unit 1 MFB KVA and KW

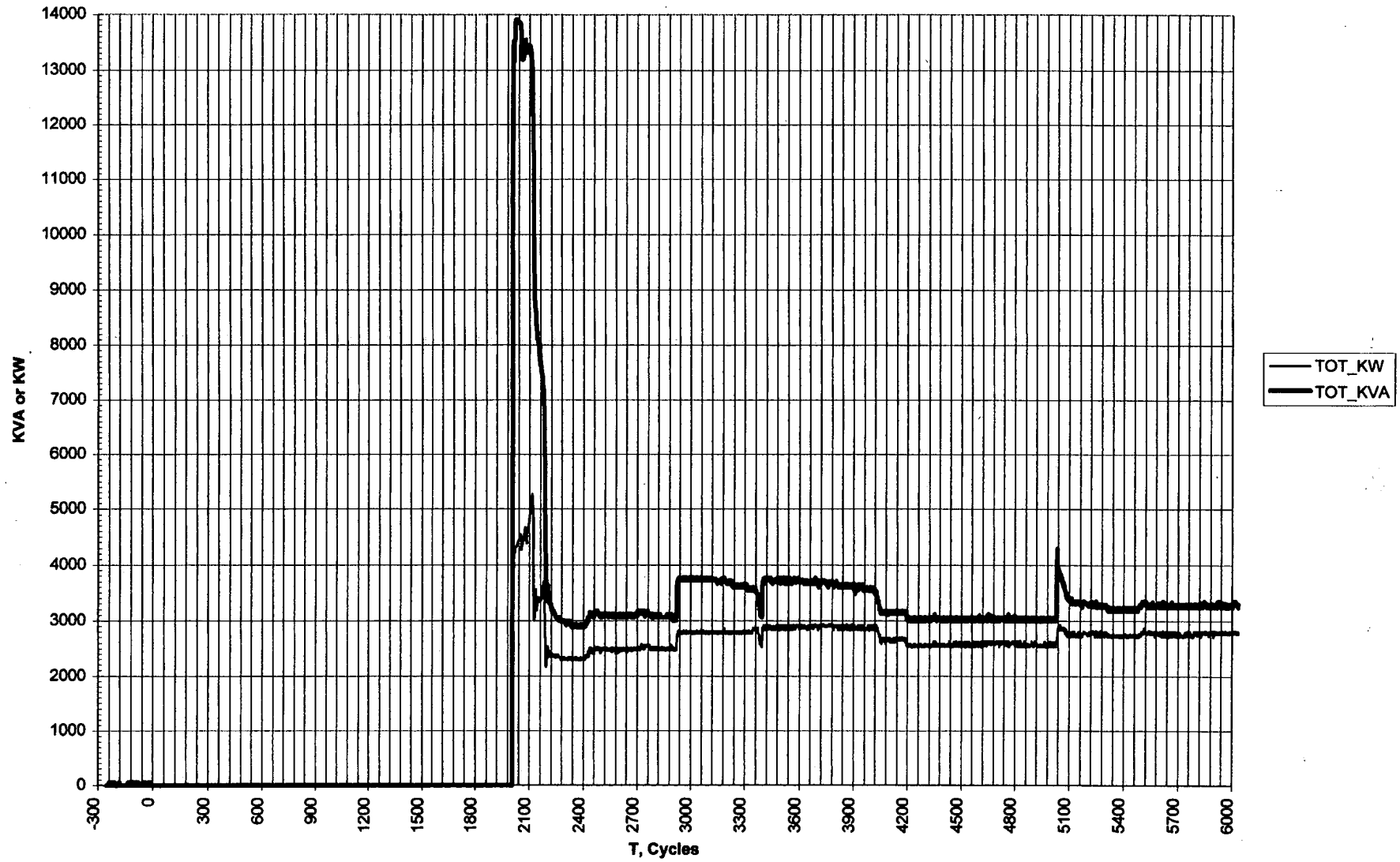


Figure 4.5.2-3: Test5, Unit 2 MFB Voltage and Current



Figure 4.5.2-4: Test5, Unit 2 MFB KVA and KW

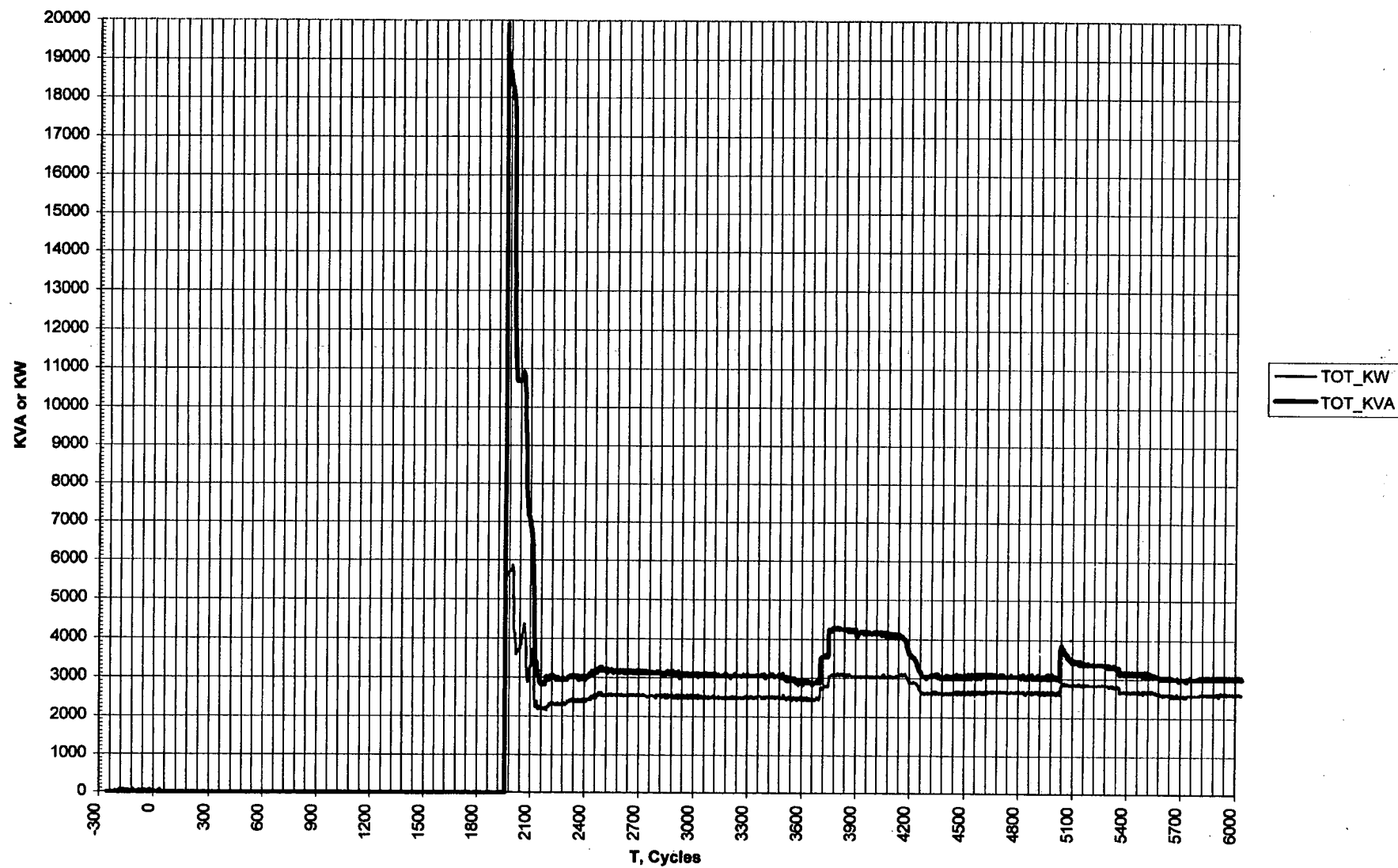


Figure 4.5.2-5: Test5, Standby Bus Voltage and Unit 3 MFB Current

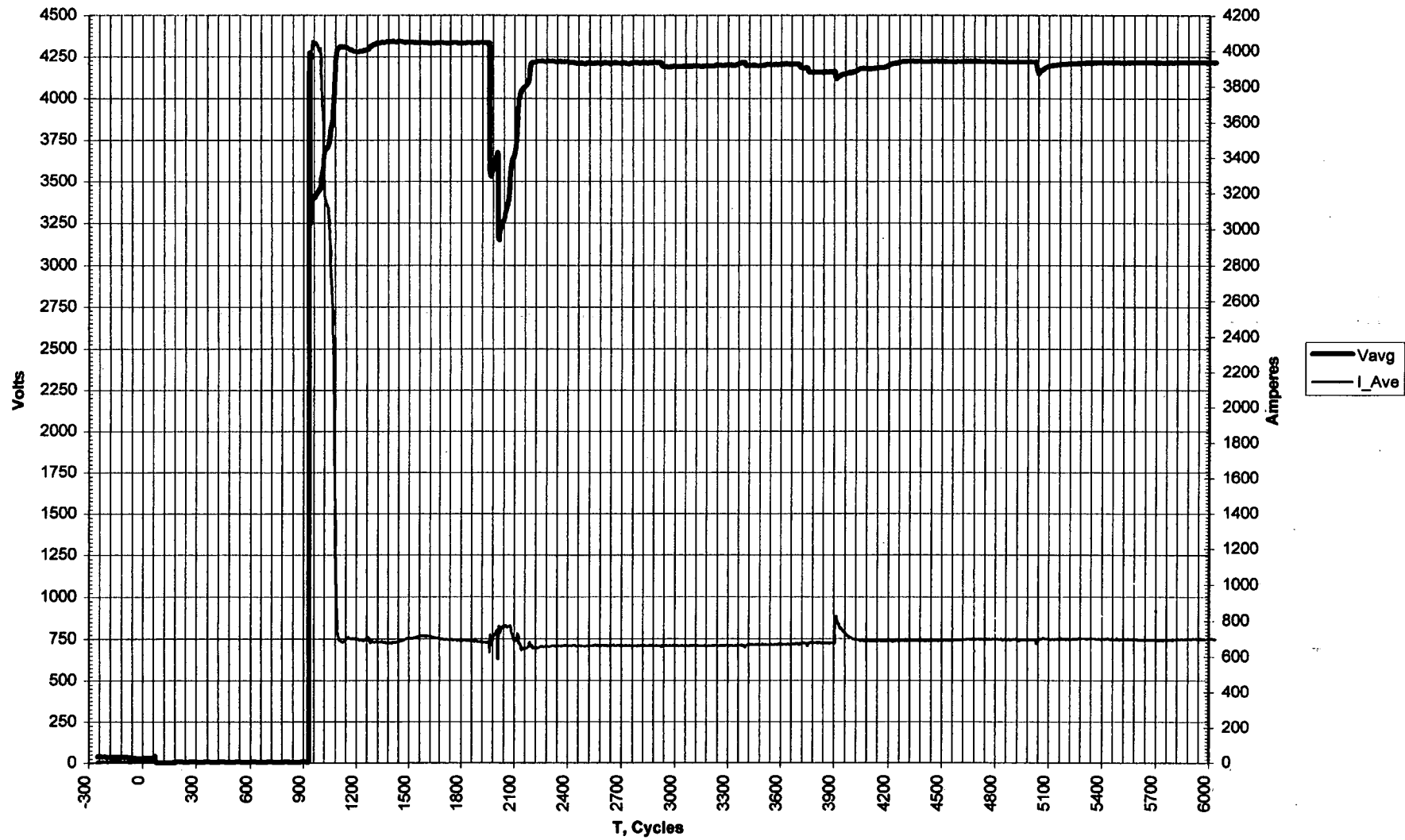


Figure 4.5.2-6: Test5, Unit 3 MFB KVA and KW

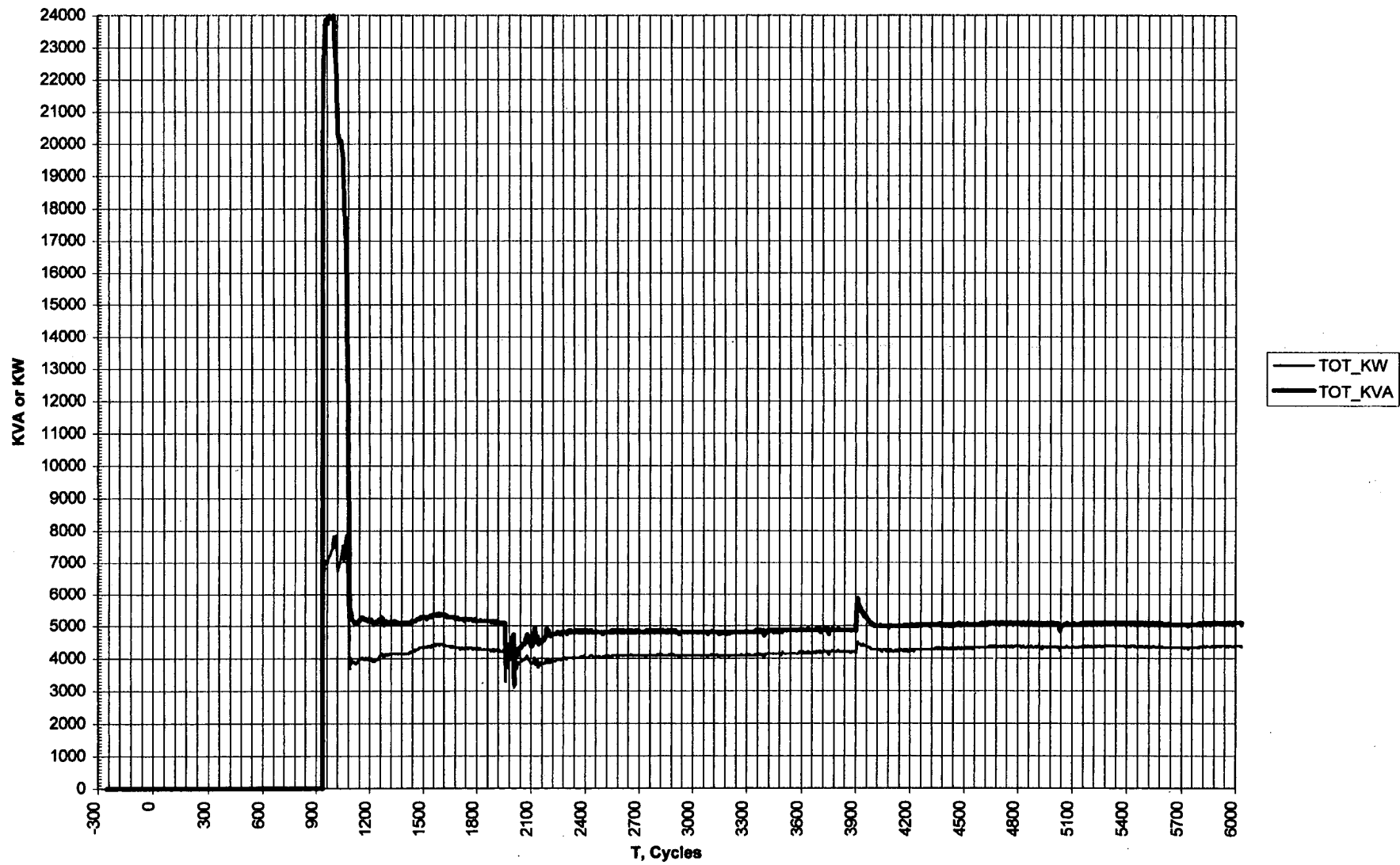


Figure 4.5.3- 1: Test5, EFW 3B Voltage and Current

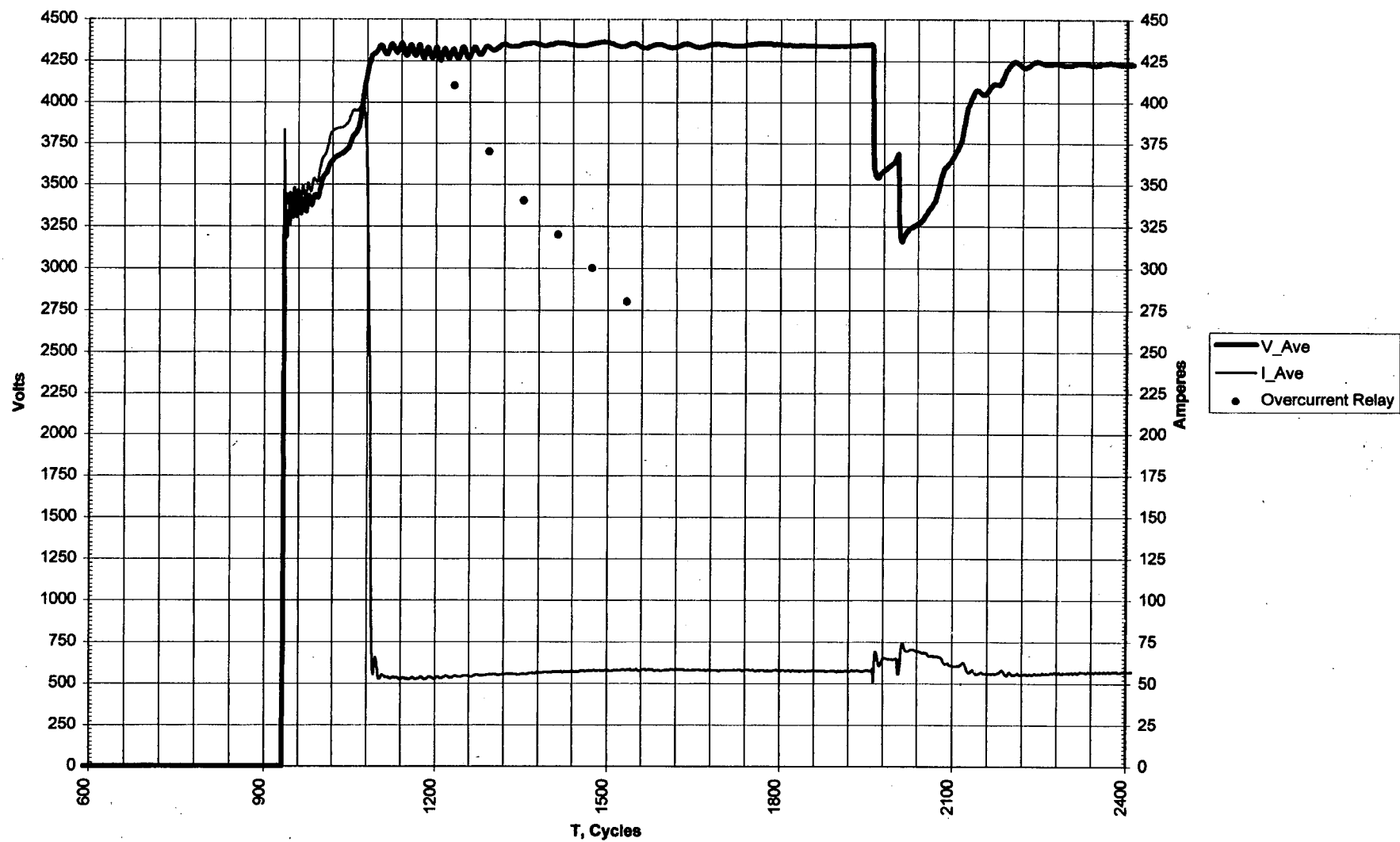


Figure 4.5.3- 2: Test5, EFW 3B KVA and KW

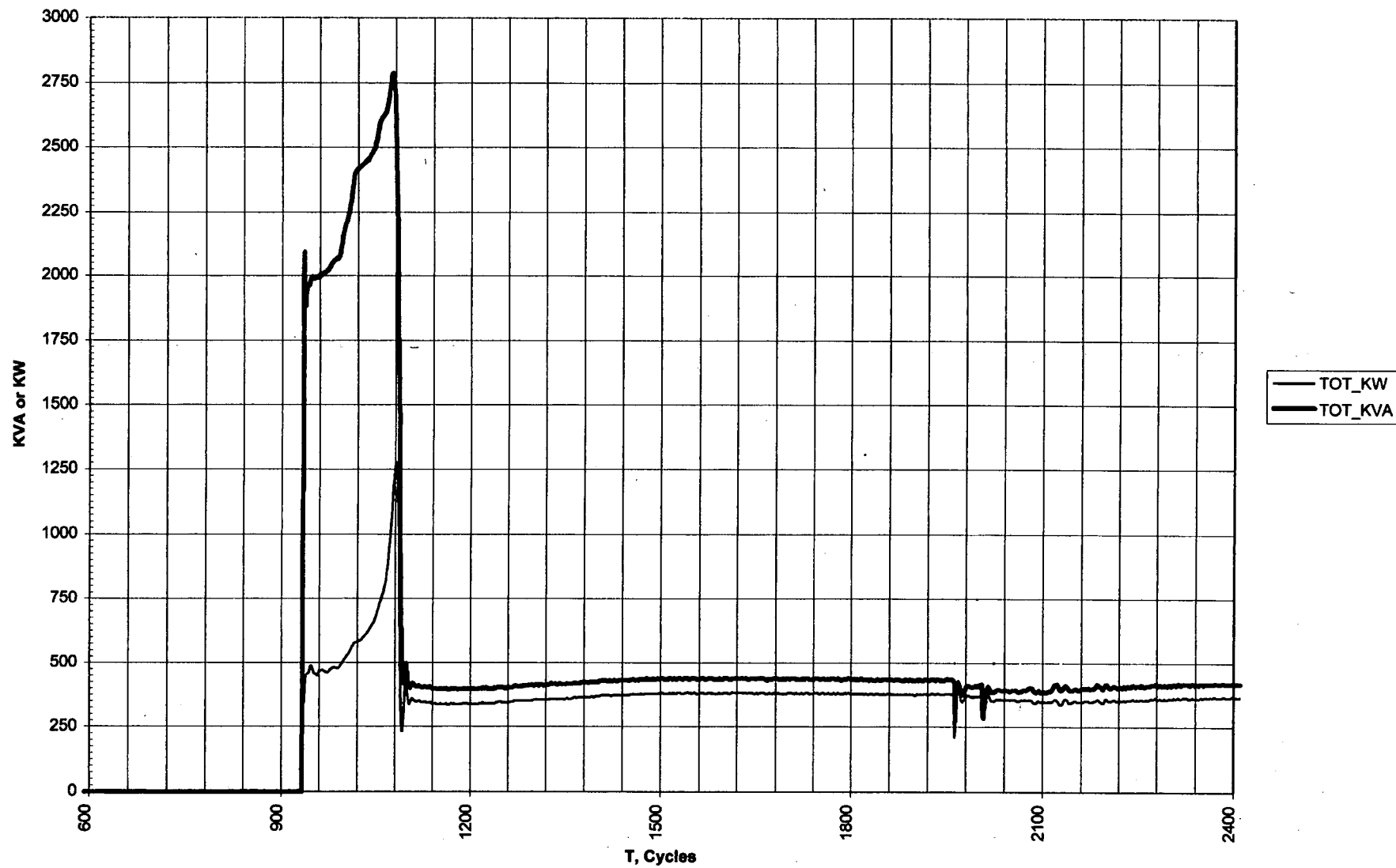


Figure 4.5.3- 3: Test5, HPI 3B Voltage and Current

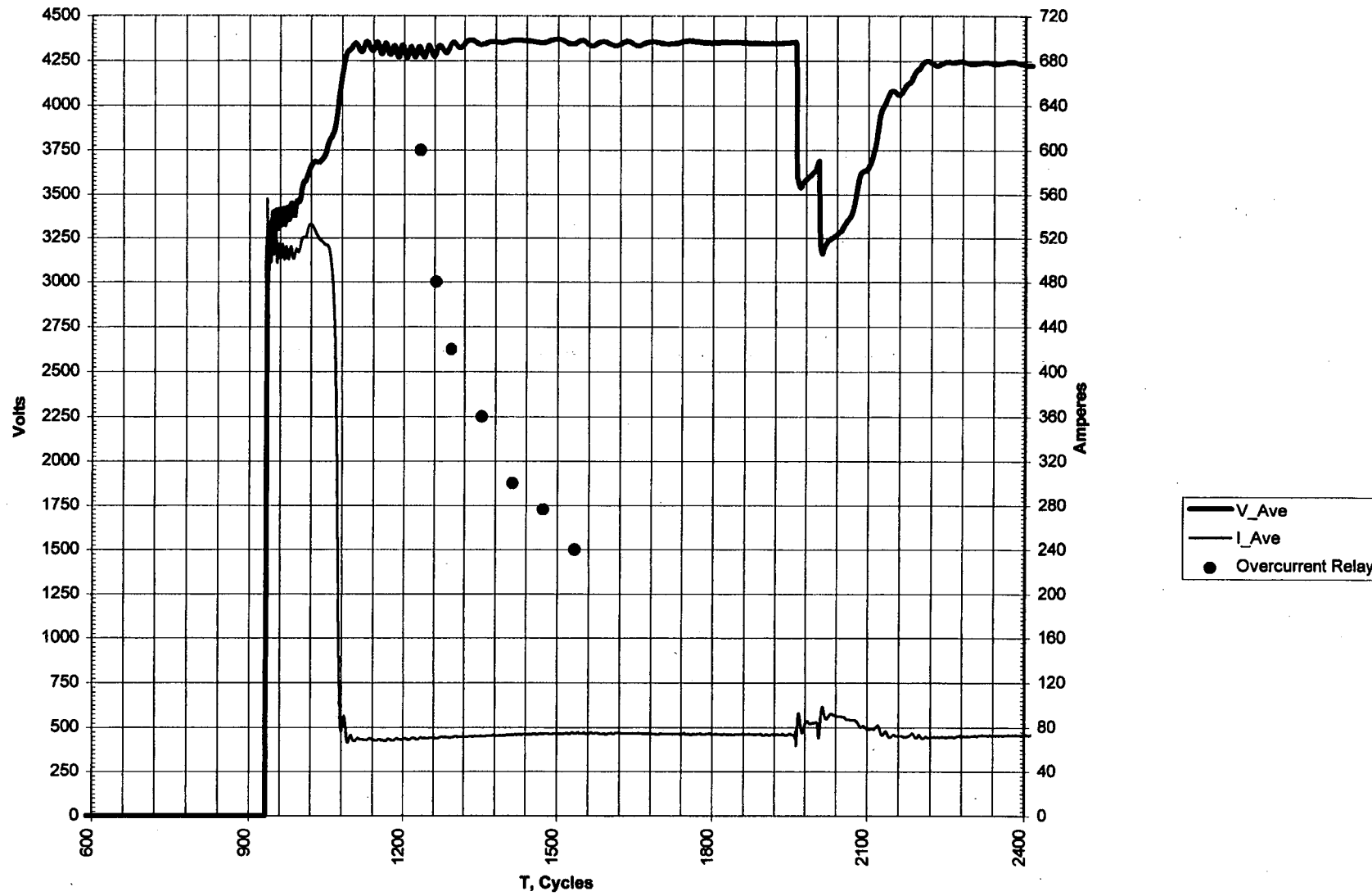


Figure 4.5.3- 4: Test5, HPI 3B KVA and KW

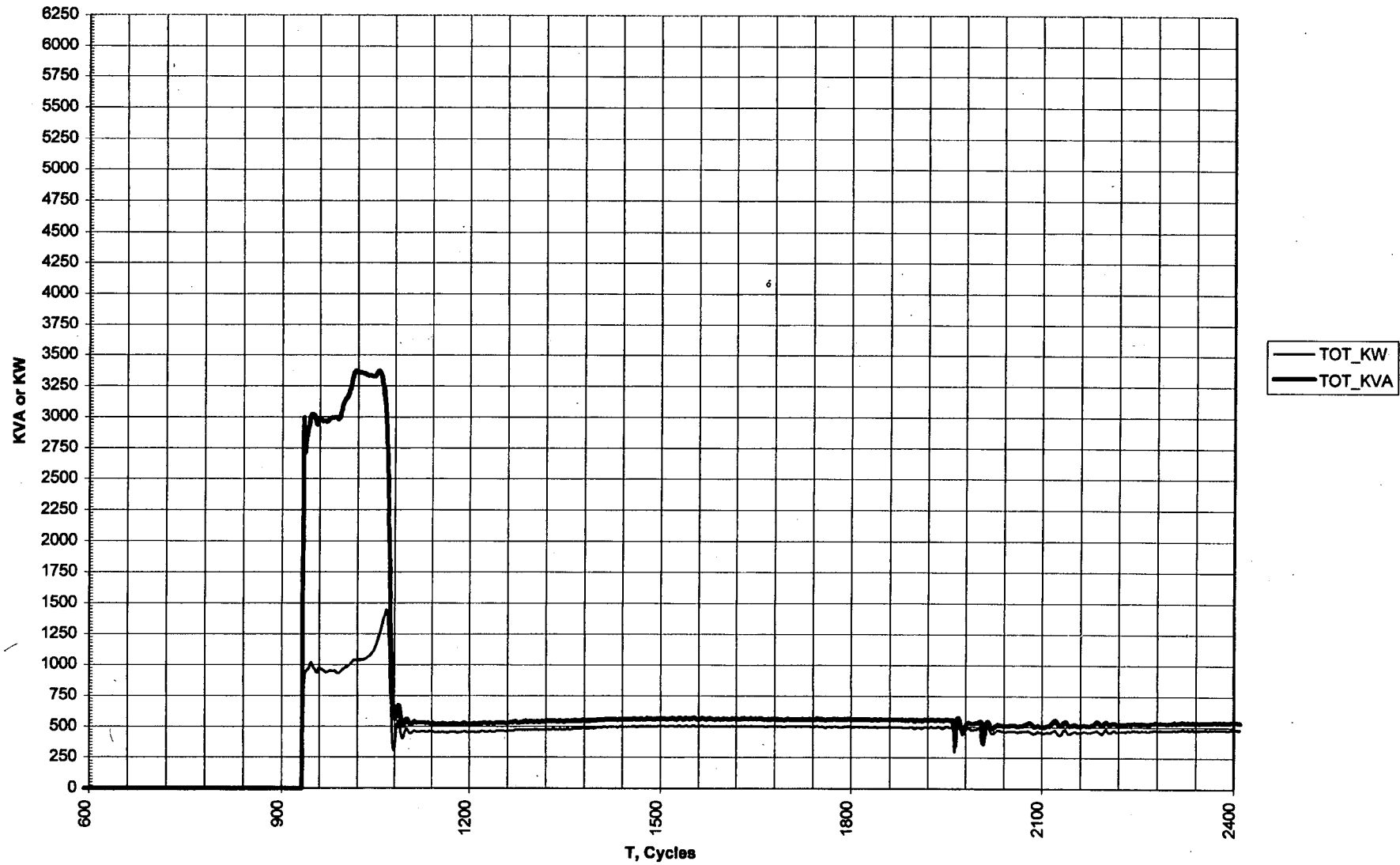


Figure 4.5.3- 5: Test5, EFW 1A Voltage and Current

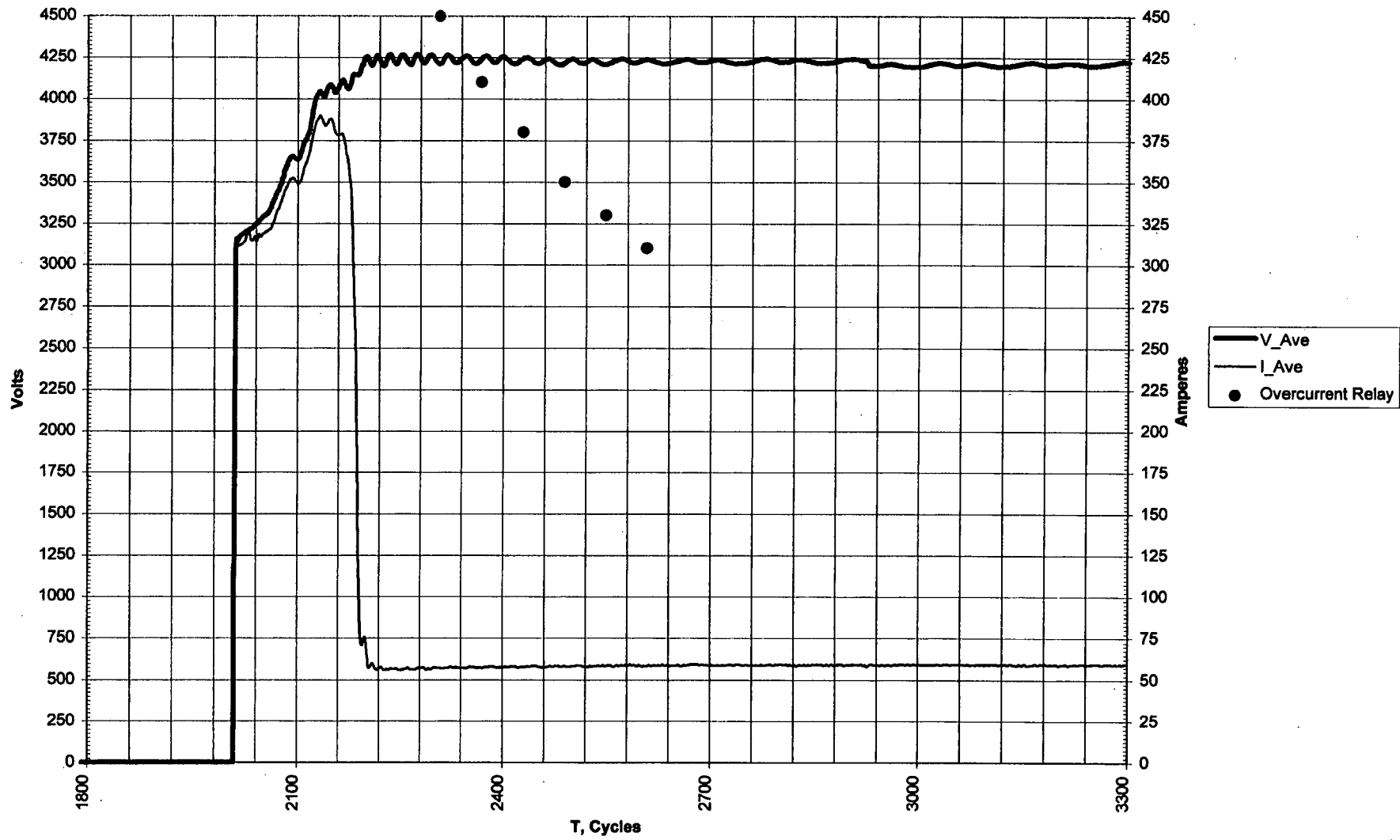


Figure 4.5.3- 6: Test5, EFW 1A KVA and KW

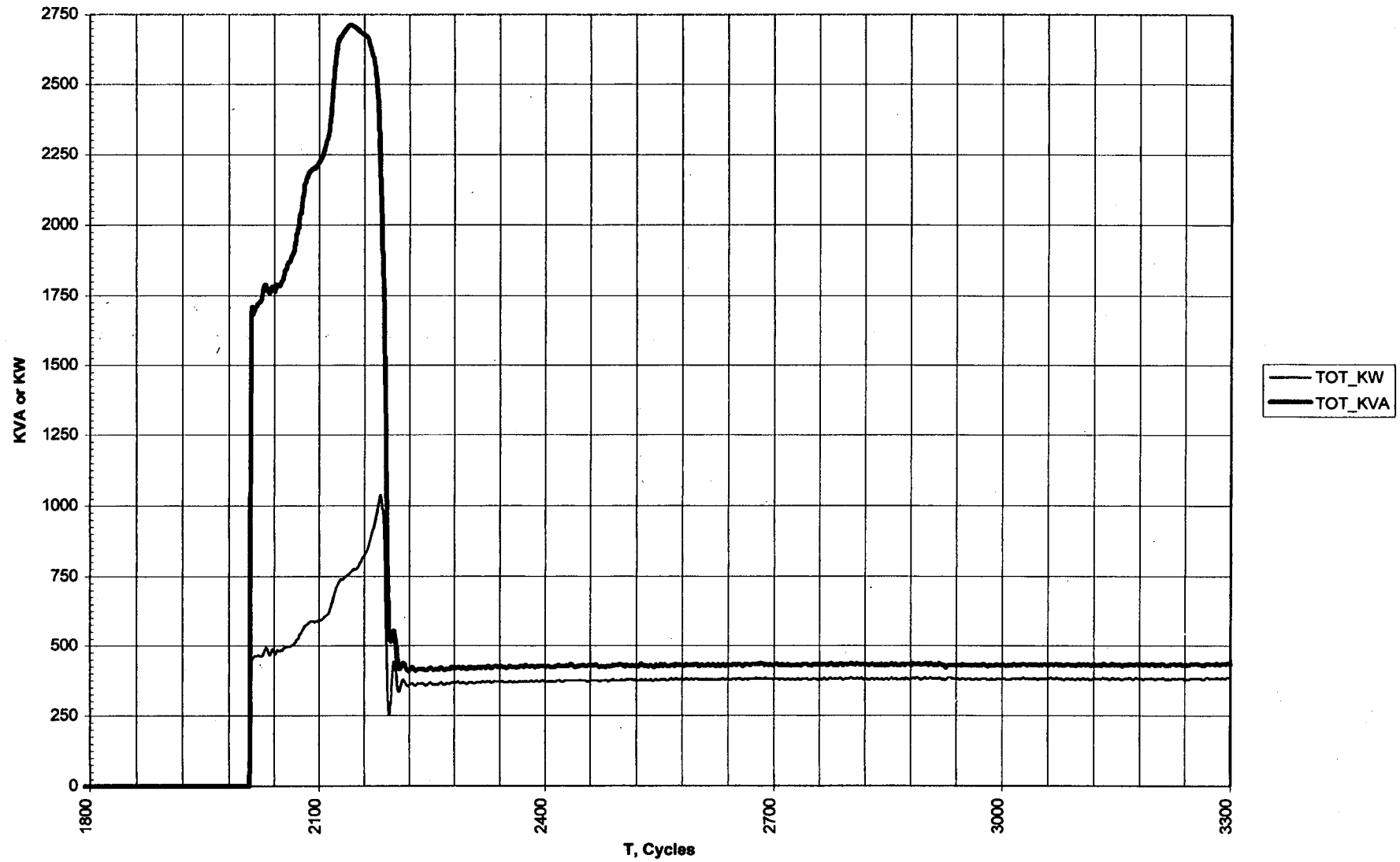


Figure 4.5.3- 7: Test5, LPSW 3B Voltage and Current

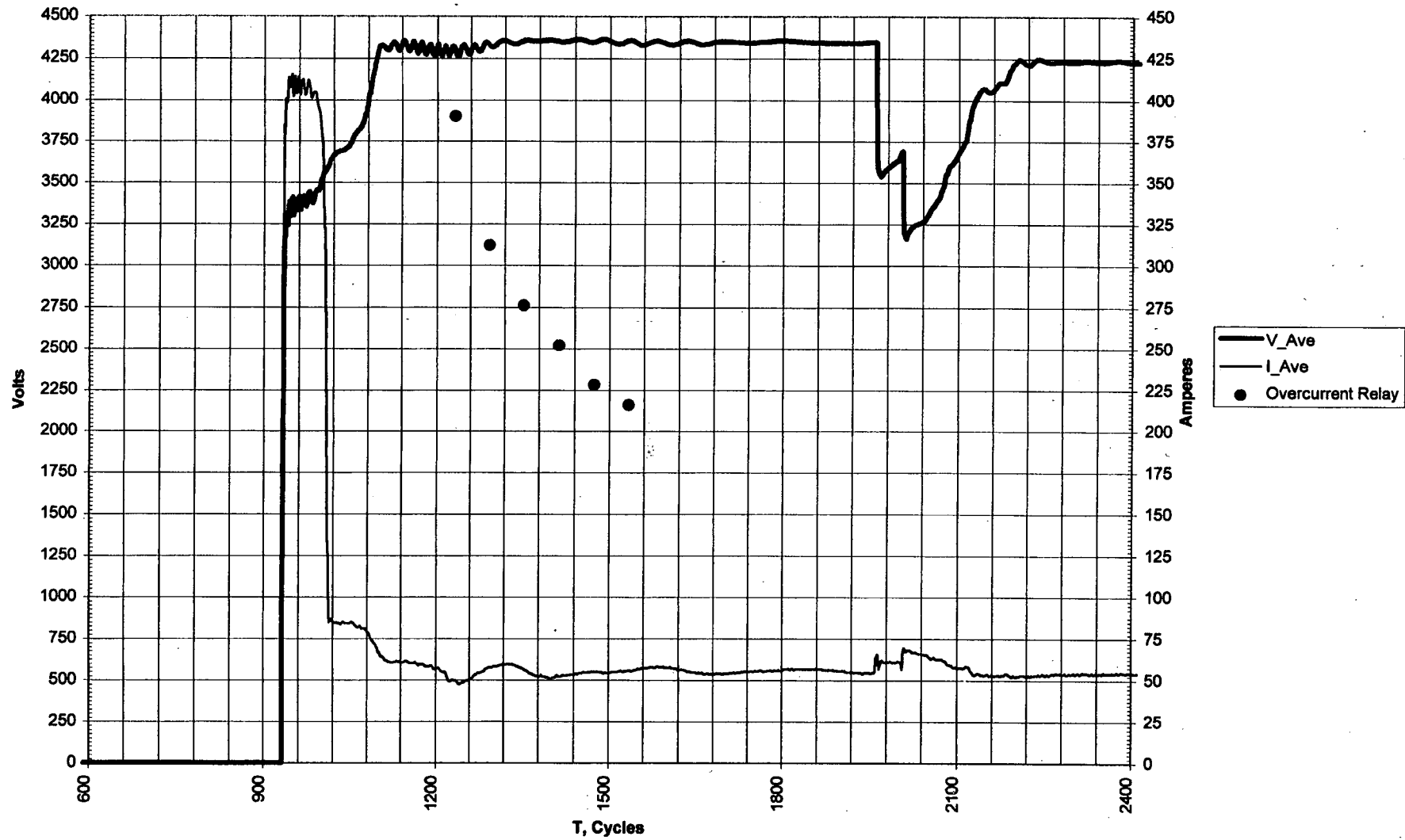


Figure 4.5.3- 8: Test5, LPSW 3B KVA and KW

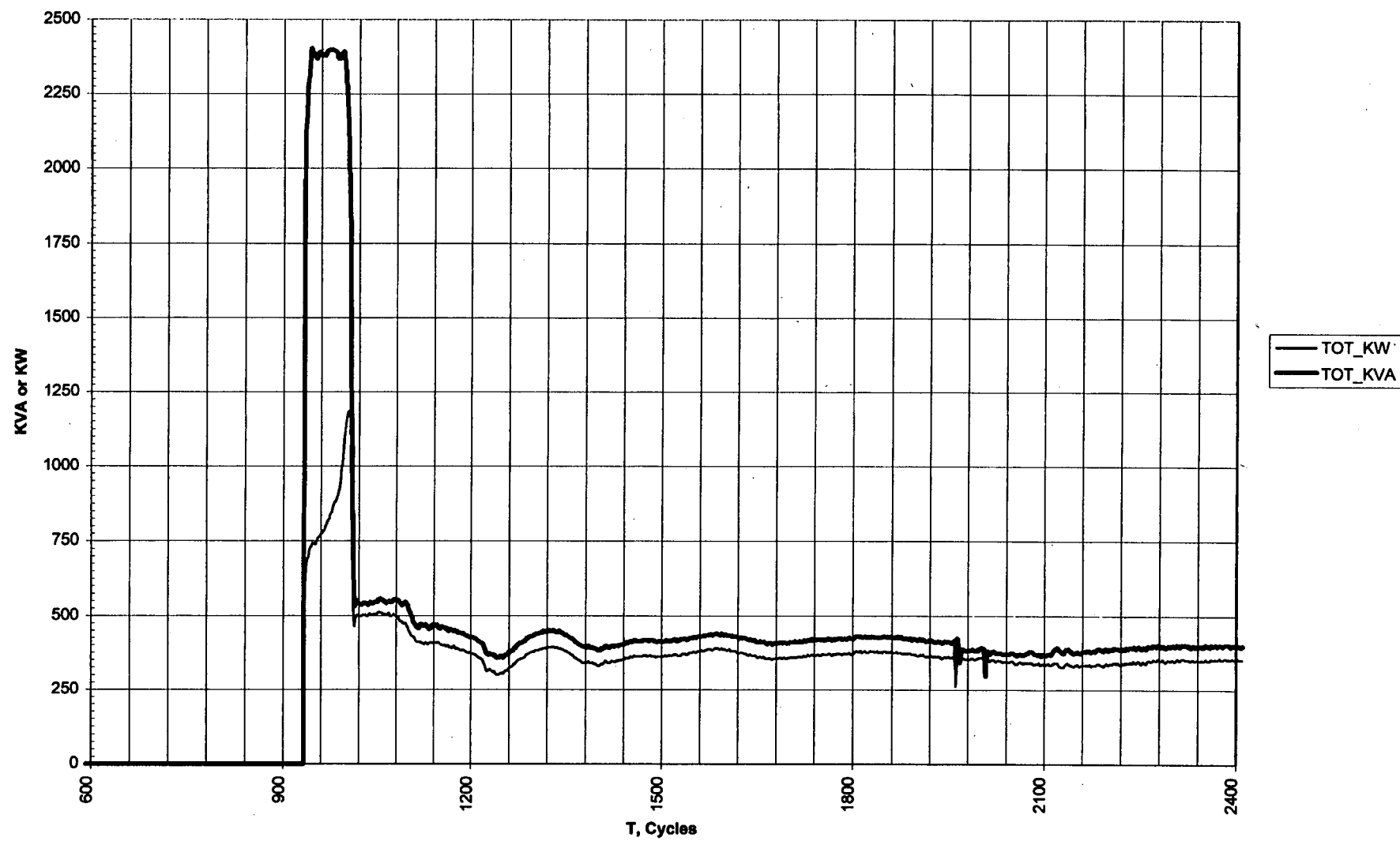


Figure 4.5.3- 9: Test5, LPI 3B Voltage and Current

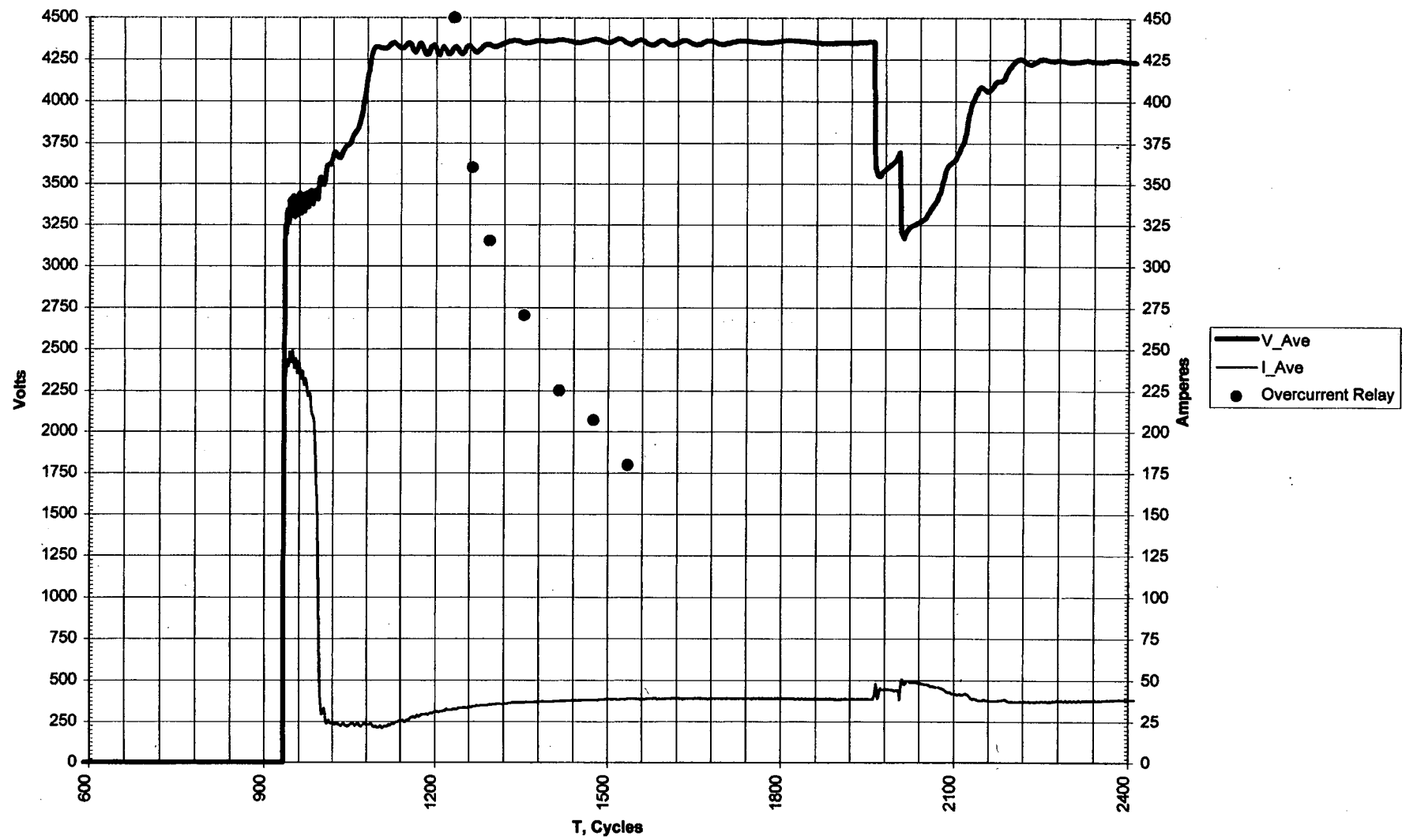


Figure 4.5.3- 10: Test5, LPI 3B KVA and KW

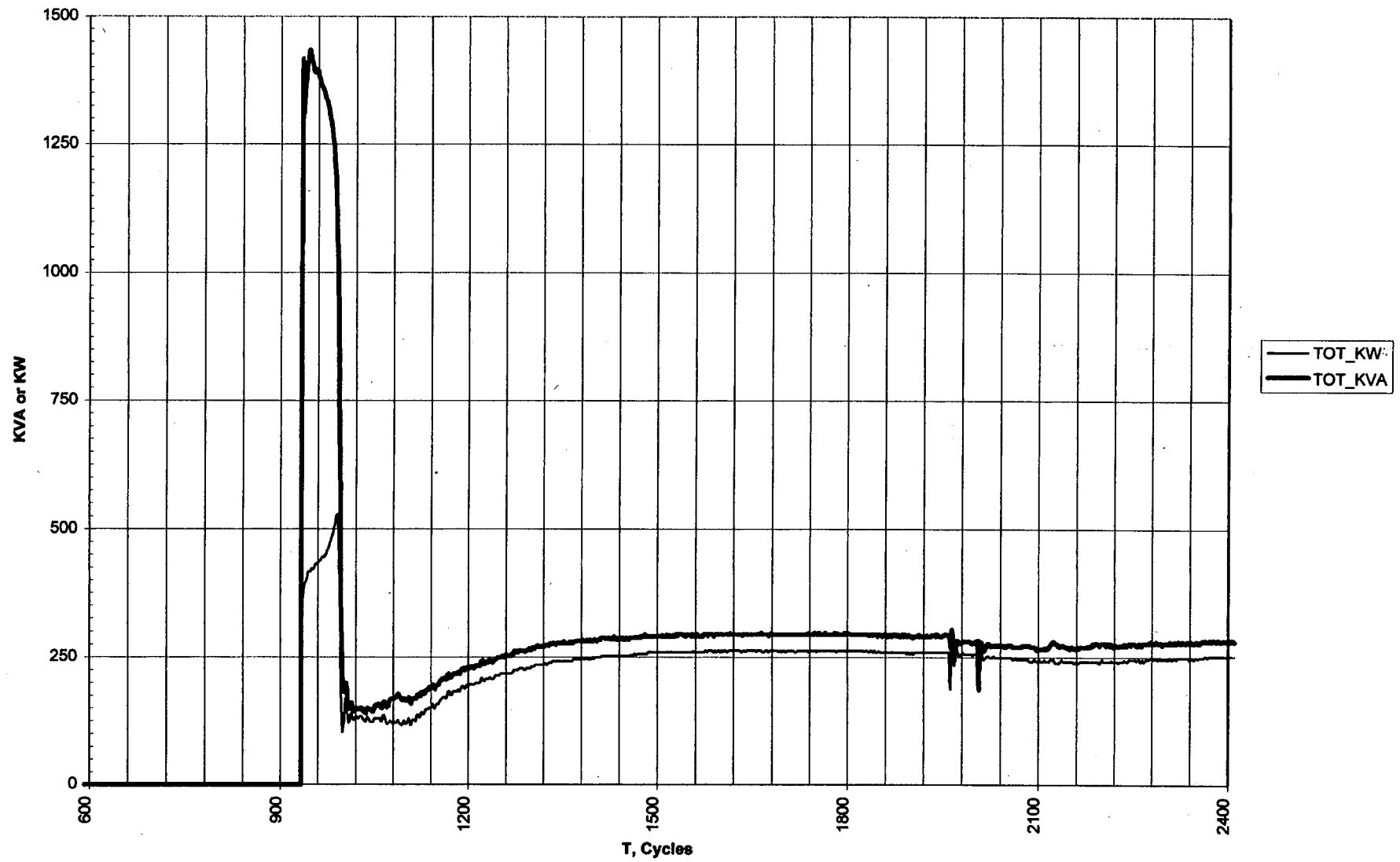


Figure 4.5.3- 11: Test5, RBS 3B Voltage and Current

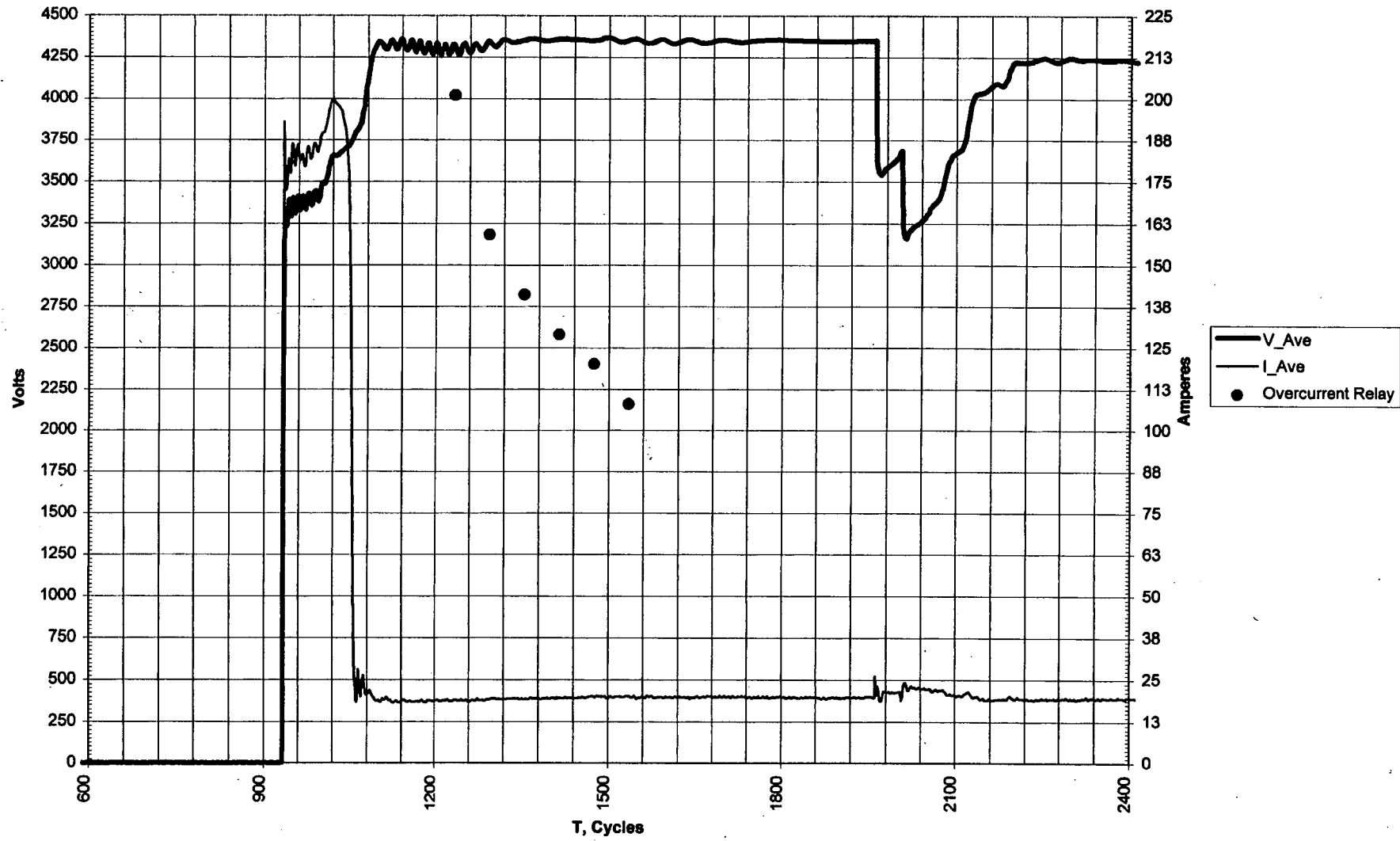


Figure 4.5.3- 12: Test5, RBS 3B KVA and KW

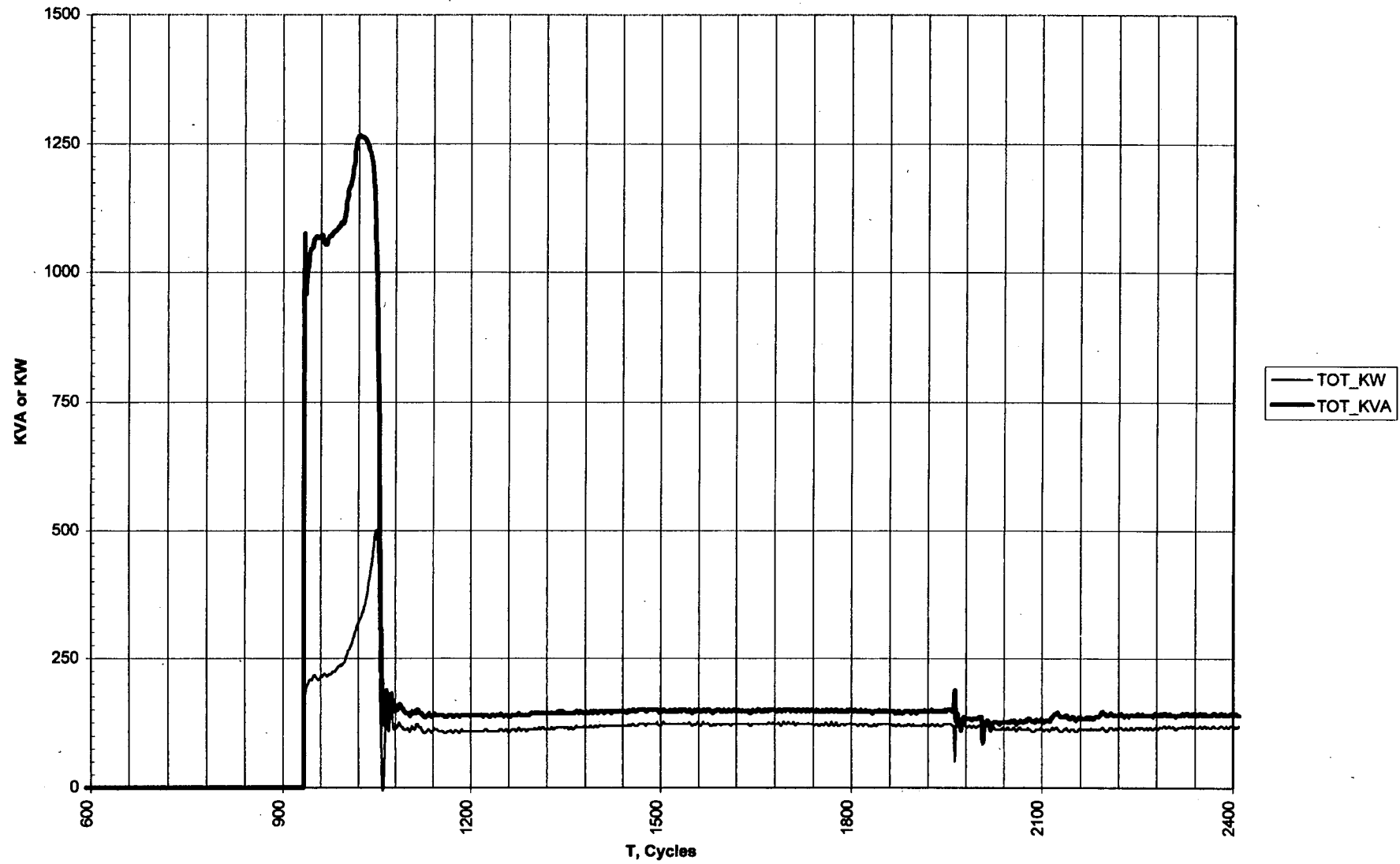


Figure 4.5.4- 1: Test5, RBCF 3B Voltage and Current

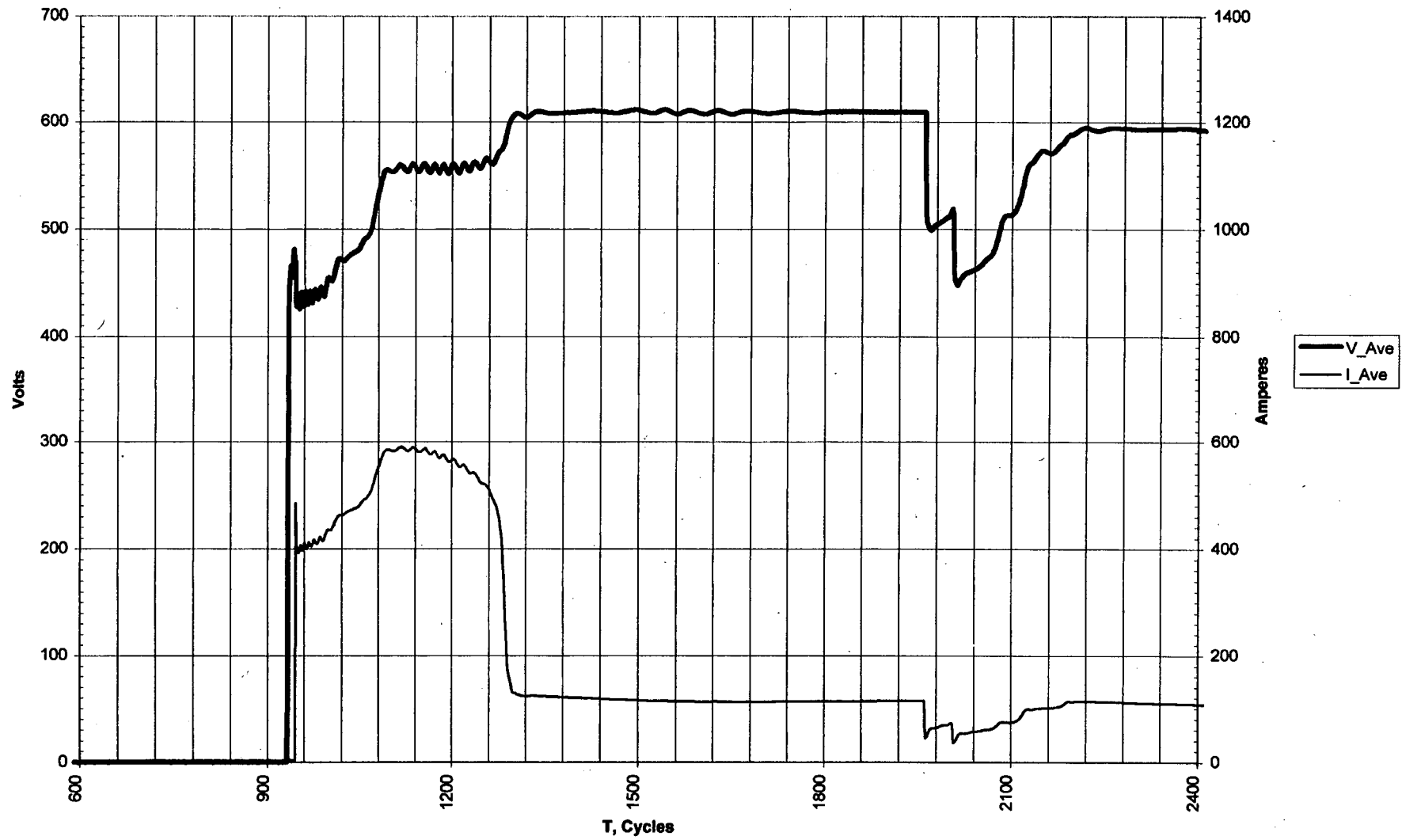


Figure 4.5.4- 14: Test5, RBCF 3B KVA and KW

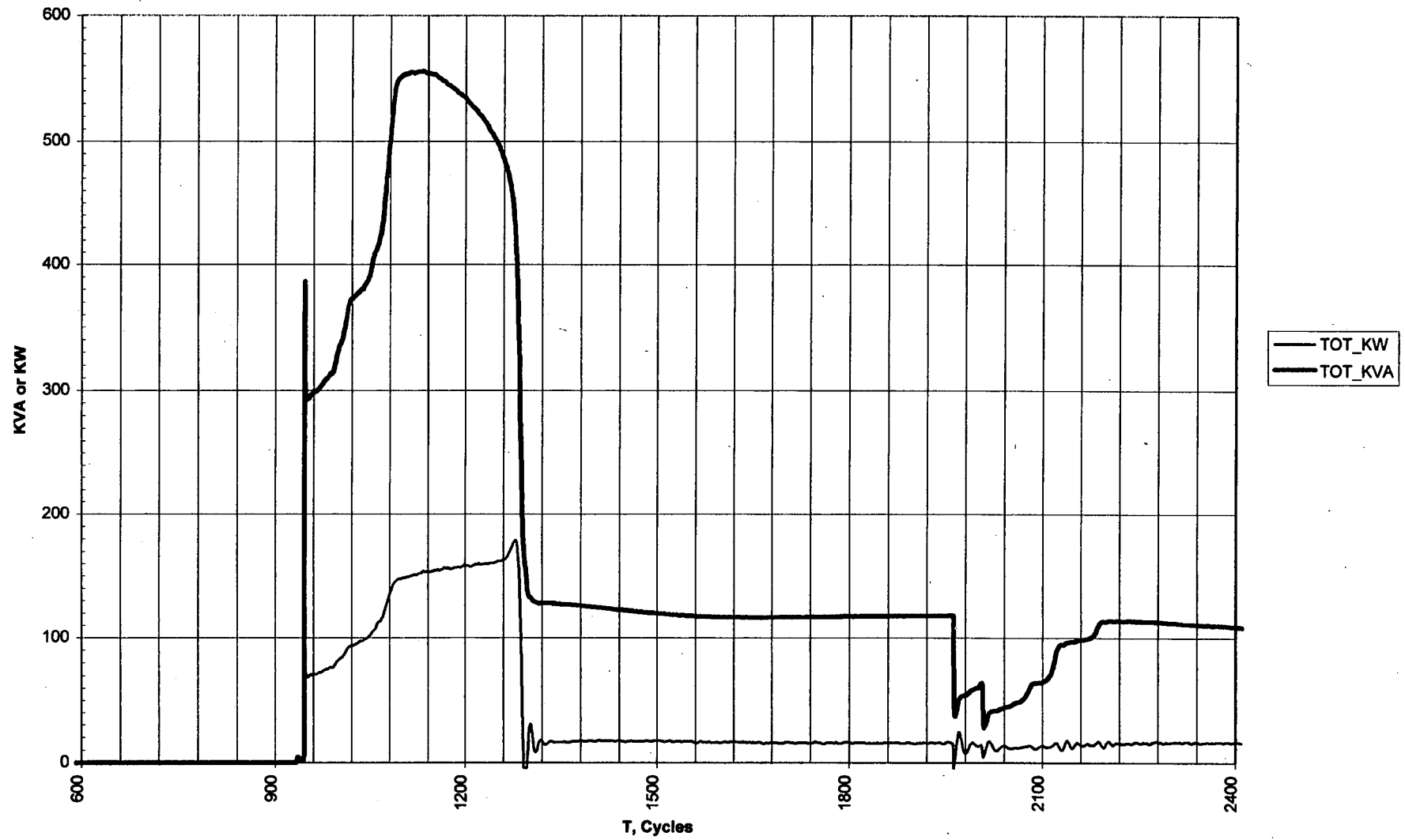


Figure 4.5.5- 1: Test5, 1X5 Voltage and Current

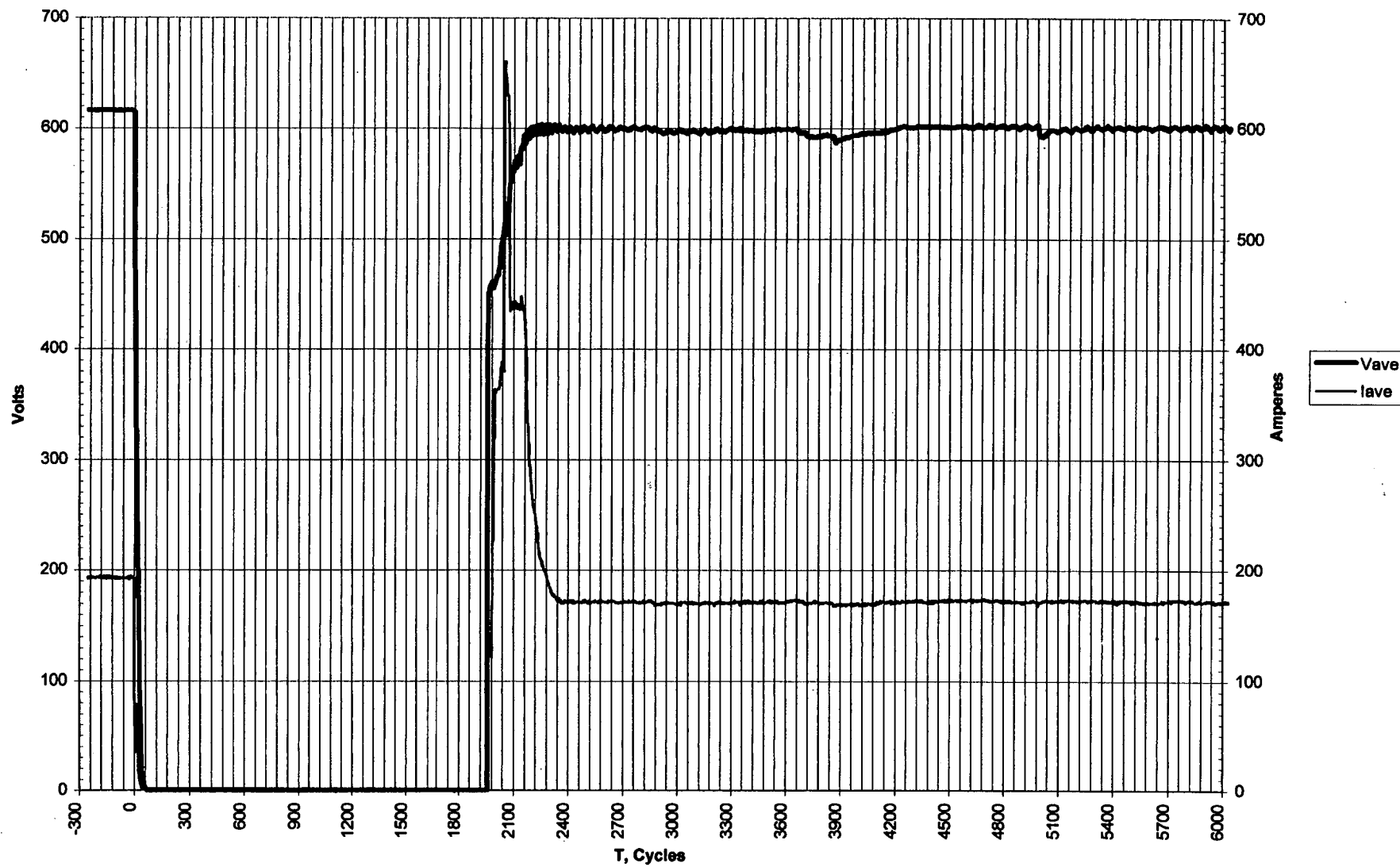


Figure 4.5.5- 2: Test5, 1X5 KVA and KW

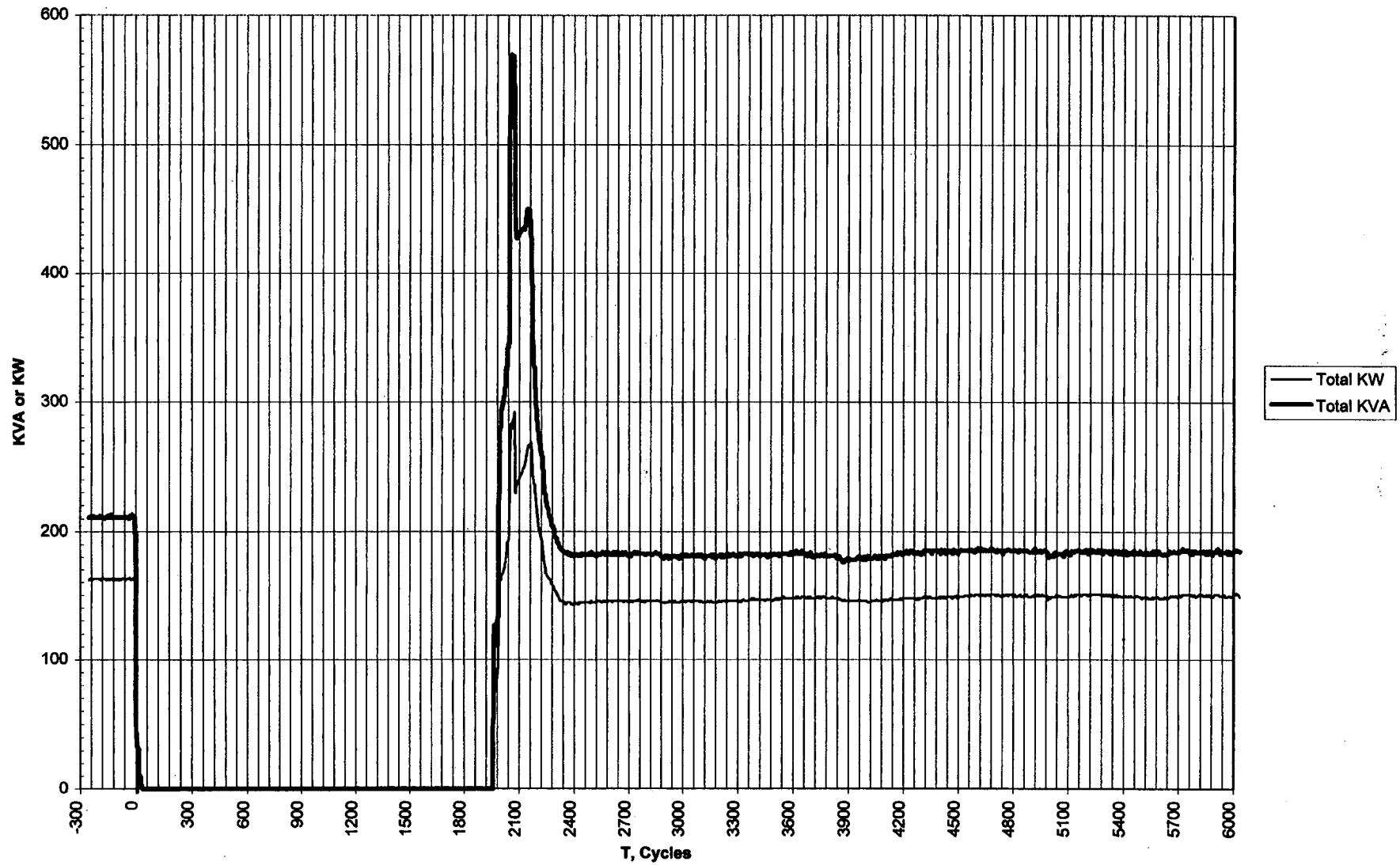


Figure 4.5.5- 3: Test5, 1X6 Voltage and Current

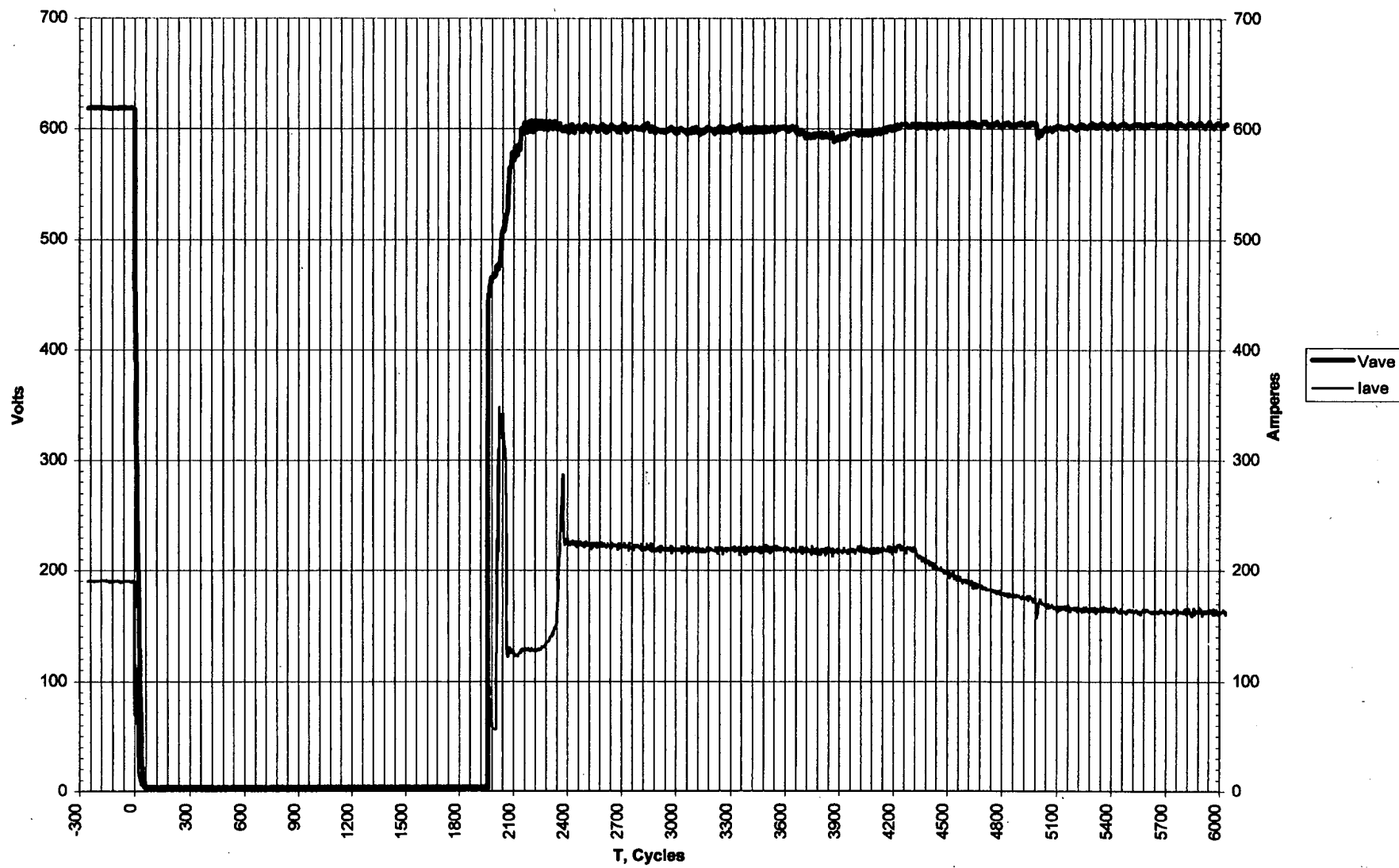


Figure 4.5.5- 4: Test5, 1X6 KVA and KW

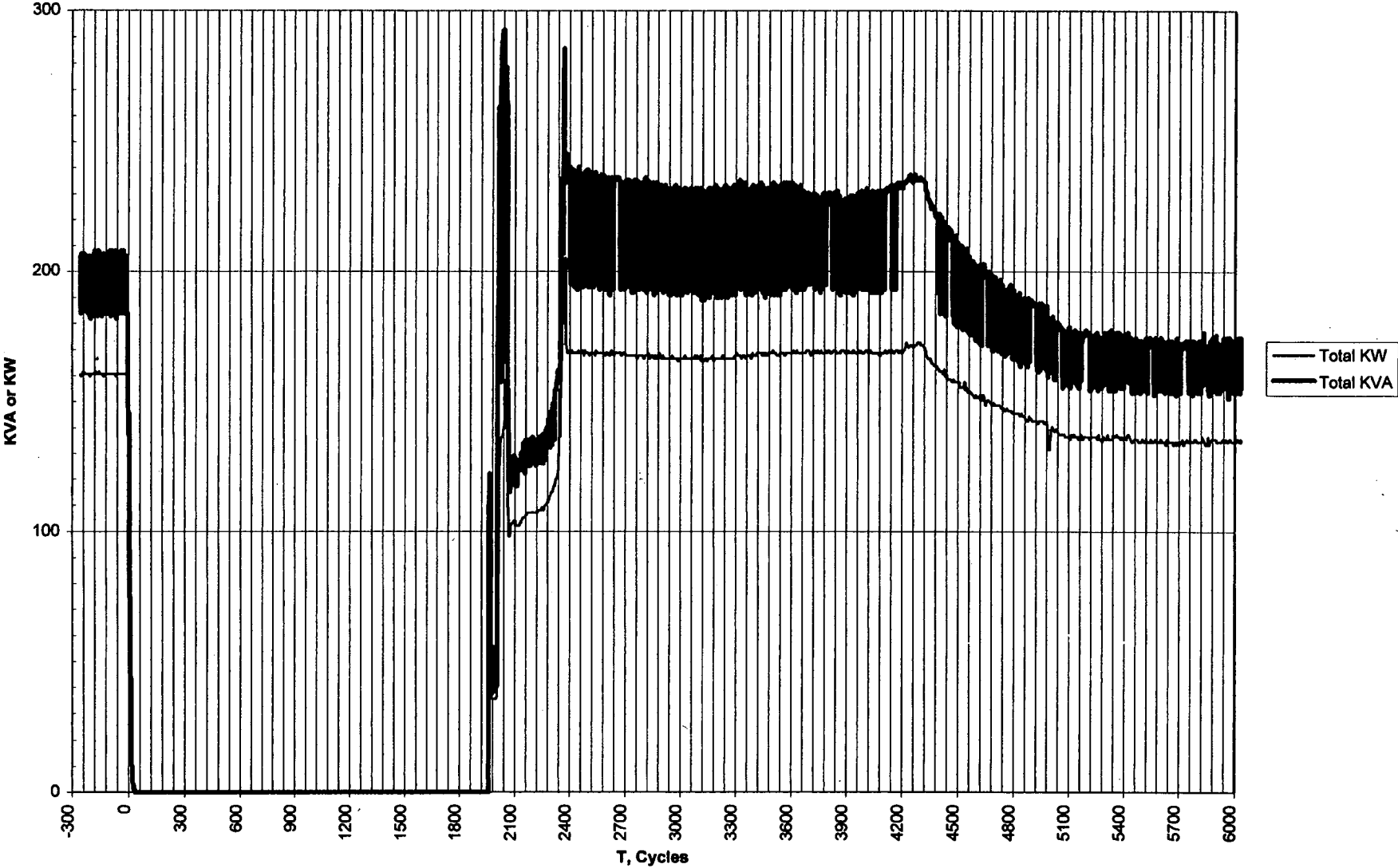


Figure 4.5.5- 5: Test5, 3X5 Voltage and Current

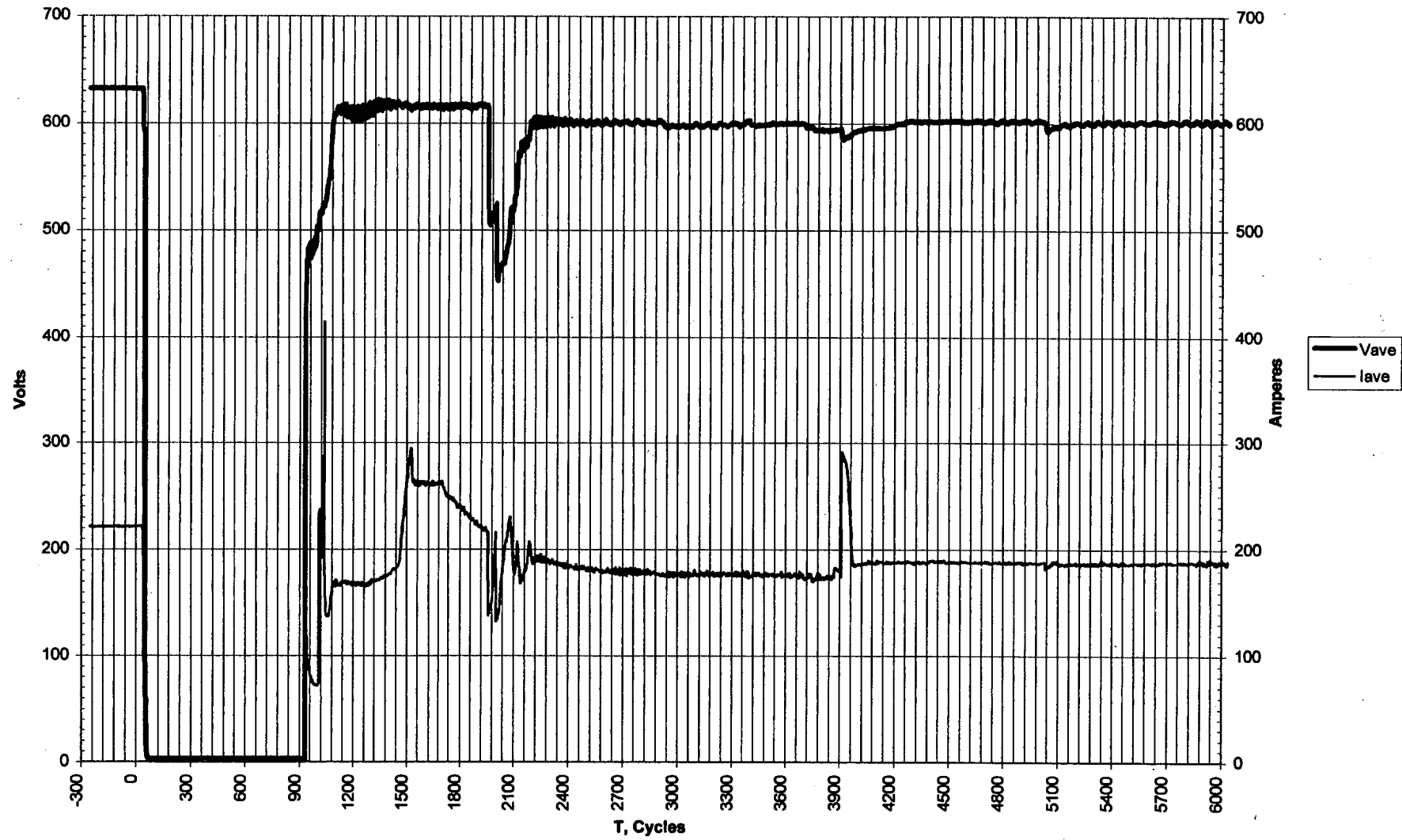


Figure 4.5.5- 6: Test5, 3X5 KVA and KW



Figure 4.5.5- 7: Test5, 3X6 Voltage and Current

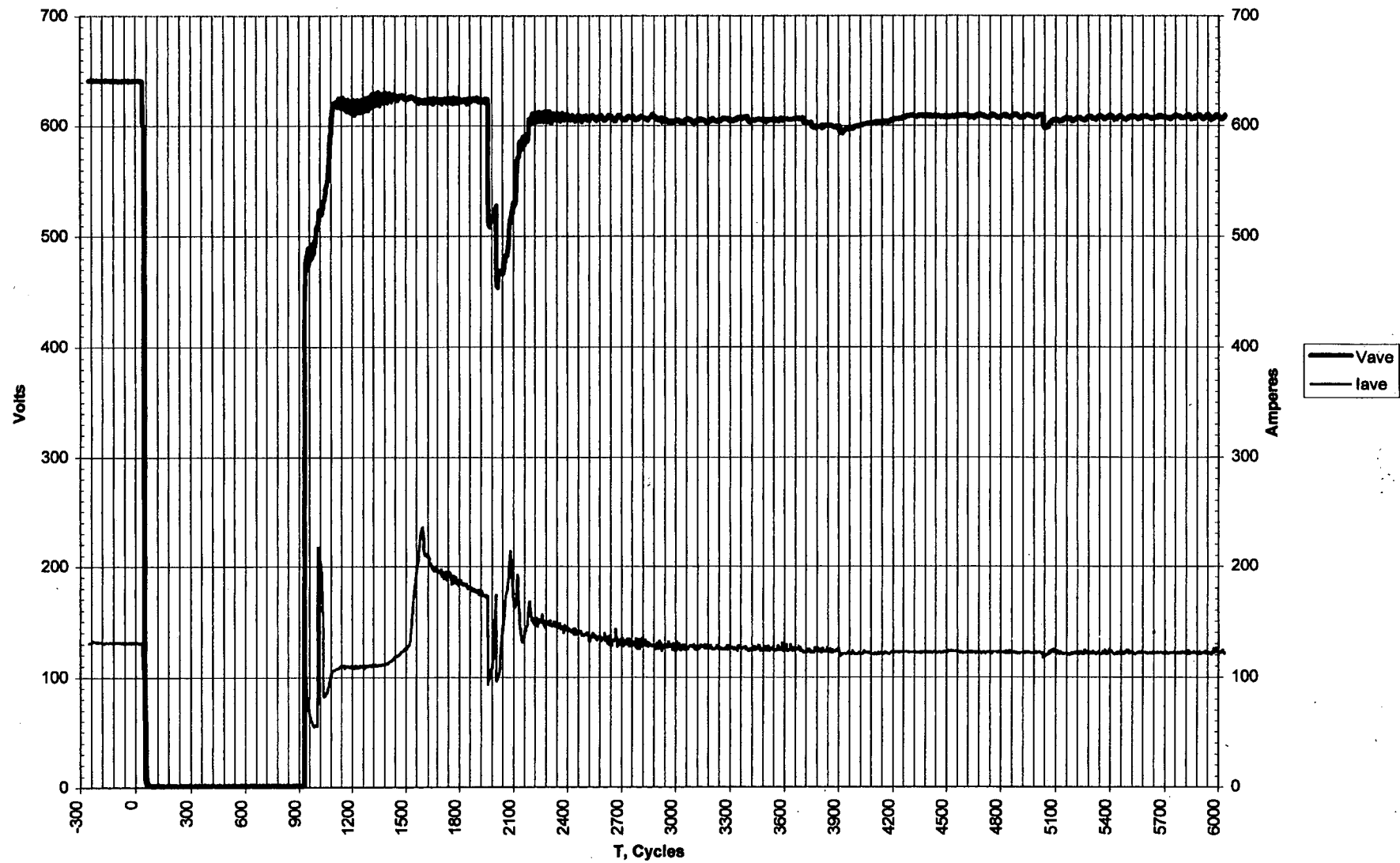


Figure 4.5.5- 8: Test5, 3X6 KVA and KW

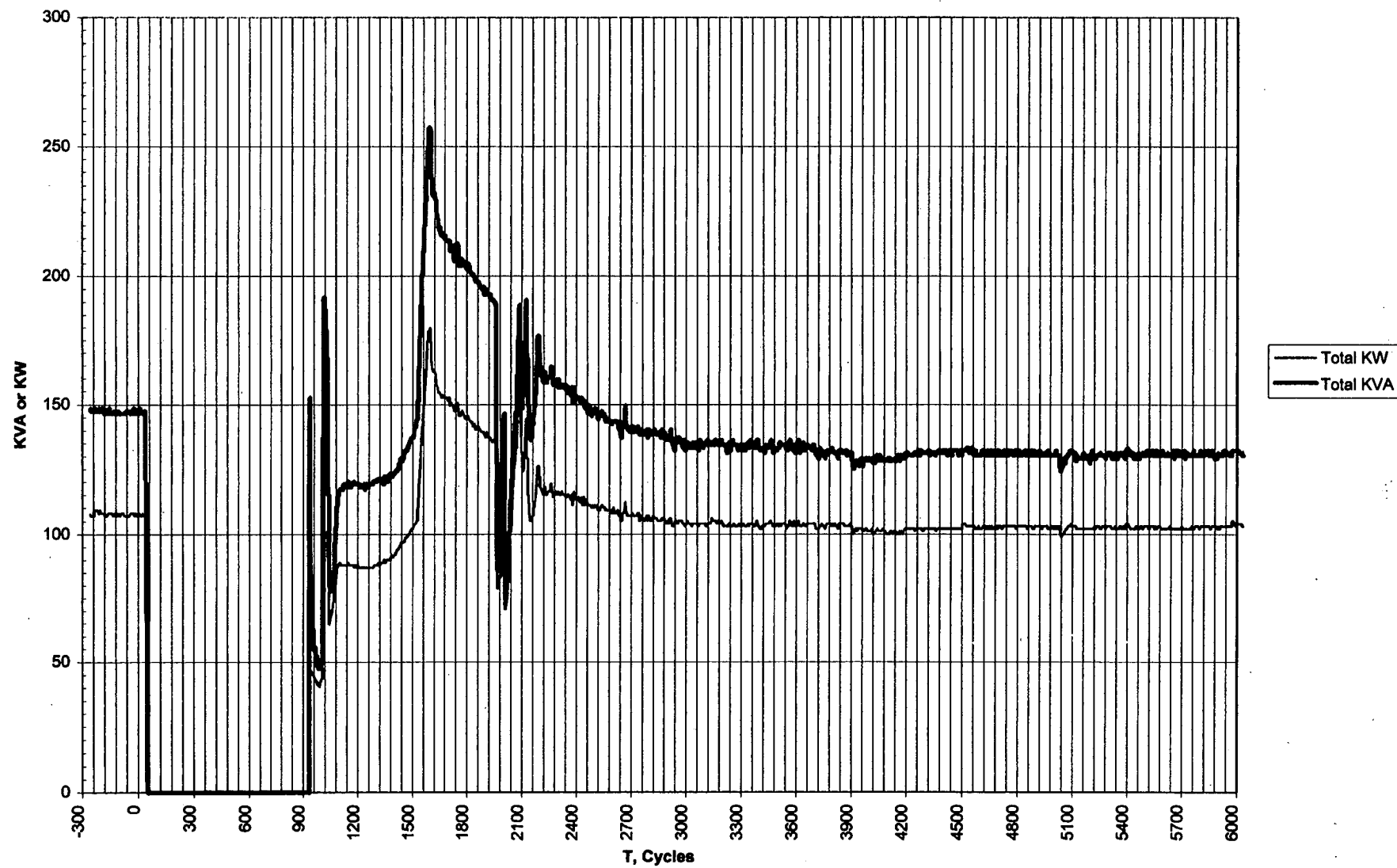


Figure 4.5.5- 9: Test5, 3X8 Voltage and Current

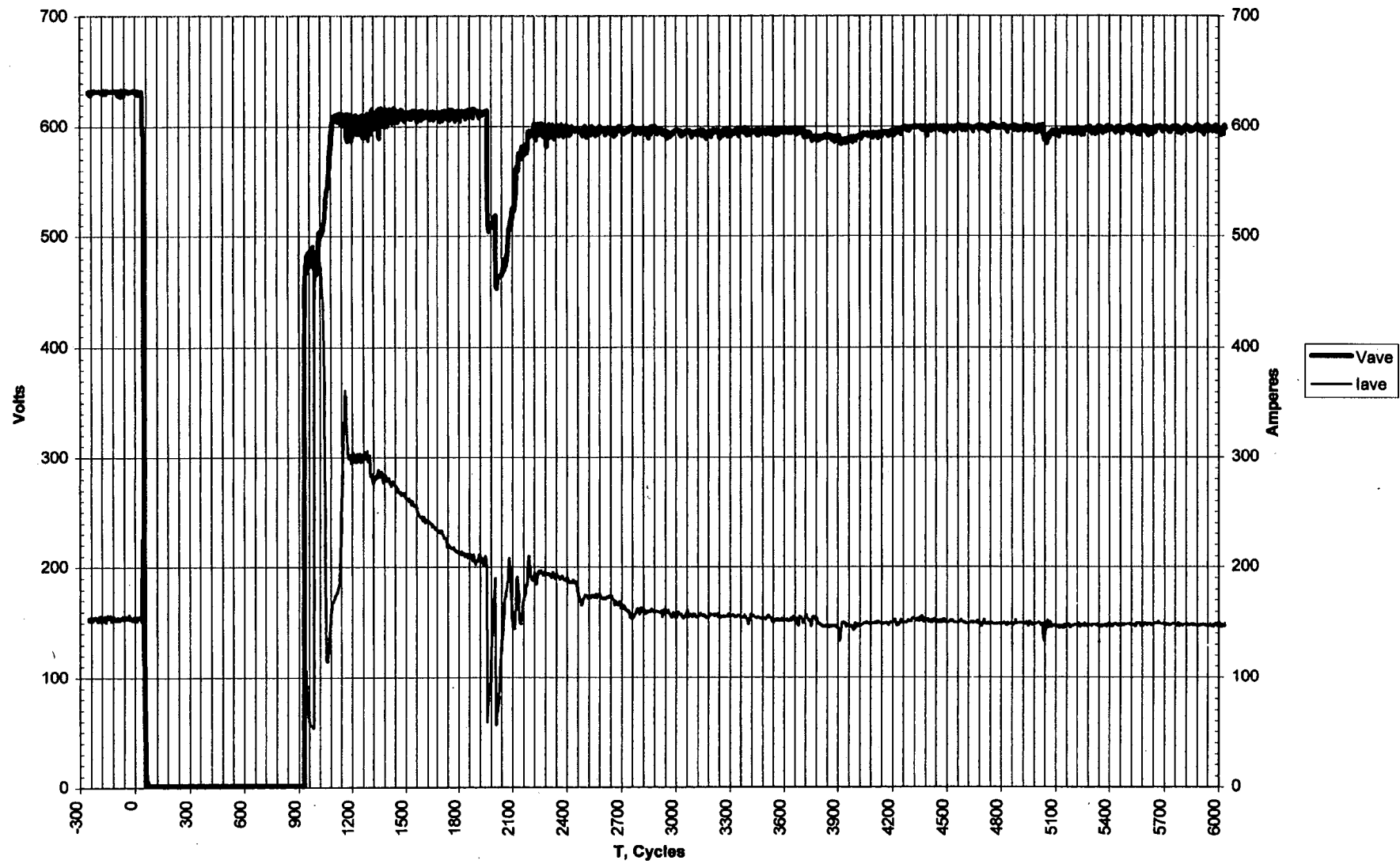


Figure 4.5.5- 10: Test5, 3X8 KVA and KW

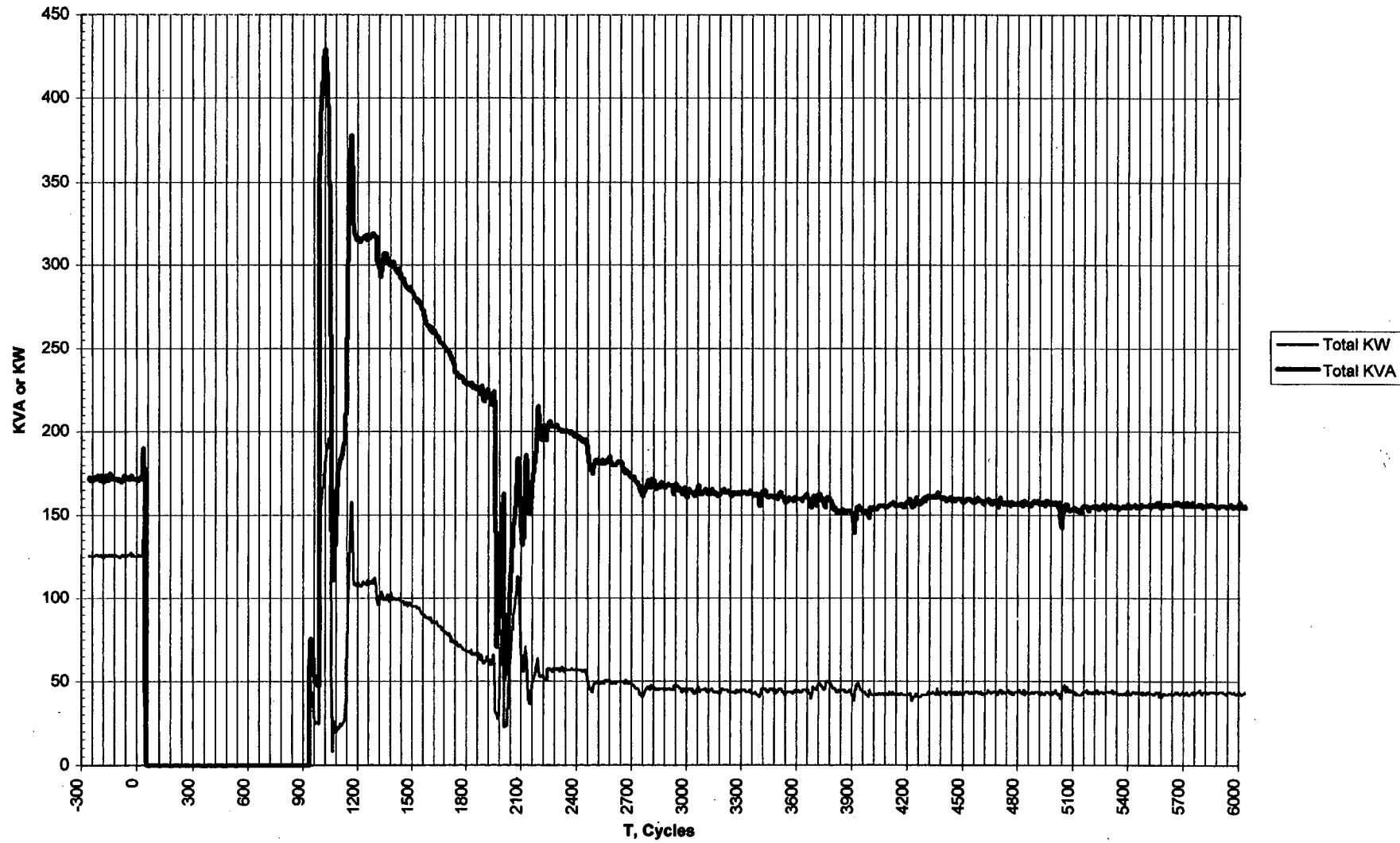


Figure 4.5.5- 11: Test5, 3X9 Voltage and Current



Figure 4.5.5- 12: Test5, 3X9 KVA and KW

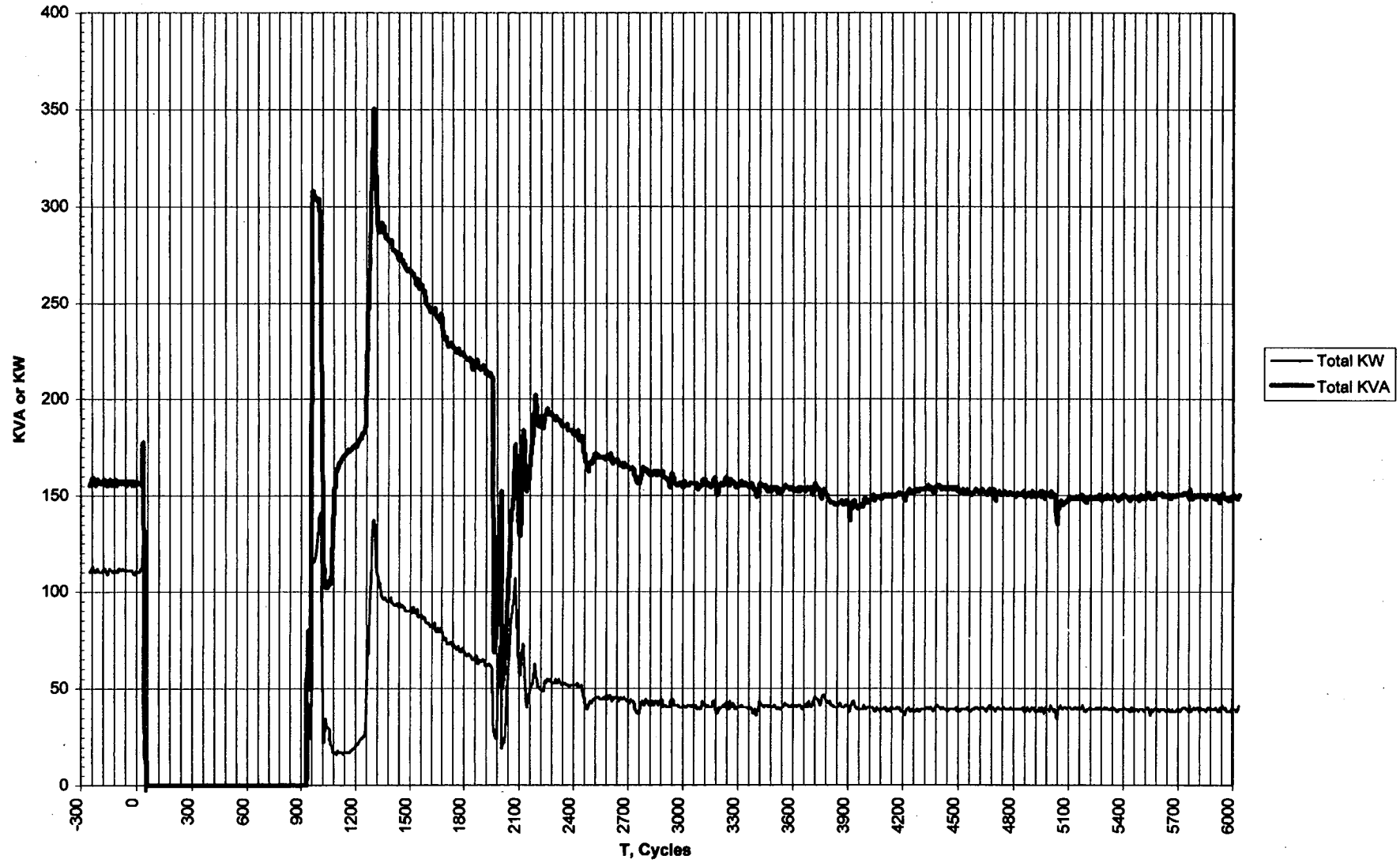


Figure 4.5.6- 1: Test5, 600V 3XS1 Voltage and Current



Figure 4.5.6- 2: Test5, 600V 3XS1 KVA and KW

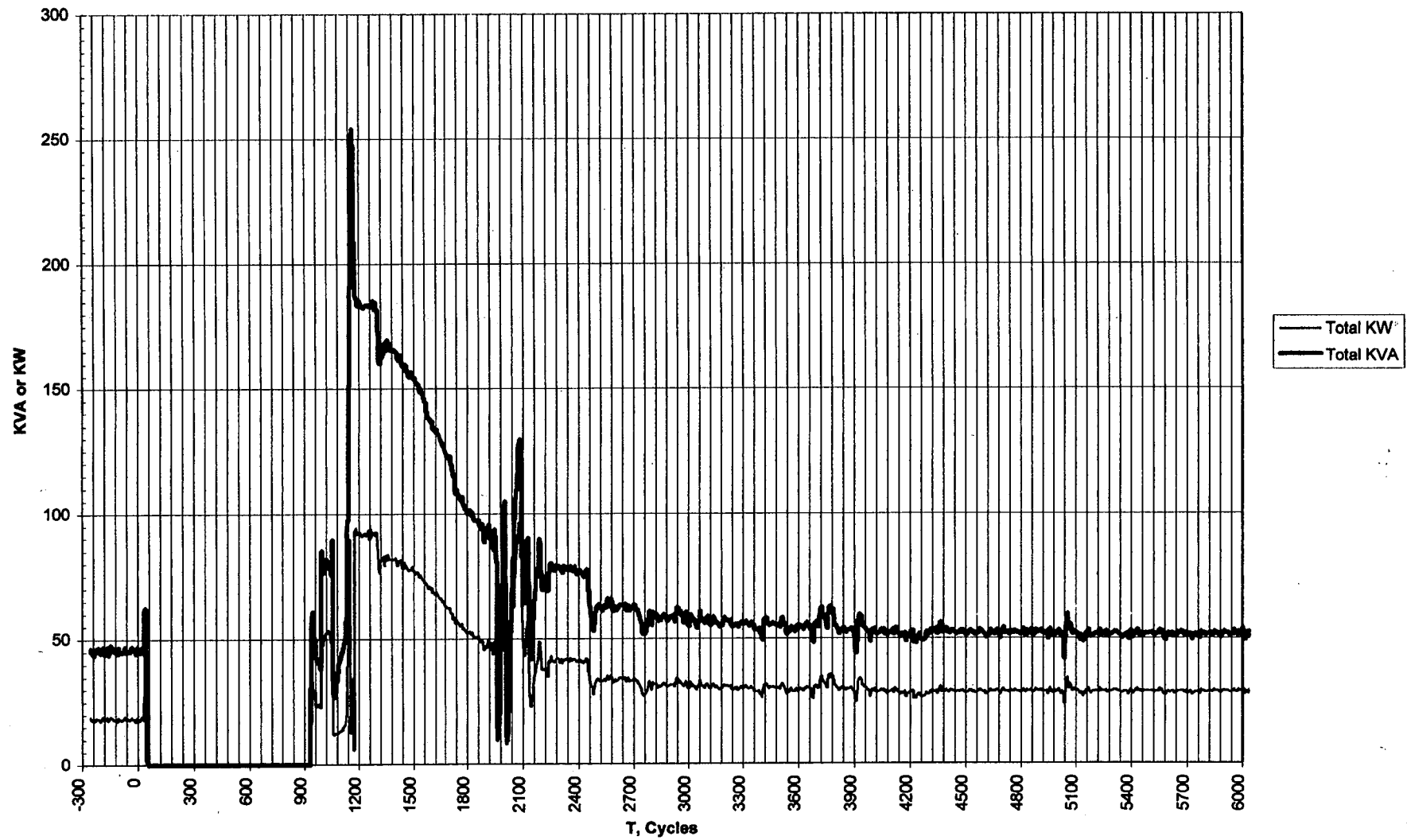


Figure 4.5.6- 3: Test5, 600V 3XS2 Voltage and Current

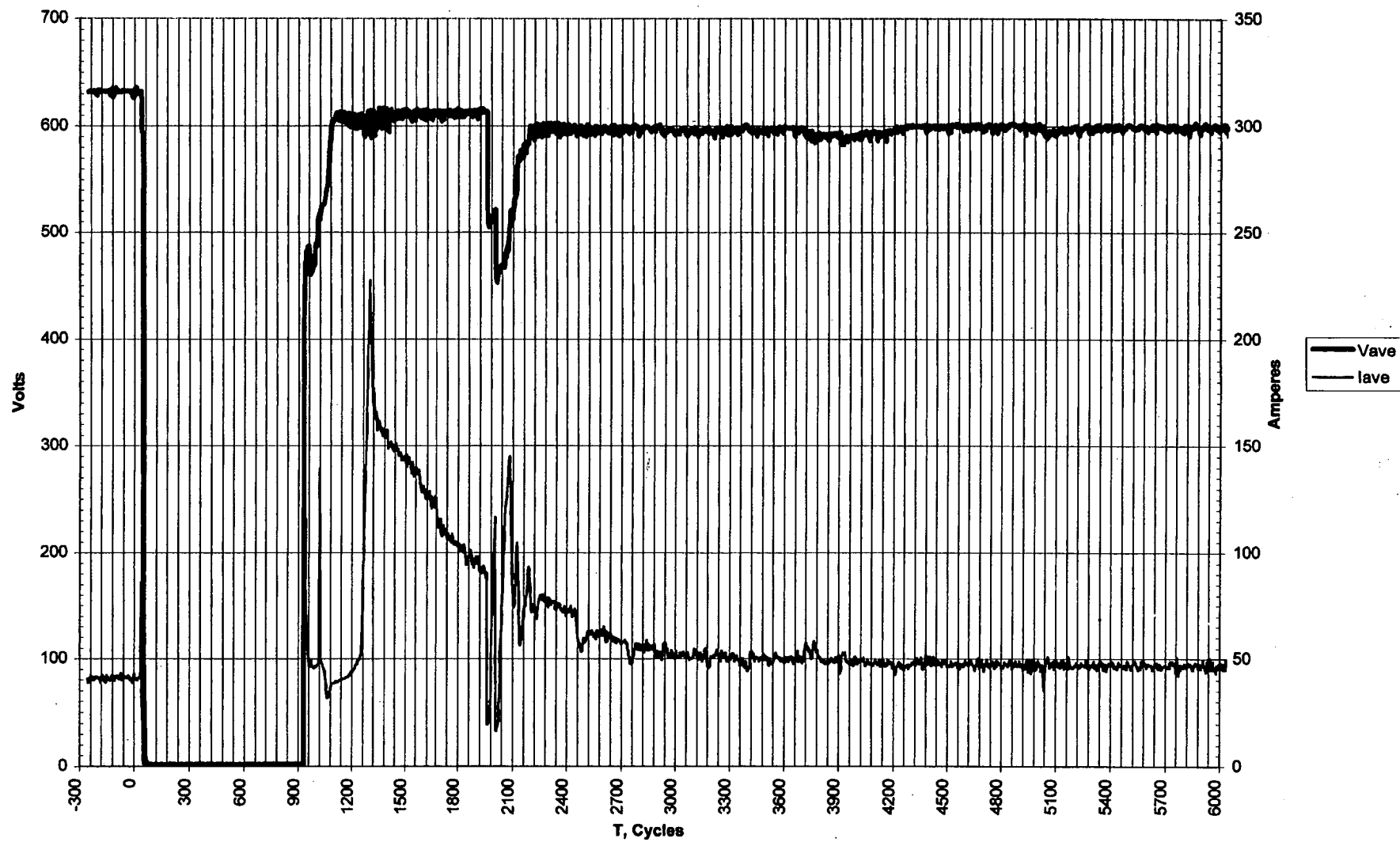


Figure 4.5.6- 4: Test5, 600V 3XS2 KVA and KW

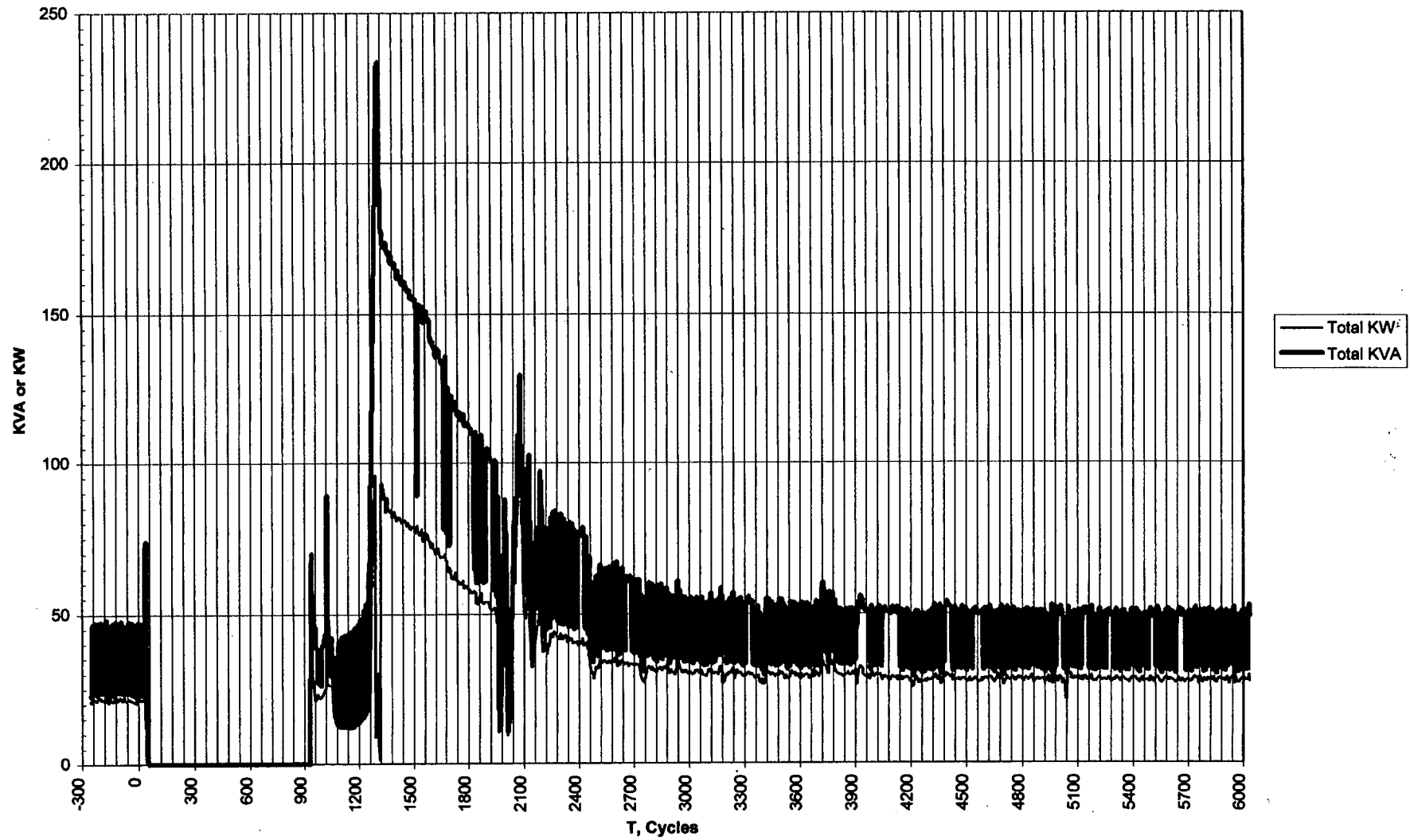


Figure 4.5.6- 5: Test5, 600V 3XS3 Voltage and Current

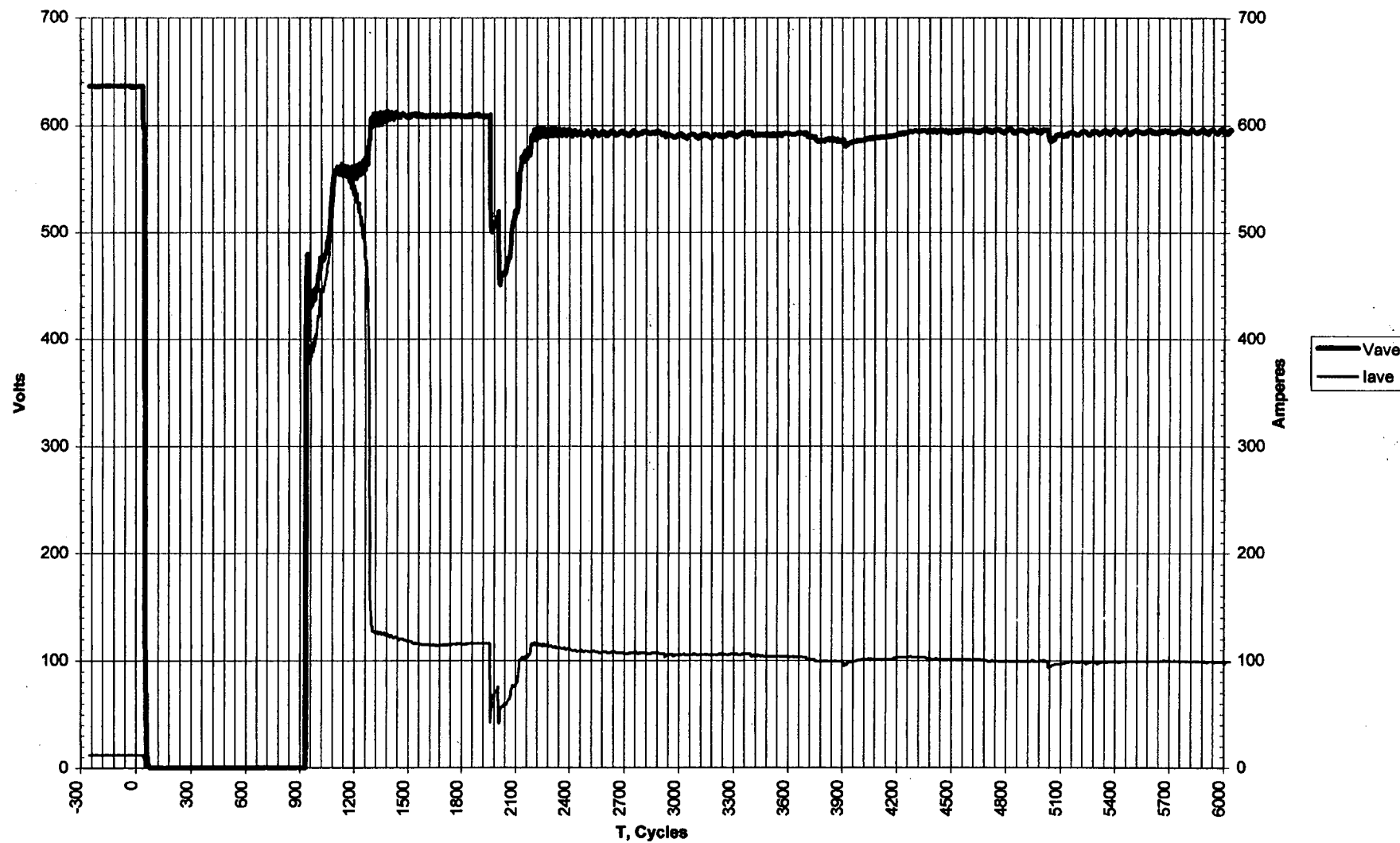


Figure 4.5.6- 6: Test5, 600V 3XS3 KVA and KW

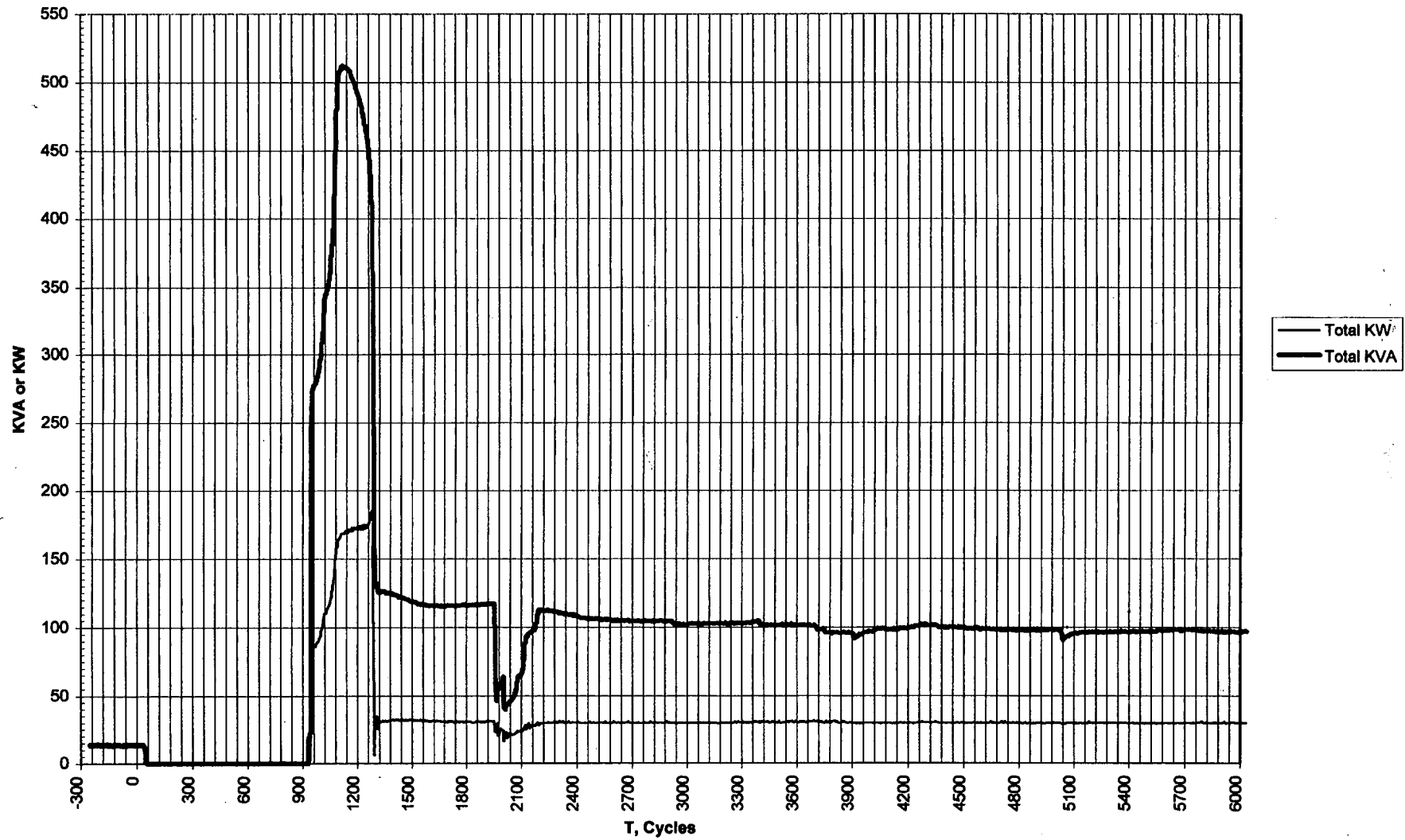


Figure 4.5.7- 1: Test5, 208V 3XS1 Voltage and Current



Figure 4.5.7- 2: Test5, 208V 3XS1 KVA and KW

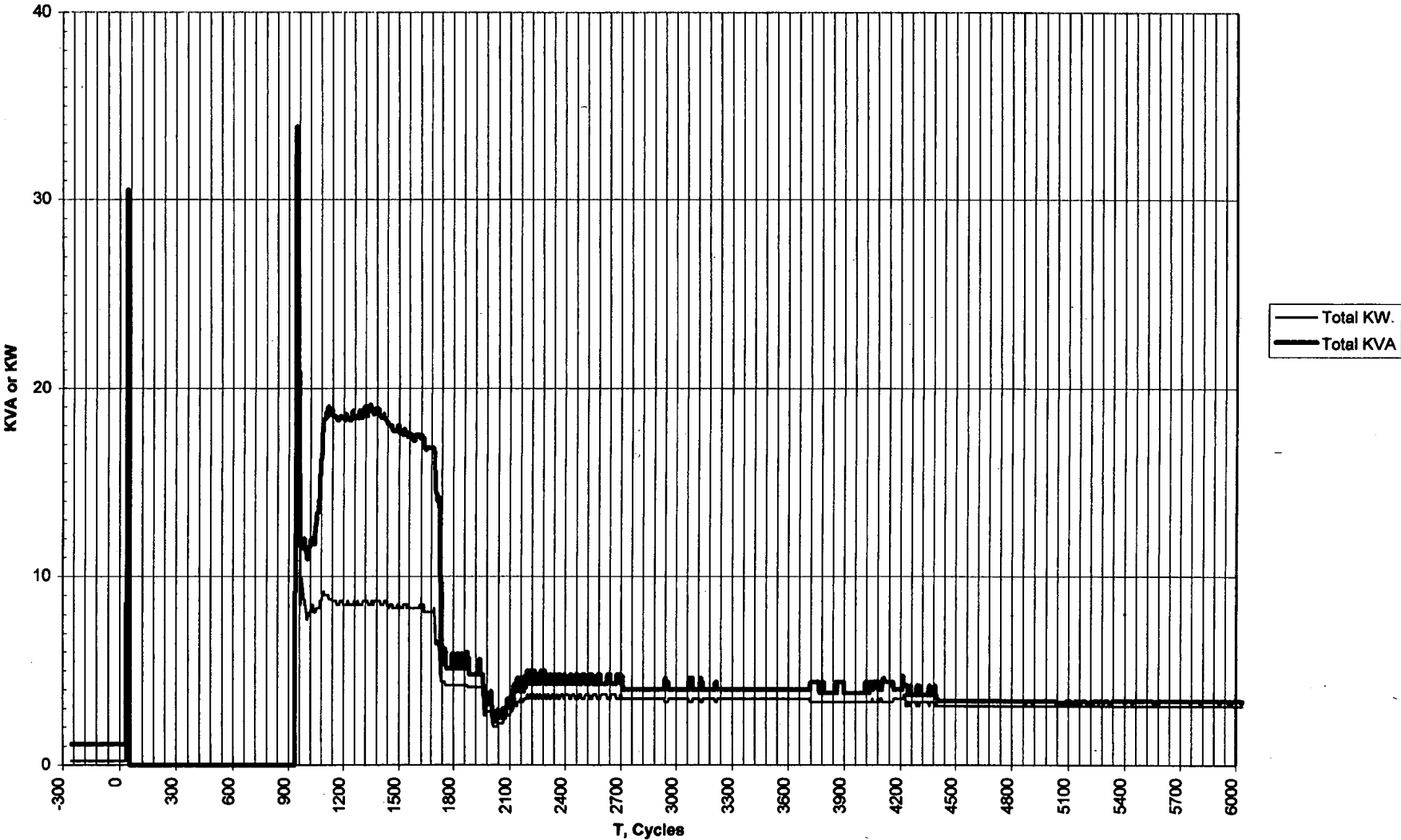


Figure 4.5.7- 3: Test5, 208V 3XS2 Voltage and Current

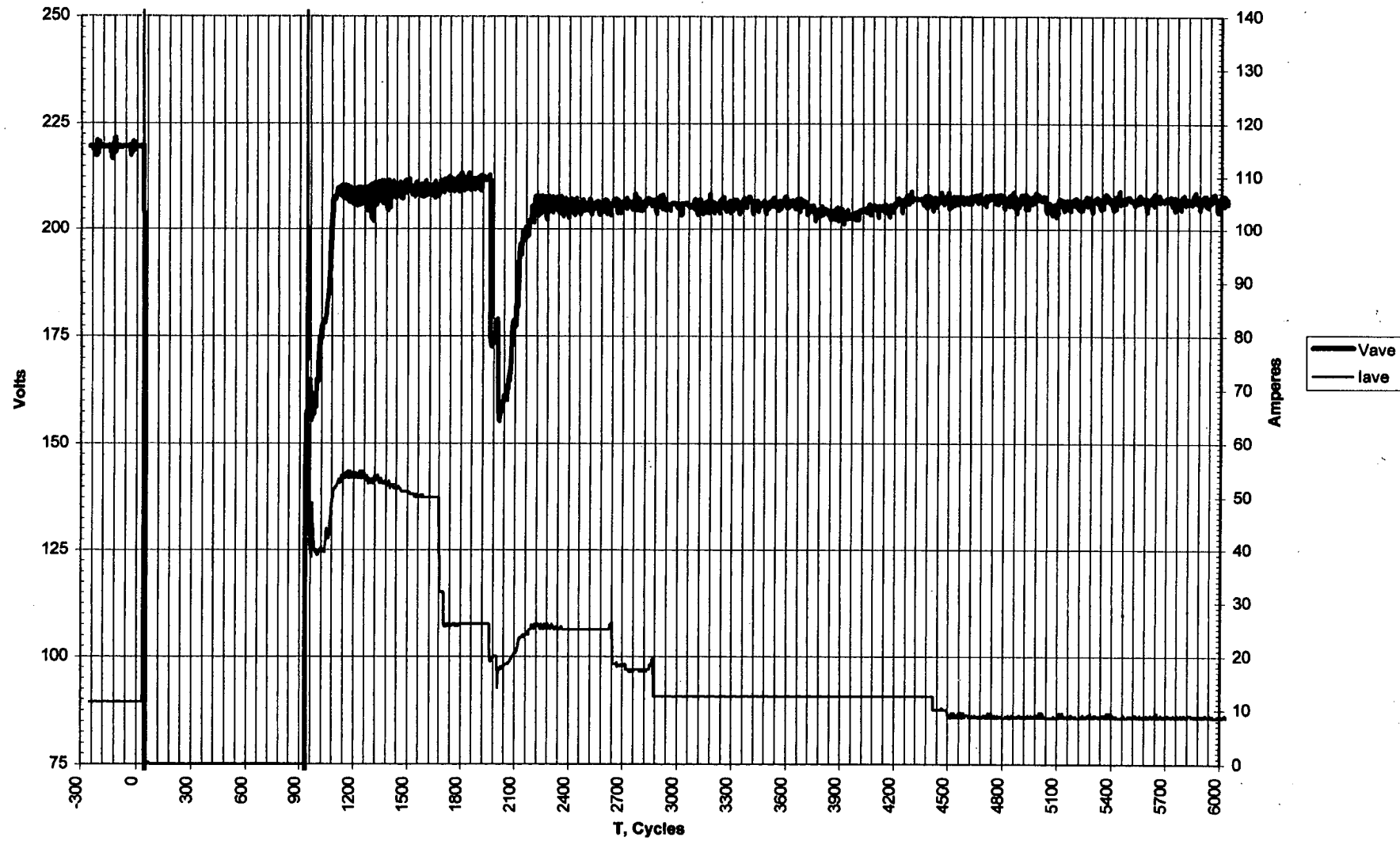


Figure 4.5.7- 4: Test5, 208V 3XS2 KVA and KW

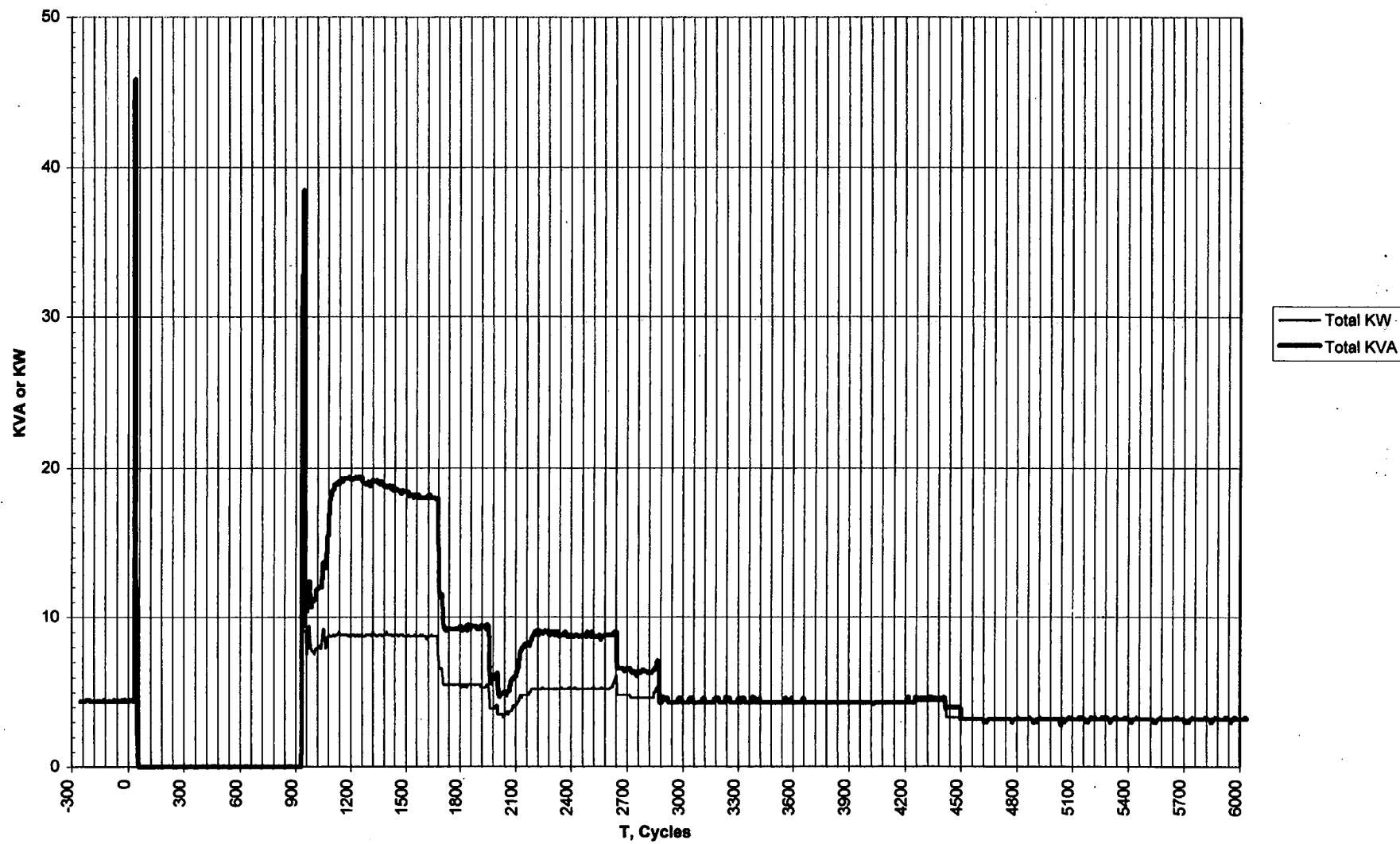


Figure 4.5.7- 5: Test5, 208V 3XS3 Voltage and Current

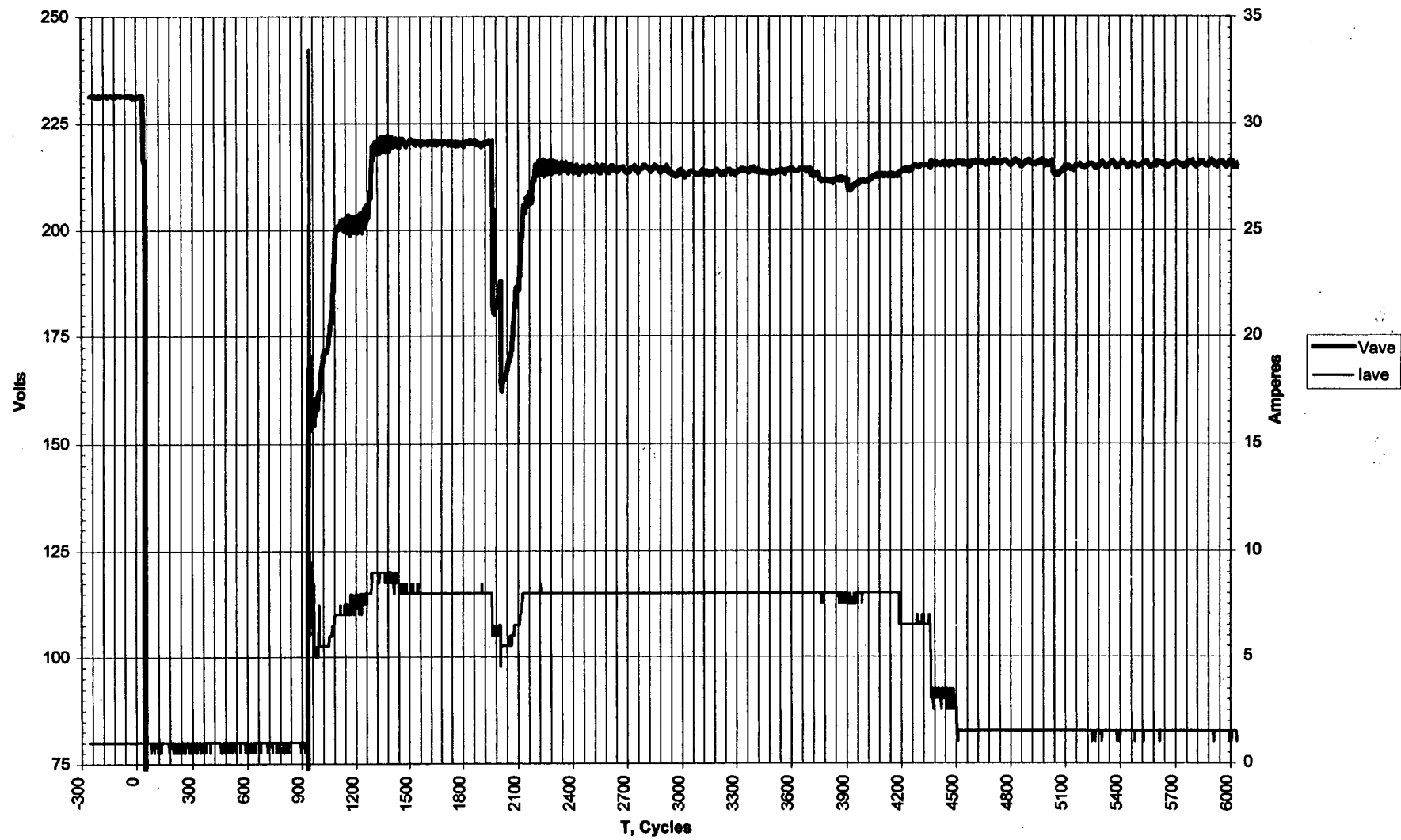


Figure 4.5.7- 6: Test5, 208V 3XS3 KVA and KW

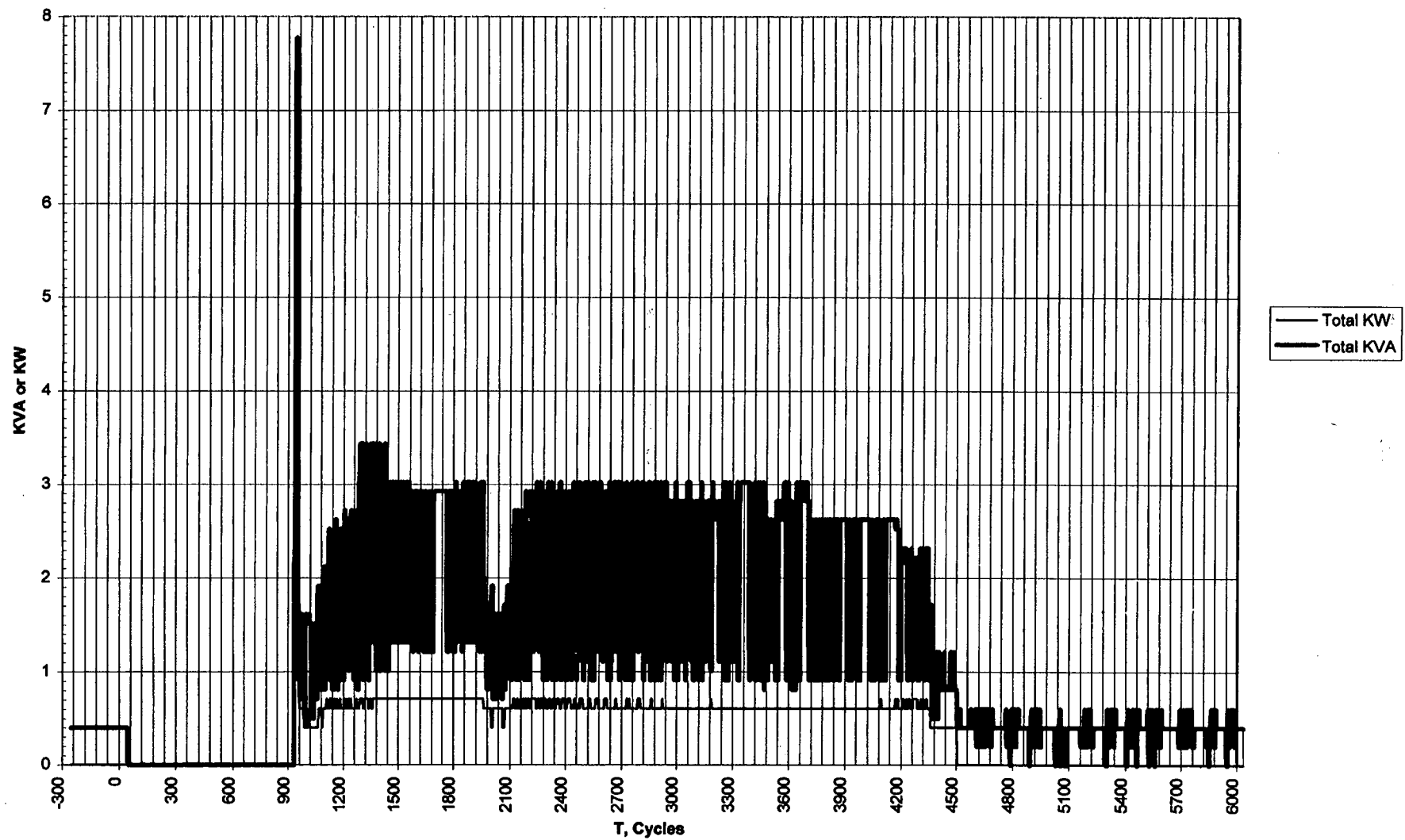
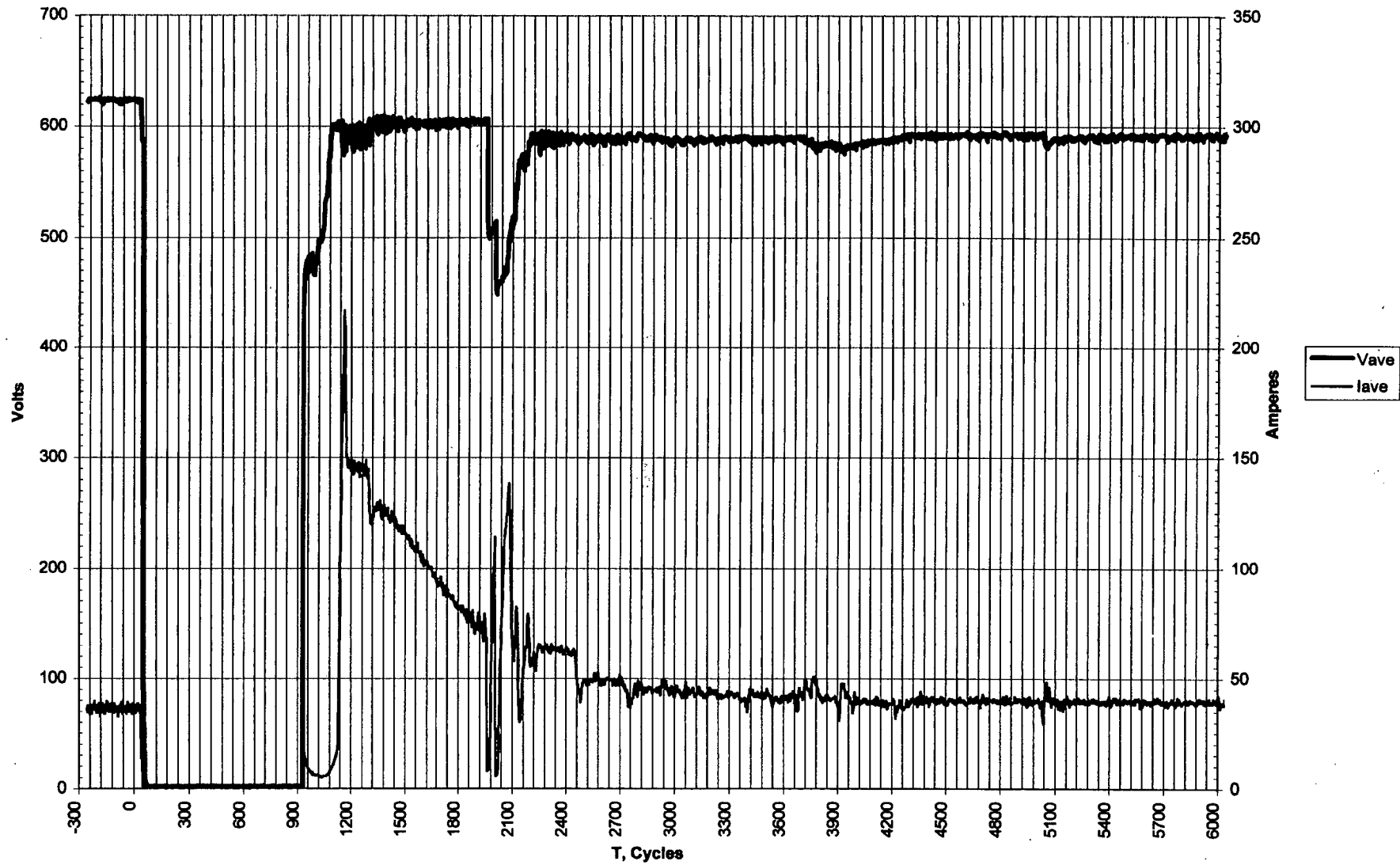
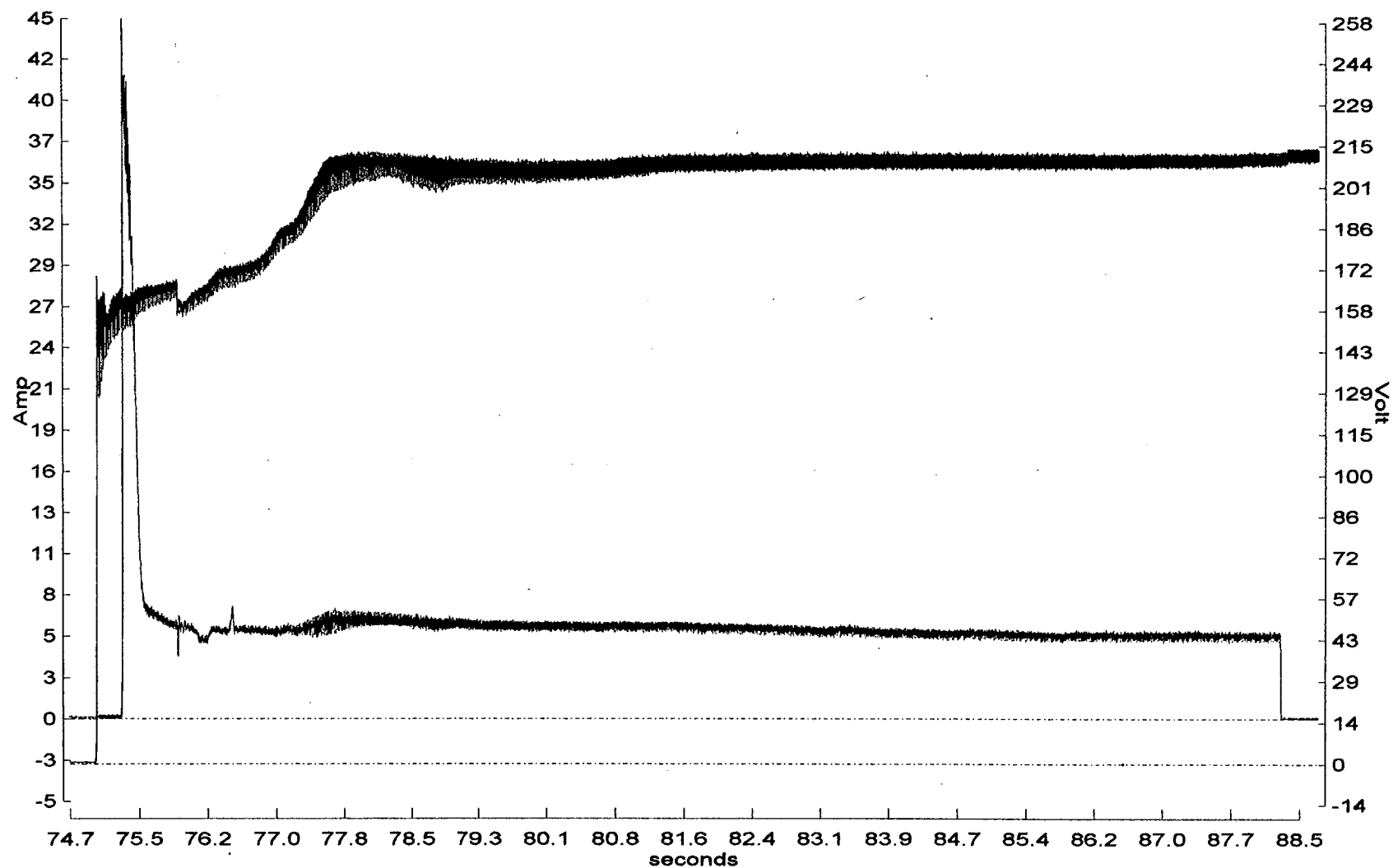


Figure 4.5.8- 1: Test5, Battery Charger 3CA Voltage and Current



<1> MPM Test: Ocone 3 3HP024 1-5-97 10:40a 133.8 ES 5



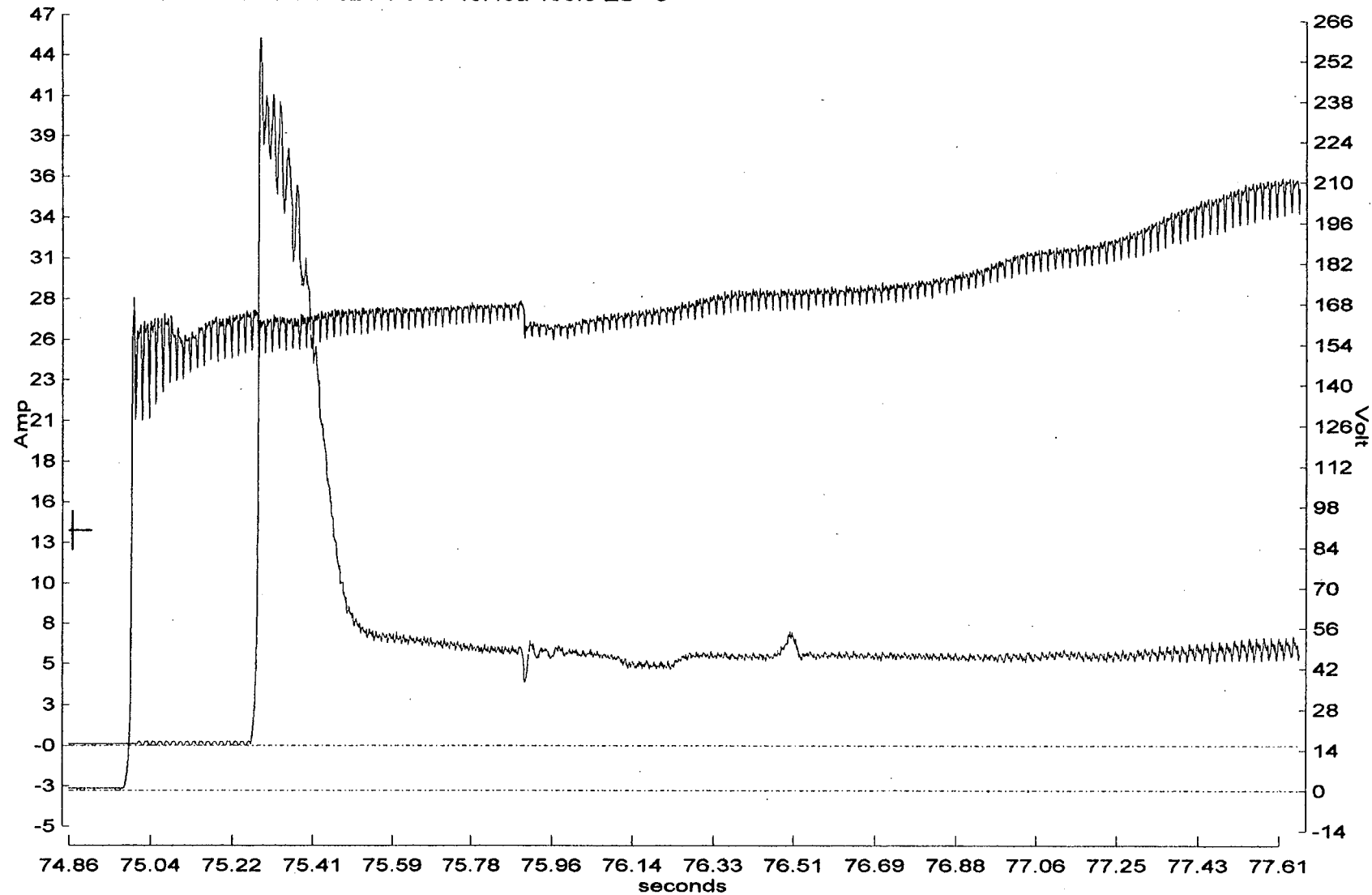
Cursor coordinates = 88.4seconds, 253Amp

— Vab-rms — Ia-rms

3HP-024
ES Test # 5
Full Stroke Voltage and Current

Figure 4.5.9.1-1: Test 5, 3HP-24 Full Stroke Voltage and Current

<1> MPM Test: Oconee 3 3HP024 1-5-97 10:40a 133.8 ES 5

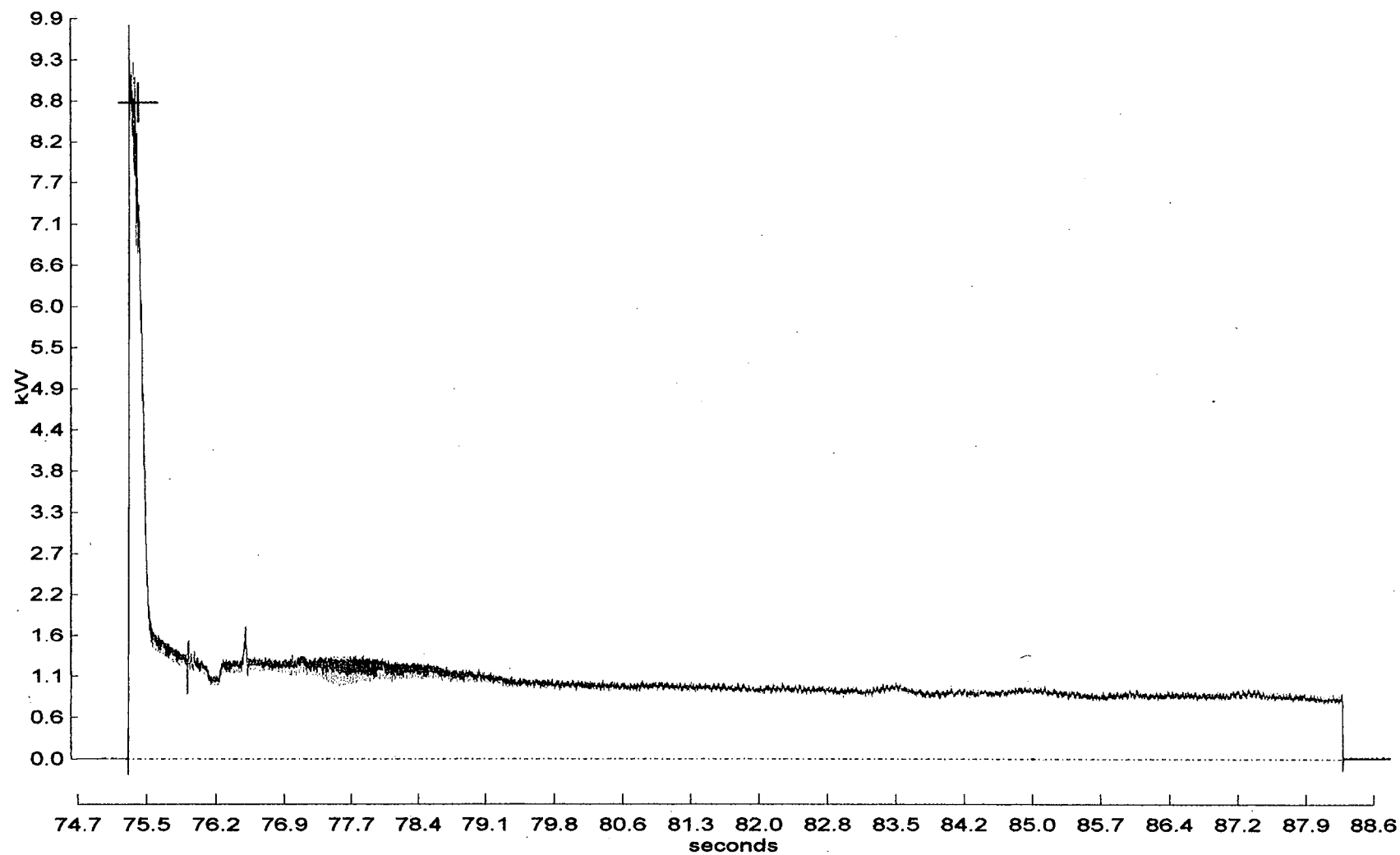


Cursor coordinates = 74.9seconds, 13.7Amp

— Vab-rms — Ia-rms

3HP-024
ES Test # 5
Inrush Voltage and Current

Figure 4.5.9.1-2: Test 5, 3HP-24 Inrush Voltage and Current



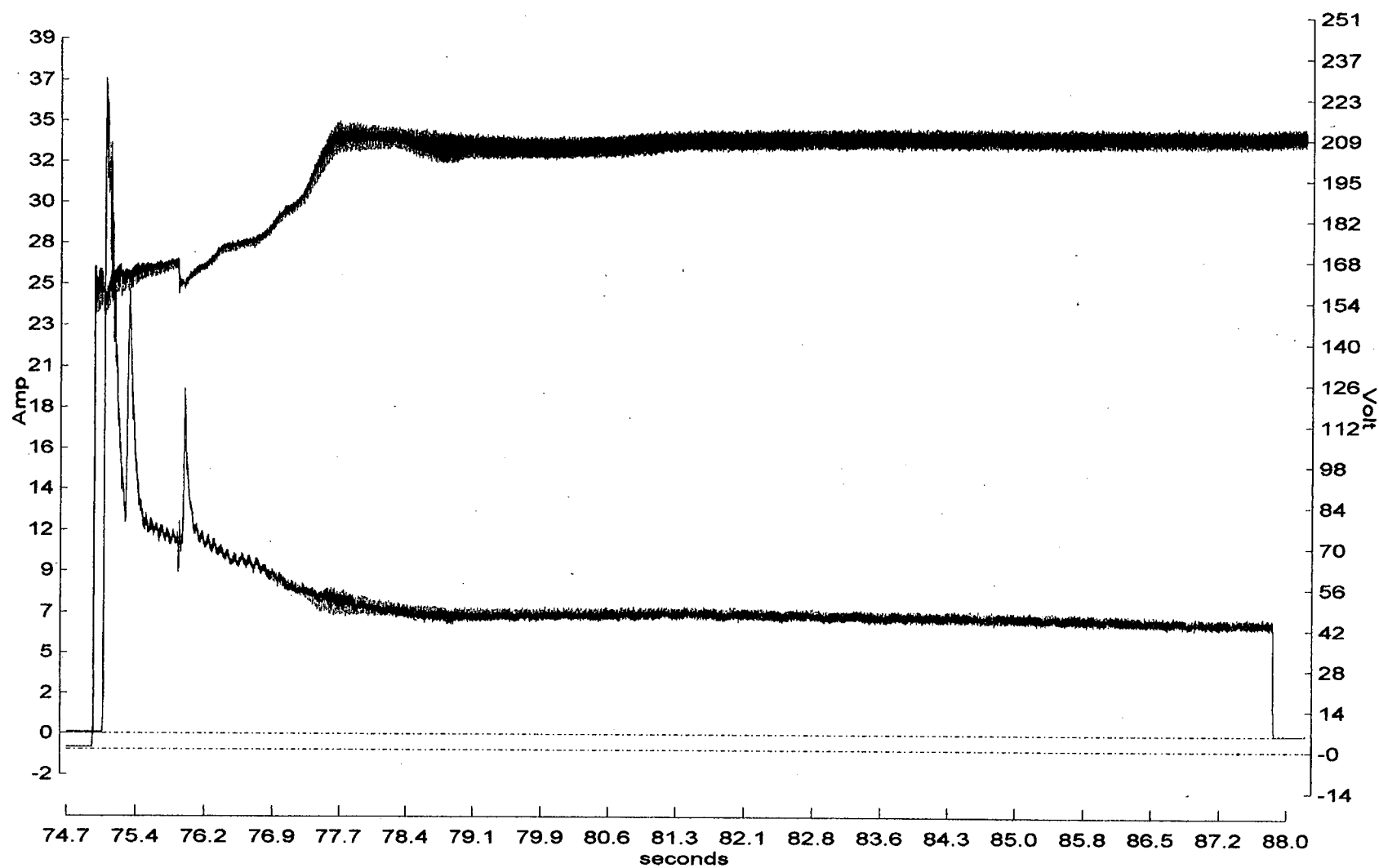
Cursor coordinates = 75.4seconds, 8.74kW

TRP

3HP-024
ES Test # 5
Full Stroke Total Real Power

Figure 4.5.9.1-3: Test 5, 3HP-24 Full Stroke Total Real Power (KW)

<1> MPM Test: Ocone 3 3HP026 1-5-97 10:40a 133.8 ES 5



Cursor coordinates = 83.5seconds, 457Amp

— V_{ab-rms} — I_{a-rms}

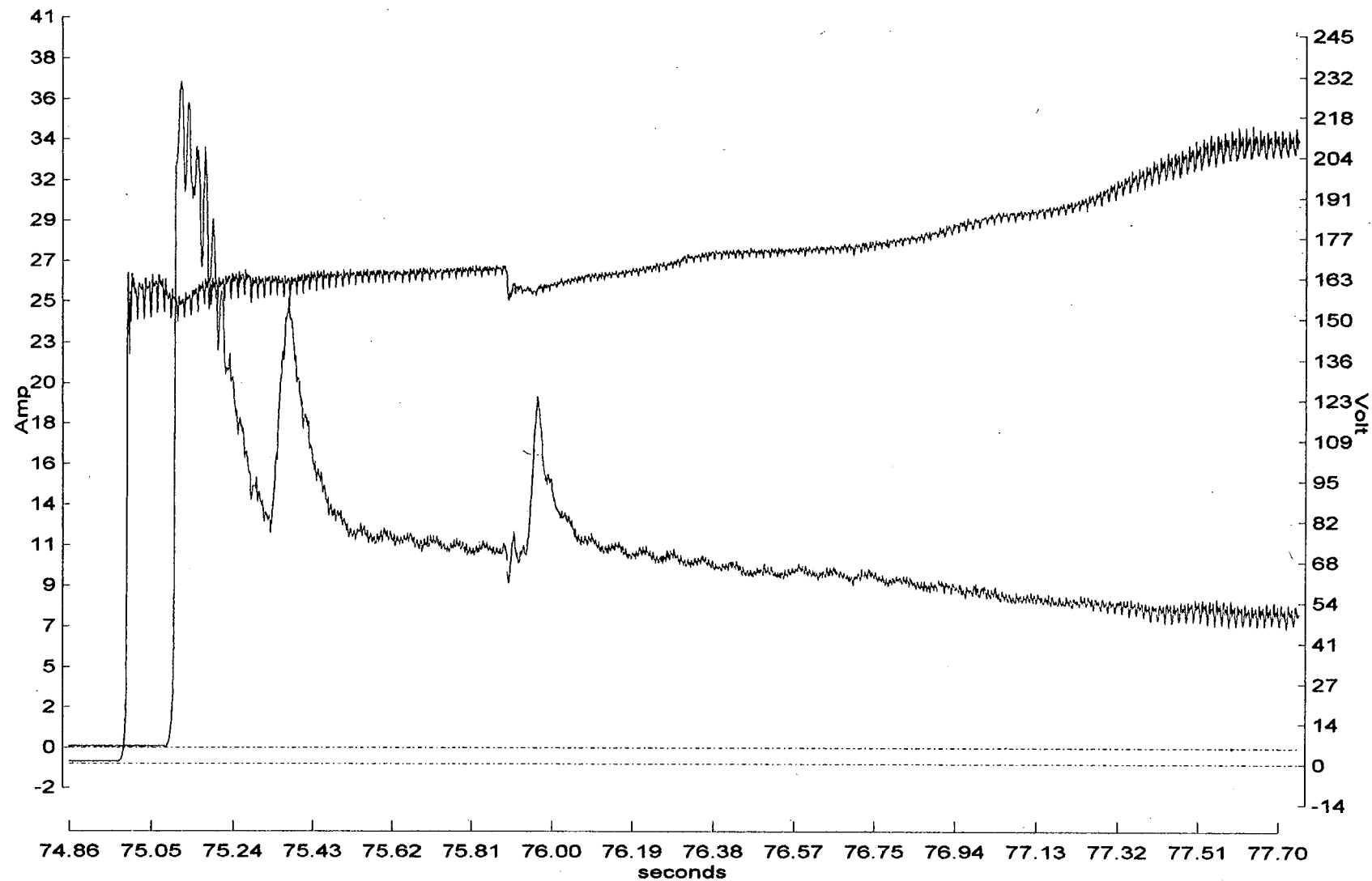
3HP-026

ES Test # 5

Full Stroke Voltage and Current

Figure 4.5.9.2-1: Test 5, 3HP-26 Full Stroke Voltage and Current

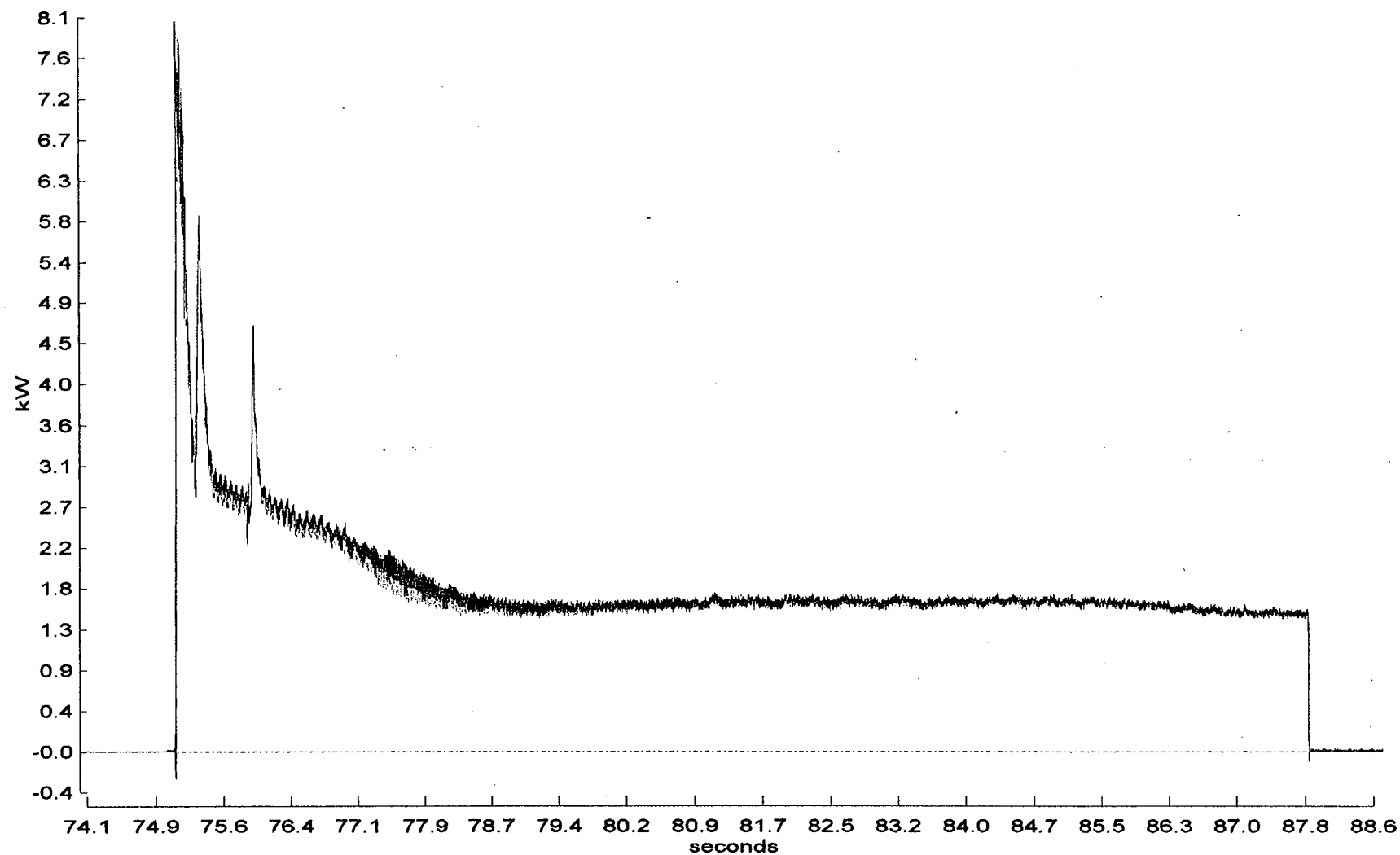
<1> MPM Test: Ocone 3 3HP026 1-5-97 10:40a 133.8 ES 5



3HP-026
ES Test # 5
Inrush Voltage and Current

Figure 4.5.9.2-2: Test 5, 3HP-26 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3HP026 1-5-97 10:40a 133.8 ES 5



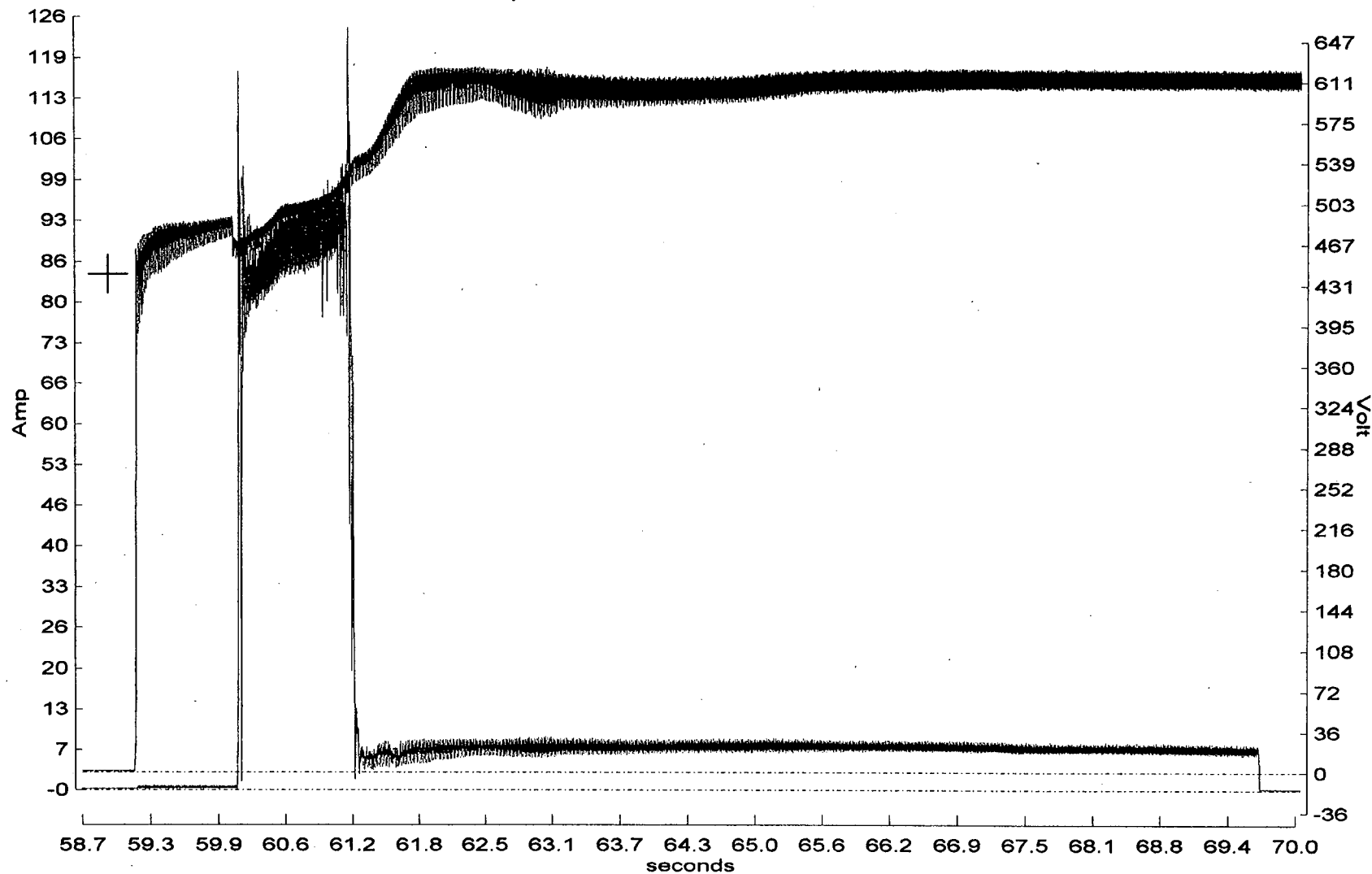
Cursor coordinates = 76.6seconds, 35.1kW

— TRP

3HP-026
ES Test # 5
Full Stroke Total Real Power

Figure 4.5.9.2-3: Test 5, 3HP-26 Full Stroke Total Real Power (KW)

<1> MPM Test: Ocone 3 3LP017 1-4-97 10:41p 130.3 5 ES



Cursor coordinates = 58.9seconds, 84.1Amp

— Vab-rms — Ia-rms

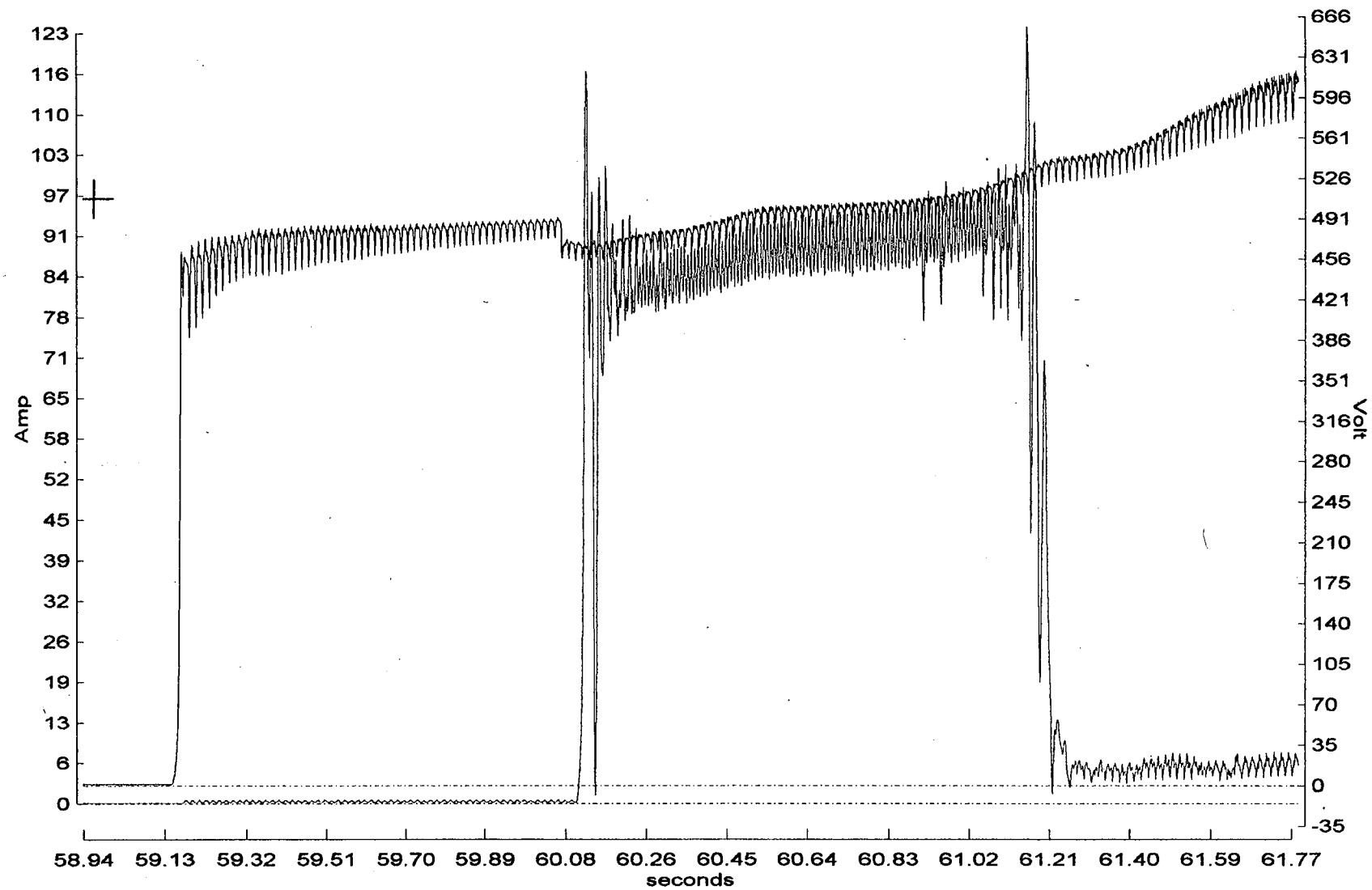
3LP-017

ES Test # 5

Full Stroke Voltage and Current

Figure 4.5.9.3-1: Test 5, 3LP-17 Full Stroke Voltage and Current

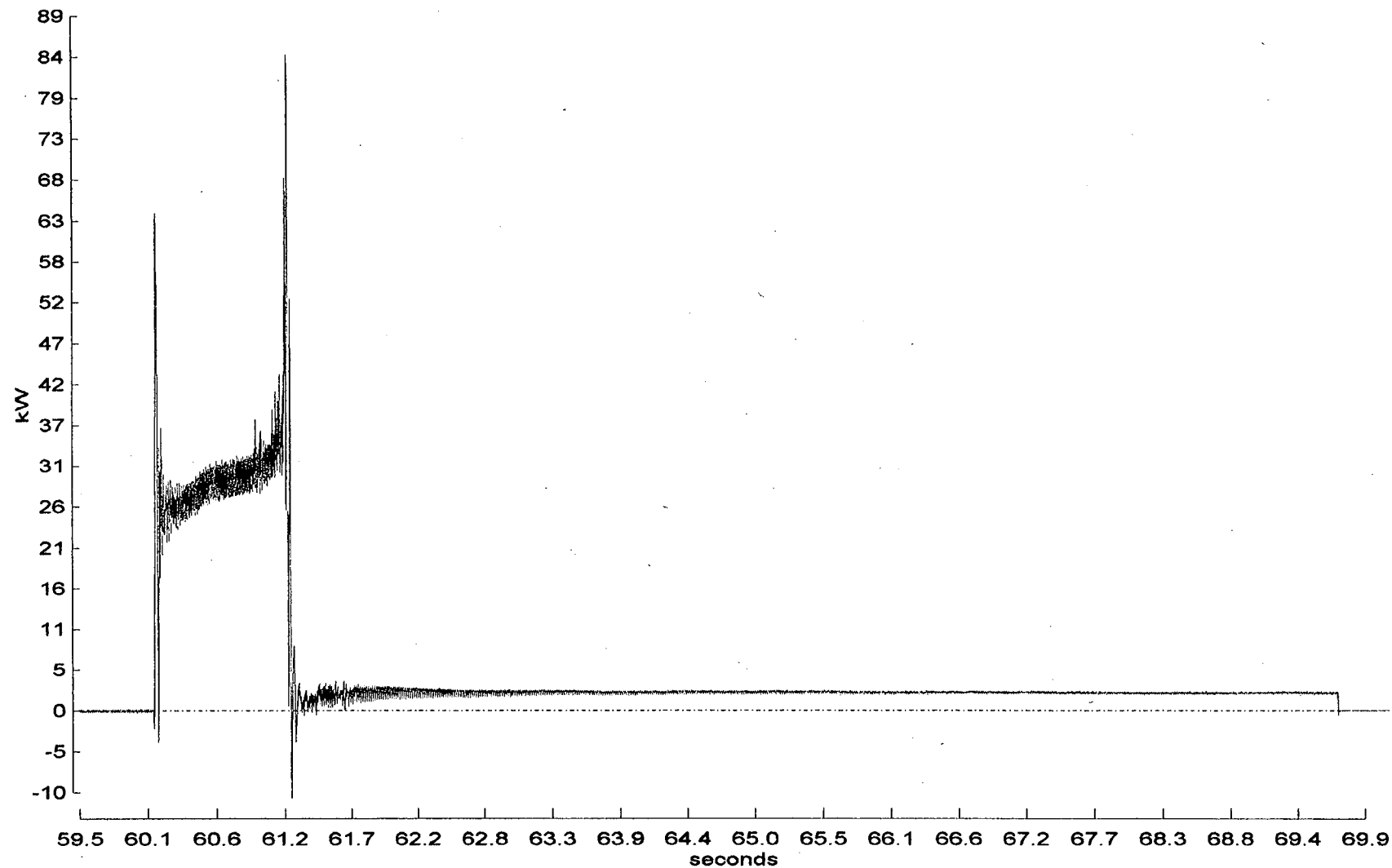
<1> MPM Test: Ocone 3 3LP017 1-4-97 10:41p 130.3 5 ES



3LP-017
ES Test # 5
Inrush Voltage and Current

Figure 4.5.9.3-2: Test 5, 3LP-17 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3LP017 1-4-97 10:41p 130.3 5 ES



Cursor coordinates = 61seconds, 98.2kW

—TRP

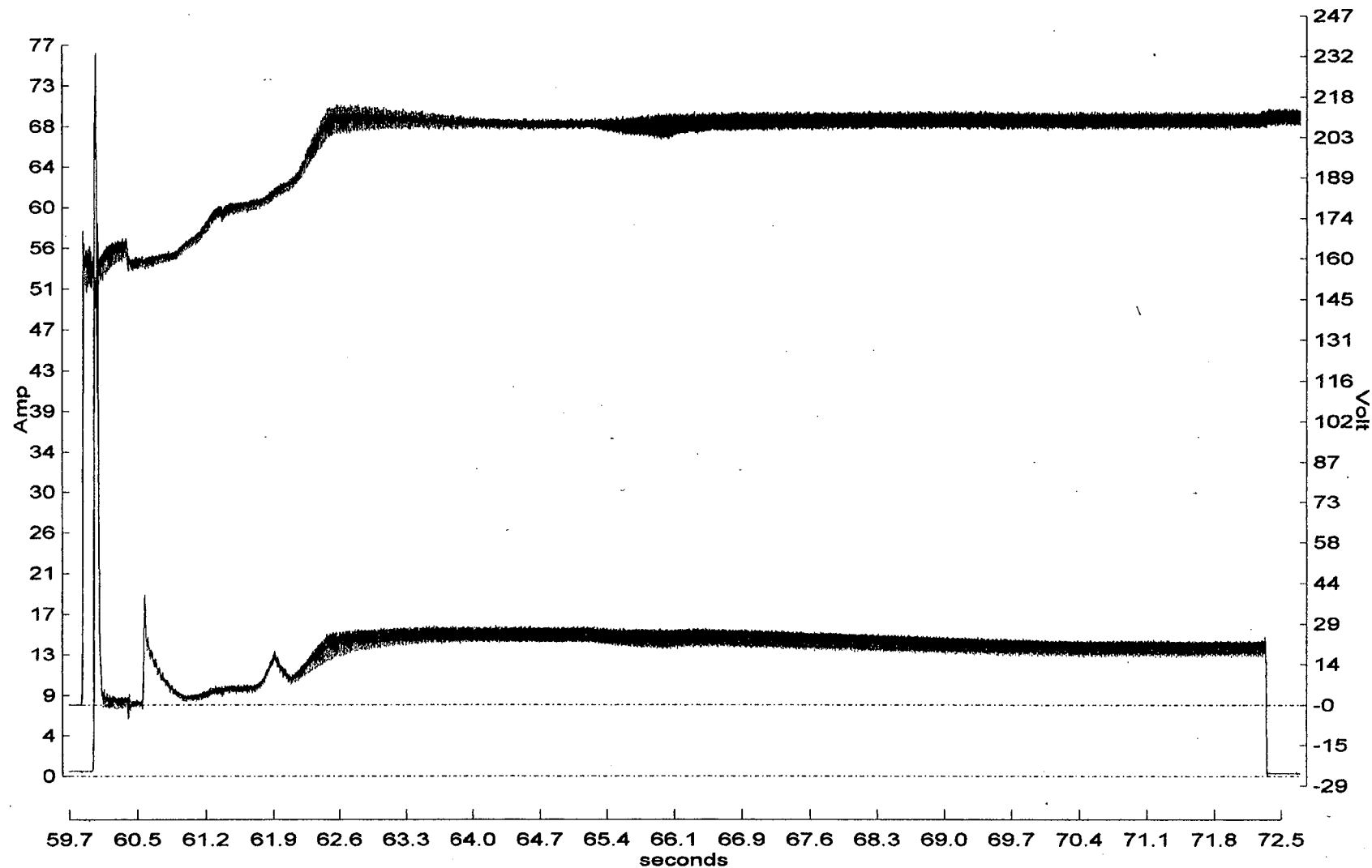
3LP-017

ES Test # 5

Full Stroke Total Real Power

Figure 4.5.9.3-3: Test 5, 3LP-17 Full Stroke Total Real Power (KW)

<1> MPM Test: Oconee 3 3BS002 1-5-97 10:40a 133.0 ES 5



Cursor coordinates = 87.7seconds, 403Amp

— V_{ab-rms} — I_{a-rms}

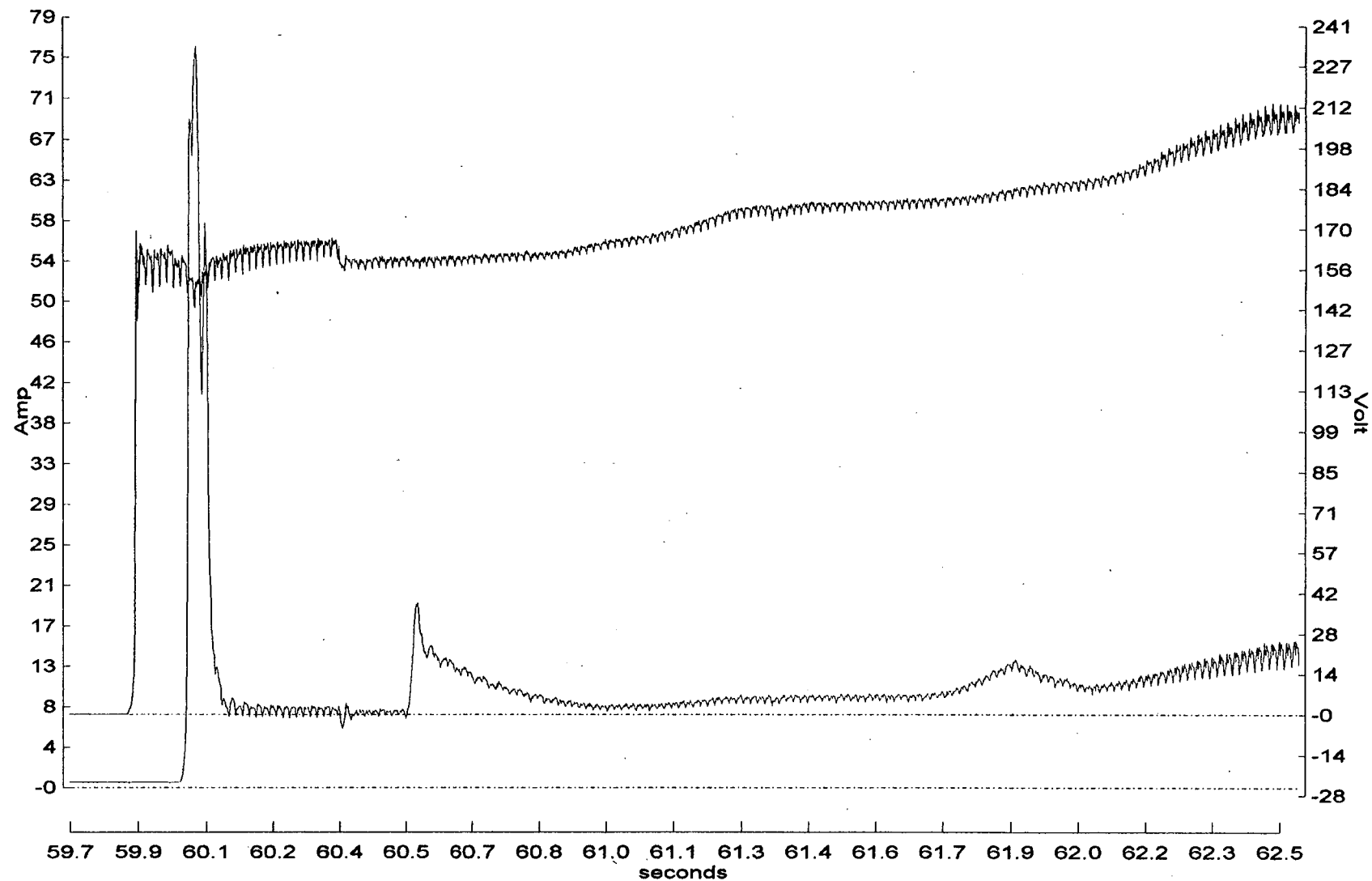
3BS-002

ES Test # 5

Full Stroke Voltage and Current

Figure 4.5.9.4-1: Test 5, 3BS-002 Full Stroke Voltage and Current

<1> MPM Test: Oconee 3 3BS002 1-5-97 10:40a 133.0 ES 5

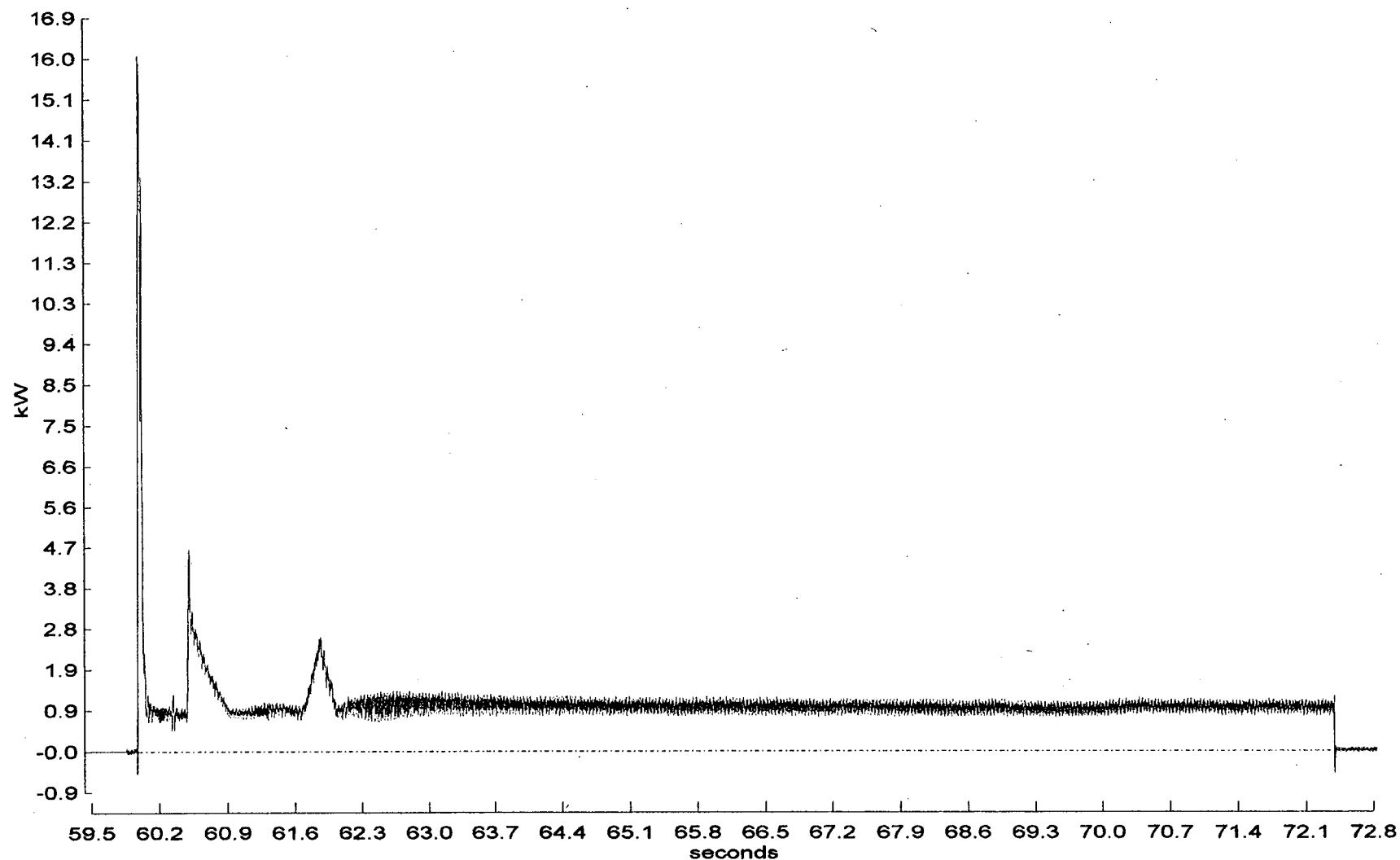


Cursor coordinates = 82seconds, 396Amp
Vab-rms la-rms

3BS-002
ES Test # 5
Inrush Voltage and Current

Figure 4.5.9.4-2: Test 5, 3BS-2 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3BS002 1-5-97 10:40a 133.0 ES 5



Cursor coordinates = 61.6seconds, 59.1kW

TRP

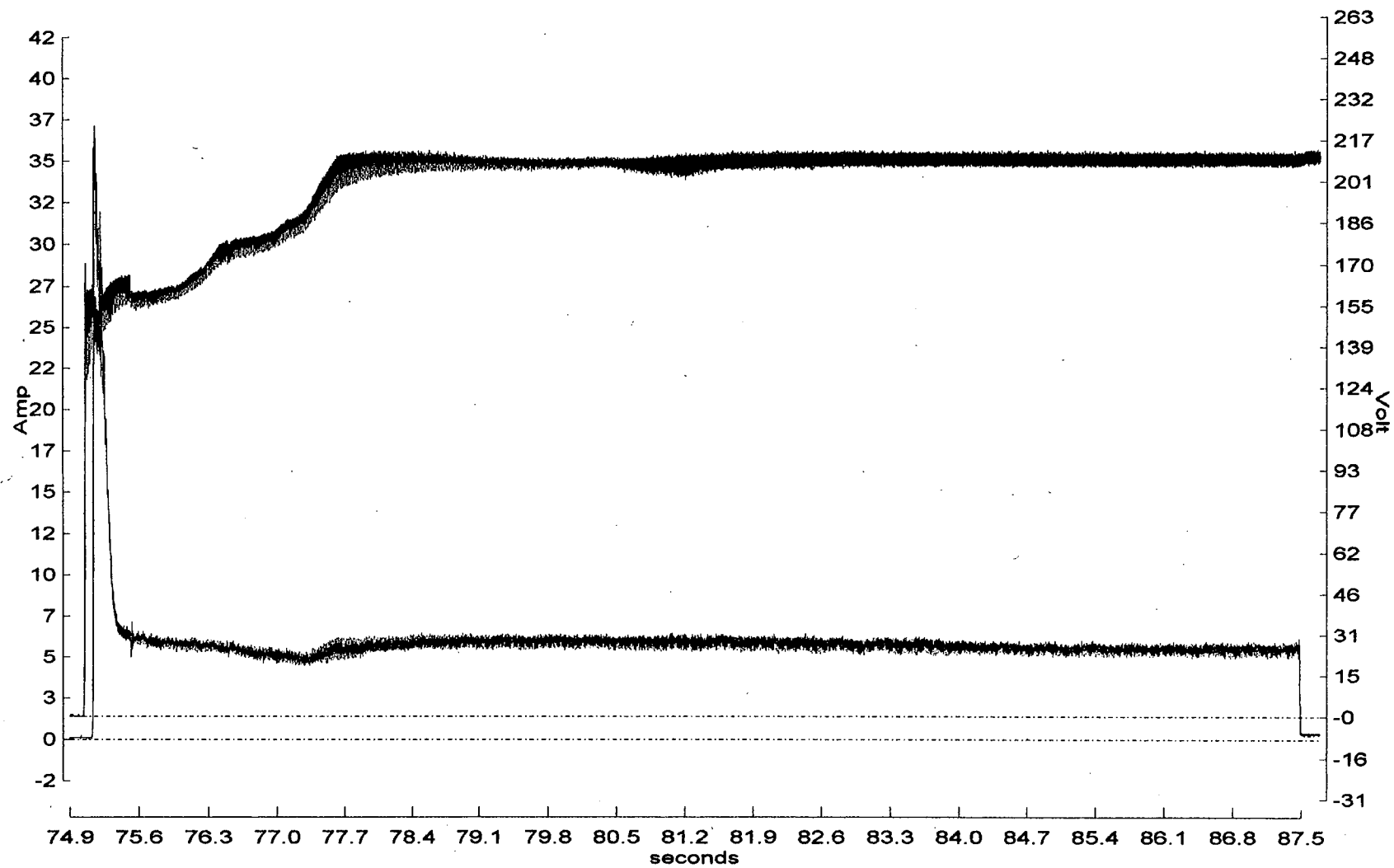
3BS-002

ES Test # 5

Full Stroke Total Real Power

Figure 4.5.9.4-3: Test 5, 3BS-2 Full Stroke Total Real Power (KW)

<1> MPM Test: Oconee 3 3HP27 1-5-97 10:41a 133.3 ES 5



Cursor coordinates = 77seconds, 150Amp

— Vab-rms — Ia-rms

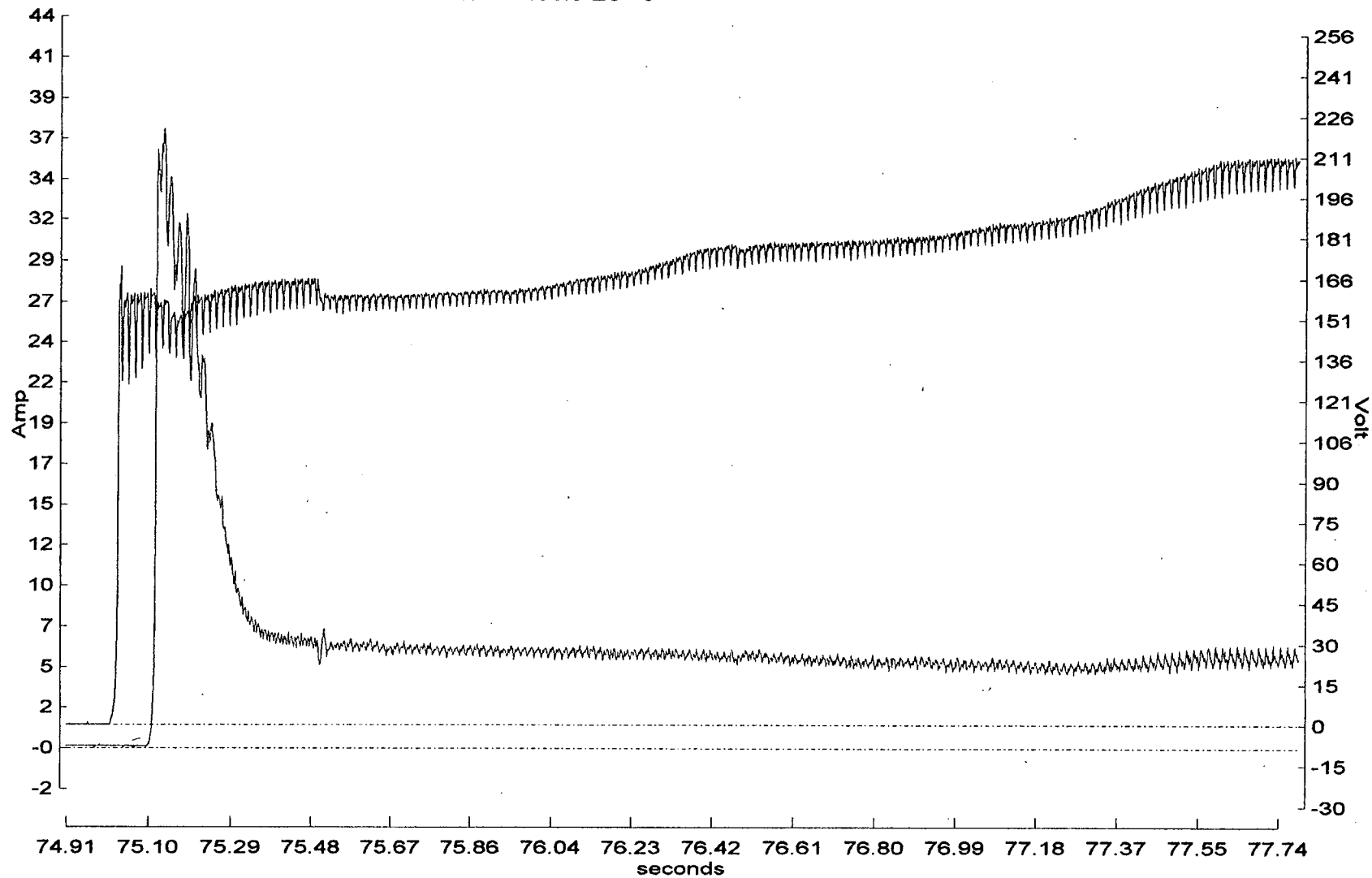
3HP-027

ES Test # 5

Full Stroke Voltage and Current

Figure 4.5.9.5-1: Test 5, 3HP-27 Full Stroke Voltage and Current

<1> MPM Test: Ocone 3 3HP27 1-5-97 10:41a 133.3 ES 5



Cursor coordinates = 67seconds, 60.1Amp

— Vab-rms — Ia-rms

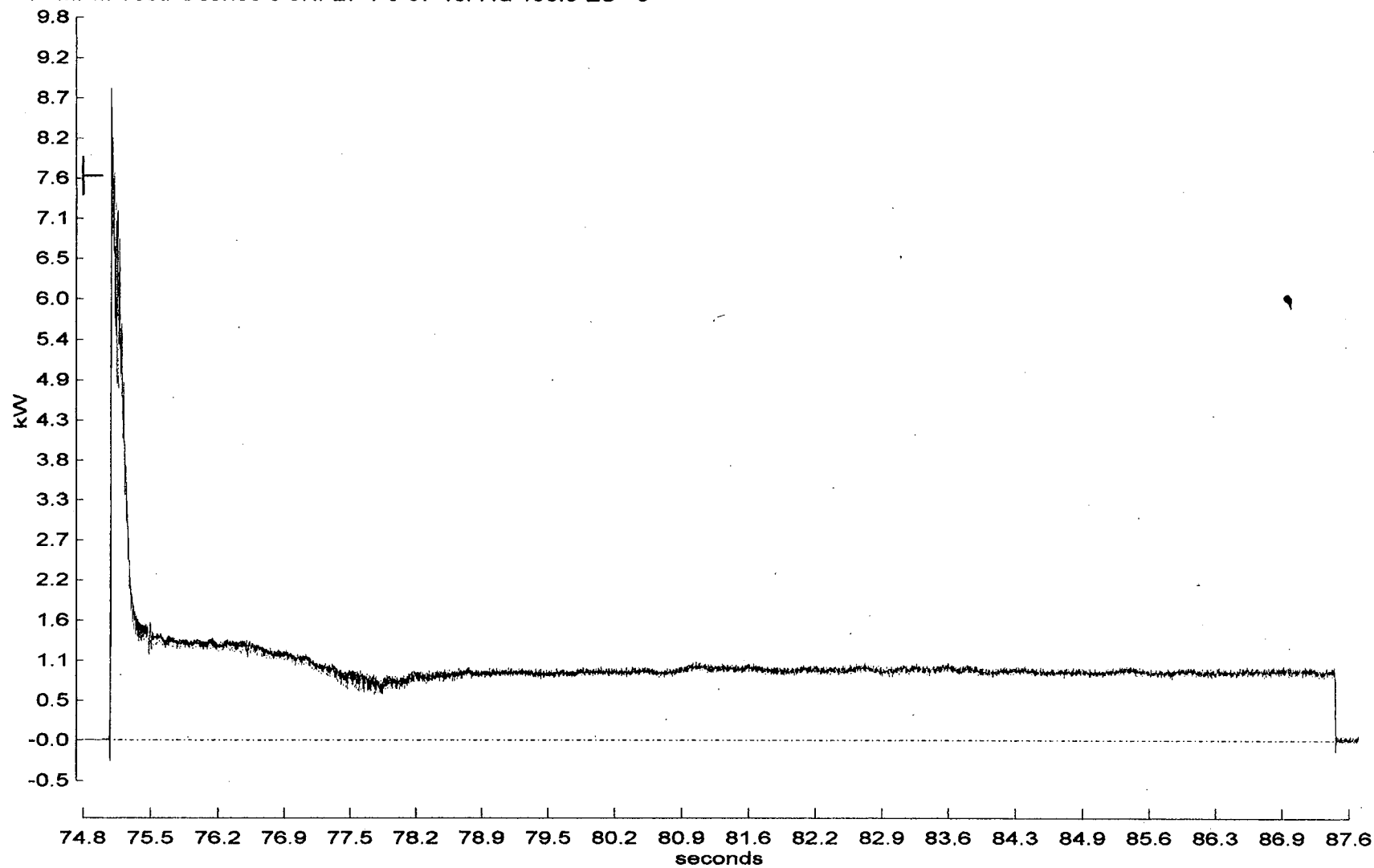
3HP-027

ES Test # 5

Inrush Voltage and Current

Figure 4.5.9.5-2: Test 5, 3HP-27 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3HP27 1-5-97 10:41a 133.3 ES 5

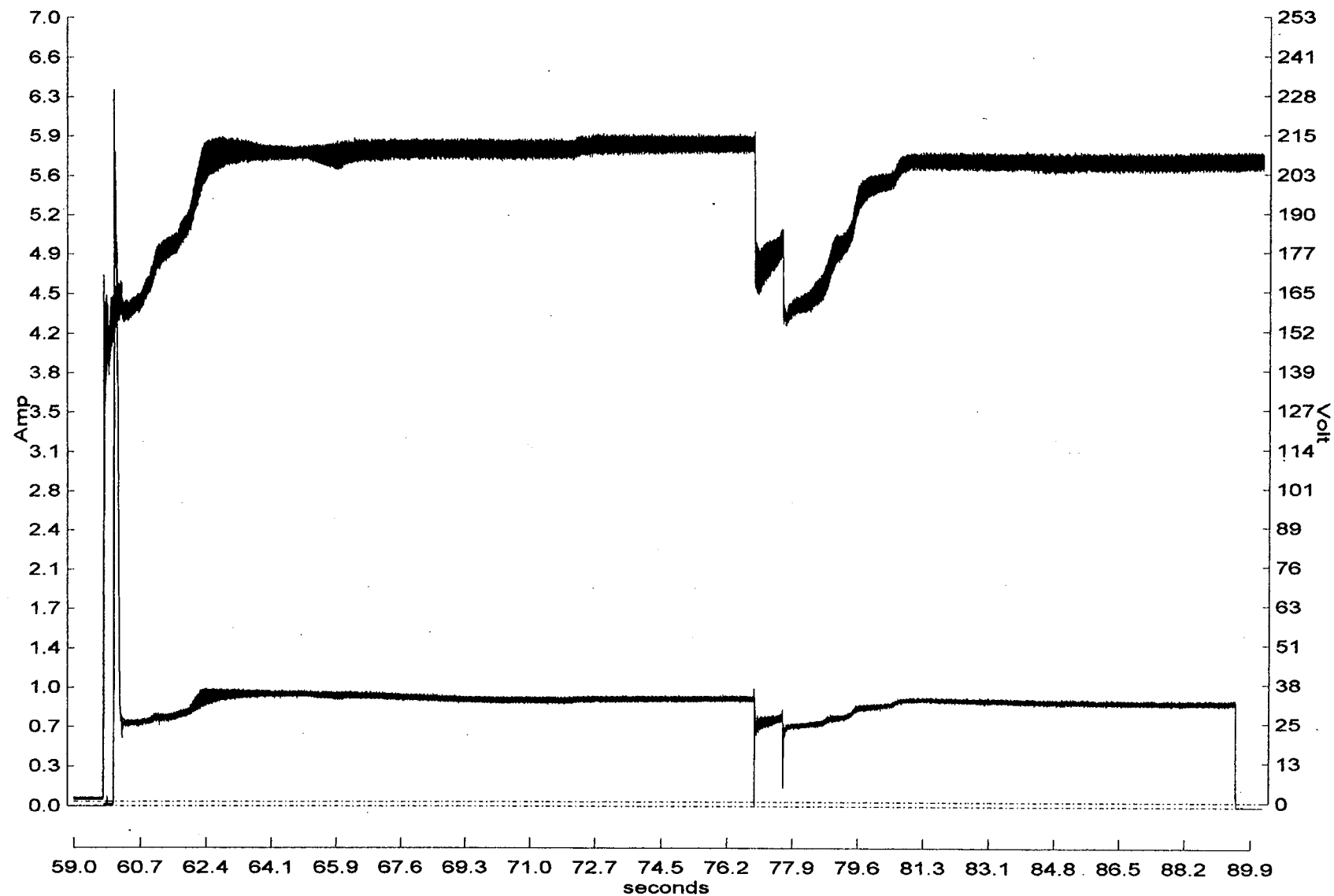


TRP

3HP-027
ES Test # 5
Full Stroke Total Real Power

Figure 4.5.9.5-3: Test 5, 3HP-27 Full Stroke Total Real Power (KW)

<1> MPM Test: Ocone 3 3LPS024 1-5-97 10:40a 150.0 ES 5



Cursor coordinates = 86.2seconds, 4.3Amp

— V_{ab-rms} — I_{a-rms}

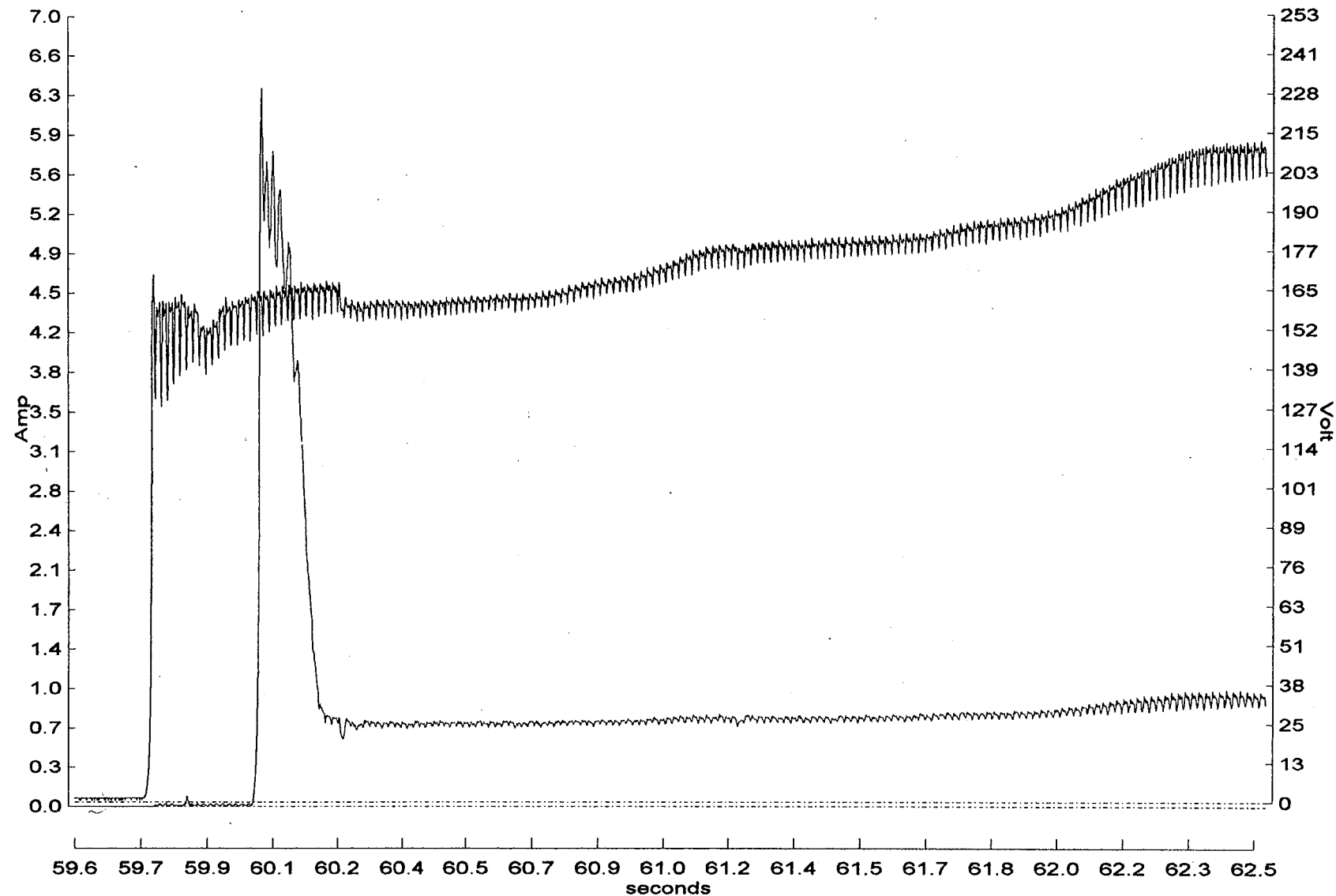
3LPSW-024

ES Test # 5

Full Stroke Voltage and Current

Figure 4.5.9.6-1: Test 5, 3LPSW-24 Full Stroke Voltage and Current

<1> MPM Test: Ocone 3 3LPS024 1-5-97 10:40a 150.0 ES 5



Cursor coordinates = 61.6seconds, 40.6Amp

— Vab-rms — Ia-rms

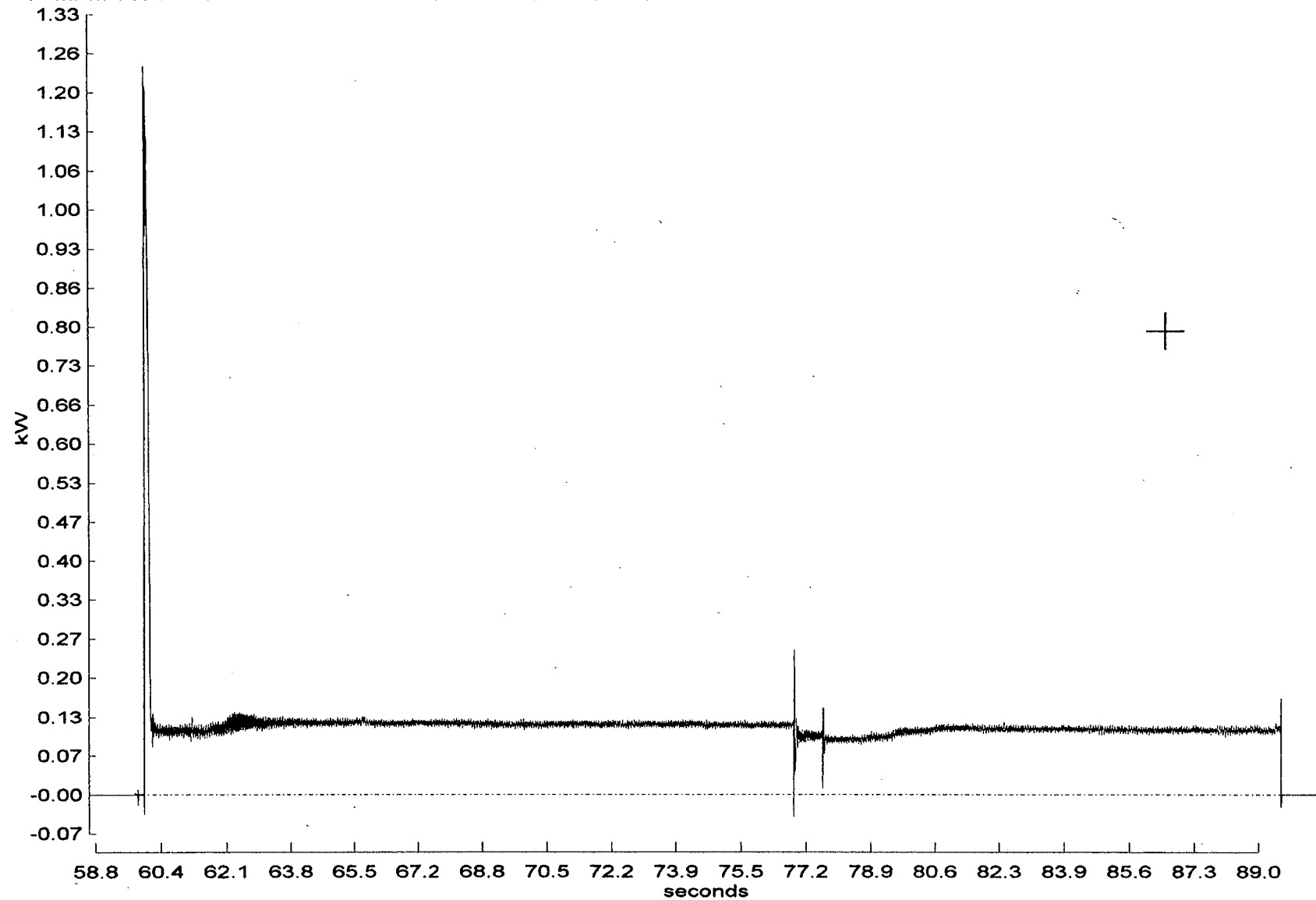
3LPSW-024

ES Test # 5

Inrush Voltage and Current

Figure 4.5.9.6-2: Test 5, 3LPSW-24 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3LPS024 1-5-97 10:40a 150.0 ES 5



Cursor coordinates = 86.5seconds, 0.79kW

TRP

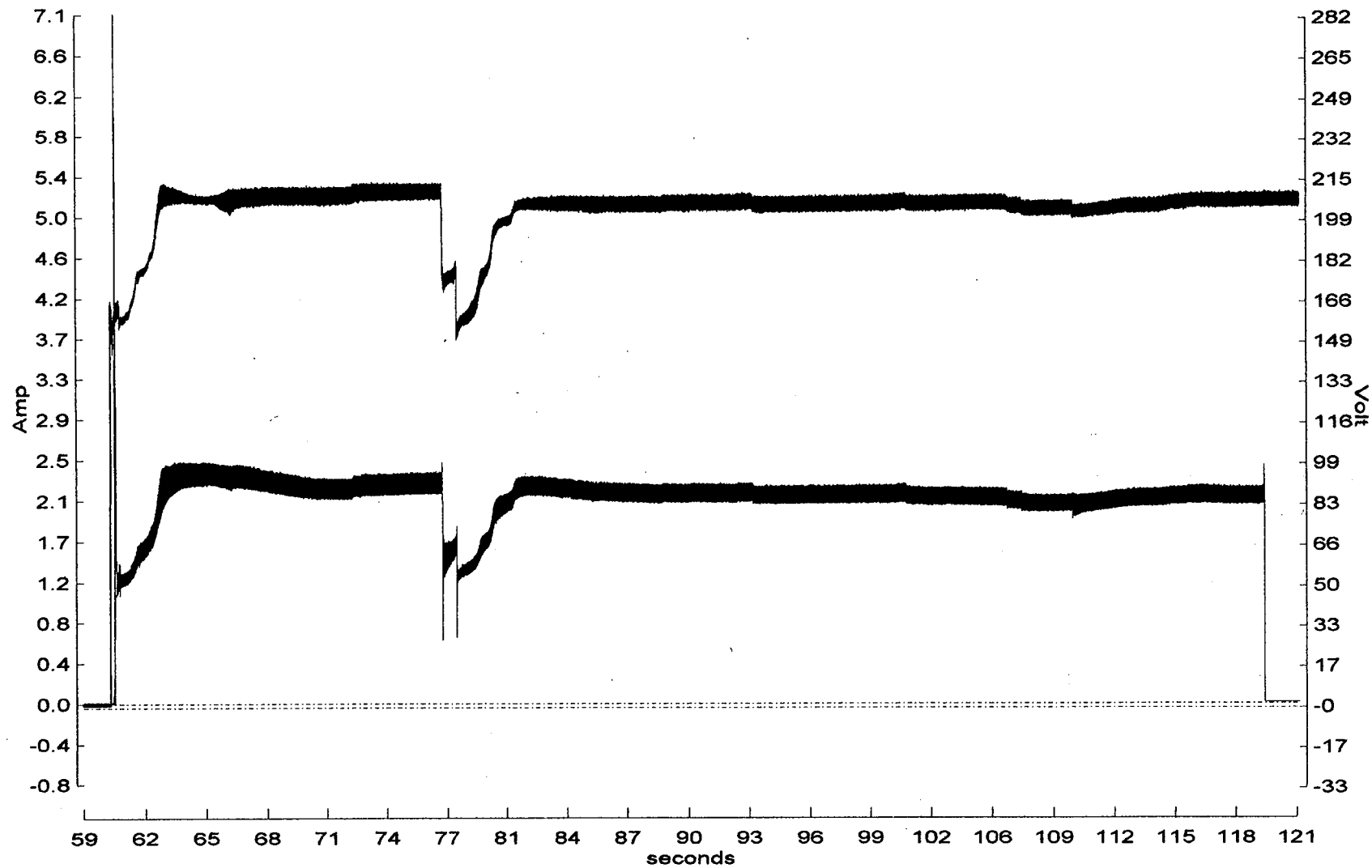
3LPSW-024

ES Test # 5

Full Stroke Total Real Power

Figure 4.5.9.6-3: Test 5, 3LPSW-24 Full Stroke Total Real Power (KW)

<1> MPM Test: Oconee 3 3PR019 1-5-97 10:39a 180.0 ES 5

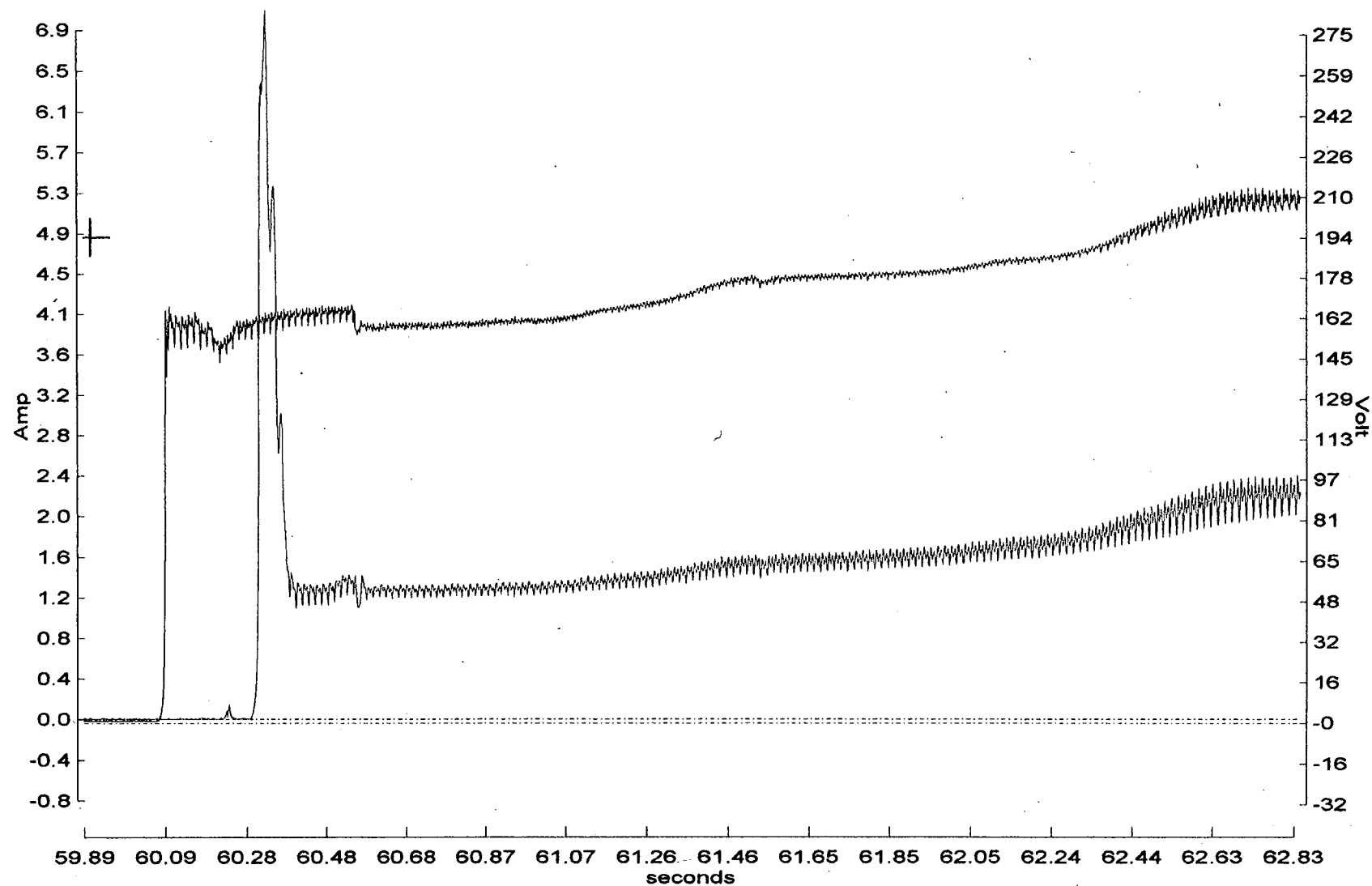


Cursor coordinates = 111seconds, 46.1Amp
— V_{ab-rms} — I_{a-rms}

3PR-019
ES Test # 5
Full Stroke Voltage and Current

Figure 4.5.9.7-1: Test 5, 3PR-19 Full Stroke Voltage and Current

<1> MPM Test: Ocone 3 3PR019 1-5-97 10:39a 180.0 ES 5



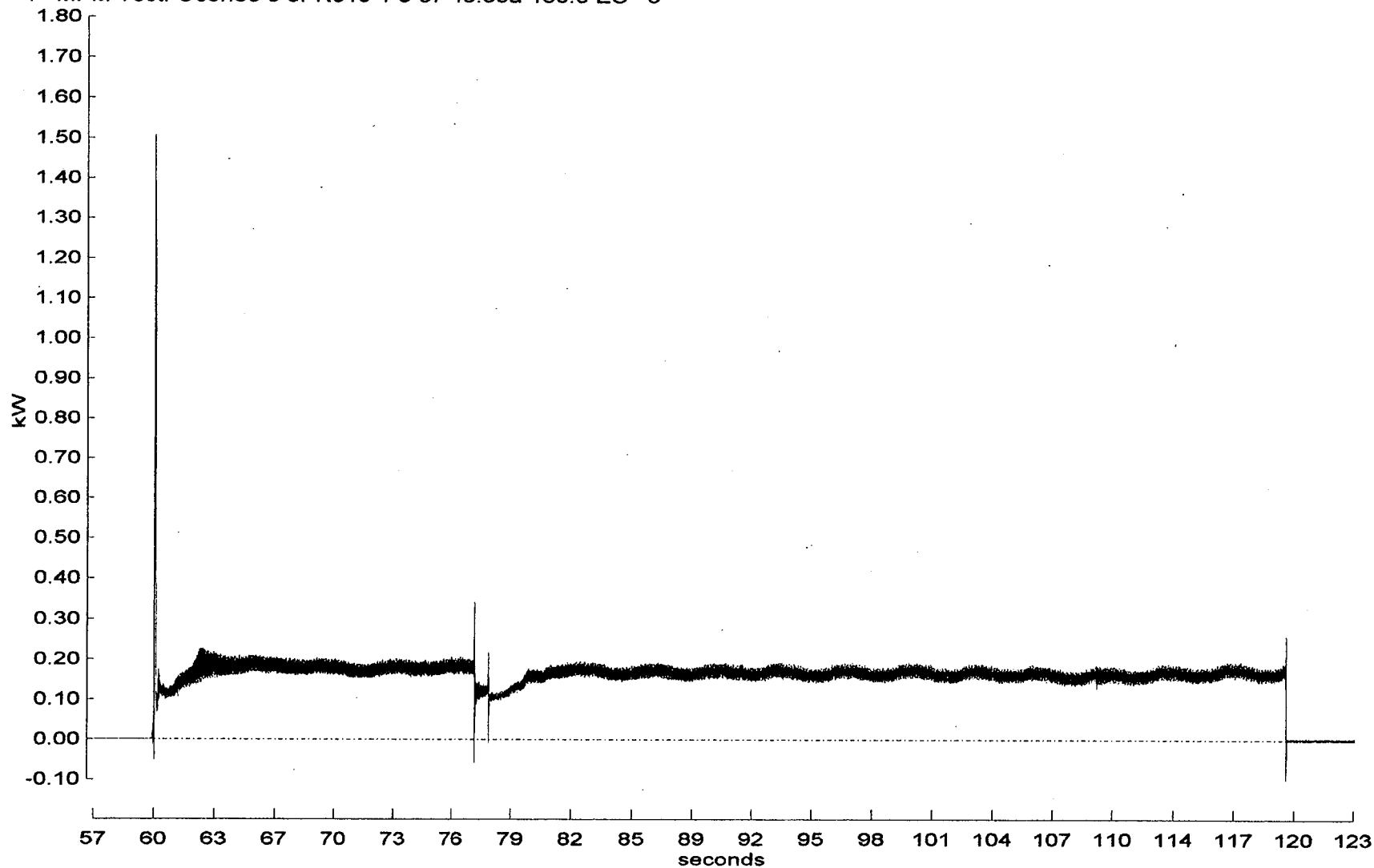
Cursor coordinates = 59.9seconds, 4.82Amp

— Vab-rms — Ia-rms

3PR-019
ES Test # 5
Inrush Voltage and Current

Figure 4.5.9.7-2: Test 5, 3PR-19 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3PR019 1-5-97 10:39a 180.0 ES 5



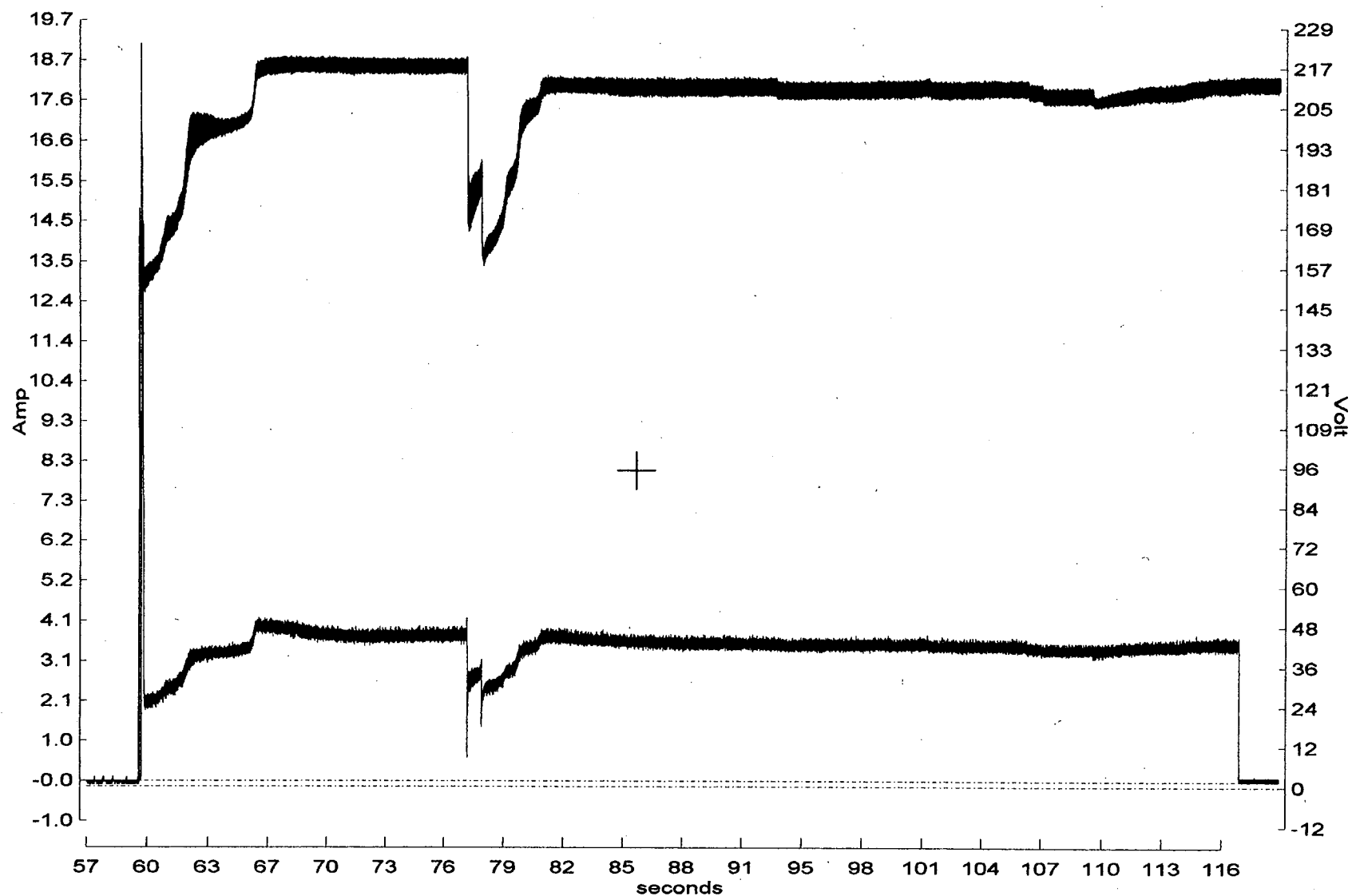
Cursor coordinates = 61.7seconds, 5.86kW

— TRP

3PR-019
ES Test # 5
Full Stroke Total Real Power

Figure 4.5.9.7-3: Test 5, 3PR-19 Full Stroke Total Real Power (KW)

<1> MPM Test: Oconee 3 3LPS6 1-5-97 10:42a 177.5 ES 5



Cursor coordinates = 85.9seconds, 8.06Amp

Vab-rms Ia-rms

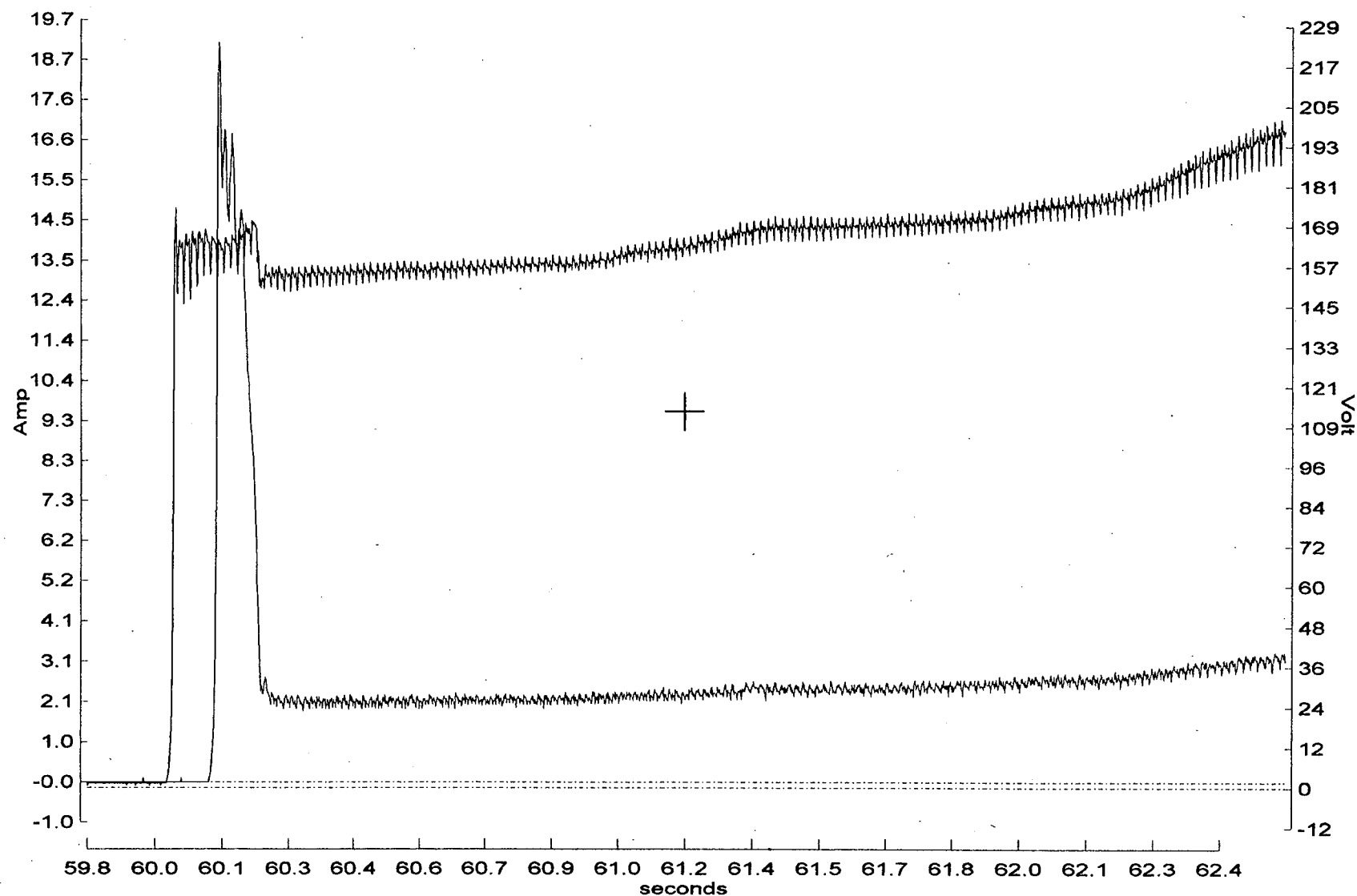
3LPSW-006

ES Test # 5

Full Stroke Voltage and Current

Figure 4.5.9.8-1: Test 5, 3LPSW-6 Full Stroke Voltage and Current

<1> MPM Test: Oconee 3 3LPS6 1-5-97 10:42a 177.5 ES 5



Cursor coordinates = 61.2seconds, 9.58Amp

—— Vab-rms ——— Ia-rms

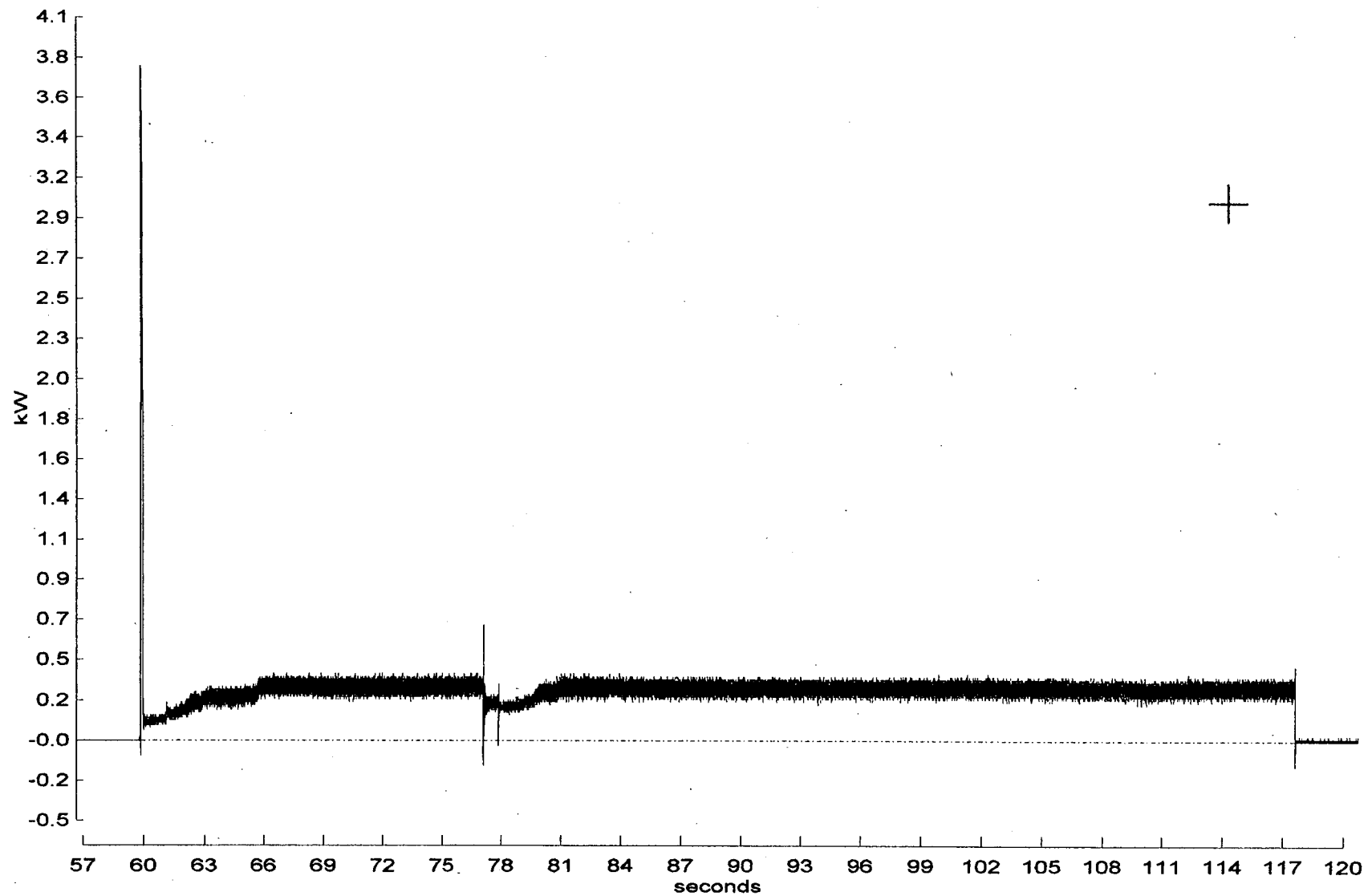
3LPSW-006

ES Test # 5

Inrush Voltage and Current

Figure 4.5.9.8-2: Test 5, 3LPSW-6 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3LPS6 1-5-97 10:42a 177.5 ES 5

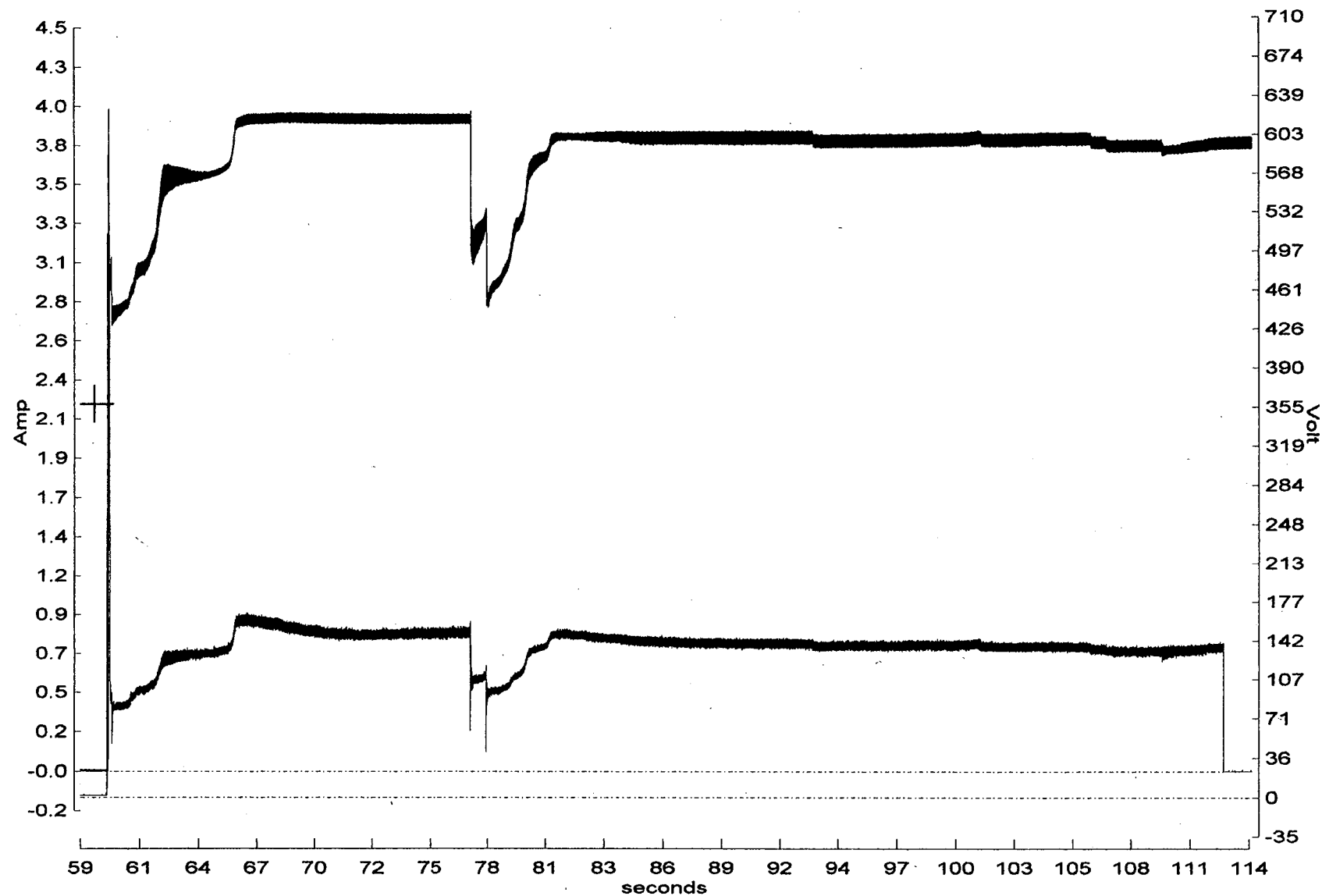


Cursor coordinates = 114seconds, 3.03kW
— TRP

3LPSW-006
ES Test # 5
Full Stroke Total Real Power

Figure 4.5.9.8-3: Test 5, 3LPSW-6 Full Stroke Total Real Power (KW)

<1> MPM Test: Ocone 3 3LPS565 1-5-97 10:40p 172.8 ES 5



Cursor coordinates = 59.4seconds, 2.22Amp

— V_{ab-rms} — I_{a-rms}

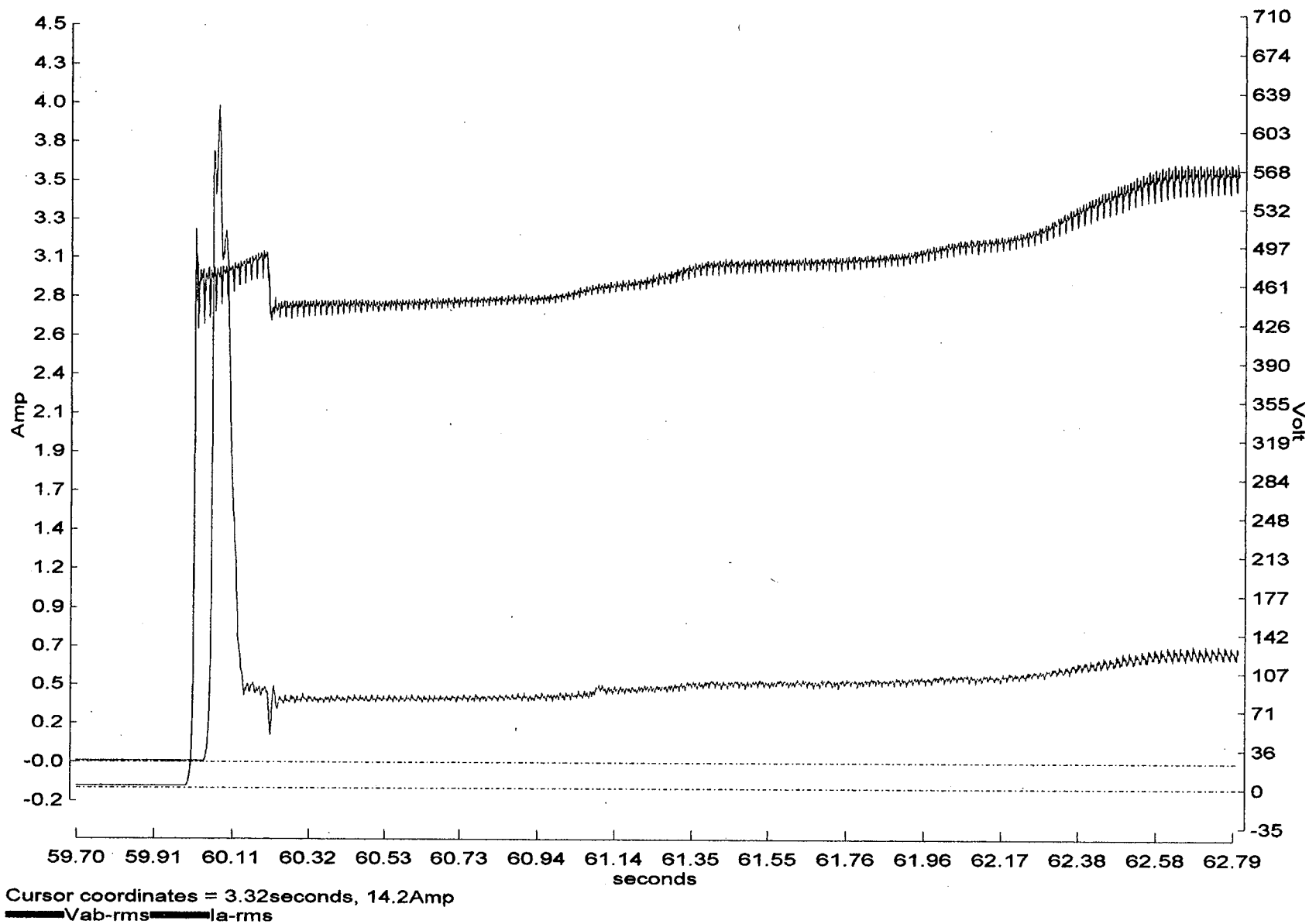
3LPSW-565

ES Test # 5

Full Stroke Voltage and Current

Figure 4.5.9.9-1: Test 5, 3LPSW-565 Full Stroke Voltage and Current

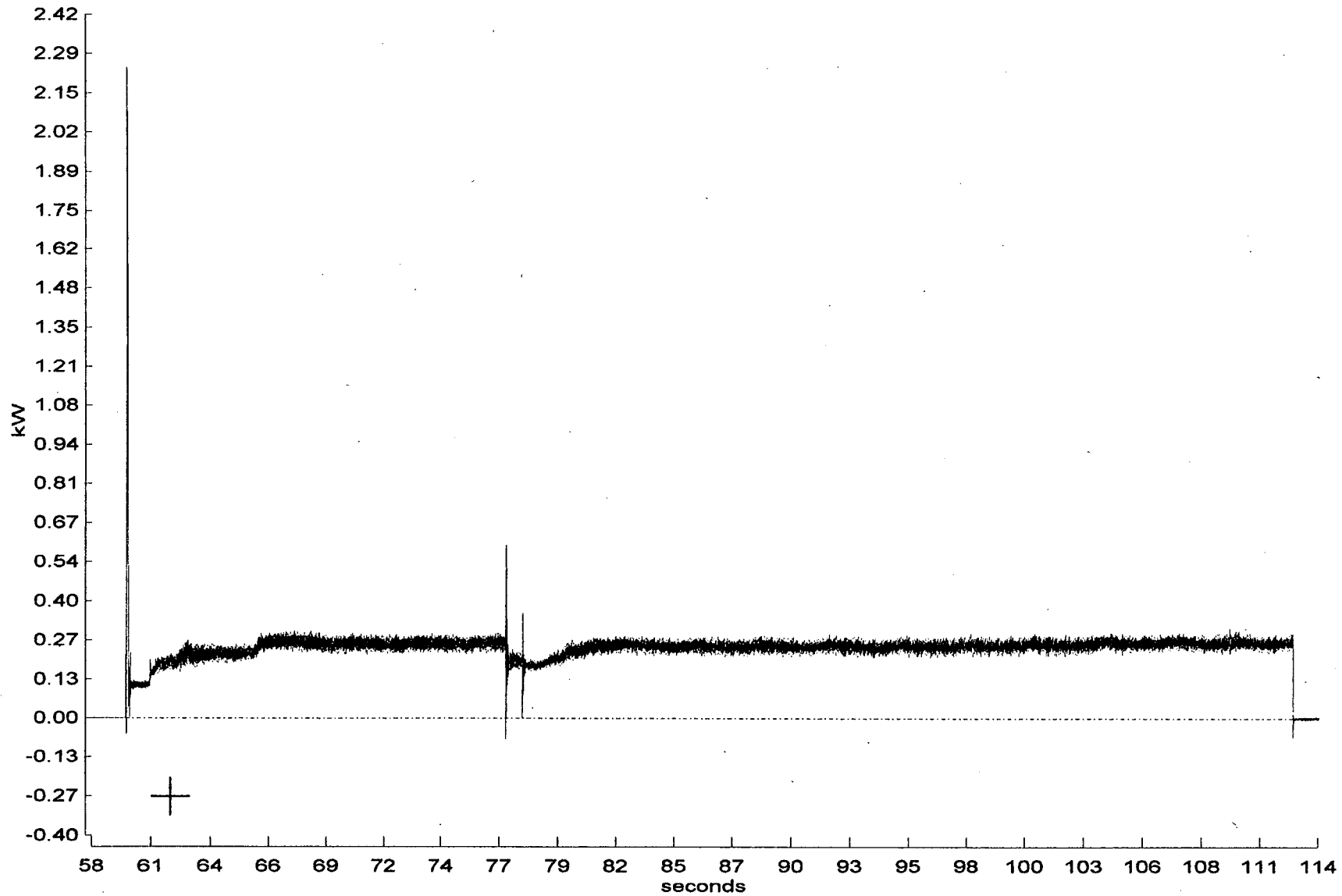
<1> MPM Test: Ocone 3 3LPS565 1-5-97 10:40p 172.8 ES 5



3LPSW-565
ES Test # 5
Inrush Voltage and Current

Figure 4.5.9.9-2: Test 5, 3LPSW-565 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3LPS565 1-5-97 10:40p 172.8 ES 5



Cursor coordinates = 62seconds, -0.271kW

TRP

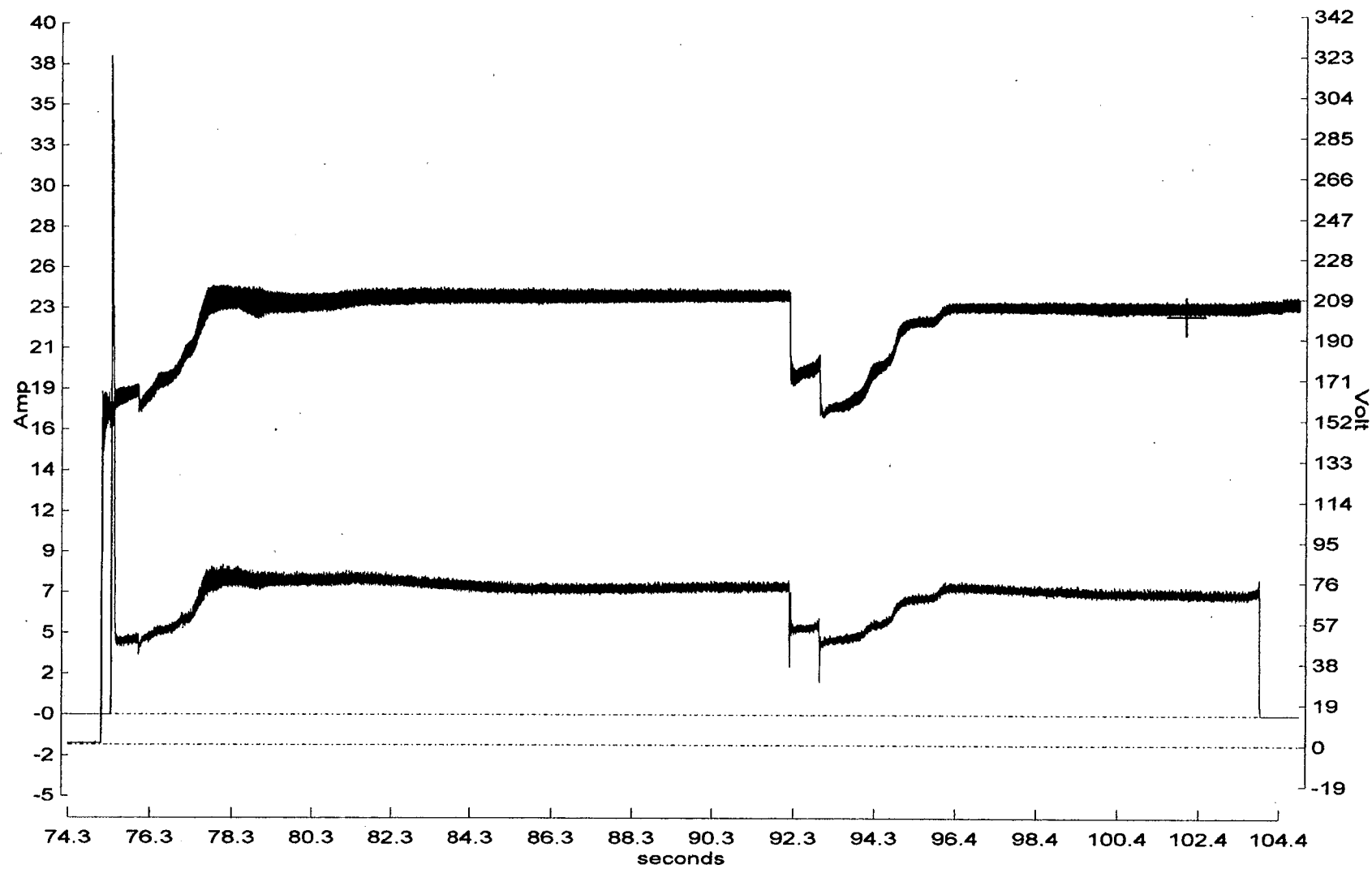
3LPSW-565

ES Test # 5

Full Stroke Total Real Power

Figure 4.5.9.3: Test 5, 3LPSW-565 Full Stroke Total Real Power (KW)

<1> MPM Test: Ocone 3 3HP004 1-5-97 10:41a 149.5 ES 5



Cursor coordinates = 102seconds, 23Amp

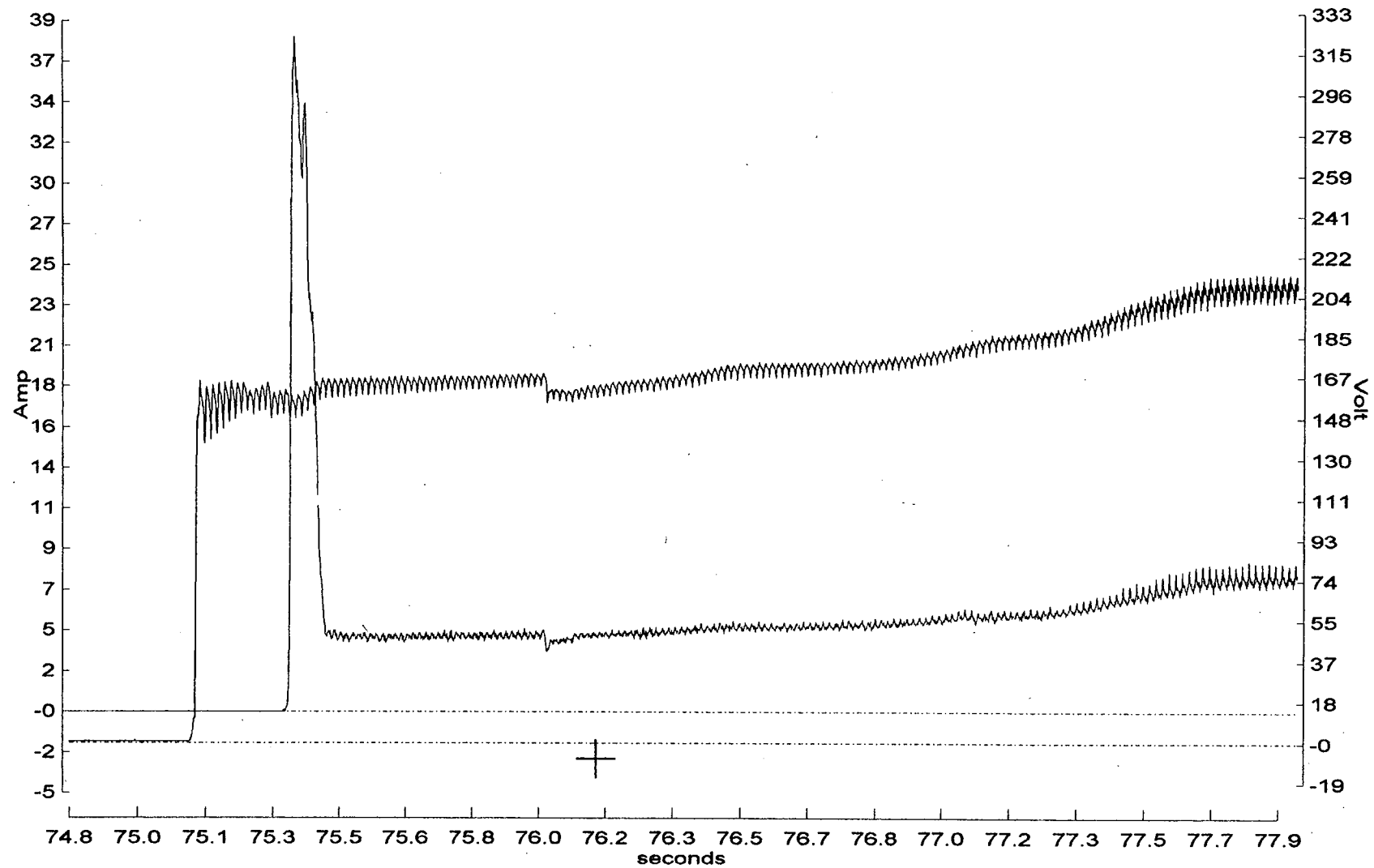
— Vab-rms — Ia-rms

3HP-004

ES Test # 5

Full Stroke Voltage and Current

Figure 4.5.9.10-1: Test 5, 3HP-4 Full Stroke Voltage and Current



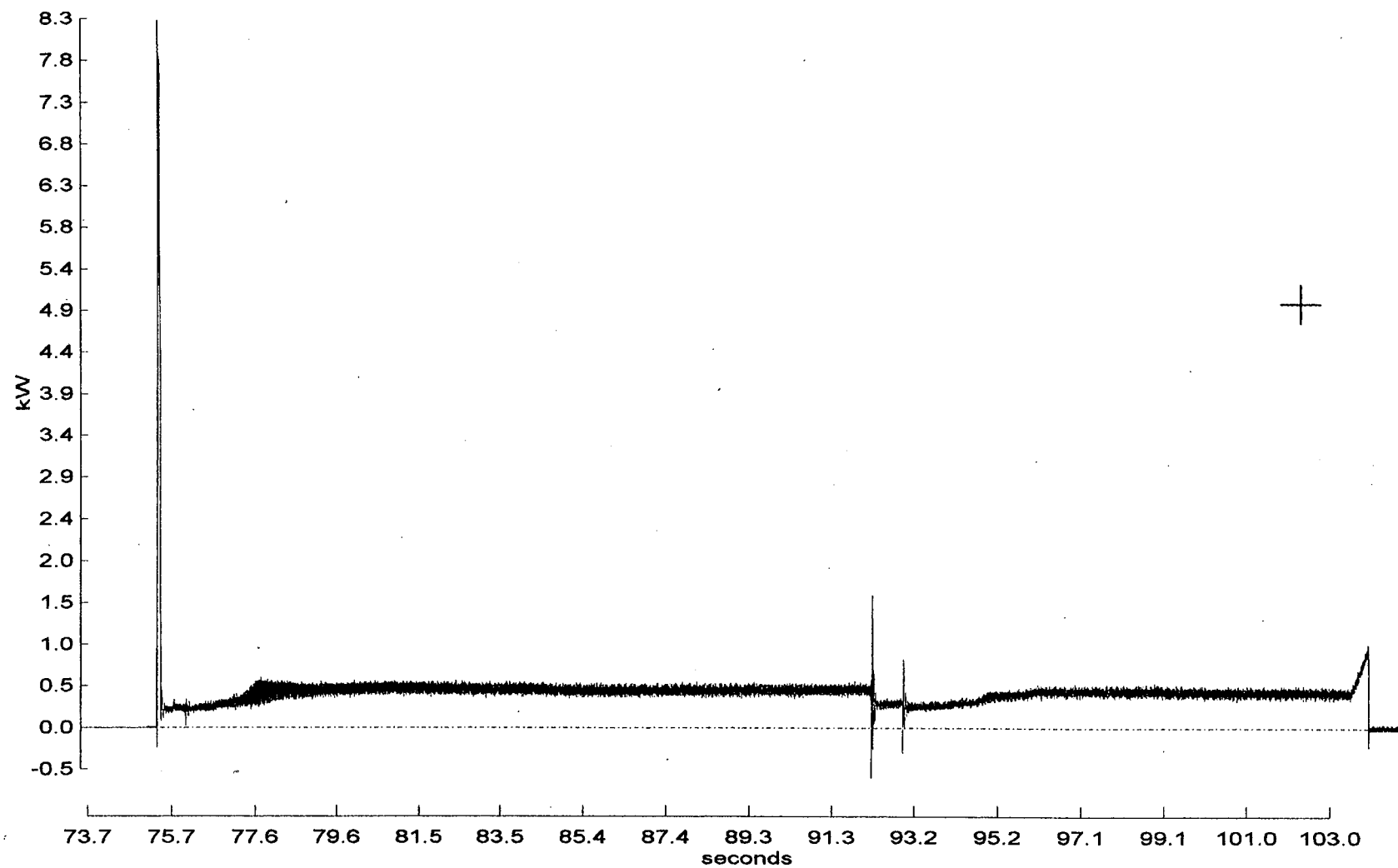
Cursor coordinates = 76.1seconds, -2.66Amp

— Vab-rms — Ia-rms

3HP-004
ES Test # 5
Inrush Voltage and Current

Figure 4.5.9.10-2: Test 5, 3HP-4 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3HP004 1-5-97 10:41a 149.5 ES 5



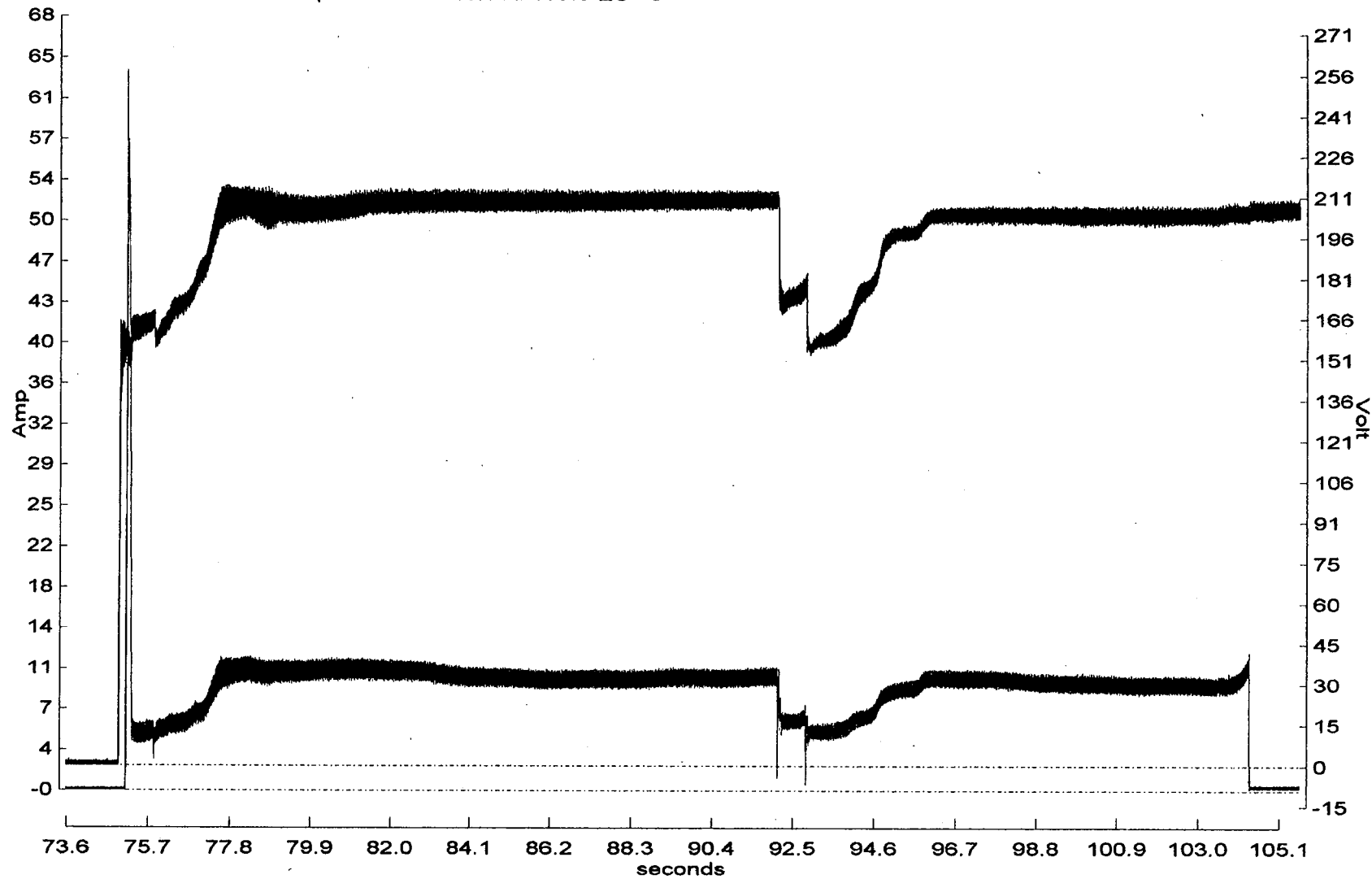
Cursor coordinates = 102seconds, 4.97kW

— TRP

3HP-004
ES Test # 5
Full Stroke Total Real Power

Figure 4.5.9.10-3: Test 5, 3HP-4 Full Stroke Total Real Power (KW)

<1> MPM Test: Ocone 3 3hp020 1-5-97 10:39a 150.3 ES 5

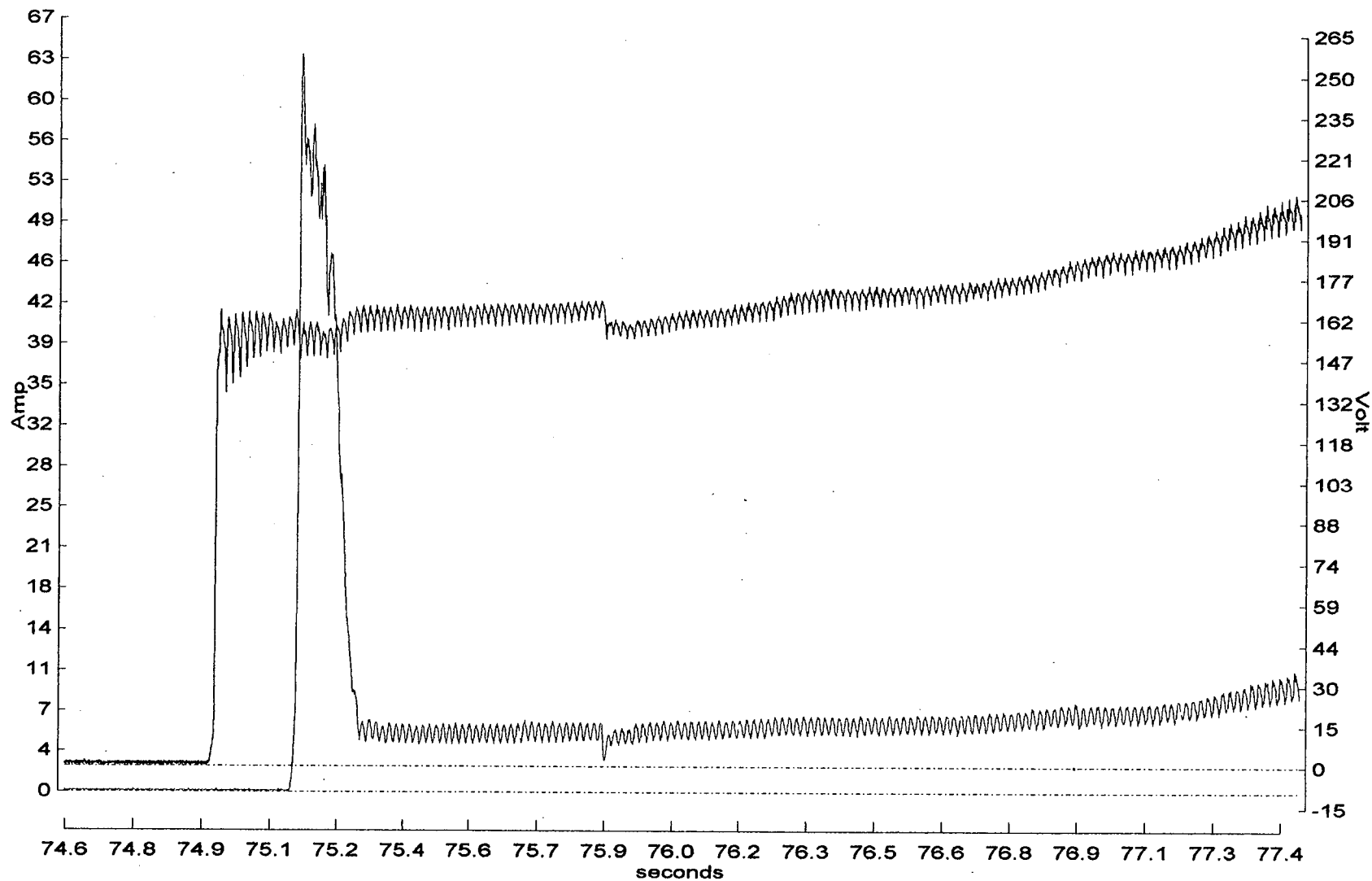


— Vab-rms — Ia-rms

3HP-020
ES Test # 5
Full Stroke Voltage and Current

Figure 4.5.9.11-1: Test 5, 3HP-20 Full Stroke Voltage and Current

<1> MPM Test: Ocone 3 3hp020 1-5-97 10:39a 150.3 ES 5

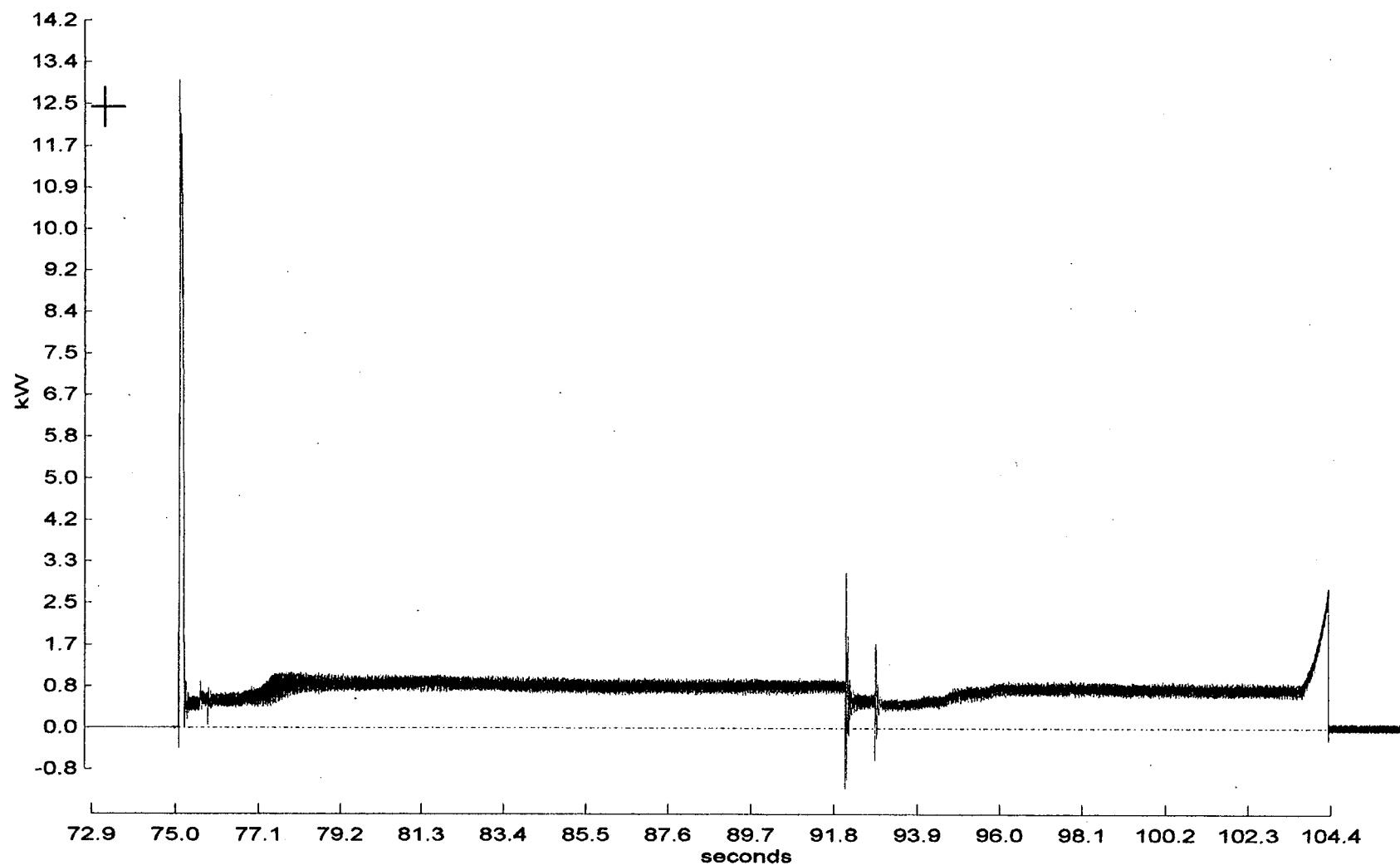


Cursor coordinates = 103seconds, 256Amp
——Vab-rms——Ia-rms

3HP-020
ES Test # 5
Inrush Voltage and Current

Figure 4.5.9.11-2: Test 5, 3HP-20 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3hp020 1-5-97 10:39a 150.3 ES 5



Cursor coordinates = 73.3seconds, 12.5kW

TRP

3HP-020
ES Test # 5
Full Stroke Total Real Power

Figure 4.5.9.11-3: Test 5, 3HP-20 Full Stroke Total Real Power (KW)

Appendix 6 - Test 6, Figures of Results

APPENDIX 6: Figures for Test 6

FIGURE	Page
Figure 4.6.1-1: Test 6, Lee Voltage and Current.....	6-3
Figure 4.6.1-2: Test 6, Lee Voltage.....	6-4
Figure 4.6.1-3: Test 6, Lee KVA.....	6-5
Figure 4.6.1-4: Test 6, Lee KW.....	6-6
Figure 4.6.1-5: Test 6, Lee Frequency and Current.....	6-7
Figure 4.6.1-6: Test 6, Lee Frequency.....	6-8
Figure 4.6.2-1: Test 6, Unit 1 MFB Voltage and Current	6-9
Figure 4.6.2-2: Test 6, Unit 1 MFB KVA and KW	6-10
Figure 4.6.2-3: Test 6, Unit 2 MFB Voltage and Current	6-11
Figure 4.6.2-4: Test 6, Unit 2 MFB KVA and KW	6-12
Figure 4.6.2-5: Test 6, Standby Bus Voltage and Unit 3 MFB Current	6-13
Figure 4.6.2-6: Test 6, Unit 3 MFB KVA and KW	6-14
Figure 4.6.3- 1: Test 6, EFW 3B Voltage and Current.....	6-15
Figure 4.6.3- 2: Test 6, EFW 3B KVA and KW	6-16
Figure 4.6.3- 3: Test 6, HPI 3B Voltage and Current.....	6-17
Figure 4.6.3- 4: Test 6, HPI 3B KVA and KW	6-18
Figure 4.6.3- 5: Test 6, EFW 1A Voltage and Current.....	6-19
Figure 4.6.3- 6: Test 6, EFW 1A KVA and KW	6-20
Figure 4.6.3- 7: Test 6, LPSW 3B Voltage and Current.....	6-21
Figure 4.6.3- 8: Test 6, LPSW 3B KVA and KW	6-22
Figure 4.6.3- 9: Test 6, LPI 3B Voltage and Current	6-23
Figure 4.6.3- 10: Test 6, LPI 3B KVA and KW.....	6-24
Figure 4.6.3- 11: Test 6, RBS 3B Voltage and Current.....	6-25
Figure 4.6.3- 12: Test 6, RBS 3B KVA and KW	6-26
Figure 4.6.4- 1: Test 6, RBCF 3B Voltage and Current	6-27
Figure 4.6.4- 2: Test 6, RBCF 3B KVA and KW.....	6-28
Figure 4.6.5- 1: Test 6, 1X5 Voltage and Current.....	6-29
Figure 4.6.5- 2: Test 6, 1X5 KVA and KW.....	6-30
Figure 4.6.5- 3: Test 6, 1X6 Voltage and Current.....	6-31
Figure 4.6.5- 4: Test 6, 1X6 KVA and KW.....	6-32
Figure 4.6.5- 5: Test 6, 3X6 Voltage and Current.....	6-33
Figure 4.6.5- 6: Test 6, 3X6 KVA and KW.....	6-34
Figure 4.6.5- 7: Test 6, 3X8 Voltage and Current.....	6-35
Figure 4.6.5- 8: Test 6, 3X8 KVA and KW.....	6-36
Figure 4.6.5- 9: Test 6, 3X9 Voltage and Current.....	6-37
Figure 4.6.5- 10: Test 6, 3X9 KVA and KW.....	6-38
Figure 4.6.6- 1: Test 6, 600V 3XS1 Voltage and Current.....	6-39
Figure 4.6.6- 2: Test 6, 600V 3XS1 KVA and KW.....	6-40
Figure 4.6.6- 3: Test 6, 600V 3XS2 Voltage and Current.....	6-41
Figure 4.6.6- 4: Test 6, 600V 3XS2 KVA and KW.....	6-42
Figure 4.6.6- 5: Test 6, 600V 3XS3 Voltage and Current.....	6-43
Figure 4.6.6- 6: Test 6, 600V 3XS3 KVA and KW.....	6-44
Figure 4.6.7- 1: Test 6, 208V 3XS1 Voltage and Current.....	6-45
Figure 4.6.7- 2: Test 6, 208V 3XS1 KVA and KW.....	6-46
Figure 4.6.7- 3: Test 6, 208V 3XS2 Voltage and Current.....	6-47
Figure 4.6.7- 4: Test 6, 208V 3XS2 KVA and KW.....	6-48
Figure 4.6.7- 5: Test 6, 208V 3XS3 Voltage and Current.....	6-49
Figure 4.6.7- 6: Test 6, 208V 3XS3 KVA and KW.....	6-50
Figure 4.6.8- 1: Test 6, Battery Charger 3CA Voltage and Current.....	6-51
Figure 4.6.9.1-1: Test 6, 3HP-24 Full Stroke Voltage and Current.....	6-52

Figure 4.6.9.1-2: Test 6, 3HP-24 Inrush Voltage and Current	6-53
Figure 4.6.9.1-3: Test 6, 3HP-24 Full Stroke Total Real Power (KW)	6-54
Figure 4.6.9.2-1: Test 6, 3HP-26 Full Stroke Voltage and Current.....	6-55
Figure 4.6.9.2-2: Test 6, 3HP-26 Inrush Voltage and Current	6-56
Figure 4.6.9.2-3: Test 6, 3HP-26 Full Stroke Total Real Power (KW)	6-57
Figure 4.6.9.3-1: Test 6, 3LP-17 Full Stroke Voltage and Current	6-58
Figure 4.6.9.3-2: Test 6, 3LP-17 Inrush Voltage and Current.....	6-59
Figure 4.6.9.3-3: Test 6, 3LP-17 Full Stroke Total Real Power (KW).....	6-60
Figure 4.6.9.4-1: Test 6, 3BS-2 Full Stroke Voltage and Current.....	6-61
Figure 4.6.9.4-2: Test 6, 3BS-2 Inrush Voltage and Current.....	6-62
Figure 4.6.9.4-3: Test 6, 3BS-2 Full Stroke Total Real Power (KW)	6-63
Figure 4.6.9.5-1: Test 6, 3HP-27 Full Stroke Voltage and Current.....	6-64
Figure 4.6.9.5-2: Test 6, 3HP-27 Inrush Voltage and Current	6-65
Figure 4.6.9.5-3: Test 6, 3HP-27 Full Stroke Total Real Power (KW)	6-66
Figure 4.6.9.6-1: Test 6, 3LPSW-24 Full Stroke Voltage and Current	6-67
Figure 4.6.9.6-2: Test 6, 3LPSW-24 Inrush Voltage and Current.....	6-68
Figure 4.6.9.6-3: Test 6, 3LPSW-24 Full Stroke Total Real Power (KW).....	6-69
Figure 4.6.9.7-1: Test 6, 3PR-19 Full Stroke Voltage and Current	6-70
Figure 4.6.9.7-2: Test 6, 3PR-19 Inrush Voltage and Current.....	6-71
Figure 4.6.9.7-3: Test 6, 3PR-19 Full Stroke Total Real Power (KW)	6-72
Figure 4.6.9.8-1: Test 6, 3LPSW-6 Full Stroke Voltage and Current	6-73
Figure 4.6.9.8-2: Test 6, 3LPSW-6 Inrush Voltage and Current.....	6-74
Figure 4.6.9.8-3: Test 6, 3LPSW-6 Full Stroke Total Real Power (KW).....	6-75
Figure 4.6.9.9-1: Test 6, 3LPSW-565 Full Stroke Voltage and Current	6-76
Figure 4.6.9.9-2: Test 6, 3LPSW-565 Inrush Voltage and Current.....	6-77
Figure 4.6.9.9-3: Test 6, 3LPSW-565 Full Stroke Total Real Power (KW).....	6-78
Figure 4.6.9.10-1: Test 6, 3HP-4 Full Stroke Voltage and Current.....	6-79
Figure 4.6.9.10-2: Test 6, 3HP-4 Inrush Voltage and Current	6-80
Figure 4.6.9.10-3: Test 6, 3HP-4 Full Stroke Total Real Power (KW)	6-81
Figure 4.6.9.11-1: Test 6, 3HP-20 Full Stroke Voltage and Current.....	6-82
Figure 4.6.9.11-2: Test 6, 3HP-20 Inrush Voltage and Current	6-83
Figure 4.6.9.11-3: Test 6, 3HP-20 Full Stroke Total Real Power (KW)	6-84

Figure 4.6.1-1: Test6, Lee Voltage and Current

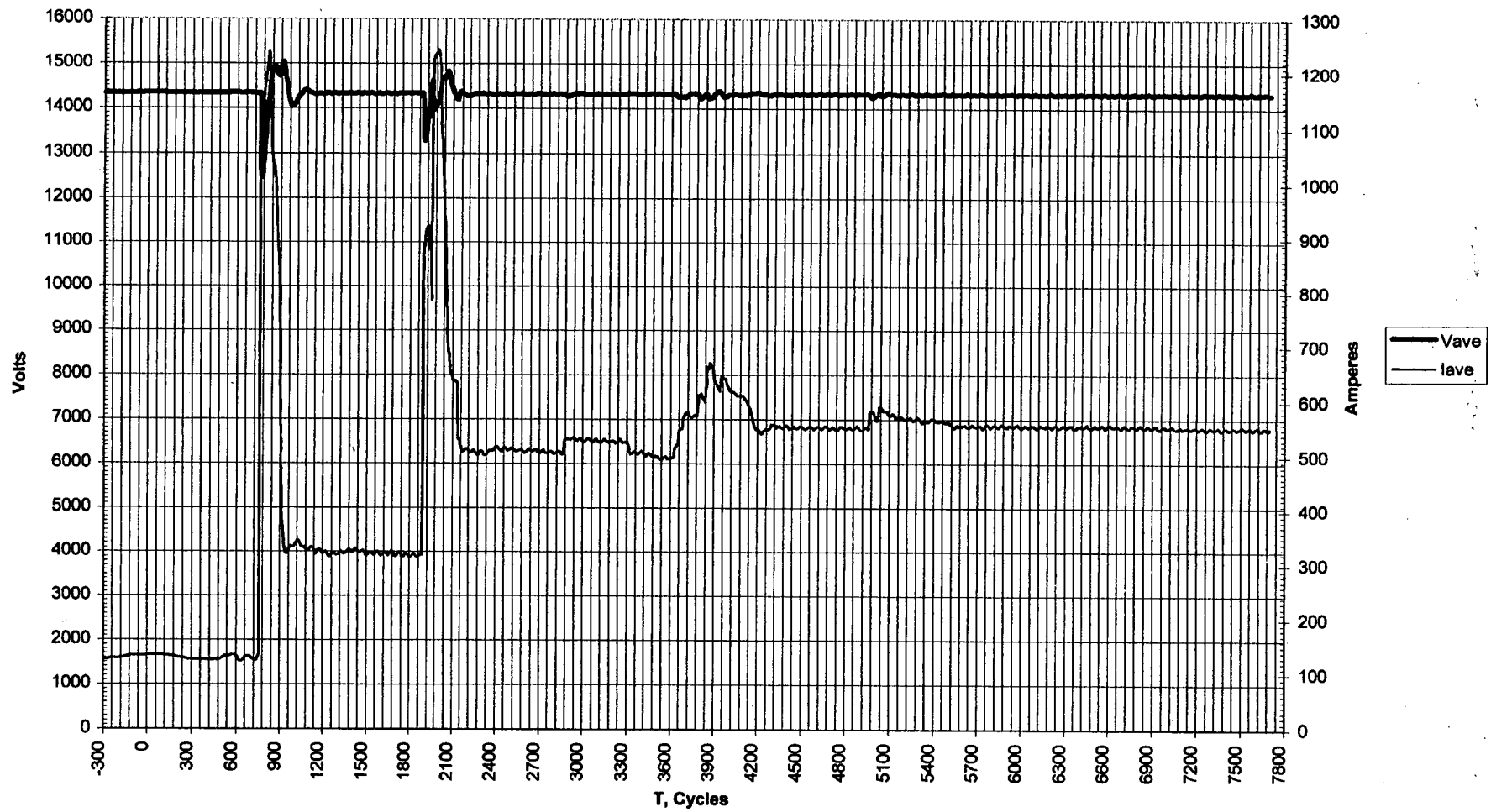


Figure 4.6.1-2: Test6, Lee Voltage

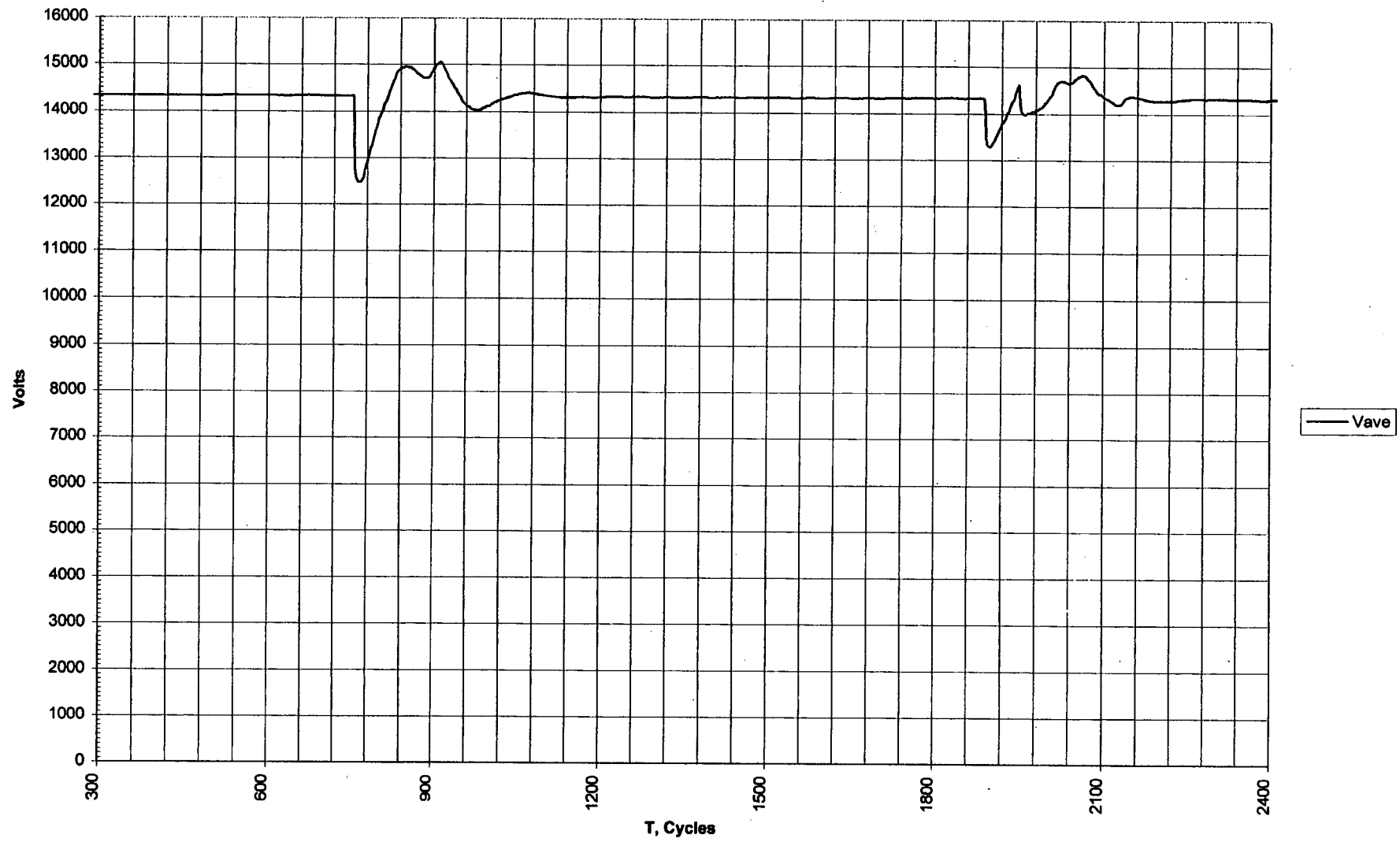


Figure 4.6.1-3, Test6, Lee KVA

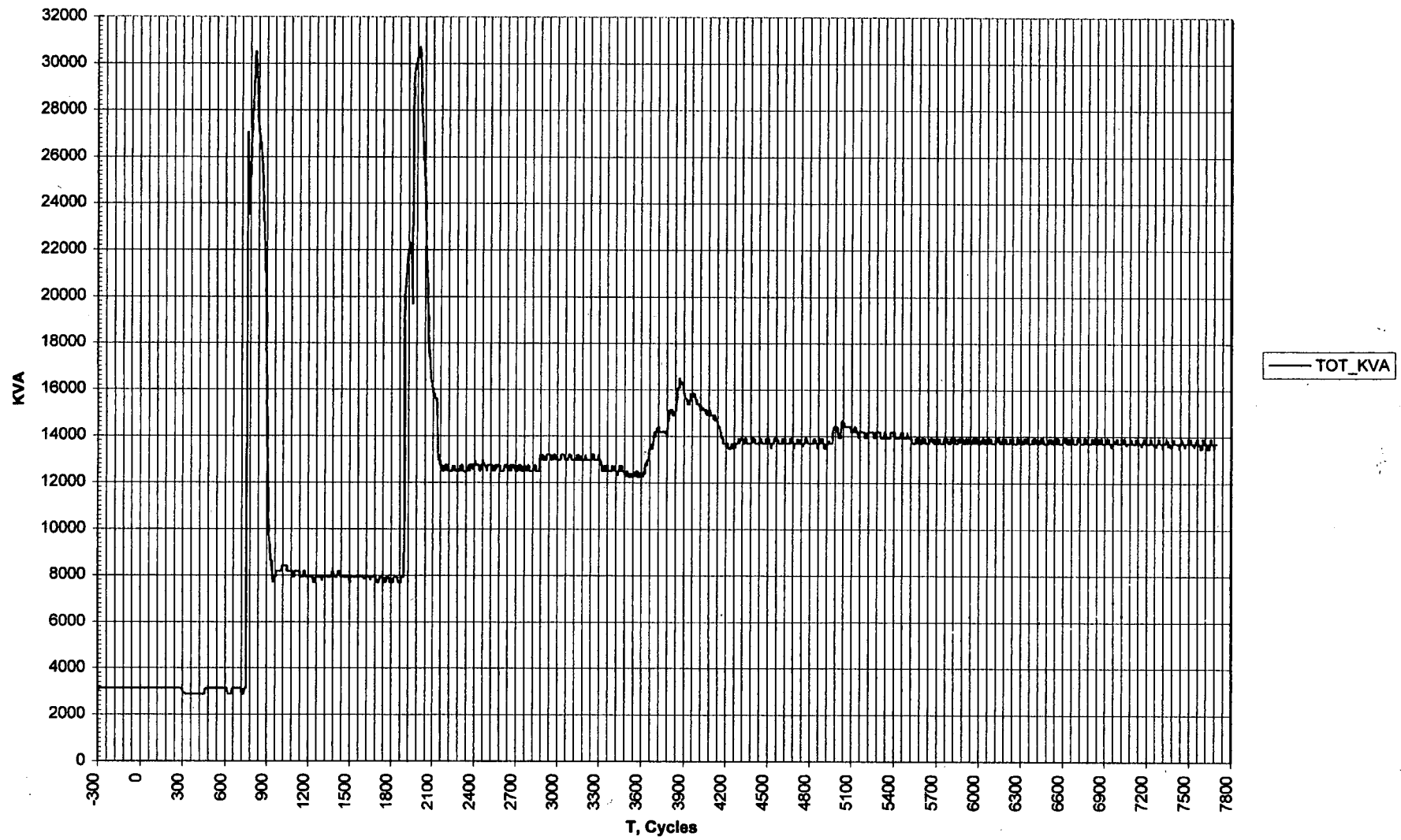


Figure 4.6.1-4: Test6, Lee KW

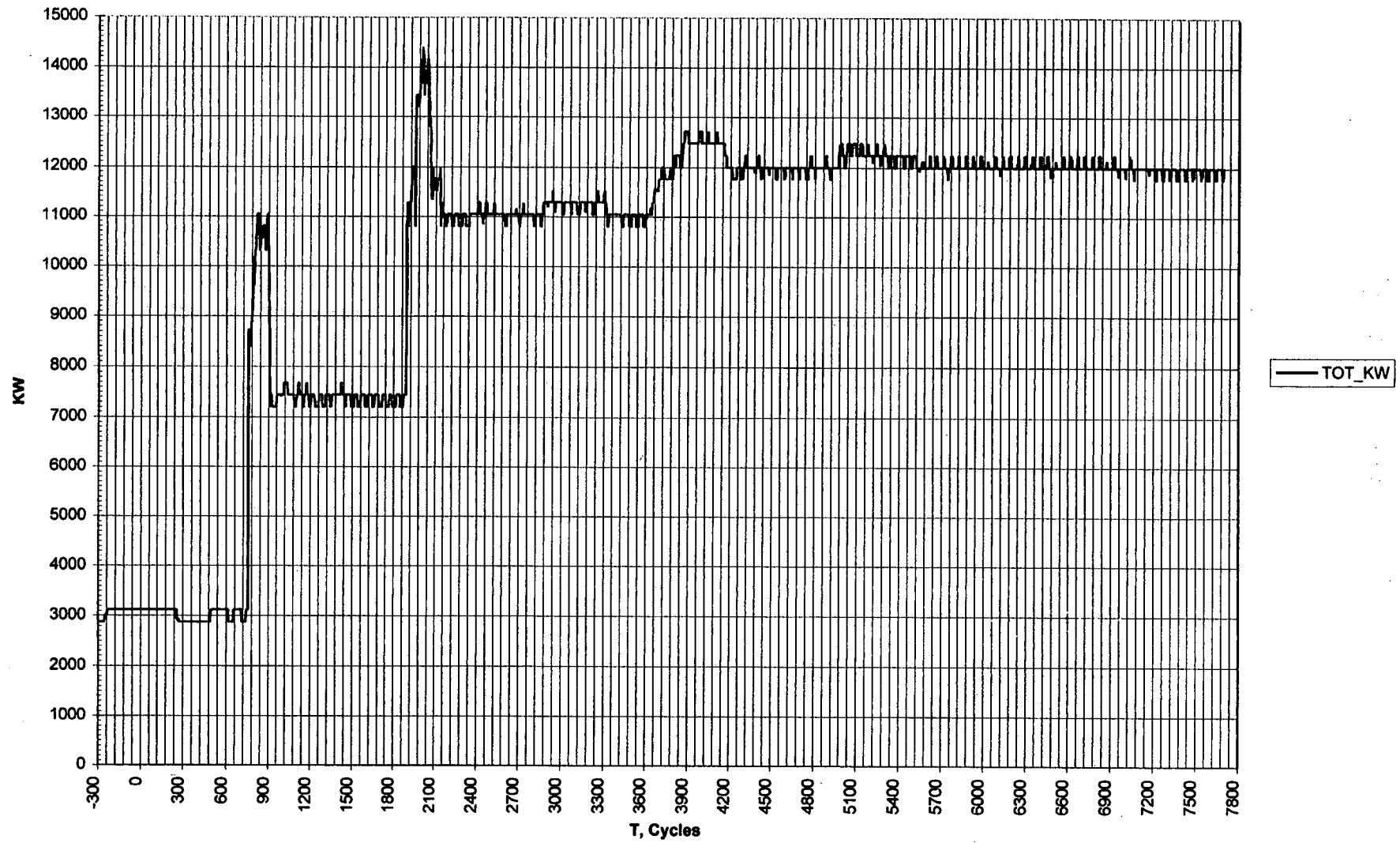


Figure 4.6.1-5: Test6, Lee Frequency and Current

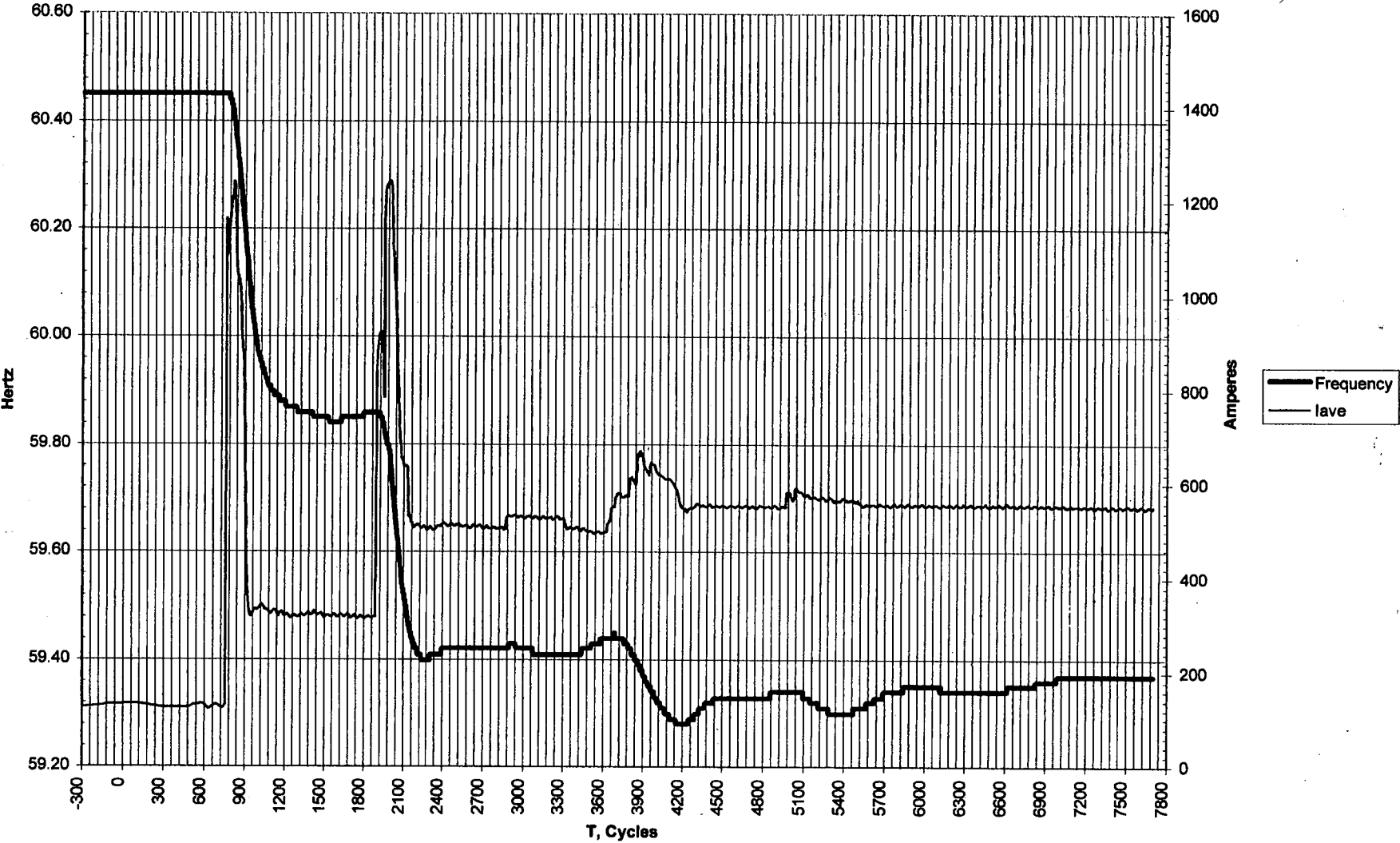


Figure 4.6.1-6: Test6, Lee Frequency

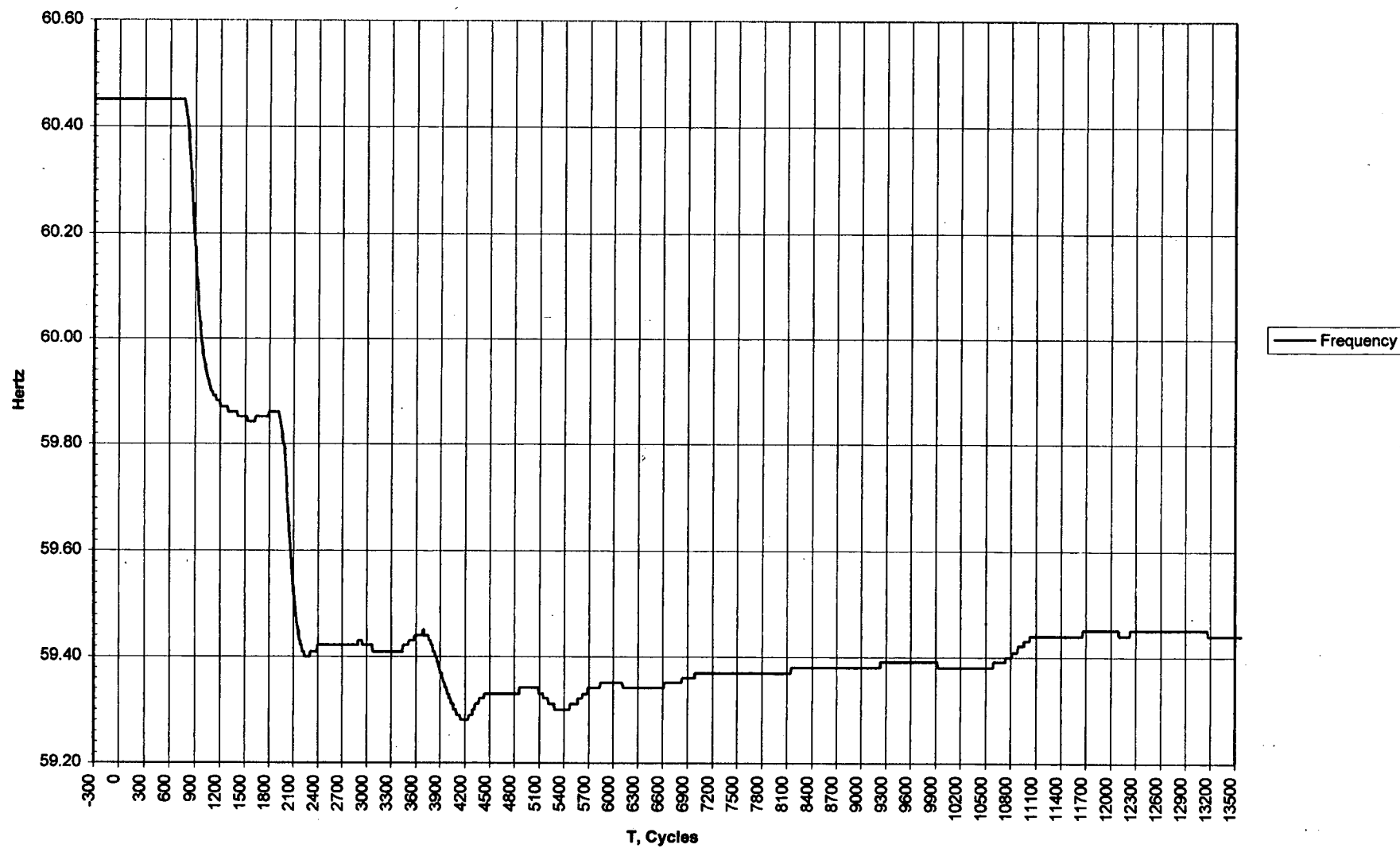


Figure 4.6.2-1: Test6, Unit 1 MFB Voltage and Current

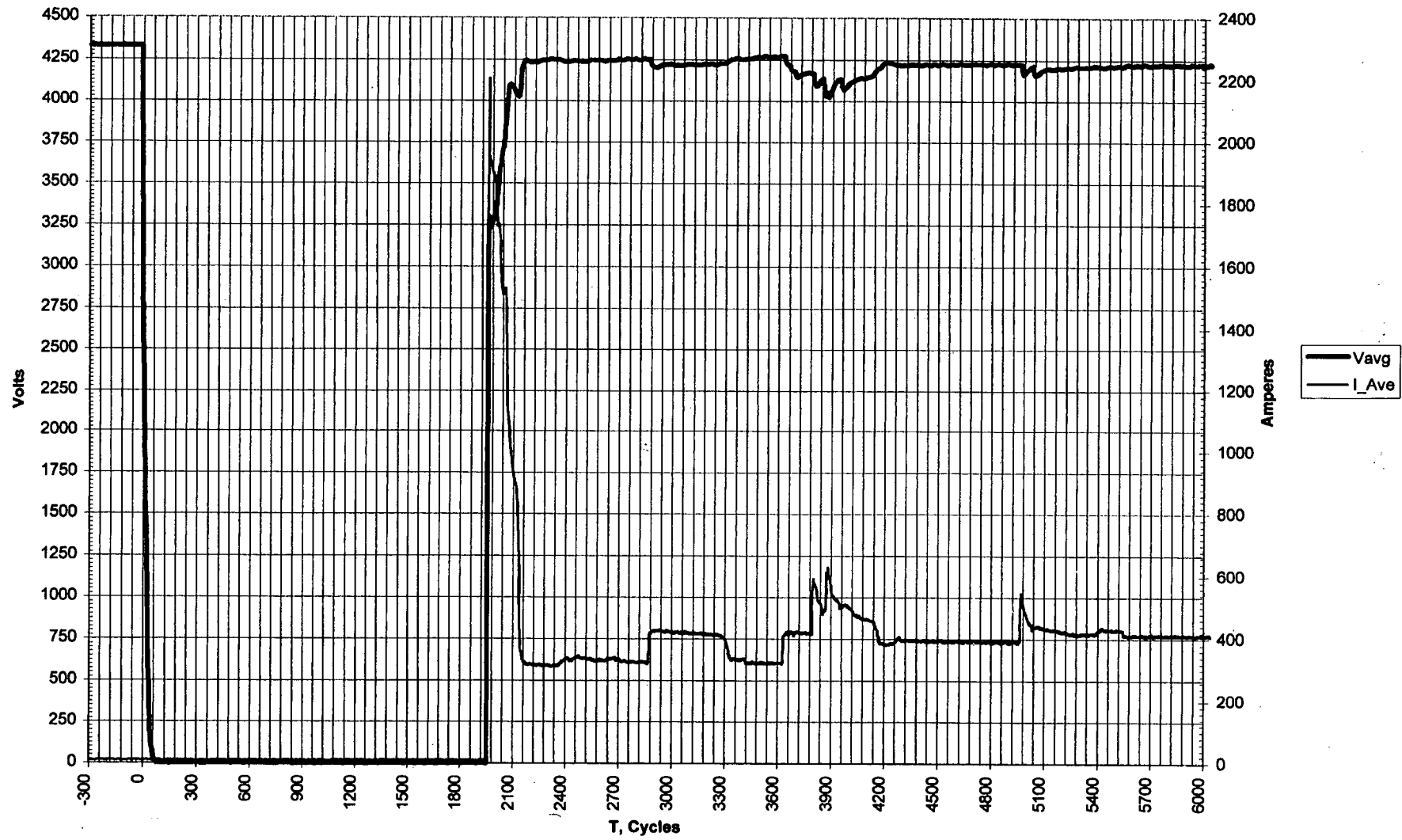


Figure 4.6.2-2: Test6, Unit 1 MFB KVA and KW

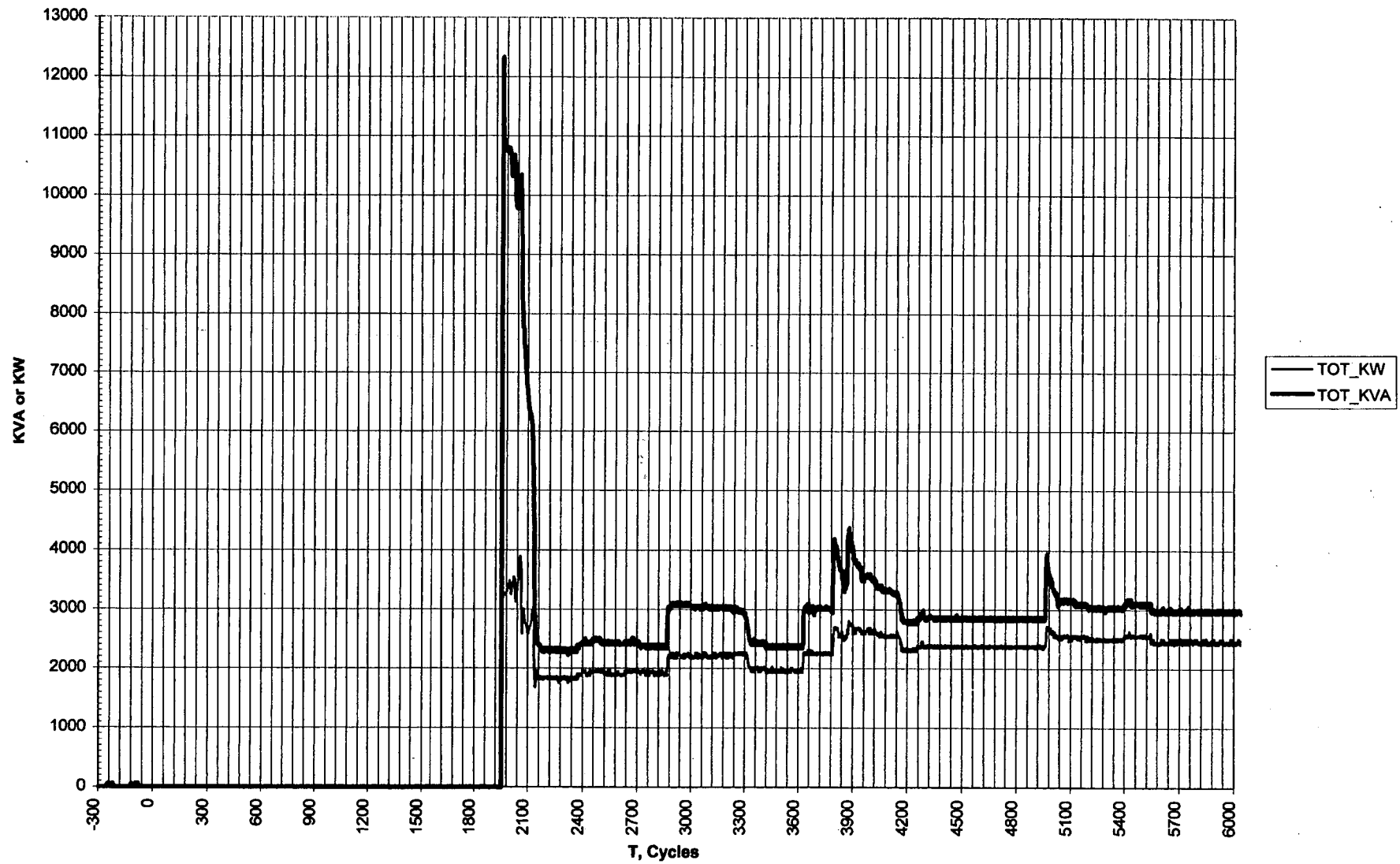


Figure 4.6.2-3: Test6, Unit 2 MFB Voltage and Current

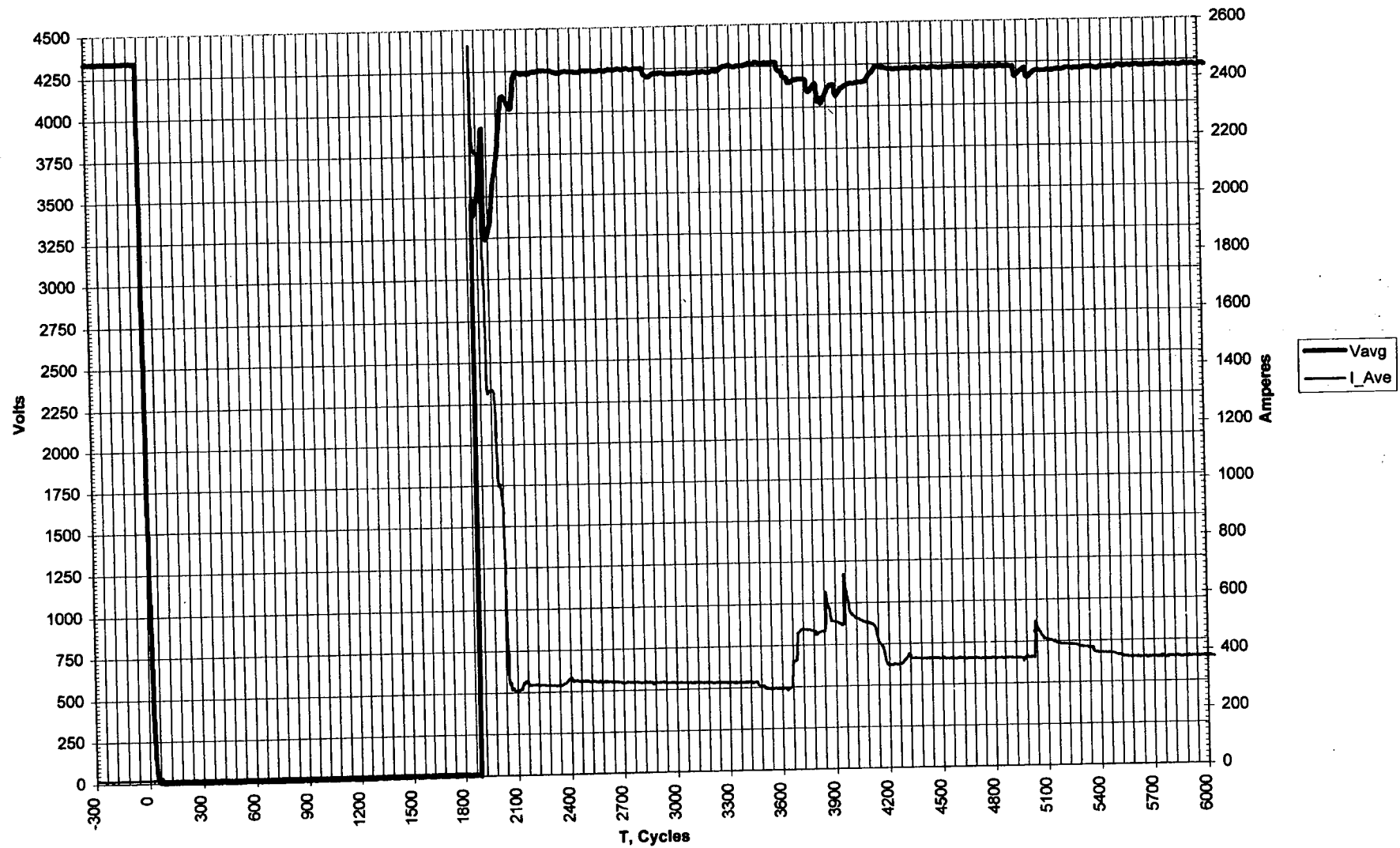


Figure 4.6.2-4: Test6, Unit 2 MFB KVA and KW

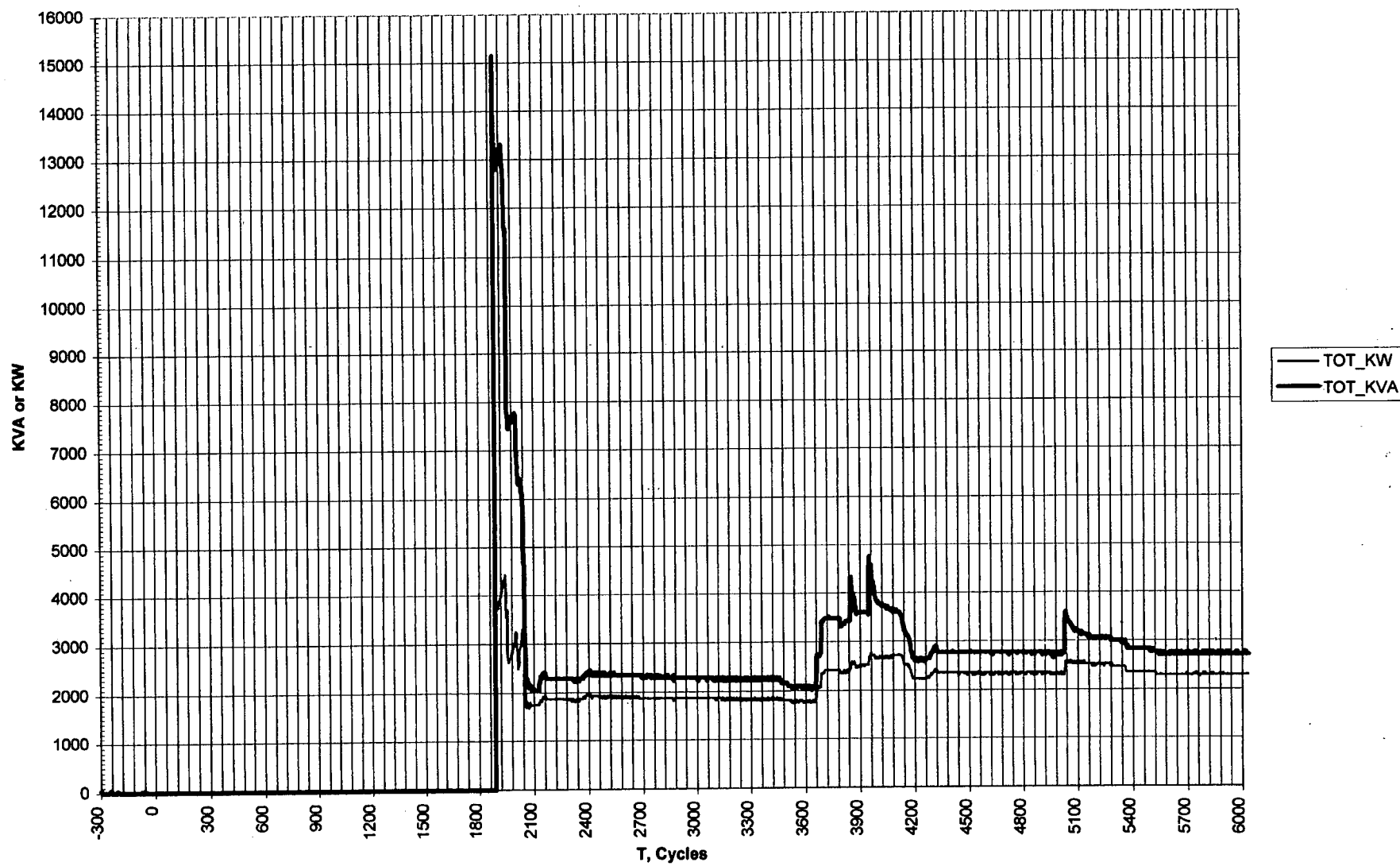


Figure 4.6.2-5: Test6, Standby Bus Voltage and Unit 3 MFB Current



Figure 4.6.2-6: Test6, Unit 3 MFB KVA and KW

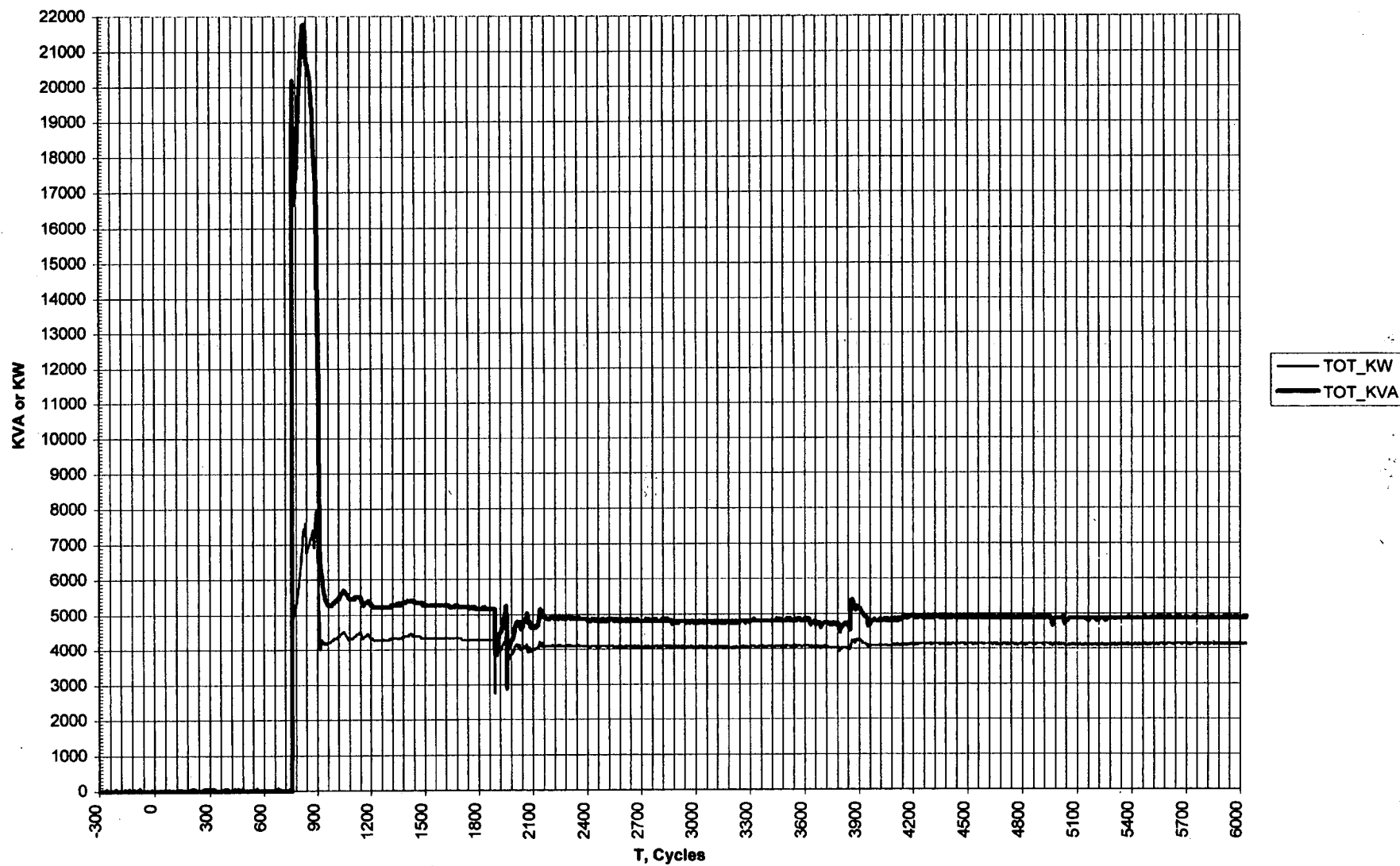


Figure 4.6.3- 1: Test6, EFW 3B Voltage and Current

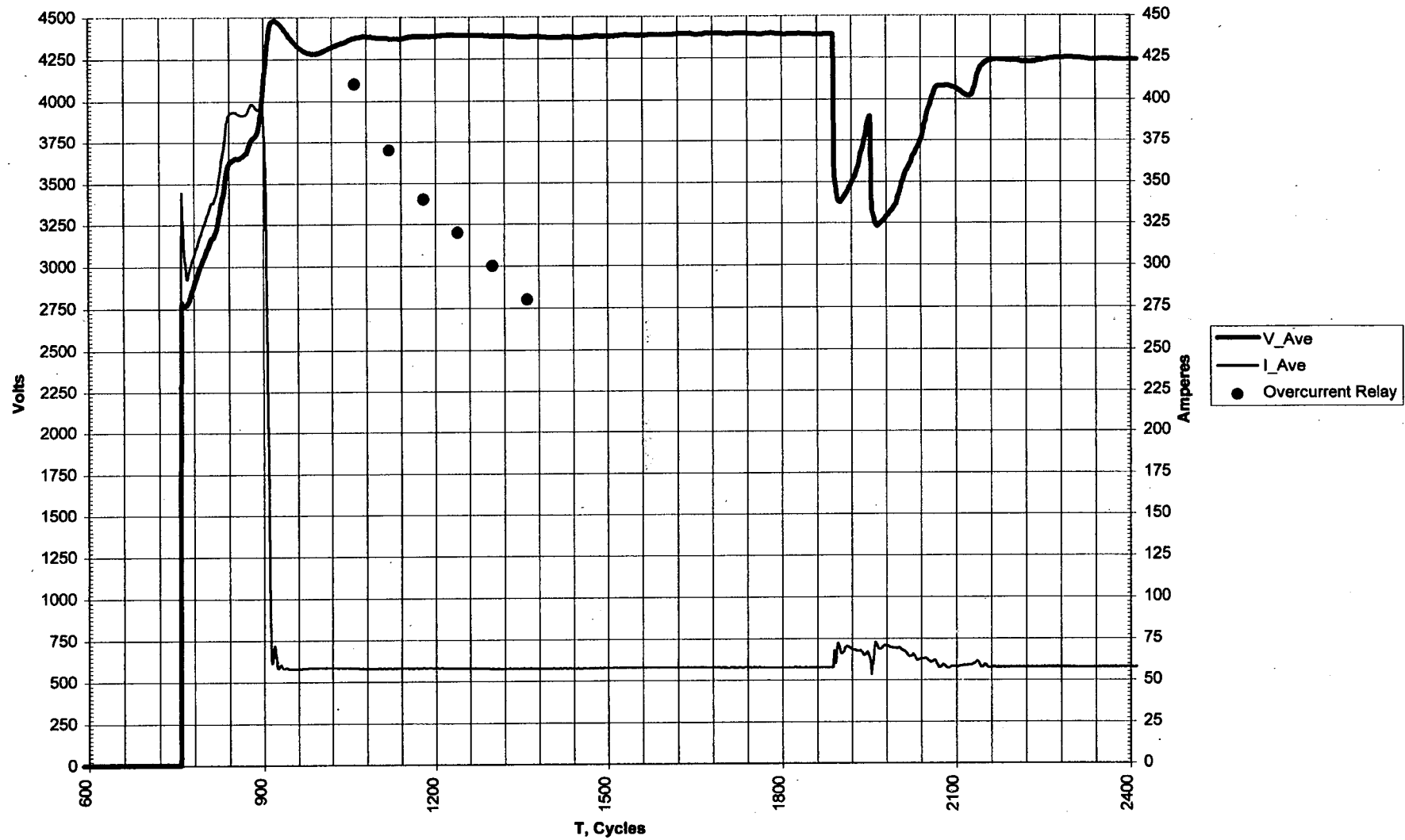


Figure 4.6.3- 2: Test6, EFW 3B KVA and KW

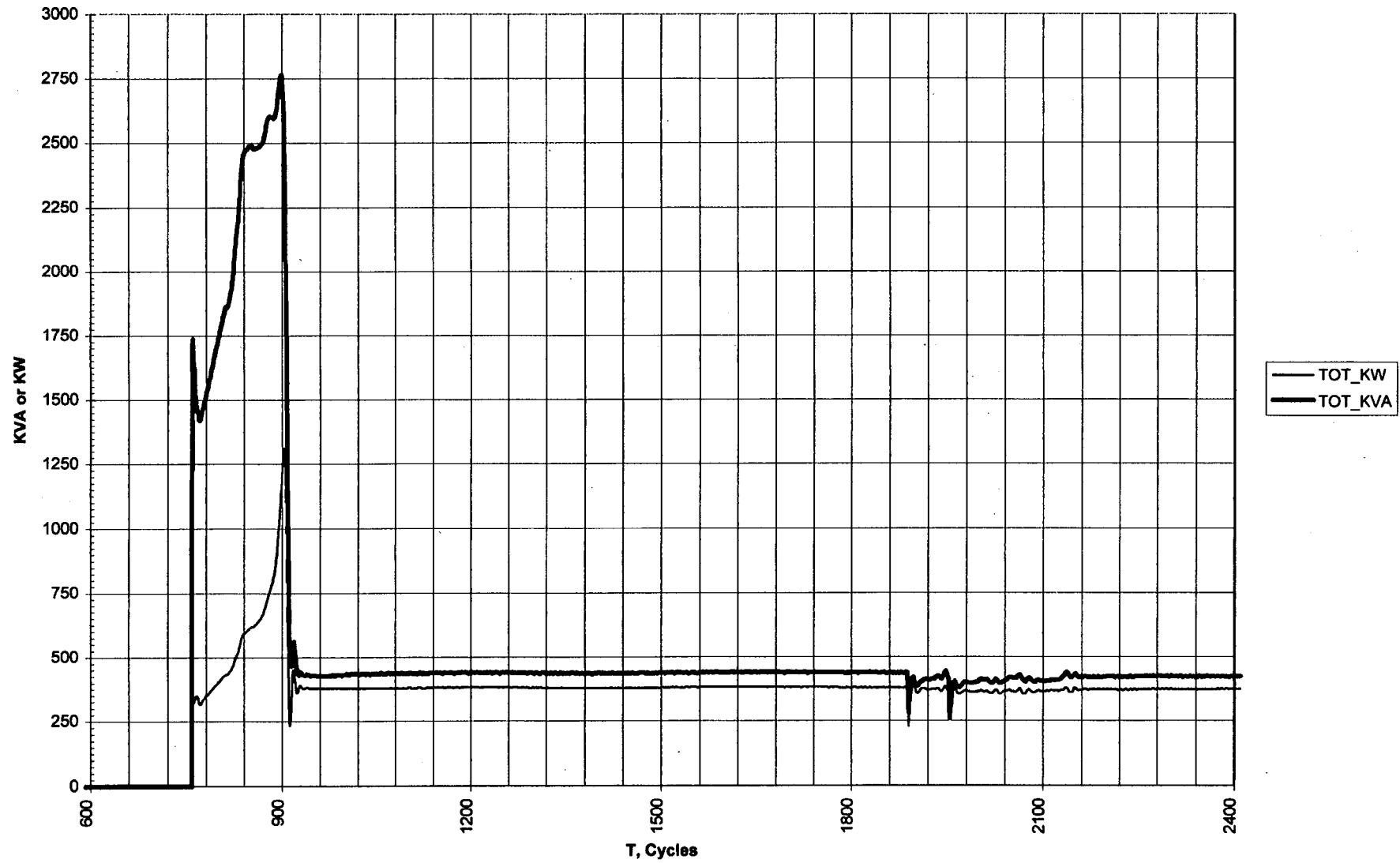


Figure 4.6.3- 3: Test6, HPI 3B Voltage and Current

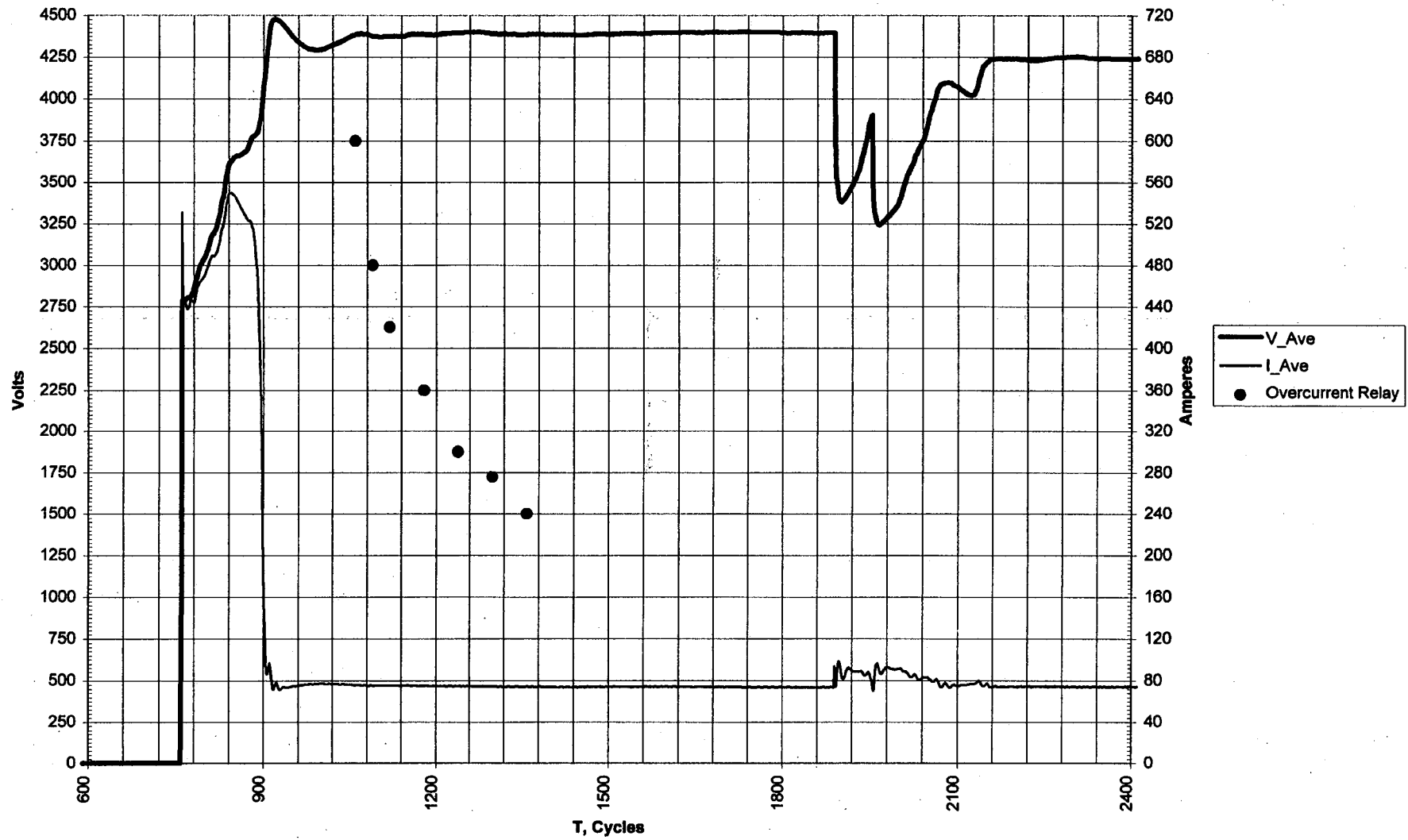


Figure 4.6.3- 4: Test6, HPI 3B KVA and KW

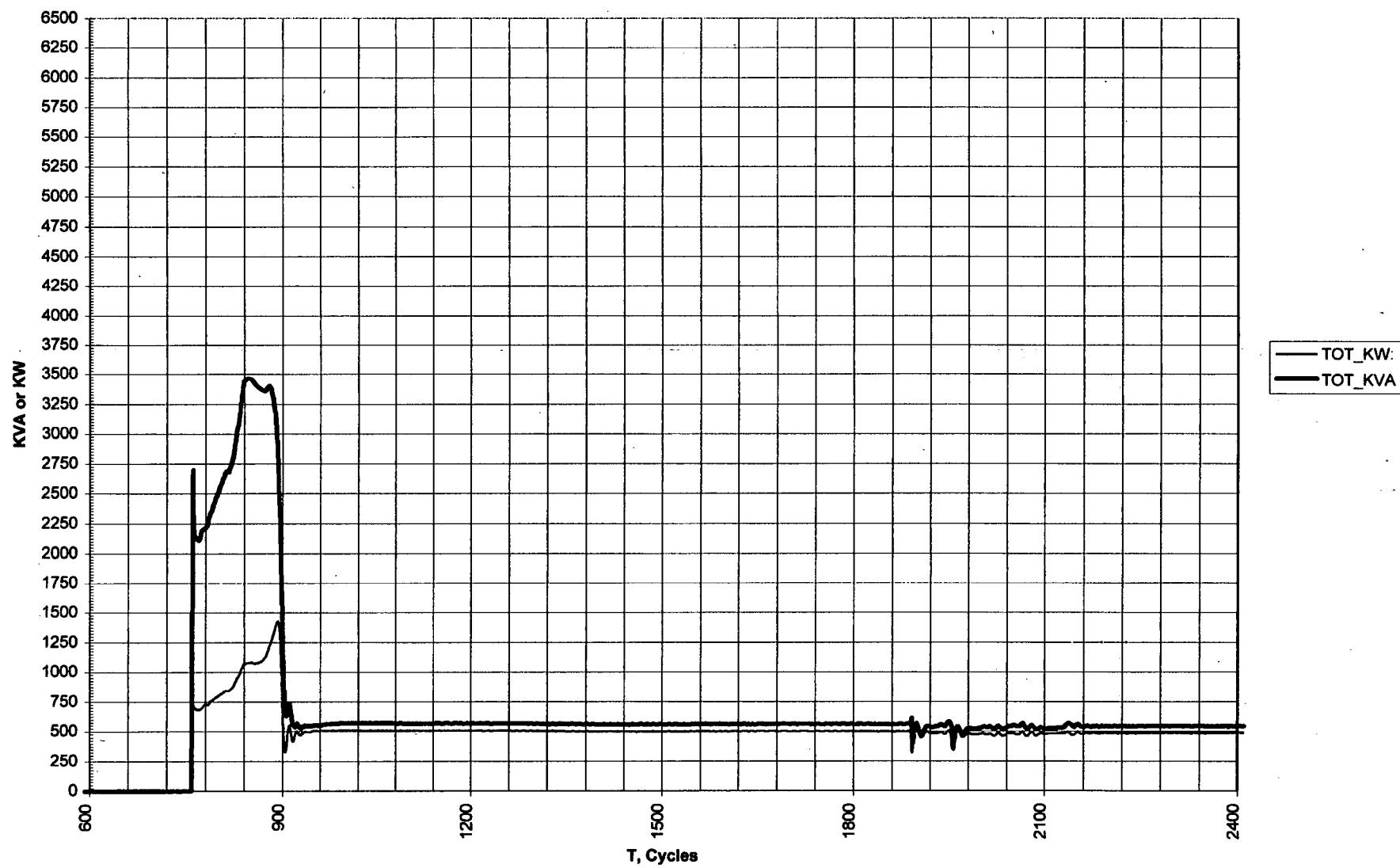


Figure 4.6.3- 5: Test6, EFW 1A Voltage and Current

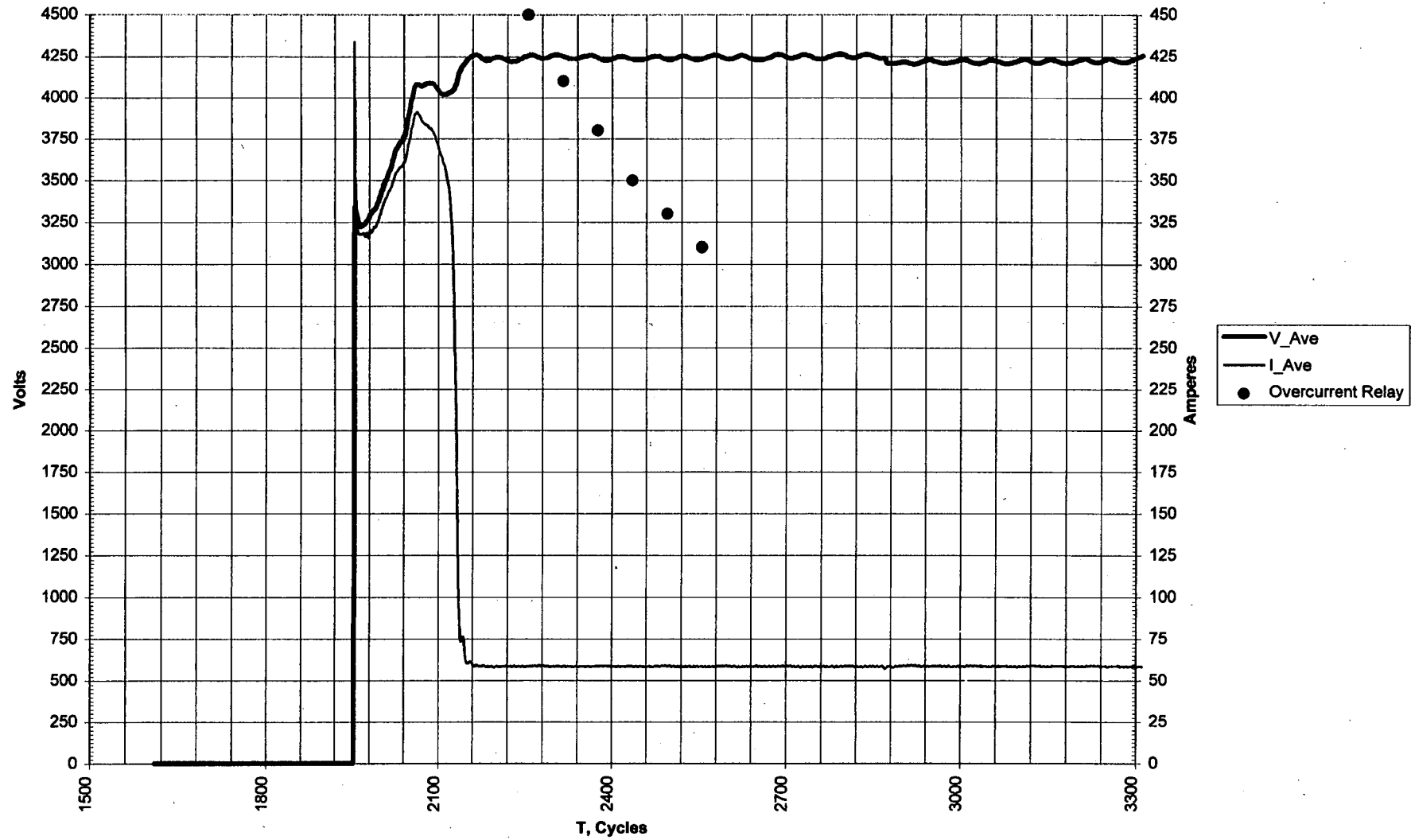


Figure 4.6.3- 6: Test6, EFW 1A KVA and KW

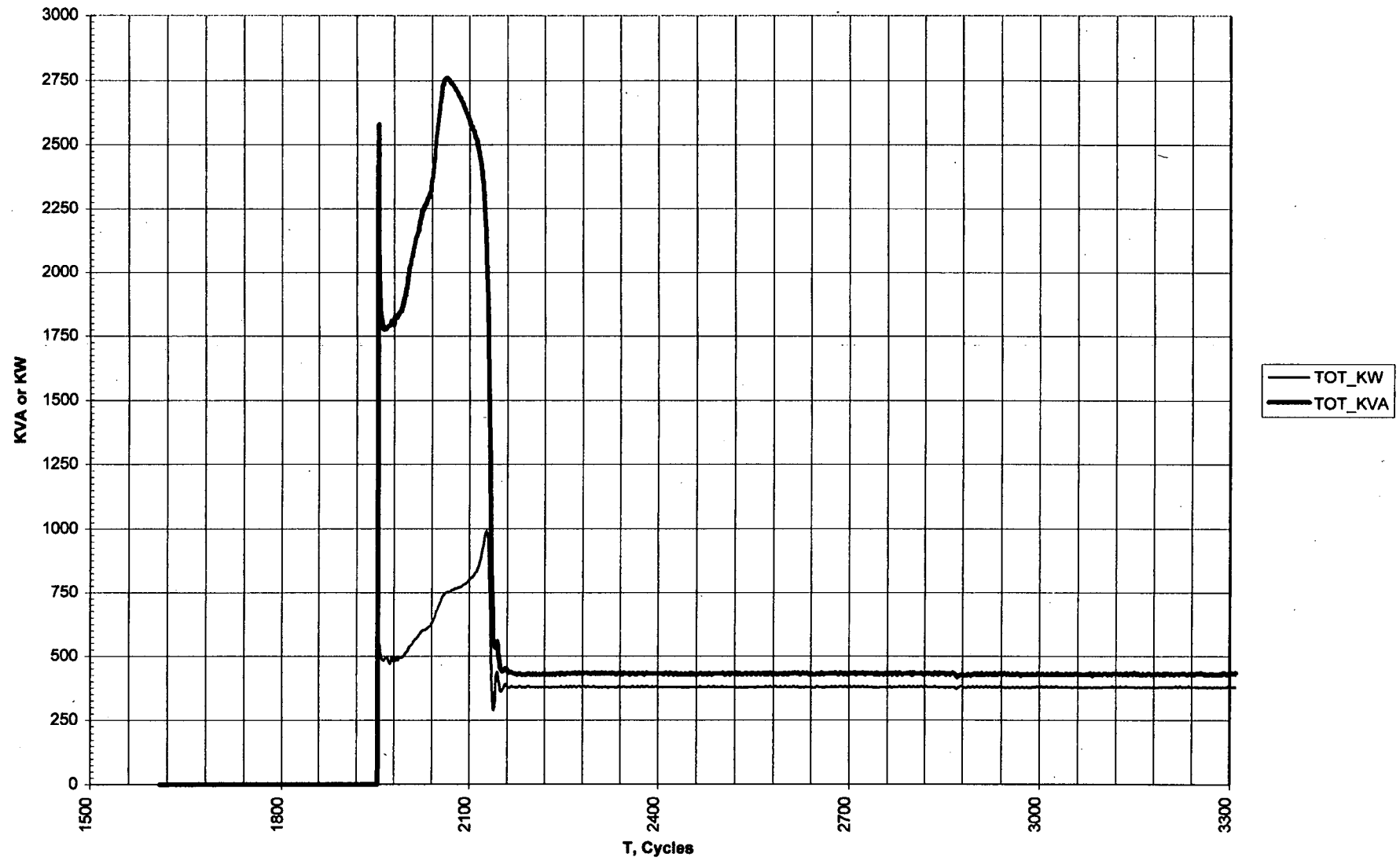


Figure 4.6.3- 7: Test6, LPSW 3B Voltage and Current

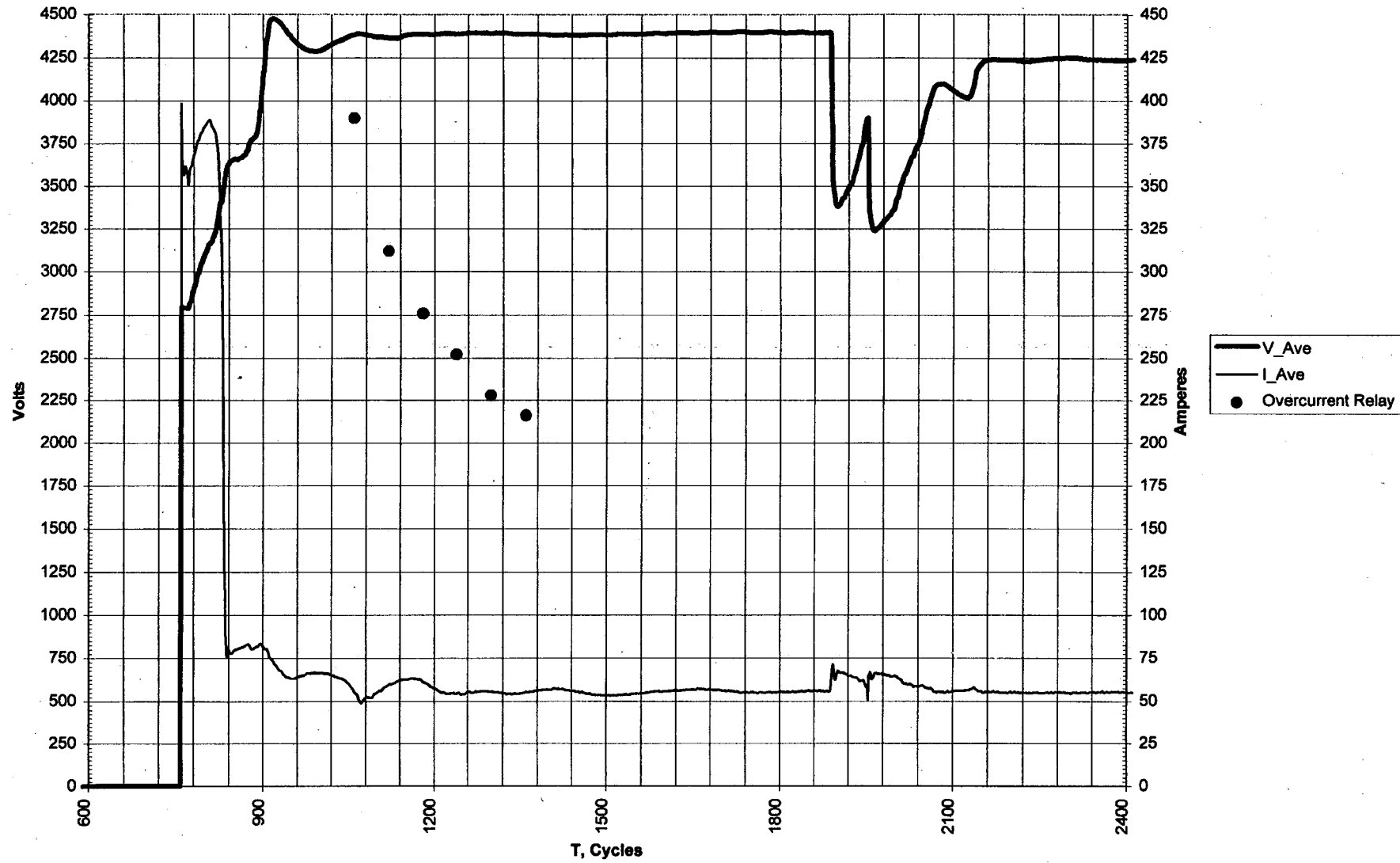


Figure 4.6.3- 8: Test6, LPSW 3B KVA and KW

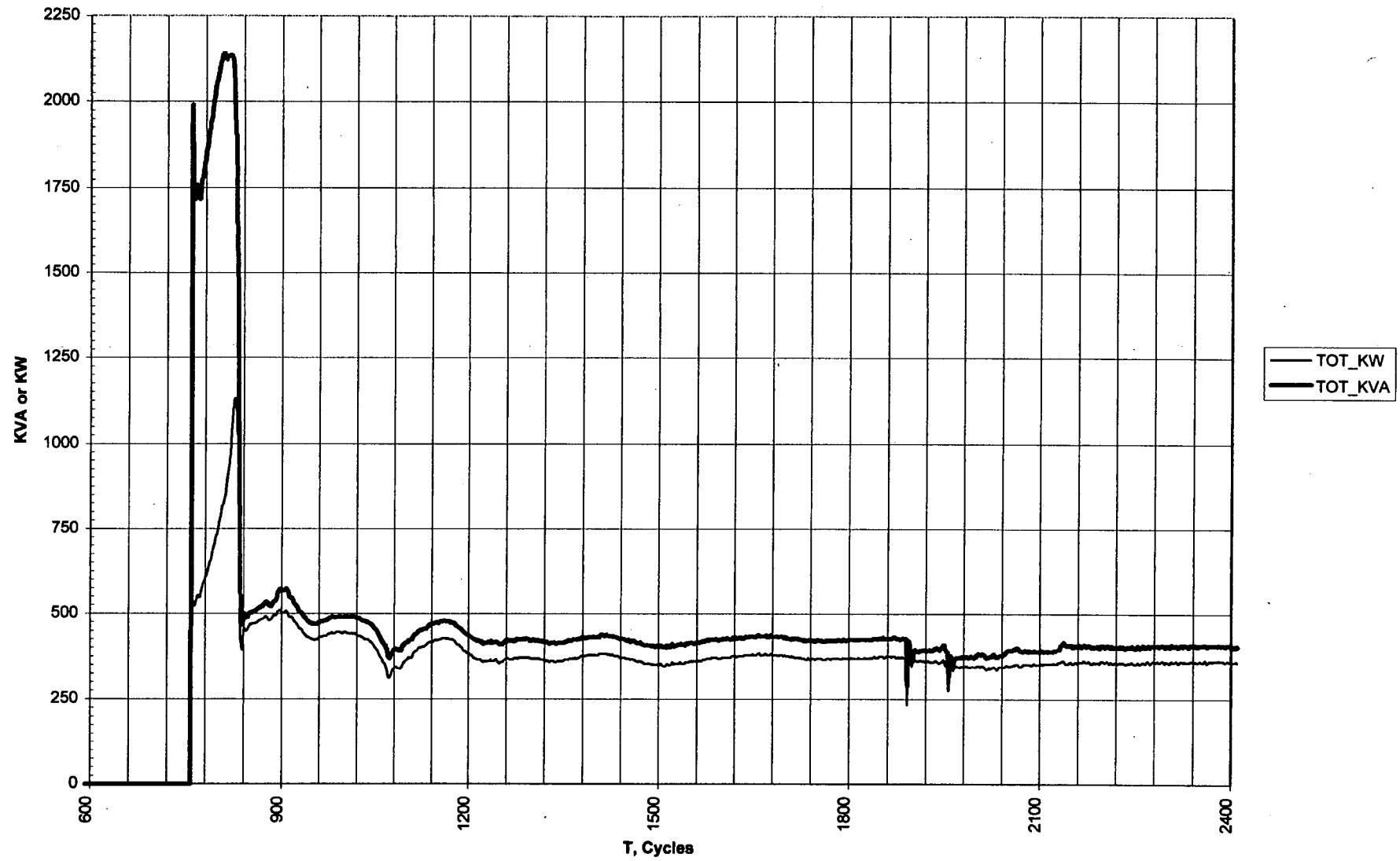


Figure 4.6.3- 9: Test6, LPI 3B Voltage and Current

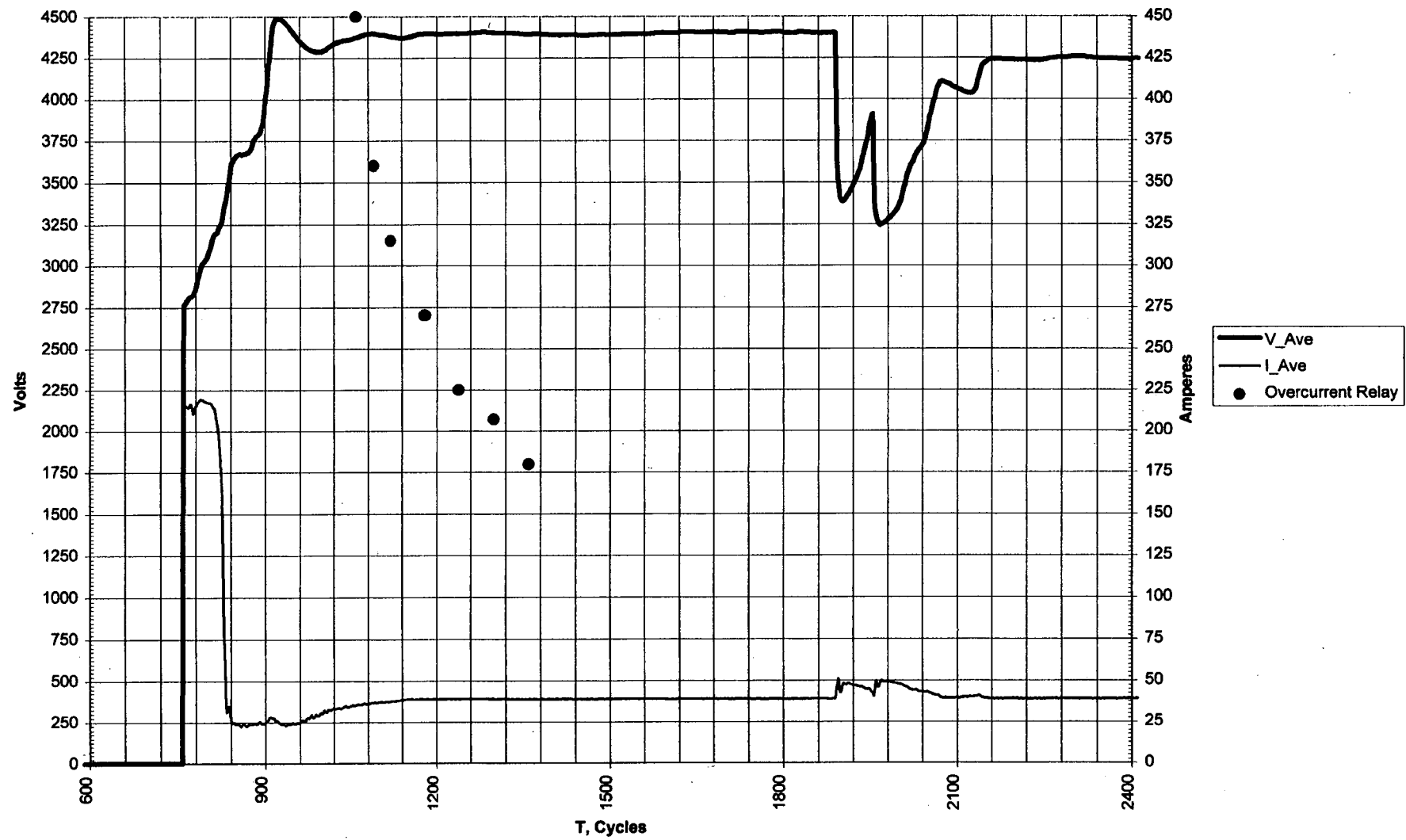


Figure 4.6.3- 10: Test6, LPI 3B KVA and KW

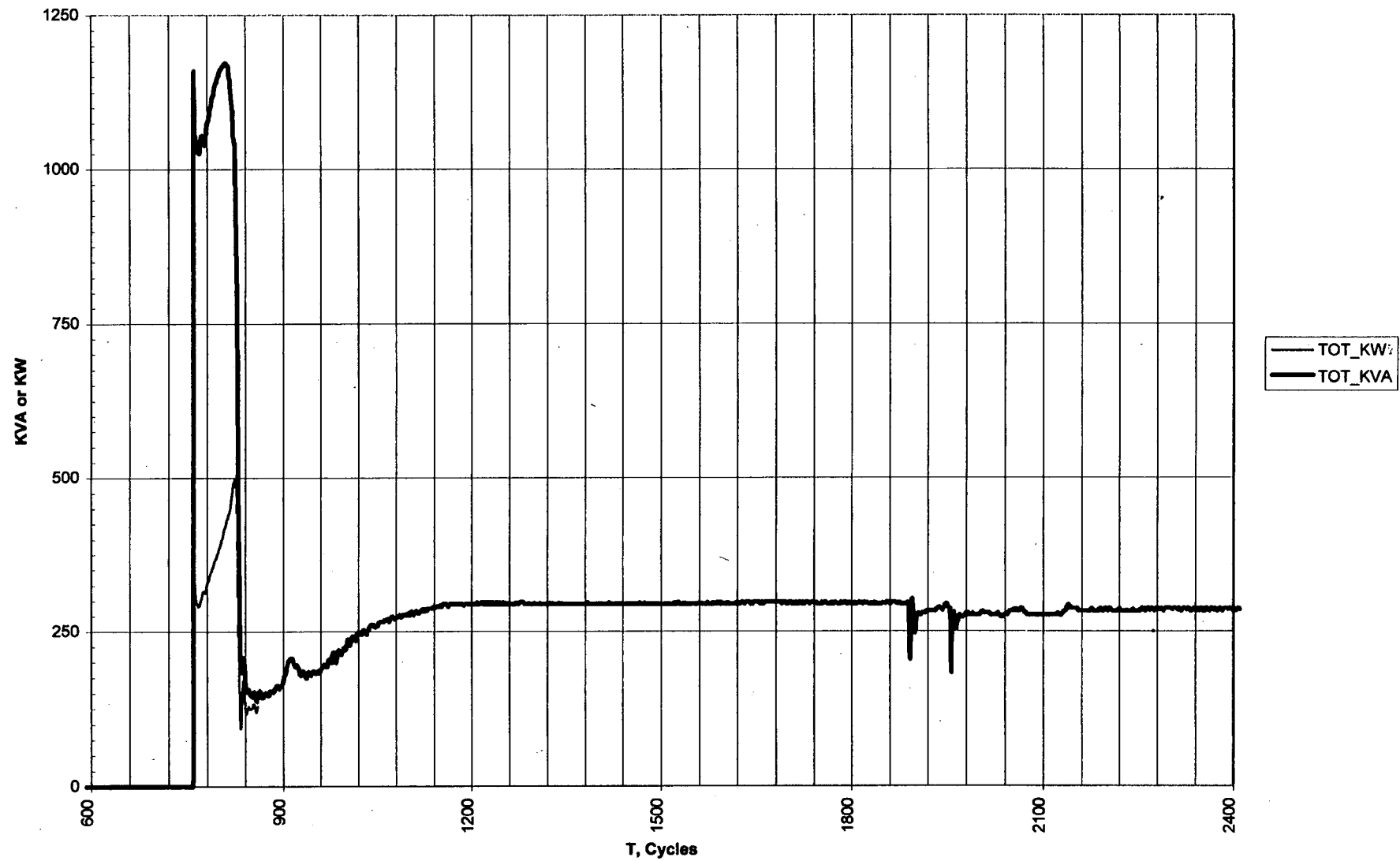


Figure 4.6.3- 11: Test6, RBS 3B Voltage and Current

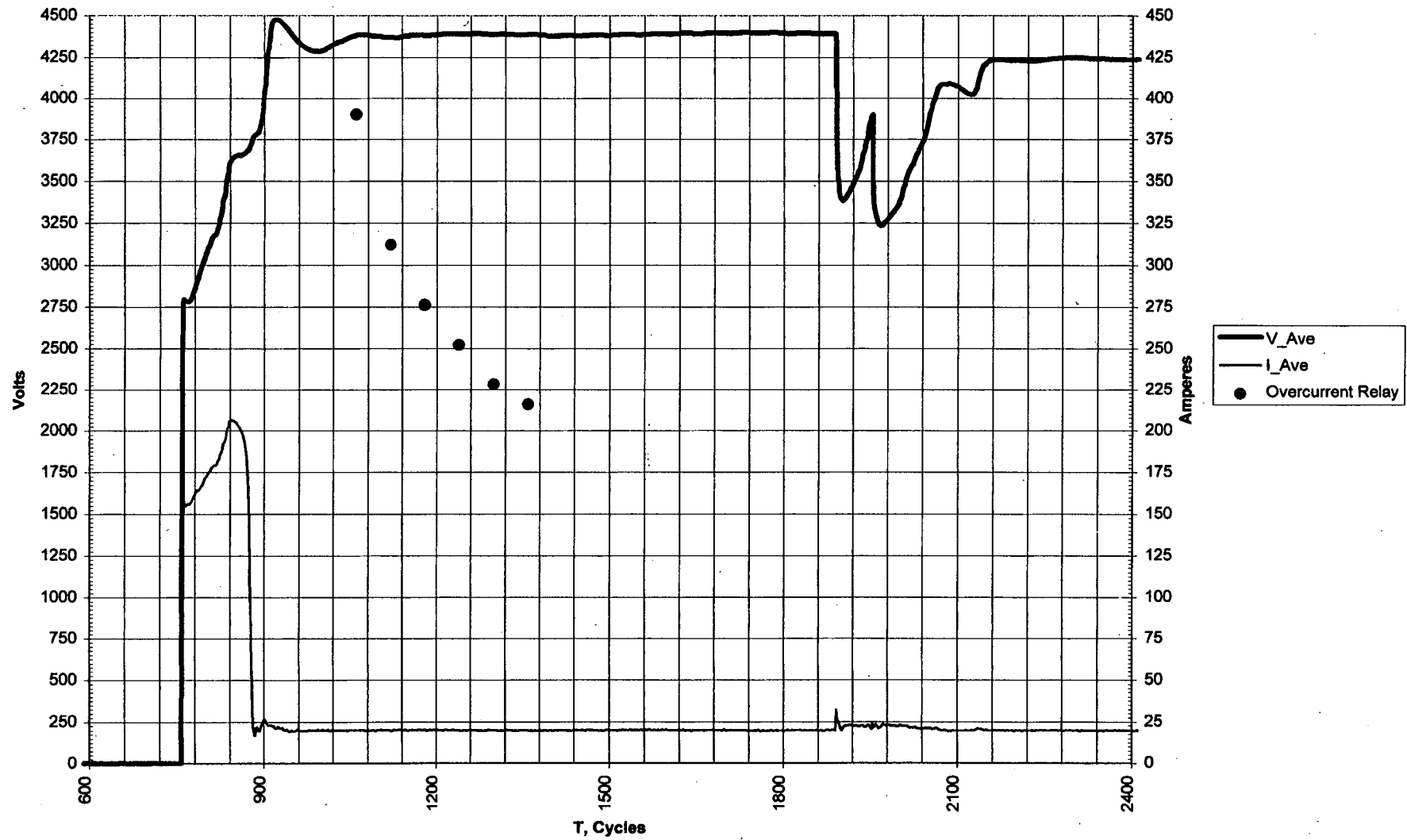


Figure 4.6.3- 12: Test6, RBS 3B KVA and KW

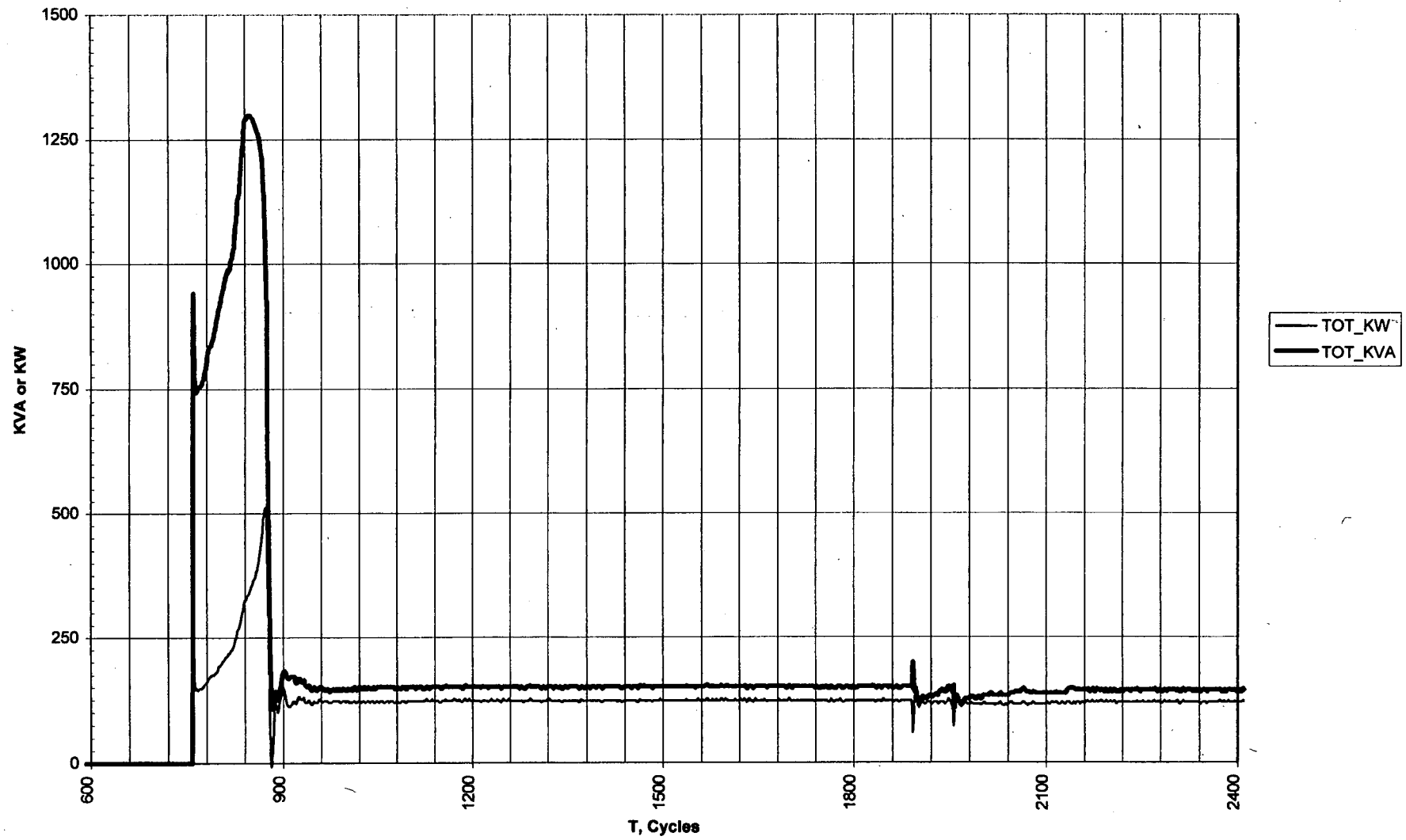


Figure 4.6.4- 1: Test6, RBCF 3B Voltage and Current

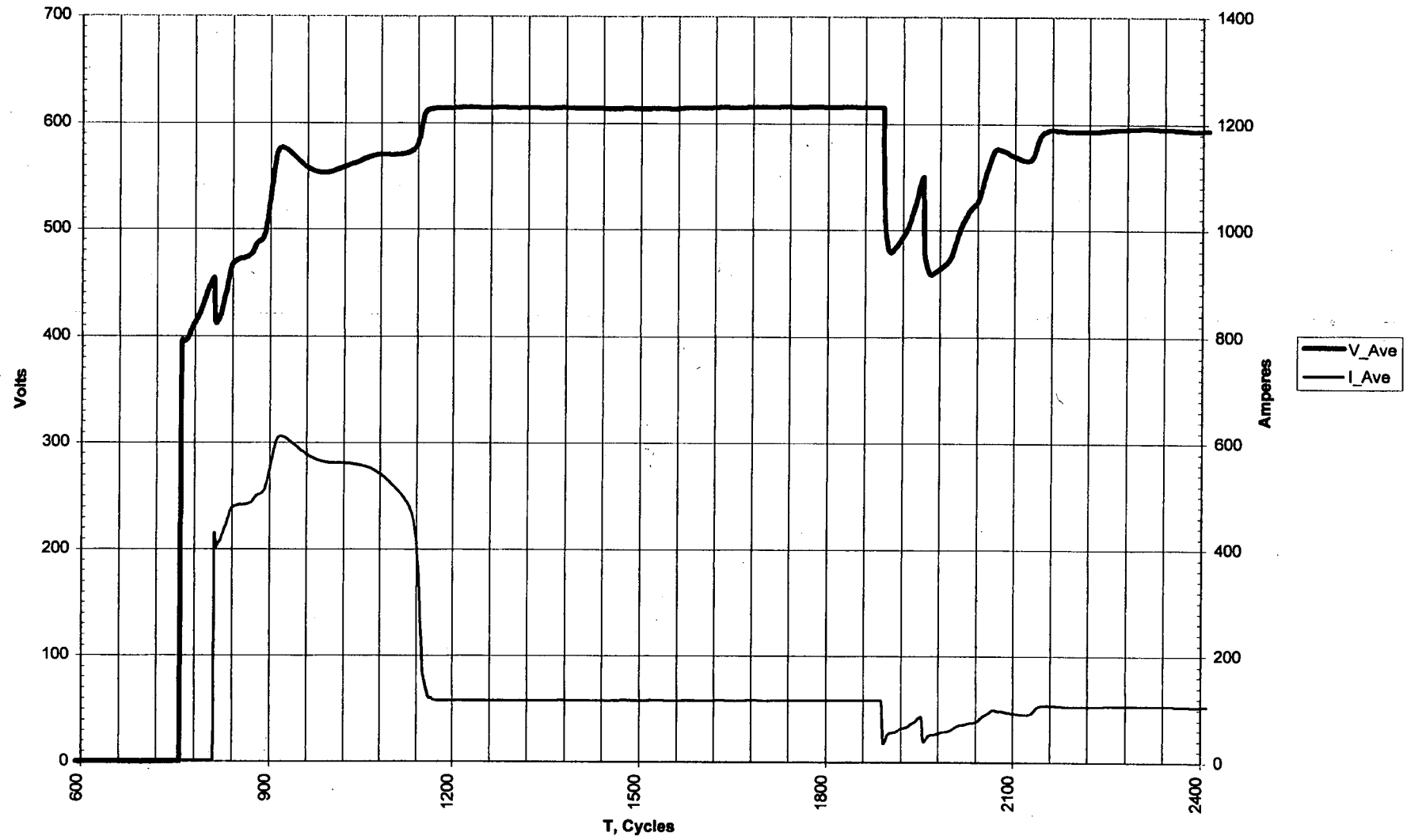


Figure 4.6.4- 2: Test6, RBCF 3B KVA and KW

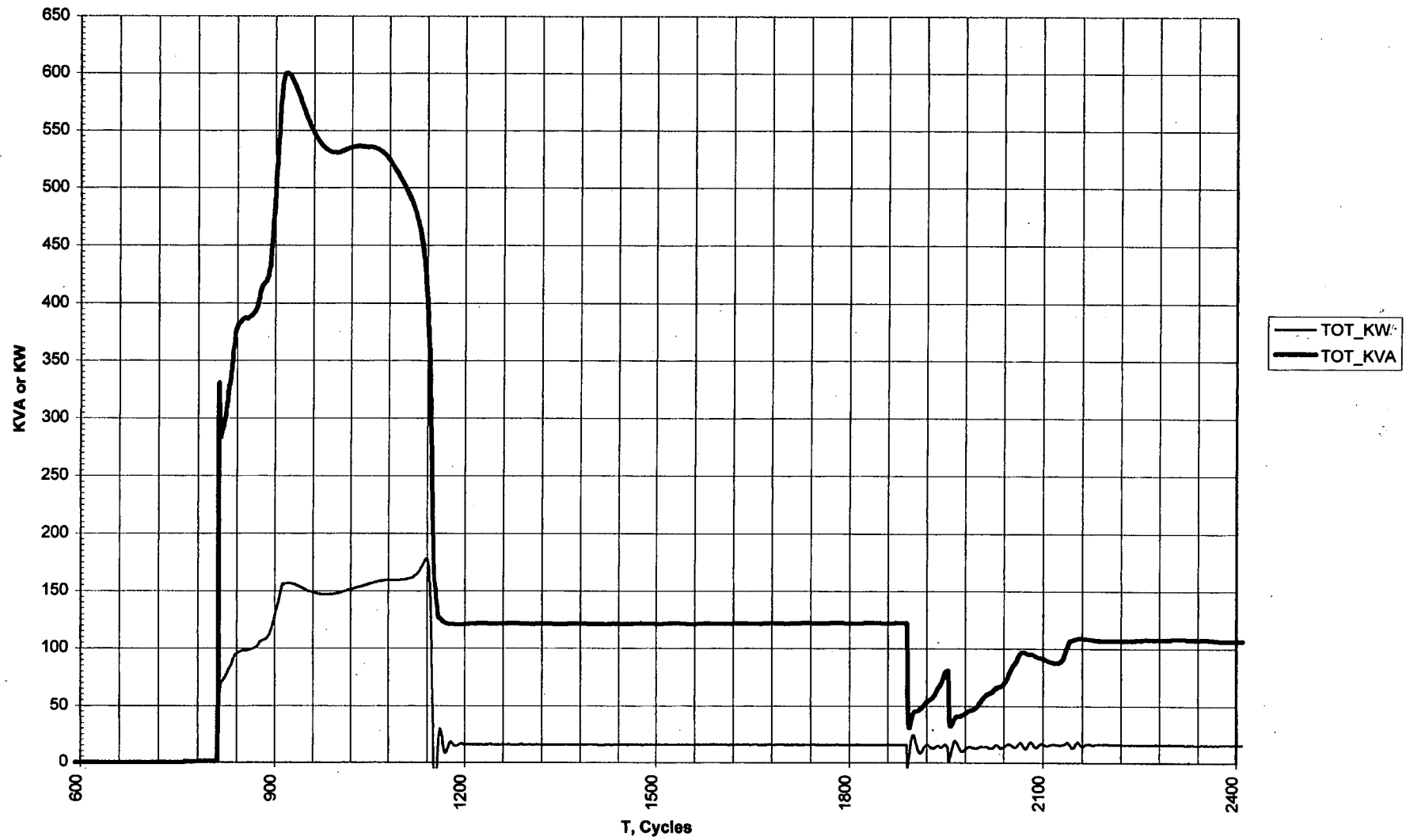


Figure 4.6.5- 1: Test6, 1X5 Voltage and Current

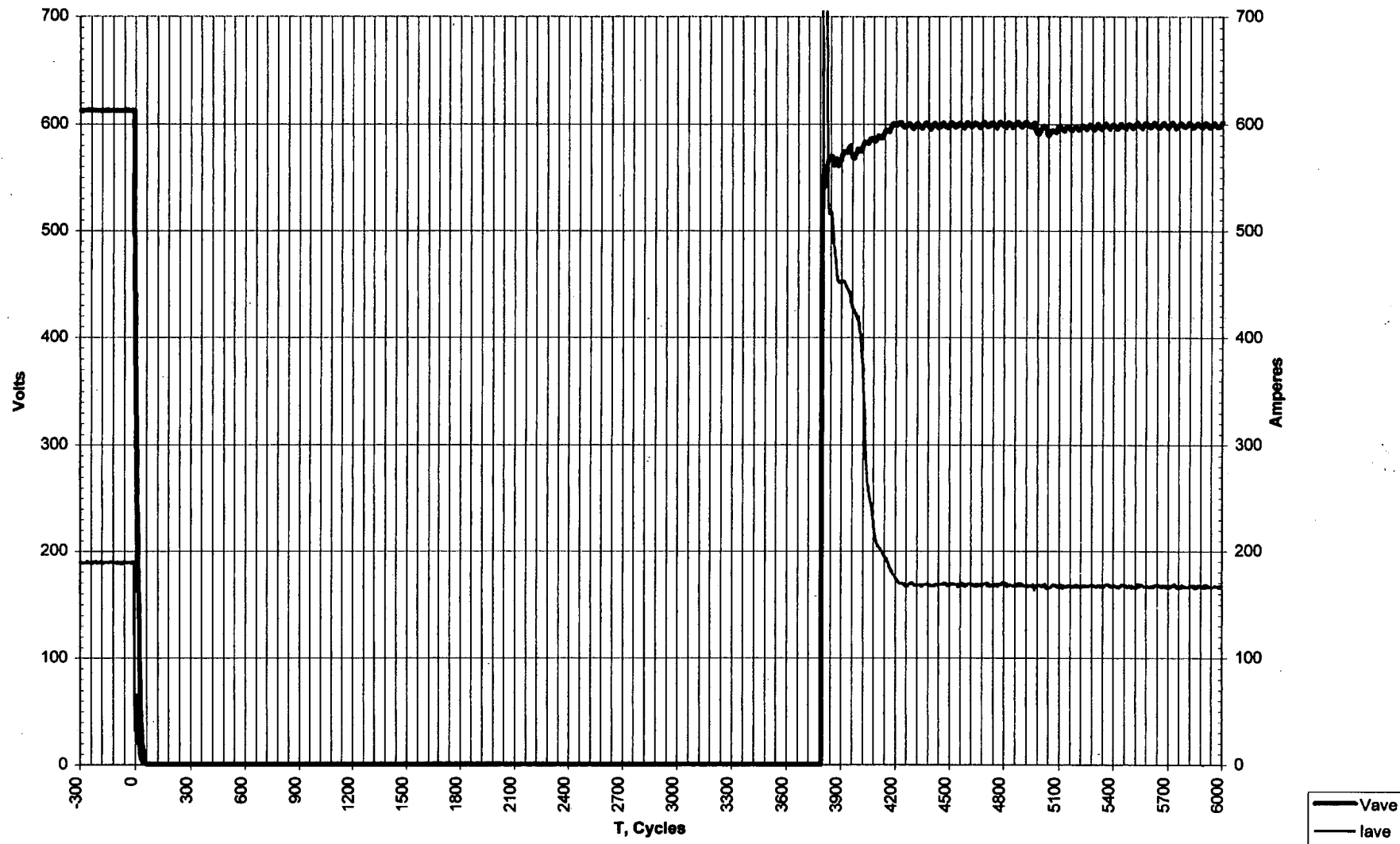


Figure 4.6.5- 2: Test6, 1X5 KVA and KW

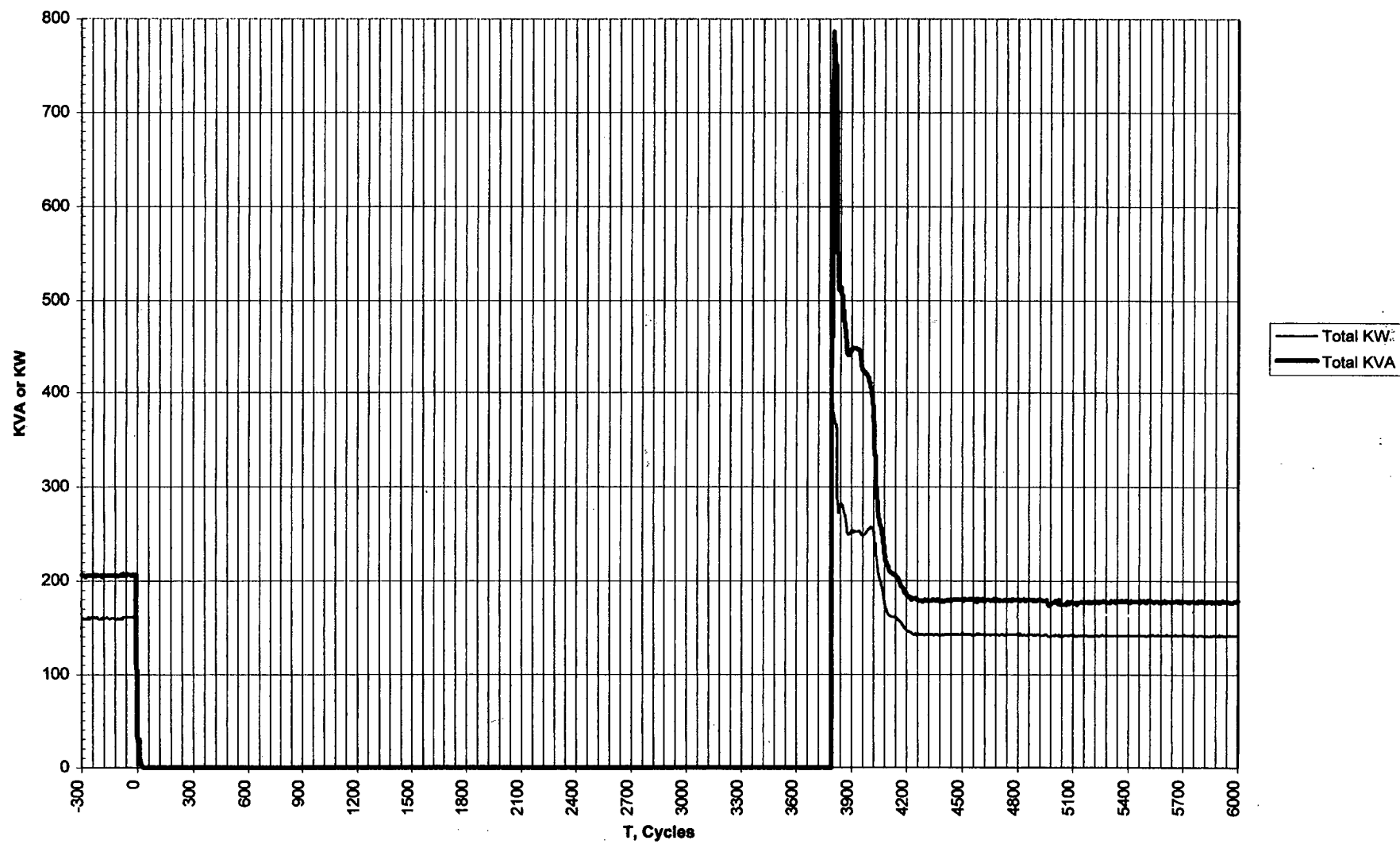


Figure 4.6.5- 3: Test6, 1X6 Voltage and Current

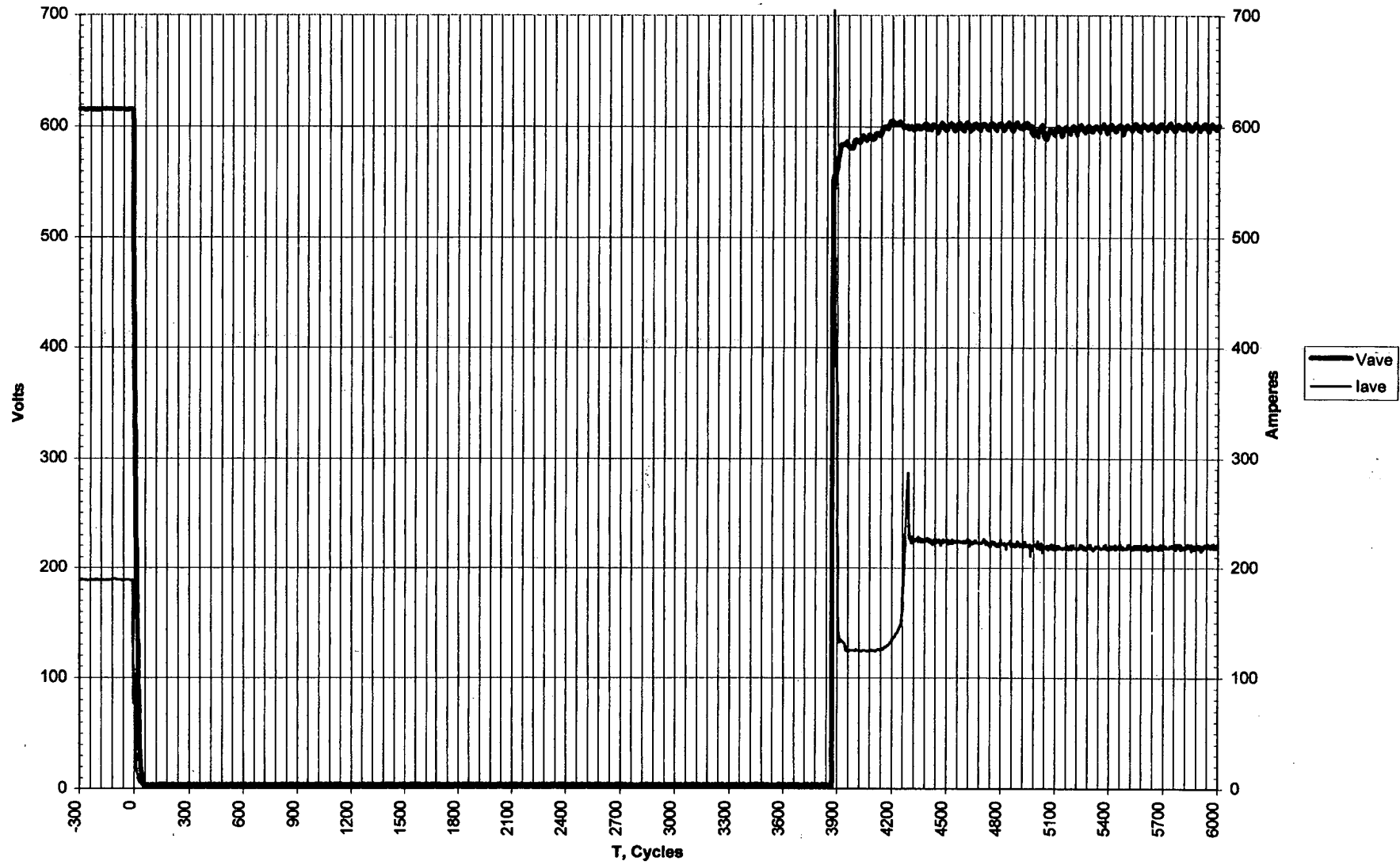


Figure 4.6.5- 4: Test6, 1X6 KVA and KW

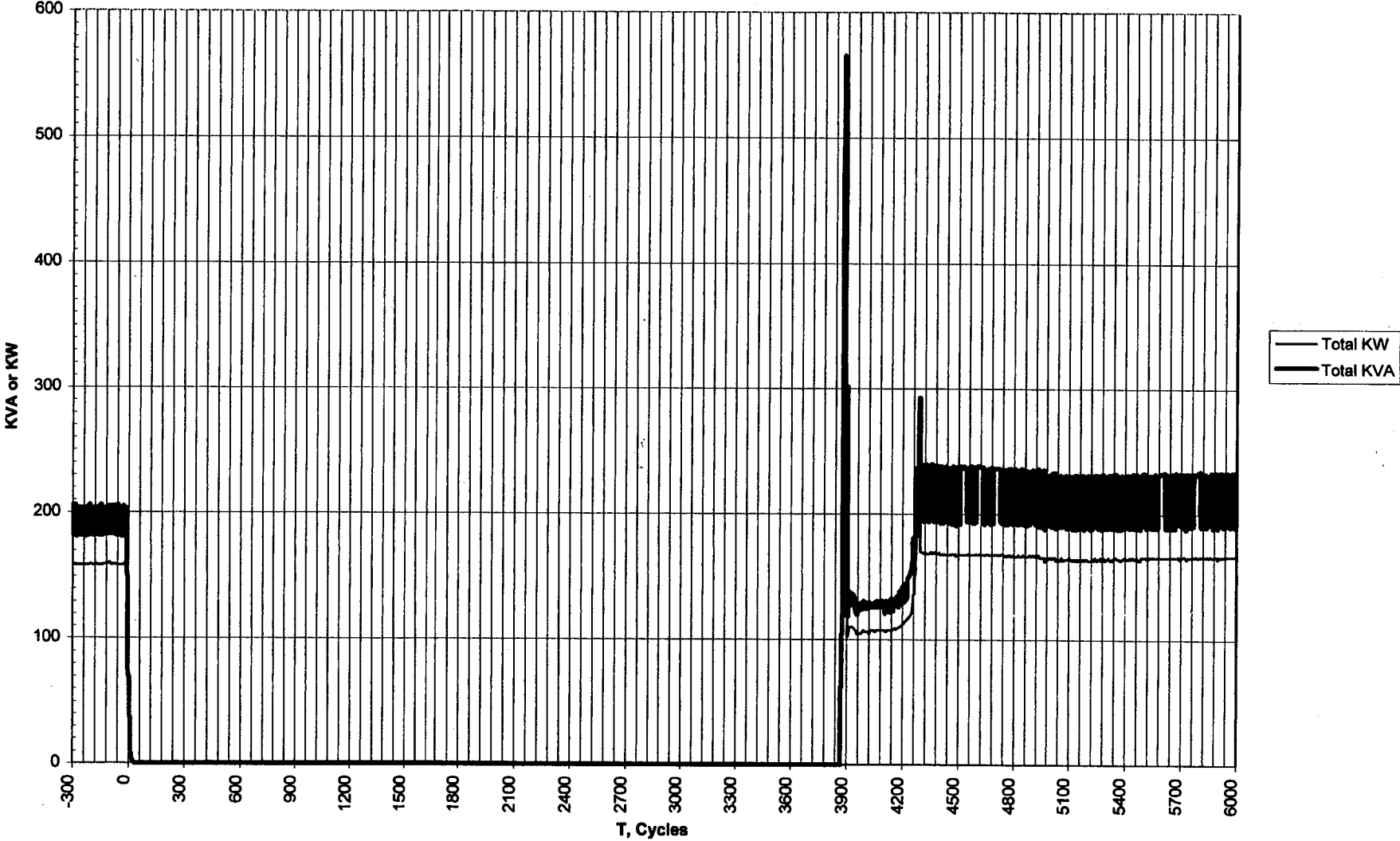


Figure 4.6.5- 5: Test6, 3X6 Voltage and Current

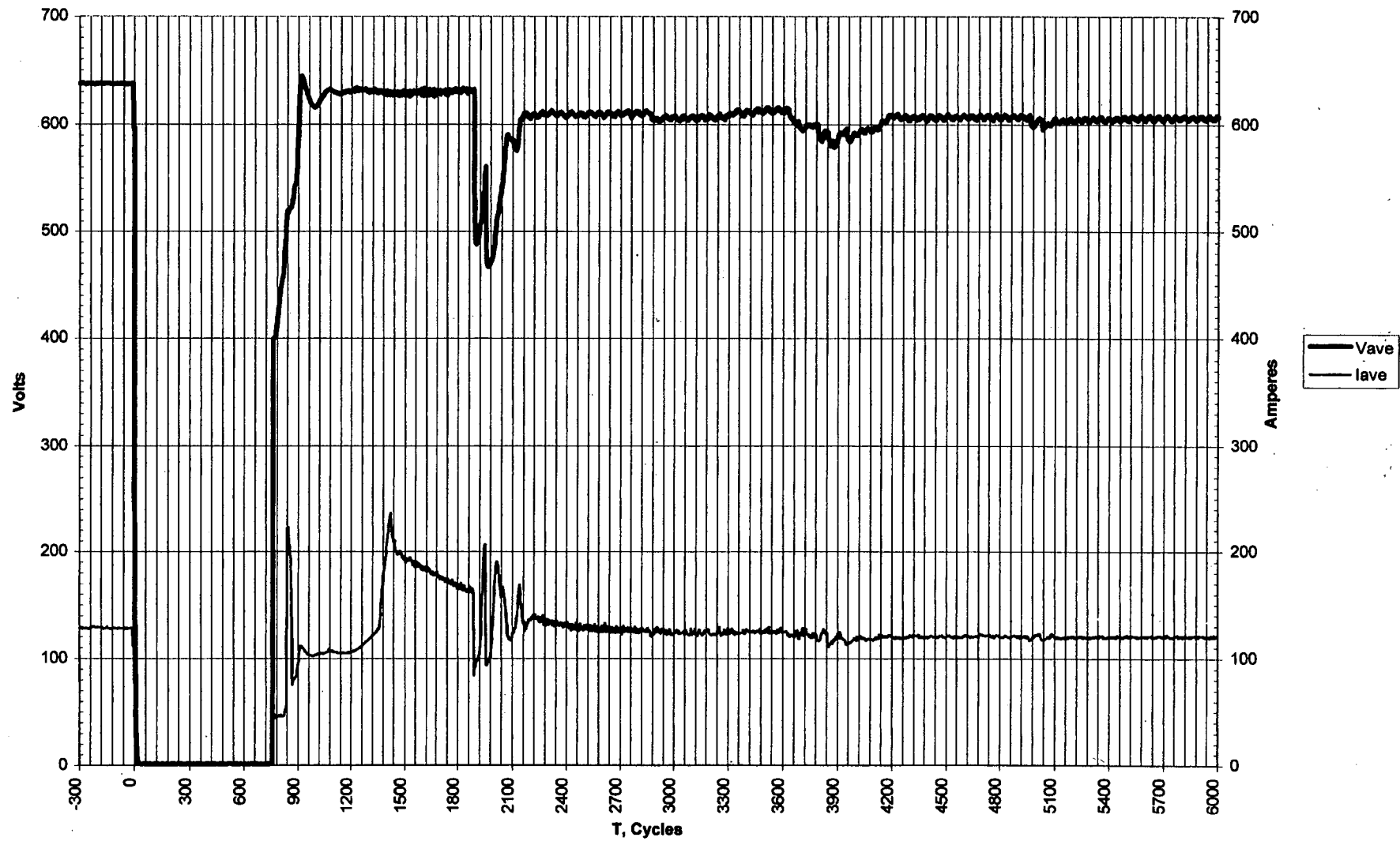


Figure 4.6.5- 6: Test6, 3X6 KVA and KW

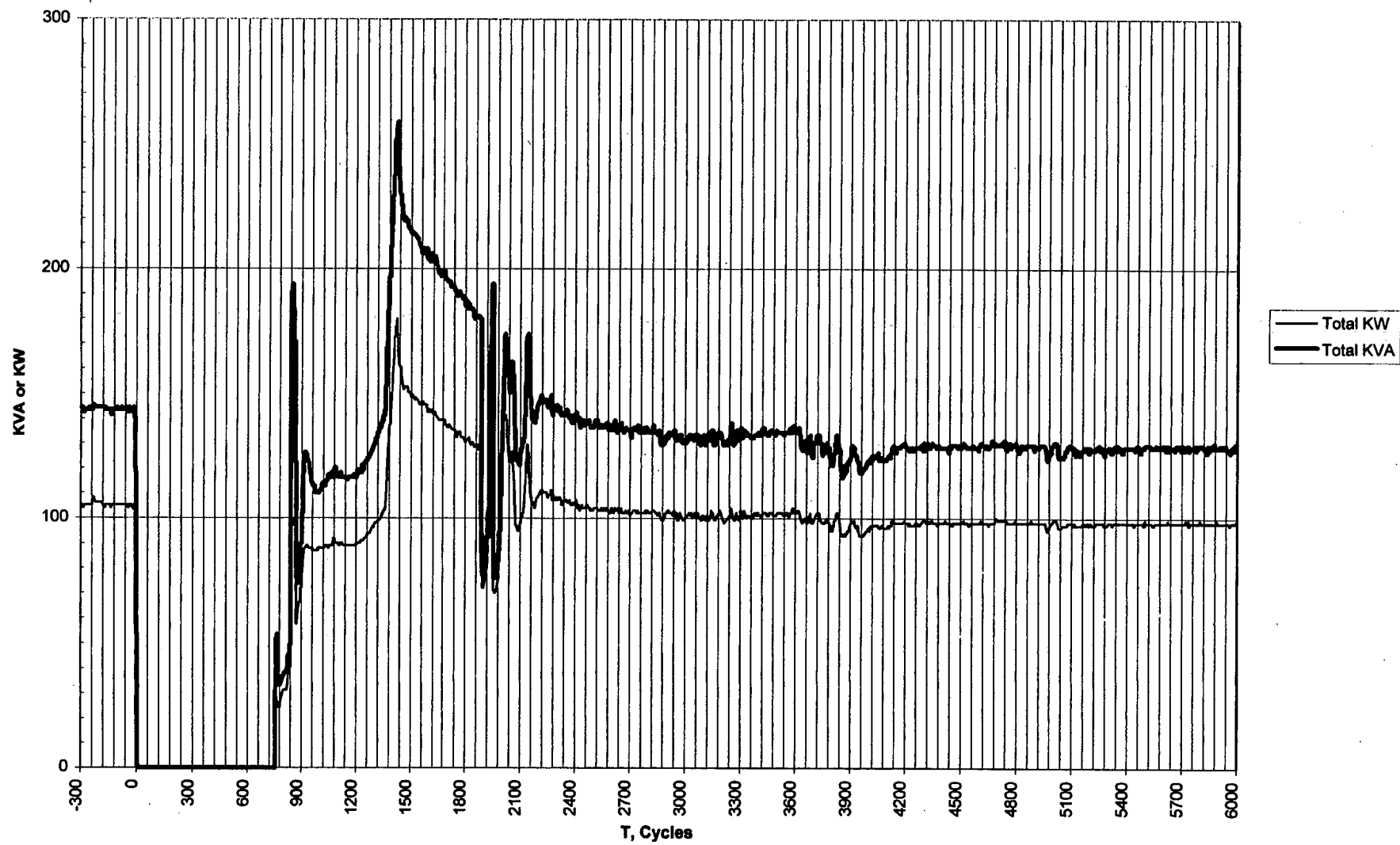


Figure 4.6.5- 7: Test6, 3X8 Voltage and Current

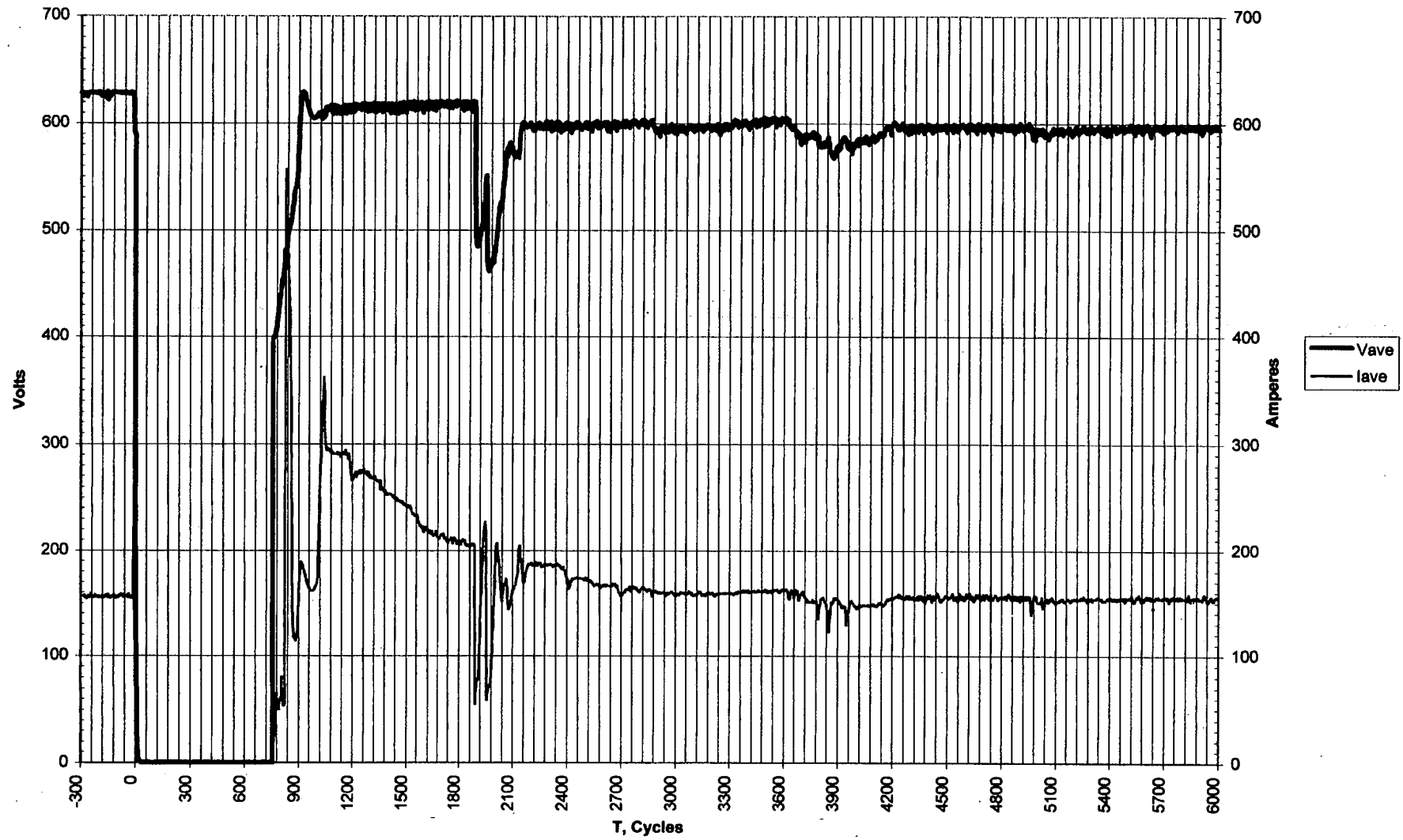


Figure 4.6.5- 8: Test6, 3X8 KVA and KW

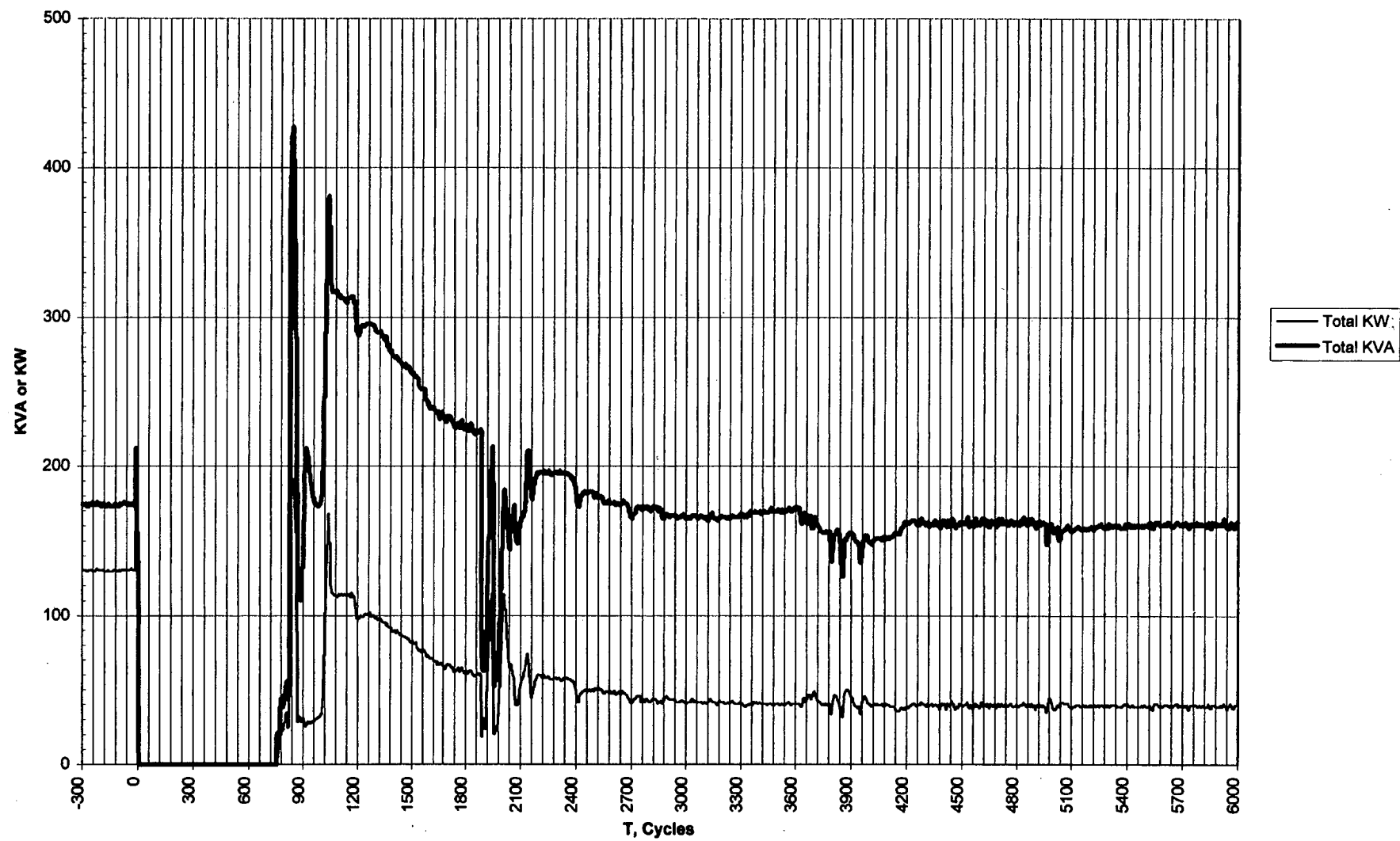


Figure 4.6.5- 9: Test6, 3X9 Voltage and Current

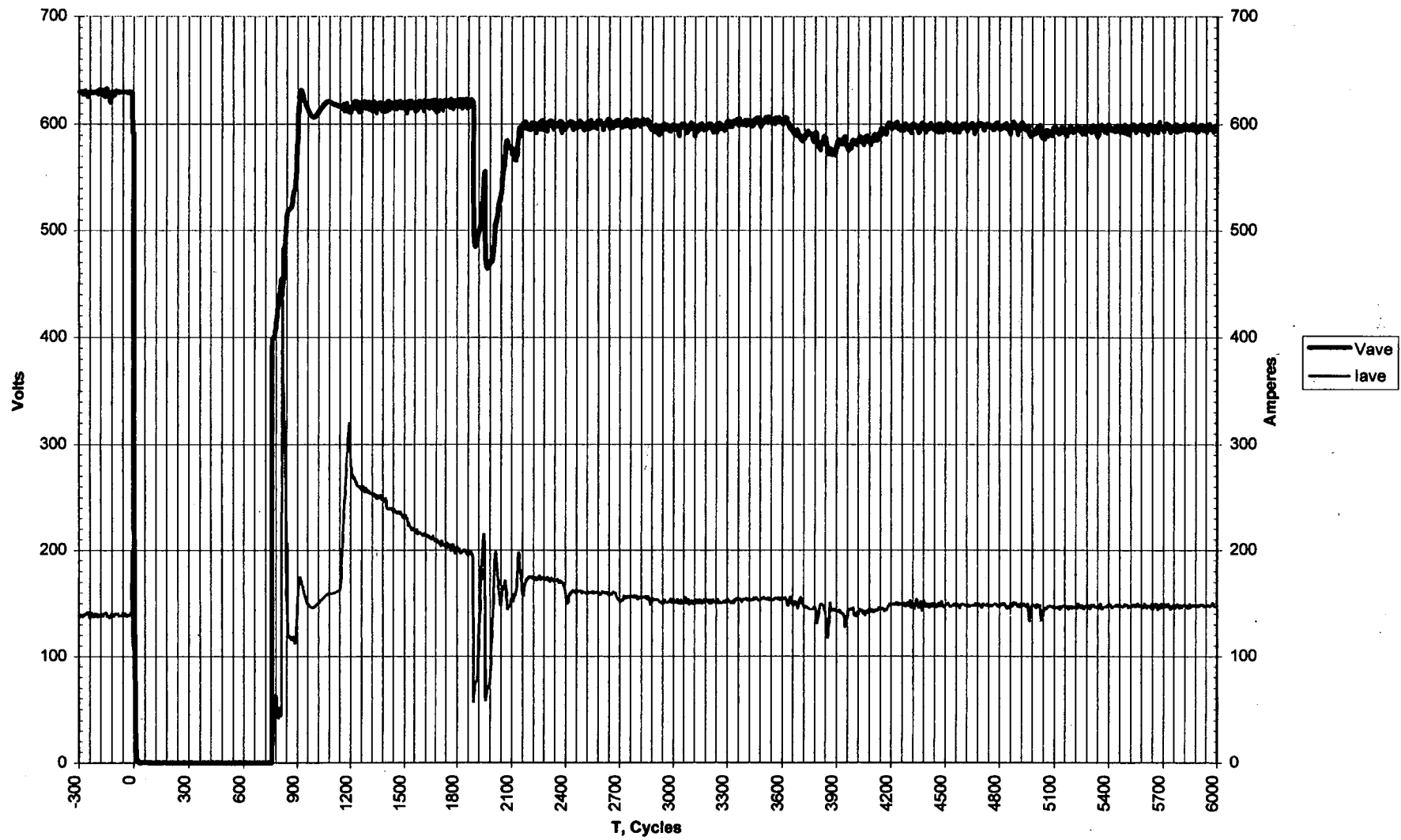


Figure 4.6.5- 10: Test6, 3X9 KVA and KW

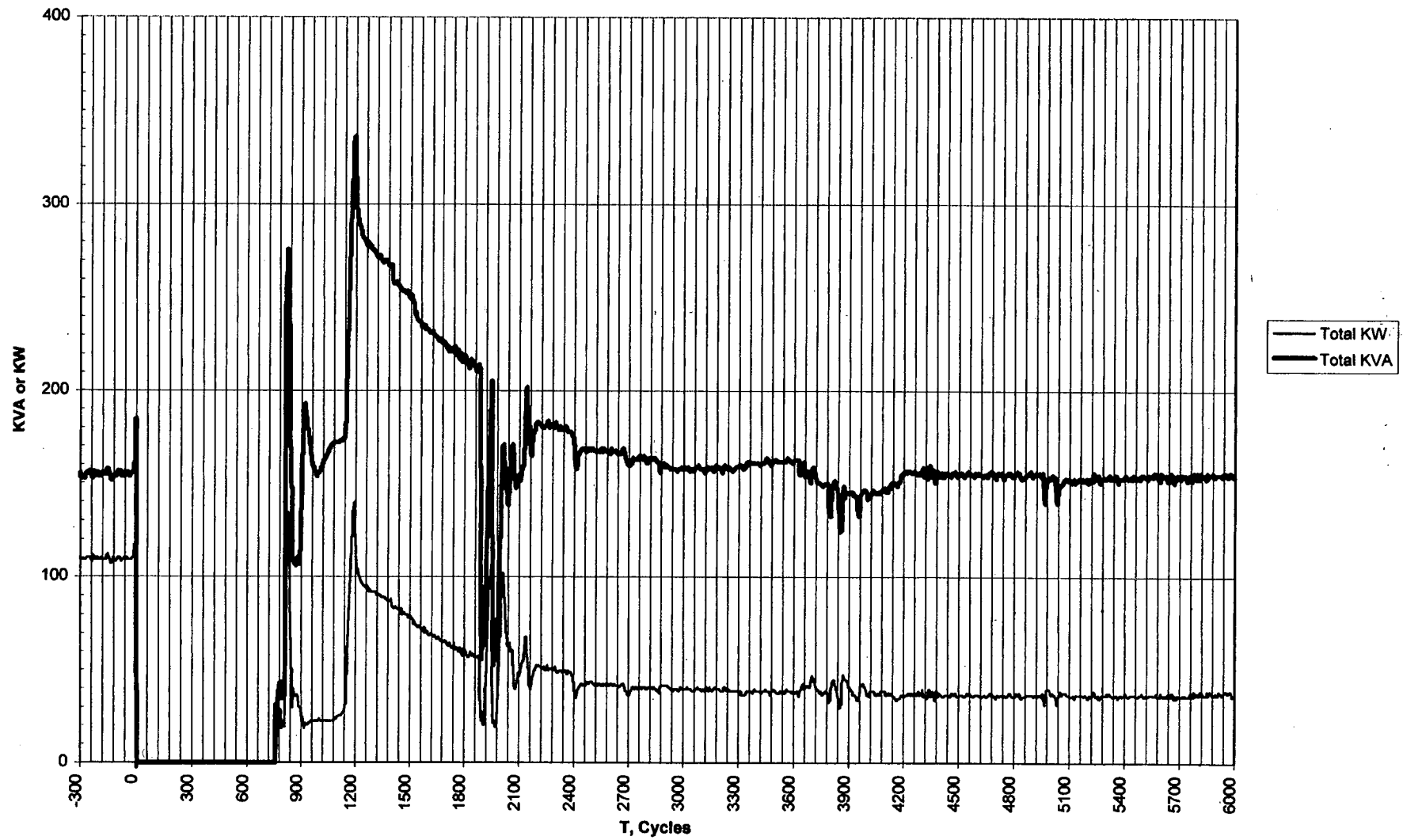


Figure 4.6.6- 1: Test6, 600V 3XS1 Voltage and Current

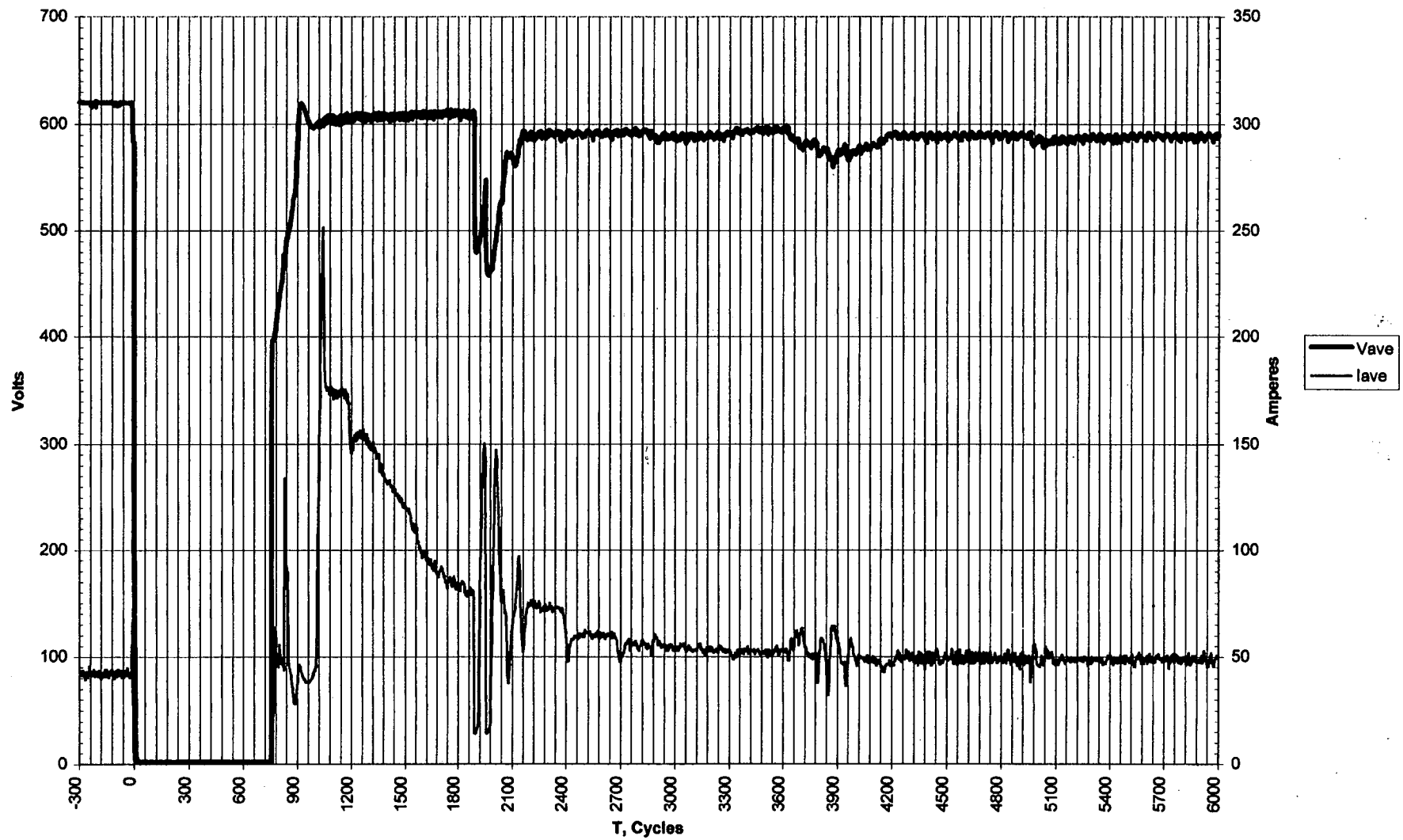


Figure 4.6.6- 2: Test6, 600V 3XS1 KVA and KW

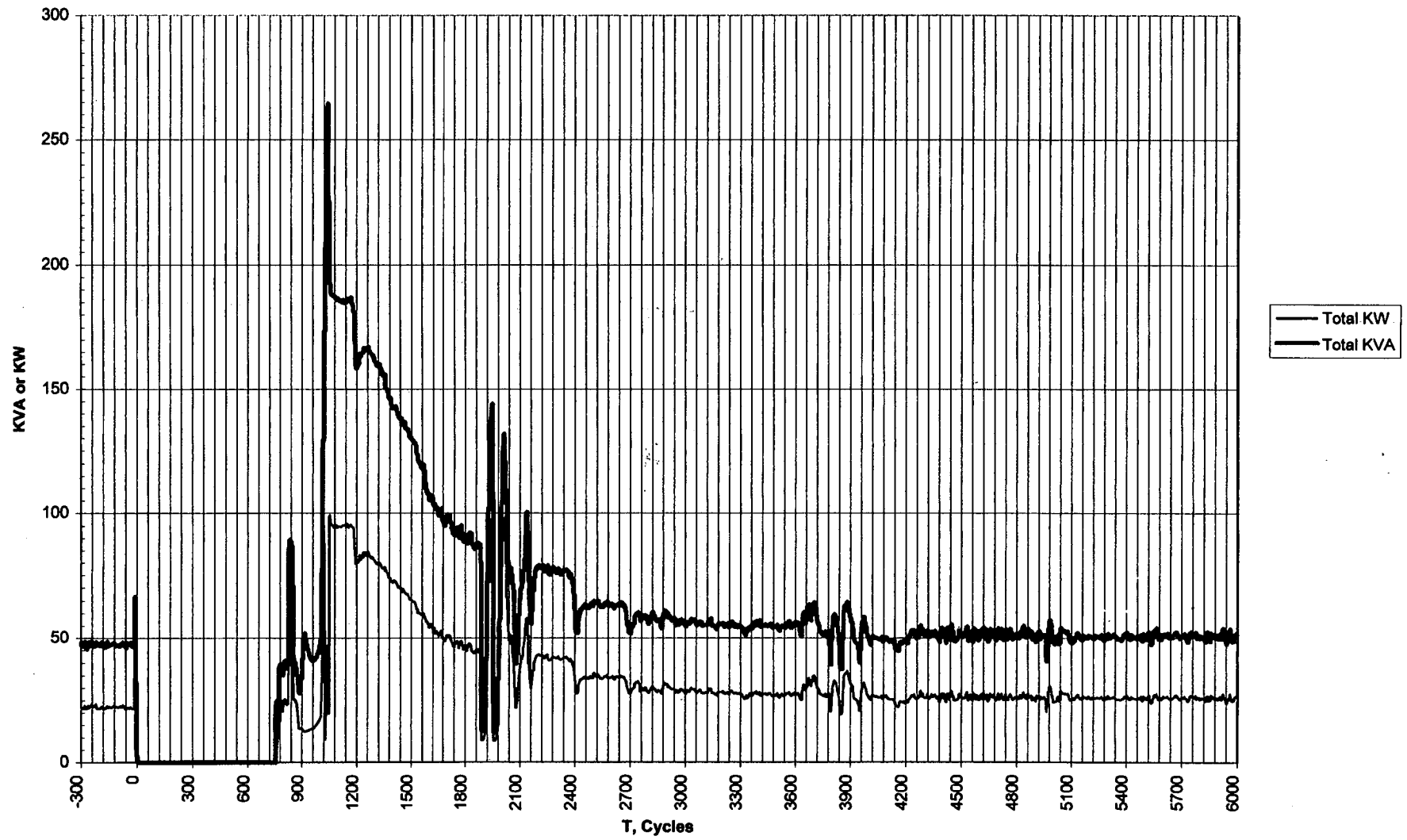


Figure 4.6.6- 3: Test6, 600V 3XS2 Voltage and Current

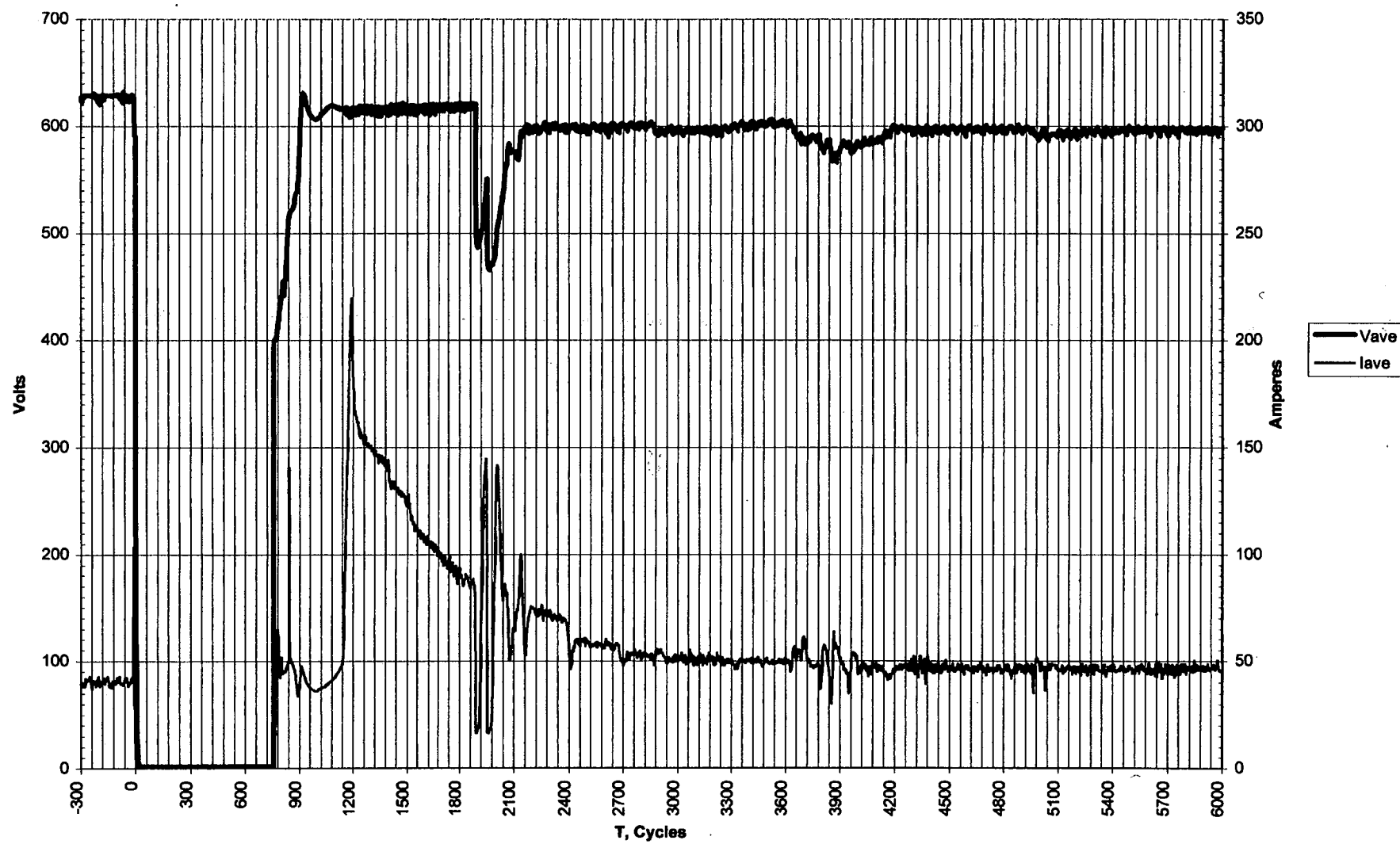


Figure 4.6.6- 4: Test6, 600V 3XS2 KVA and KW

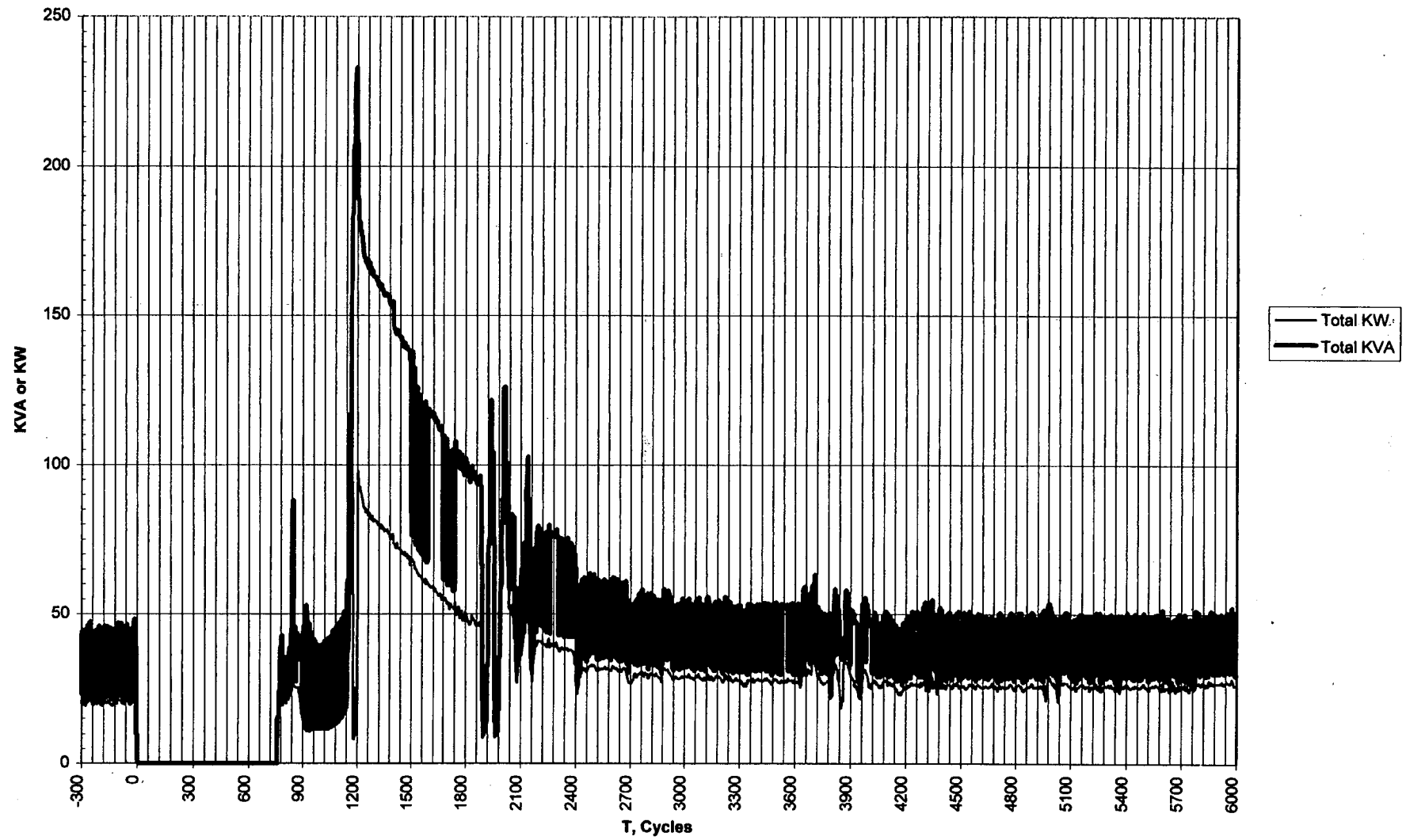


Figure 4.6.6- 5: Test6, 600V 3XS3 Voltage and Current

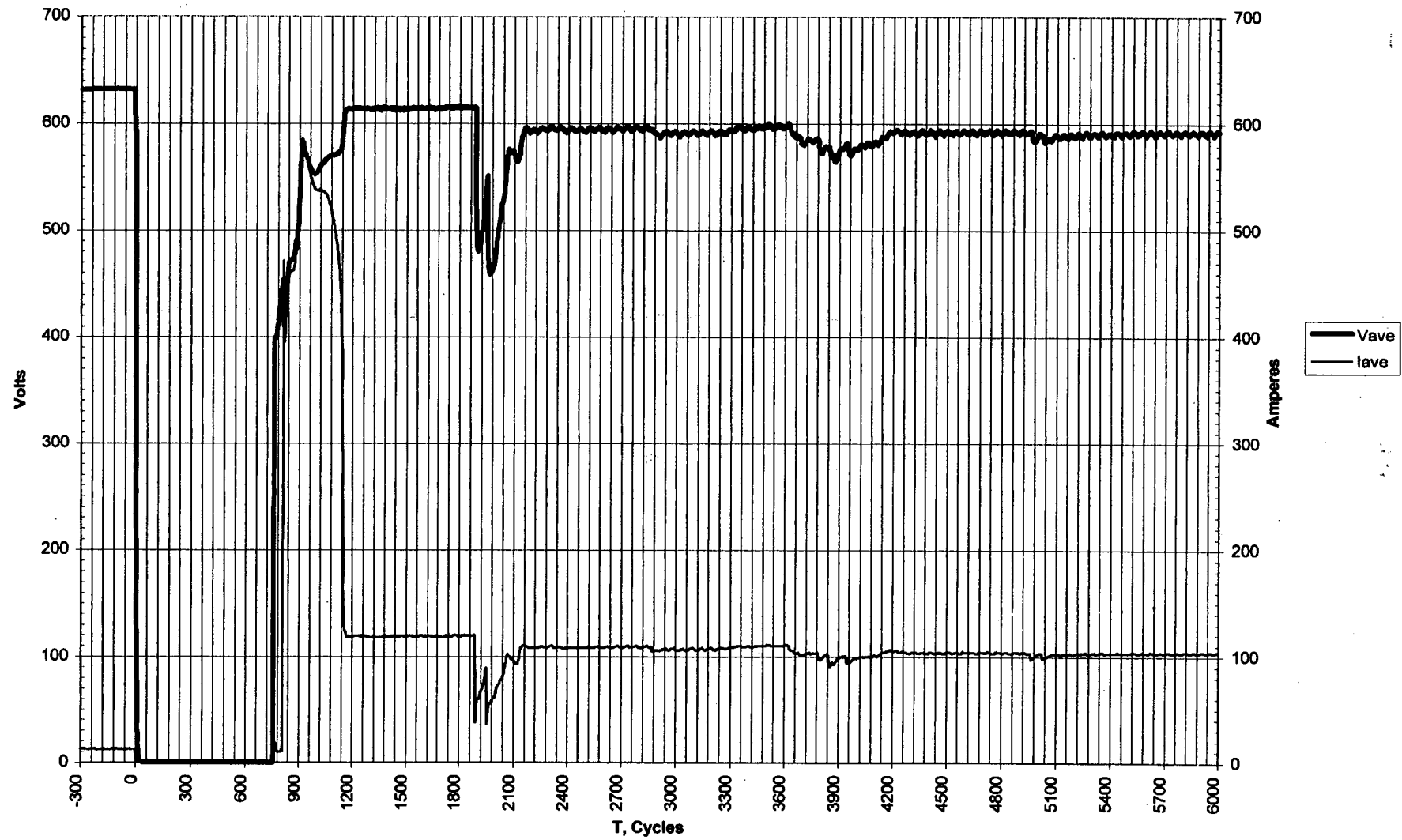


Figure 4.6.6- 6: Test6, 600V 3XS3 KVA and KW

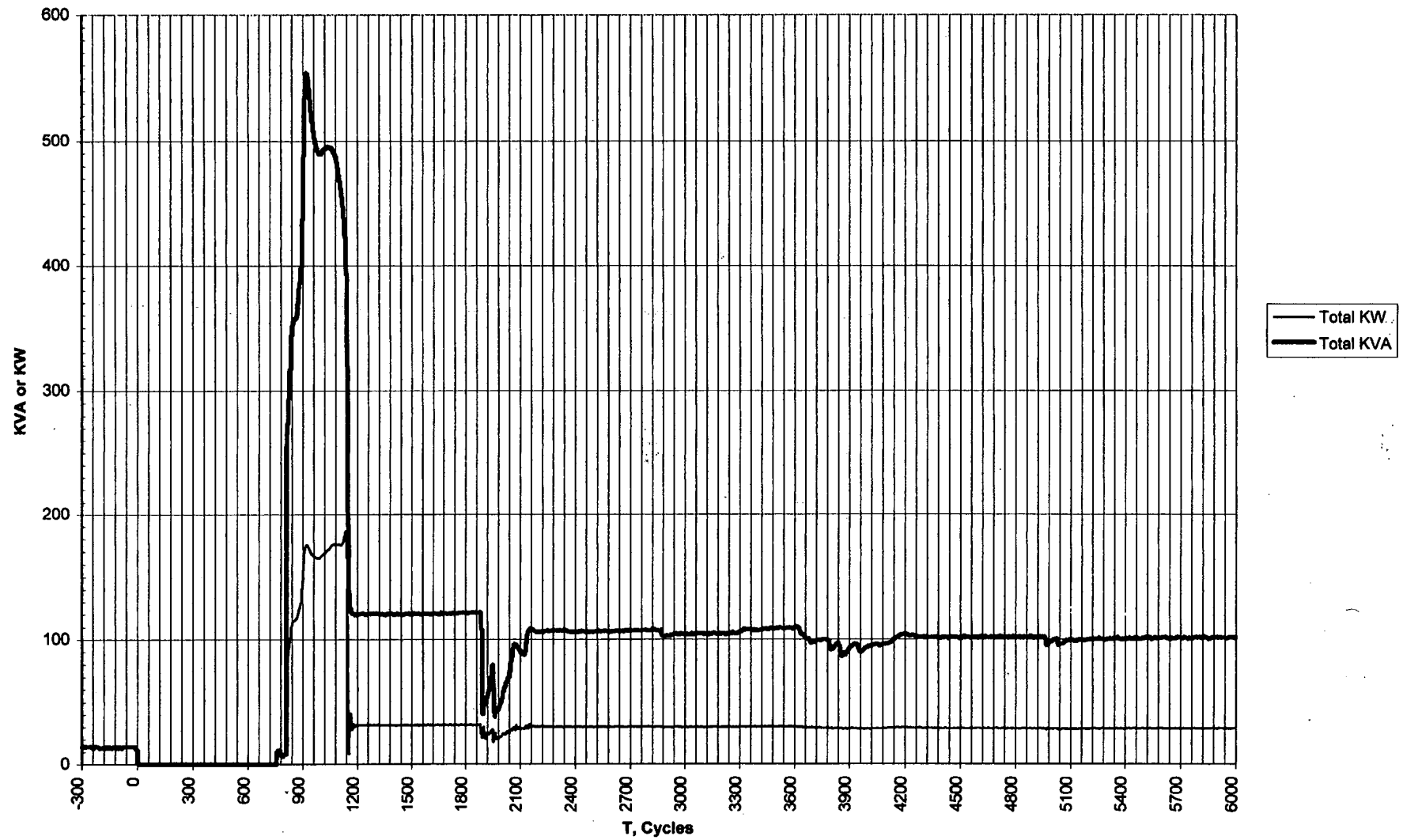


Figure 4.6.7- 1: Test6, 208V 3XS1 Voltage and Current

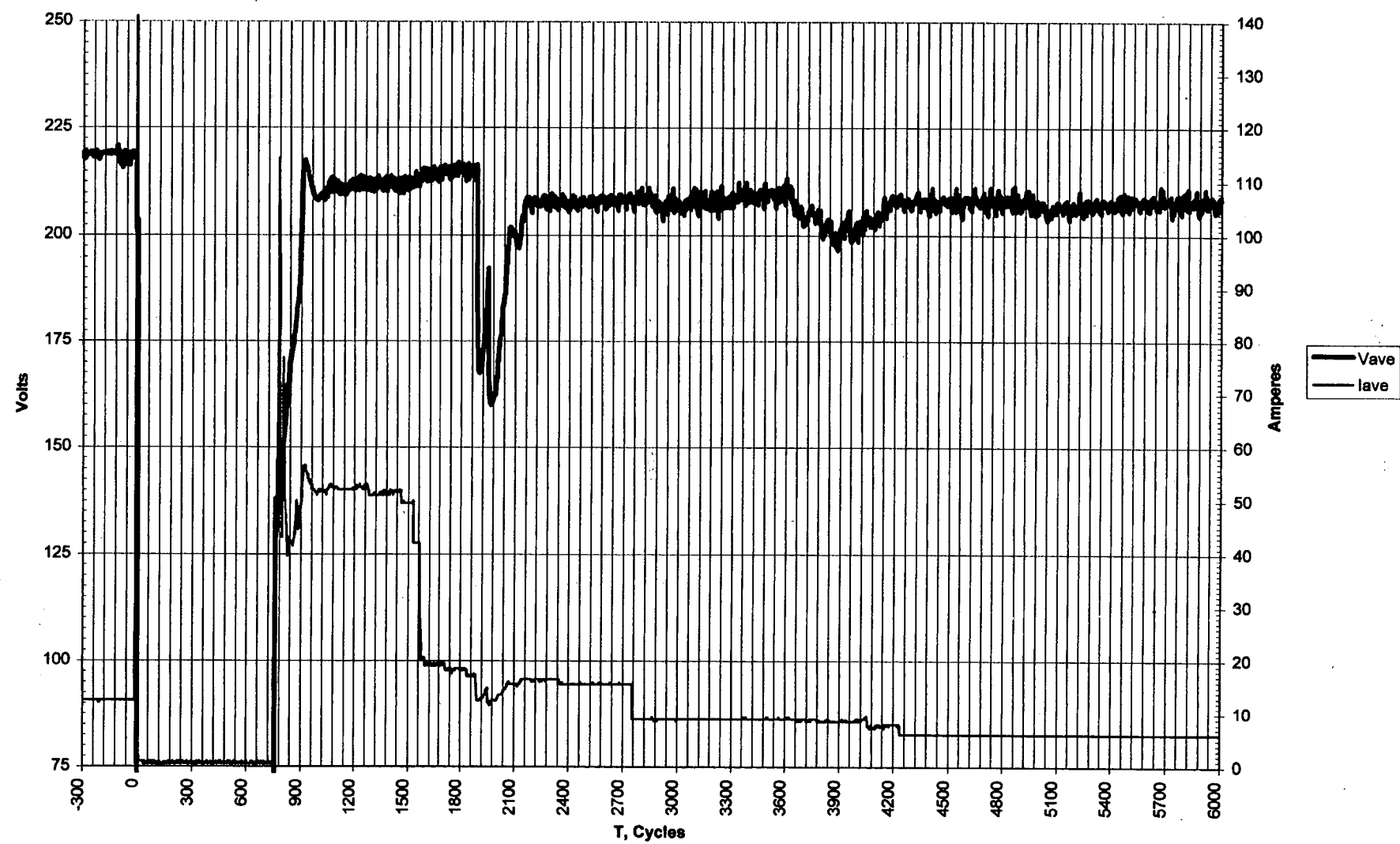


Figure 4.6.7- 2: Test6, 208V 3XS1 KVA and KW

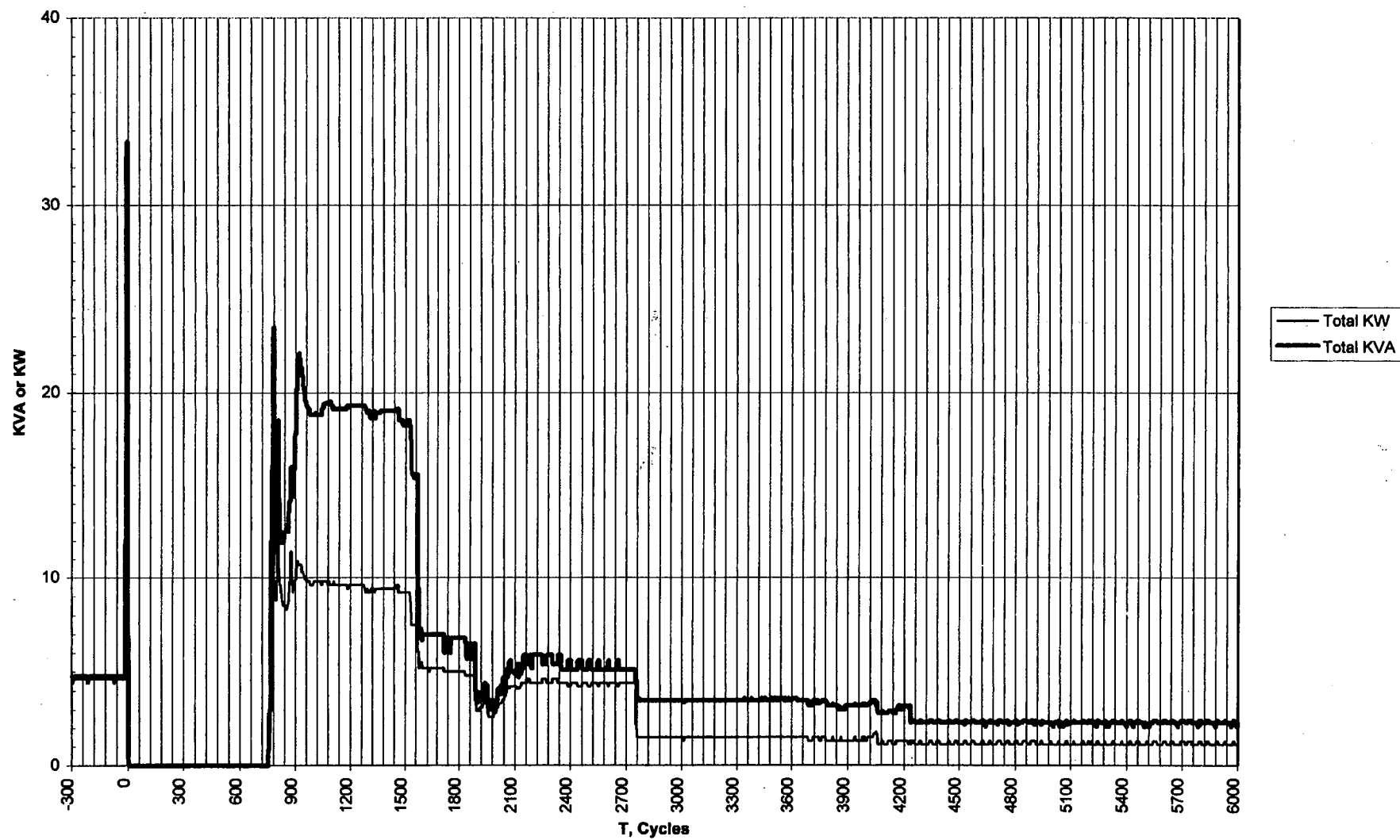


Figure 4.6.7- 3: Test6, 208V 3XS2 Voltage and Current

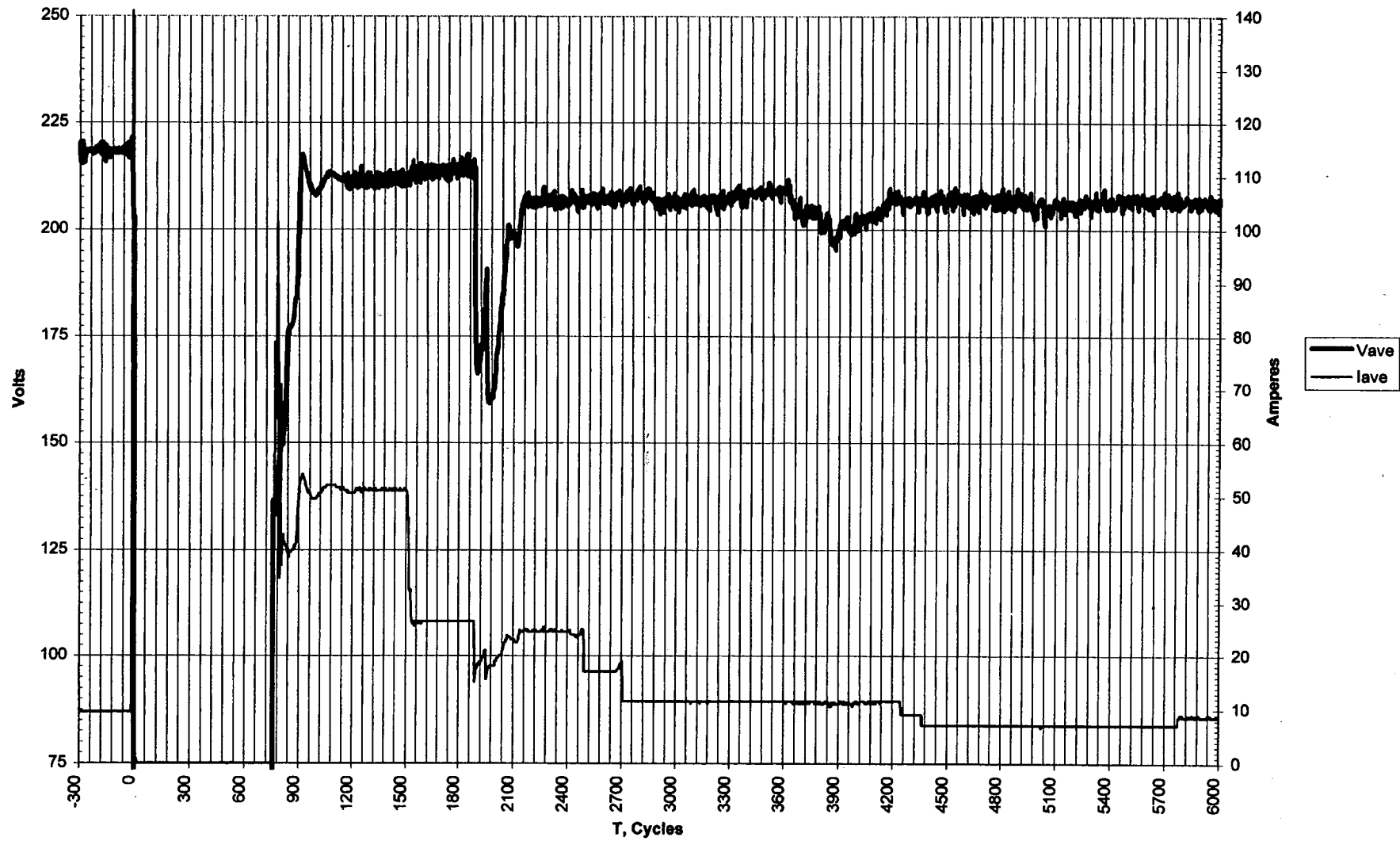


Figure 4.6.7- 4: Test6, 208V 3XS2 KVA and KW

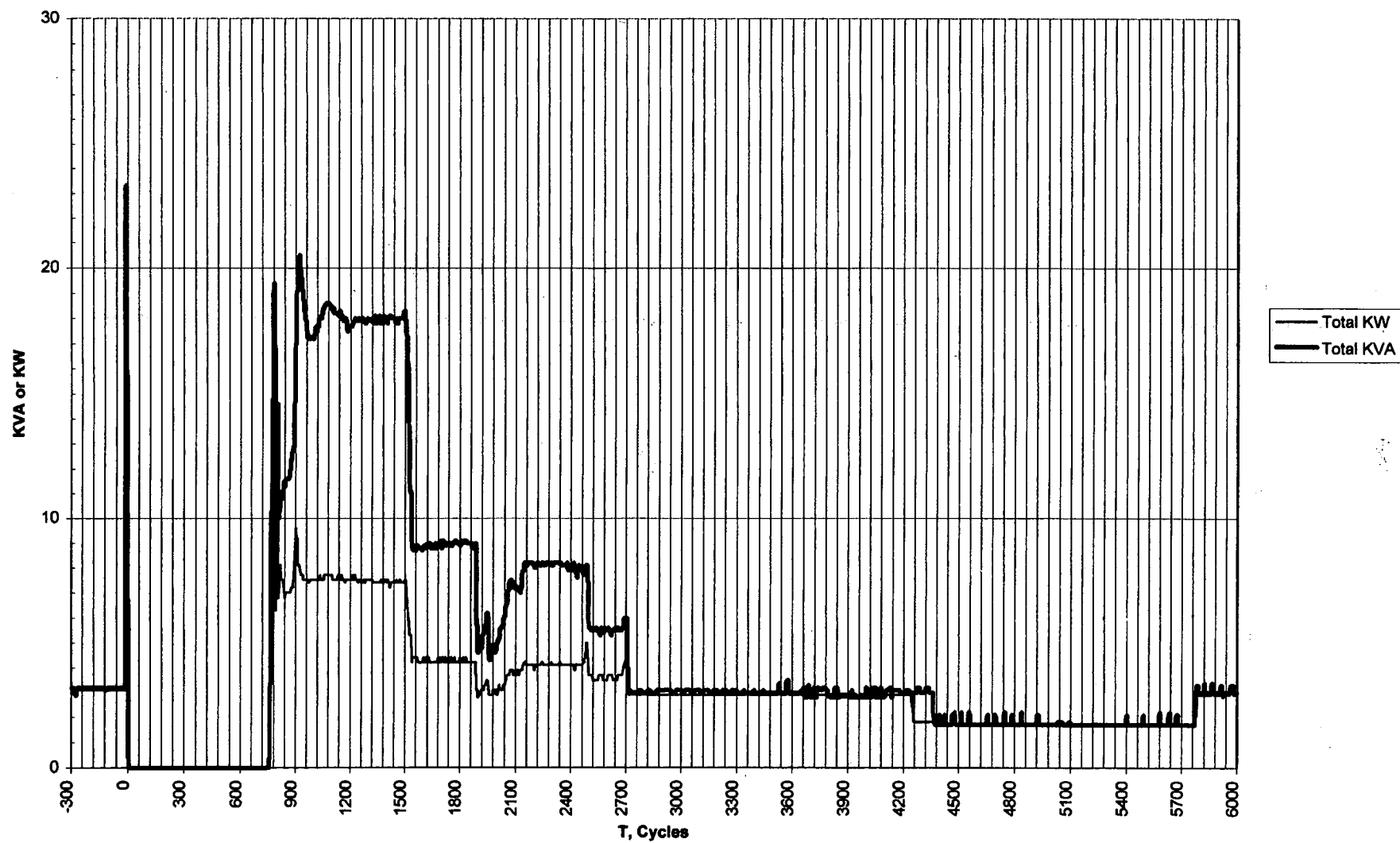


Figure 4.6.7- 5: Test6, 208V 3XS3 Voltage and Current

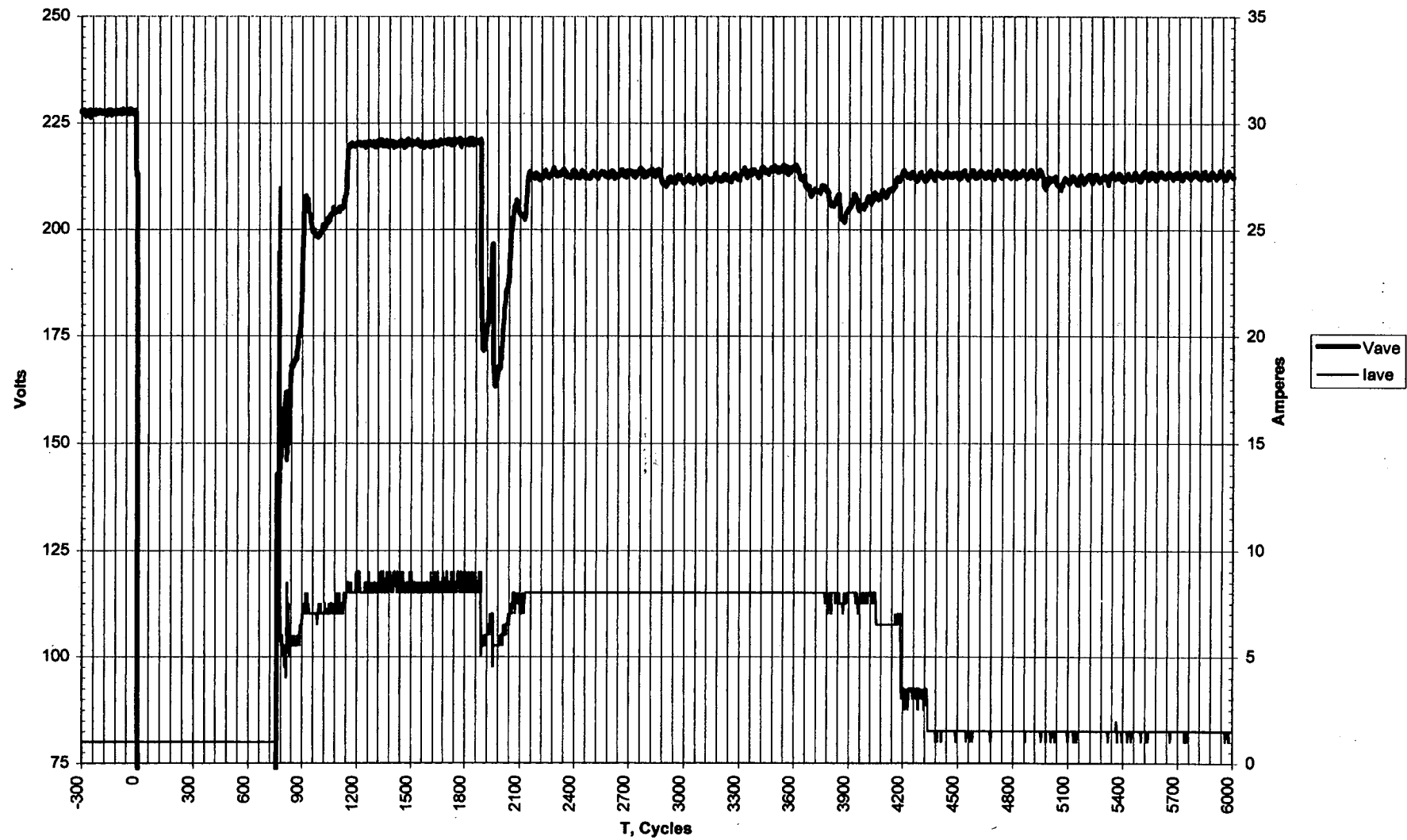


Figure 4.6.7- 6: Test6, 208V 3XS3 KVA and KW

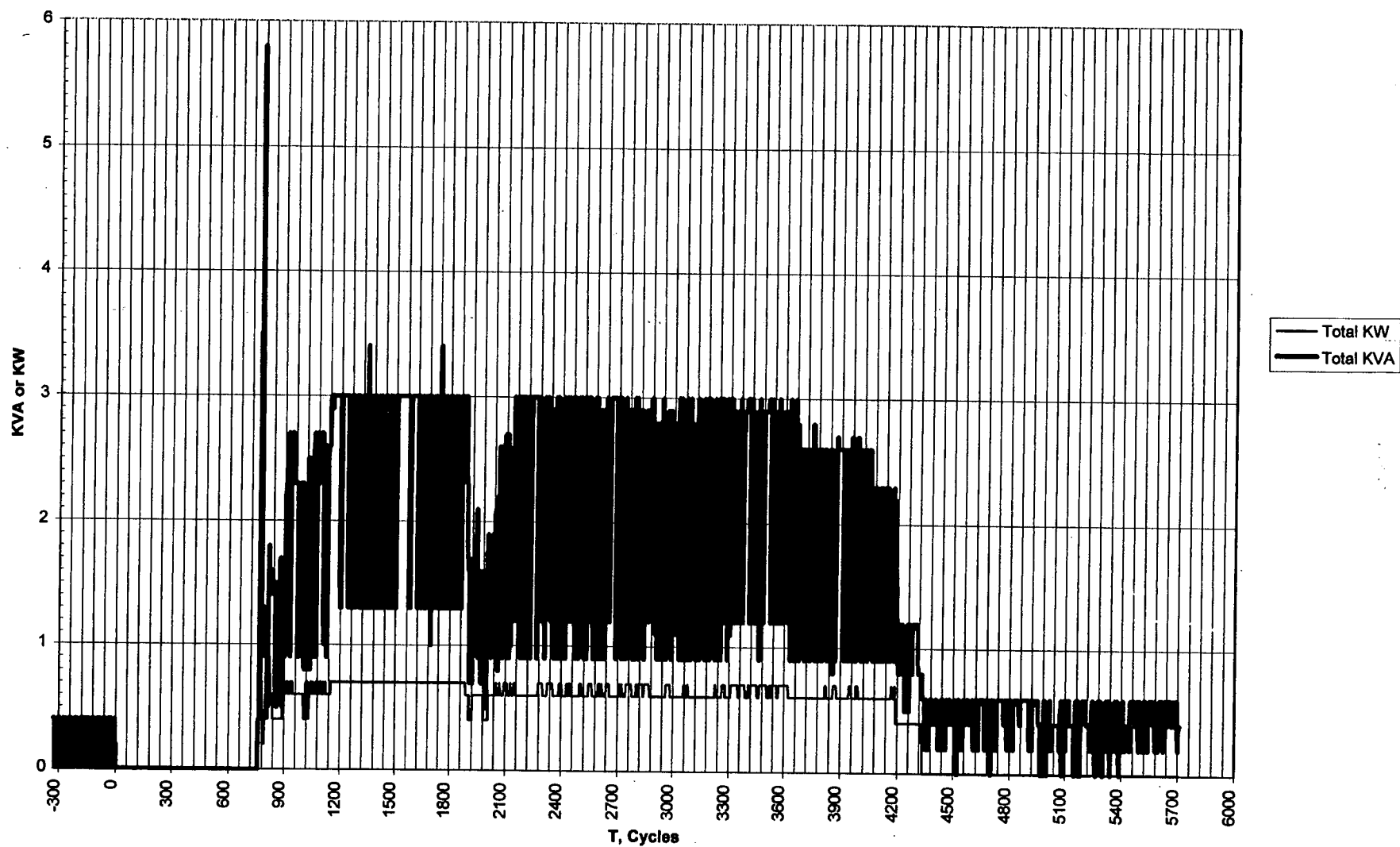
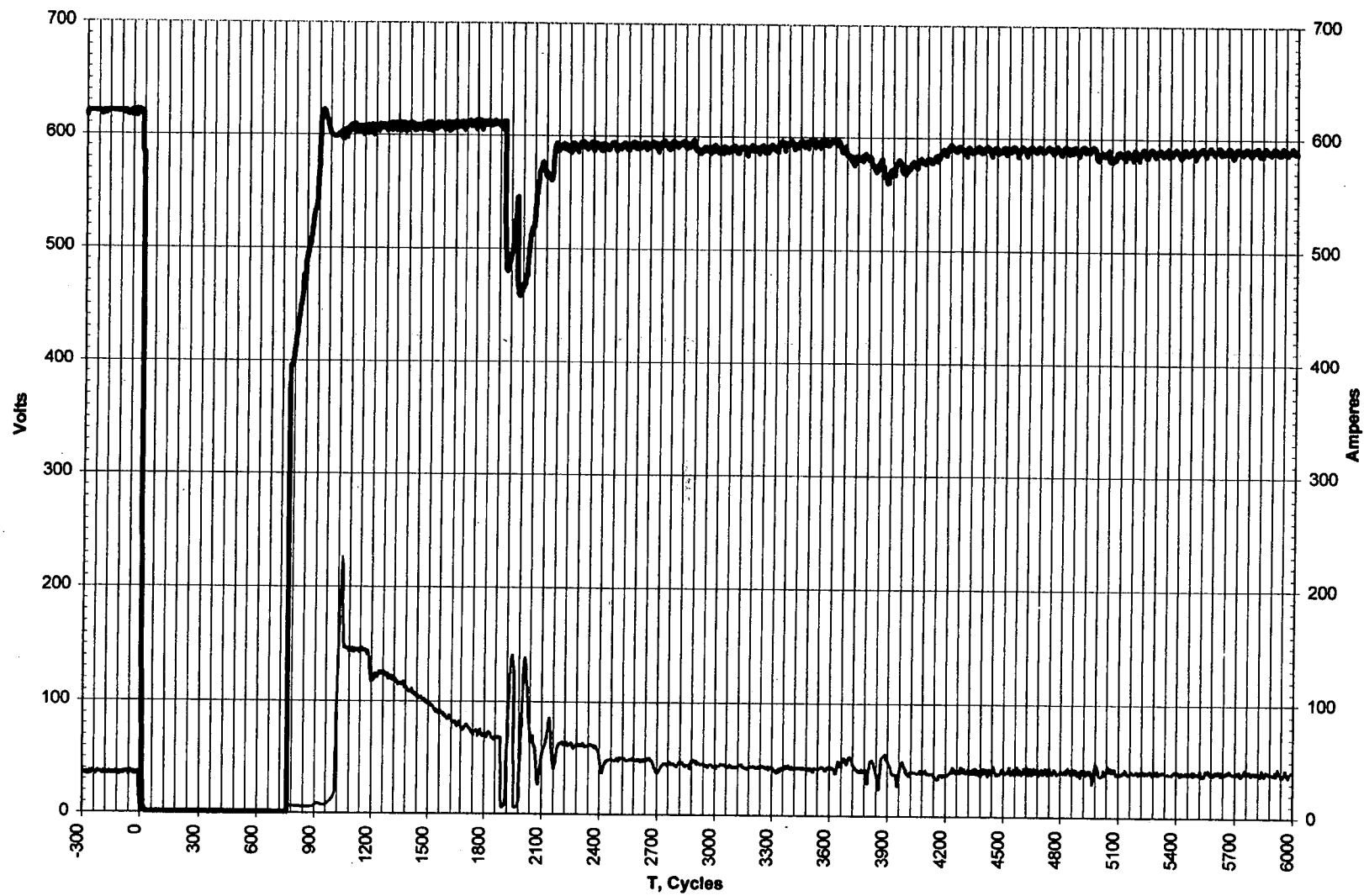
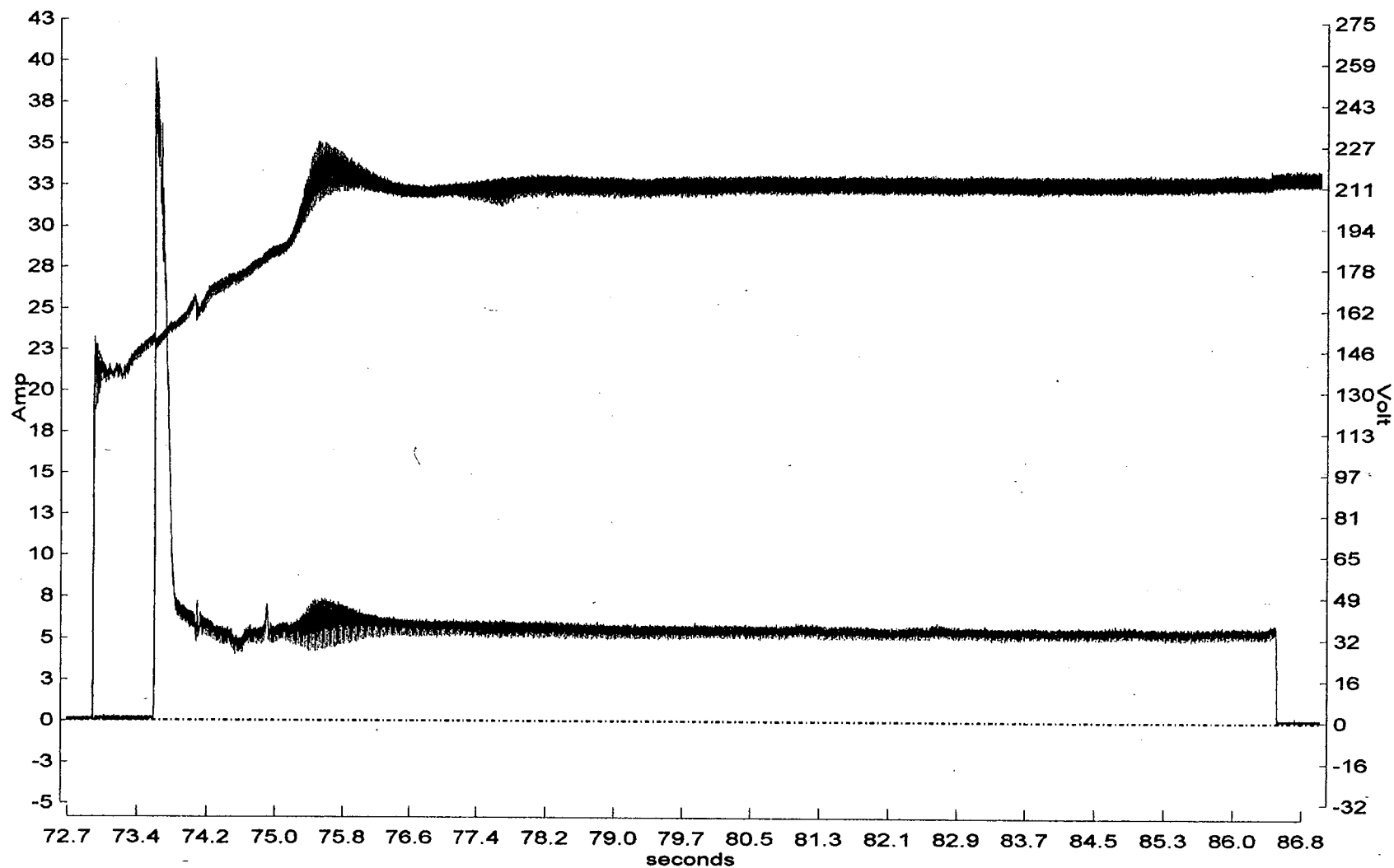


Figure 4.6.8- 1: Test6, Battery Charger 3CA Voltage and Current



<1> MPM Test: Oconee 3 3HP024 1-5-97 4:02p 134.0 ES 6



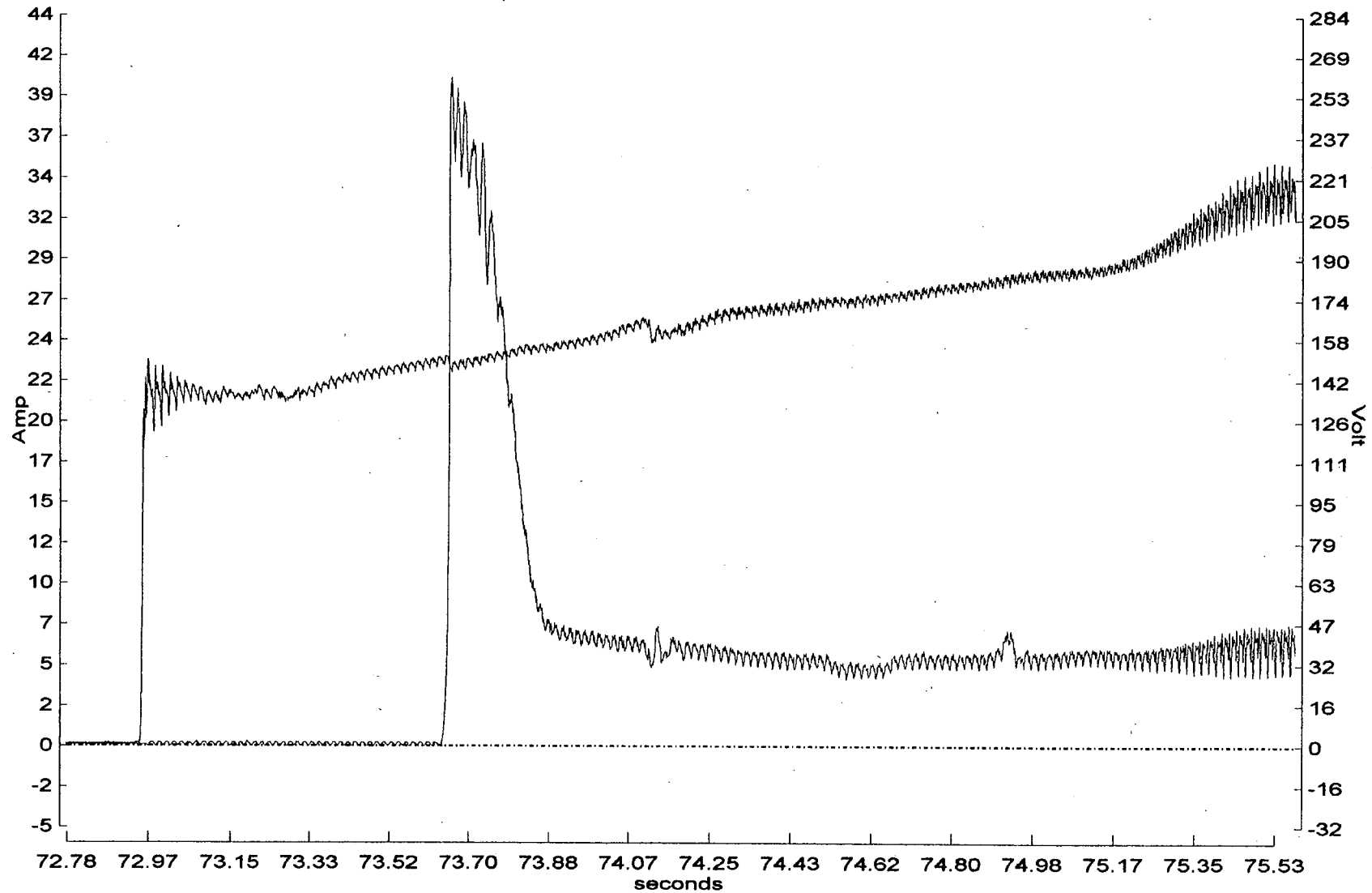
Cursor coordinates = 84.4seconds, 405Amp

— Vab-rms — Ia-rms

3HP-024
ES Test # 6
Full Stroke Voltage and Current

Figure 4.6.9-1-1: Test 6, 3HP-24 Full Stroke Voltage and Current

<1> MPM Test: Oconee 3 3HP024 1-5-97 4:02p 134.0 ES 6



Cursor coordinates = 84.8seconds, 410Amp

— Vab-rms — la-rms

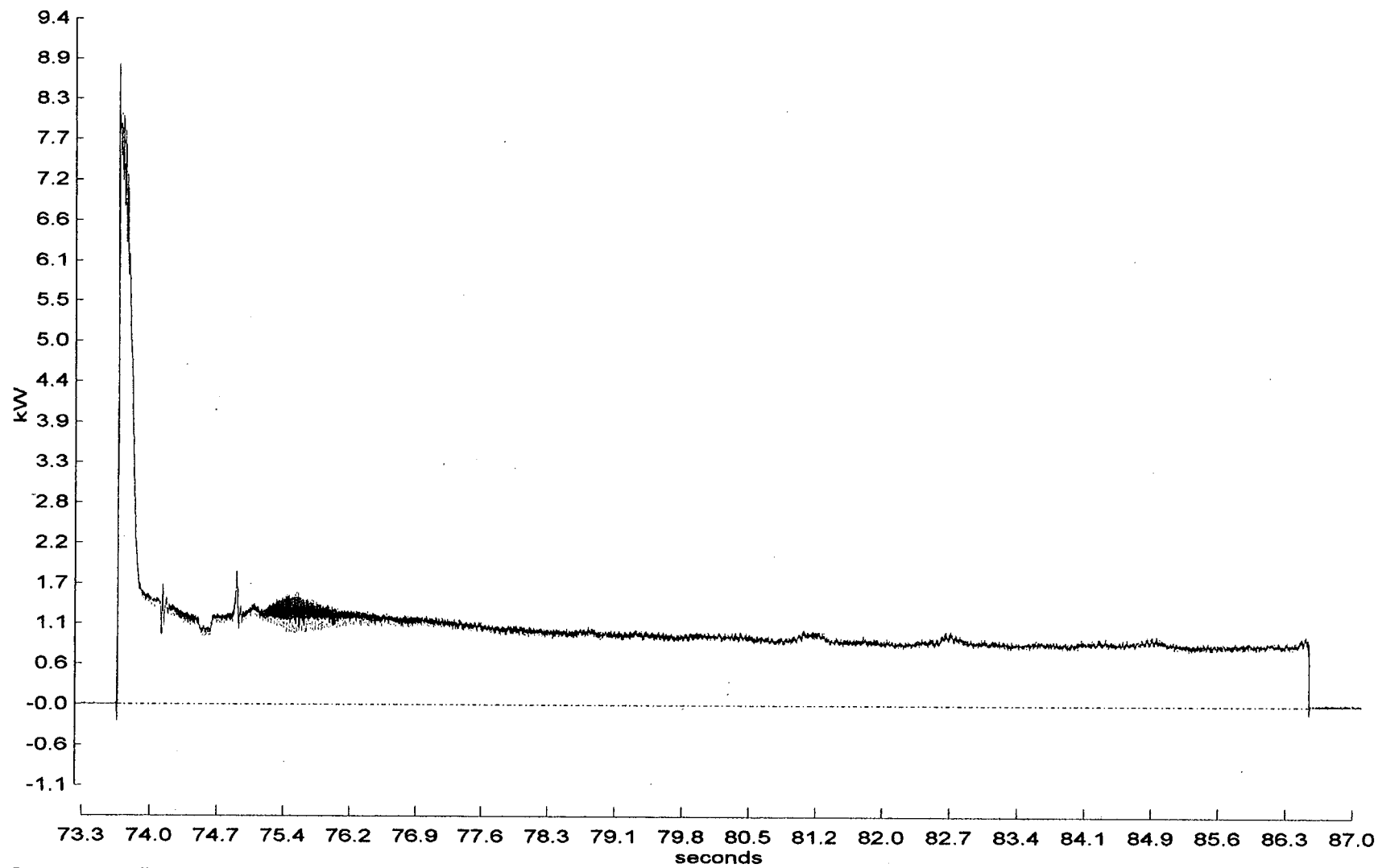
3HP-024

ES Test # 6

Inrush Voltage and Current

Figure 4.6.9.1-2: Test 6, 3HP-24 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3HP024 1-5-97 4:02p 134.0 ES 6



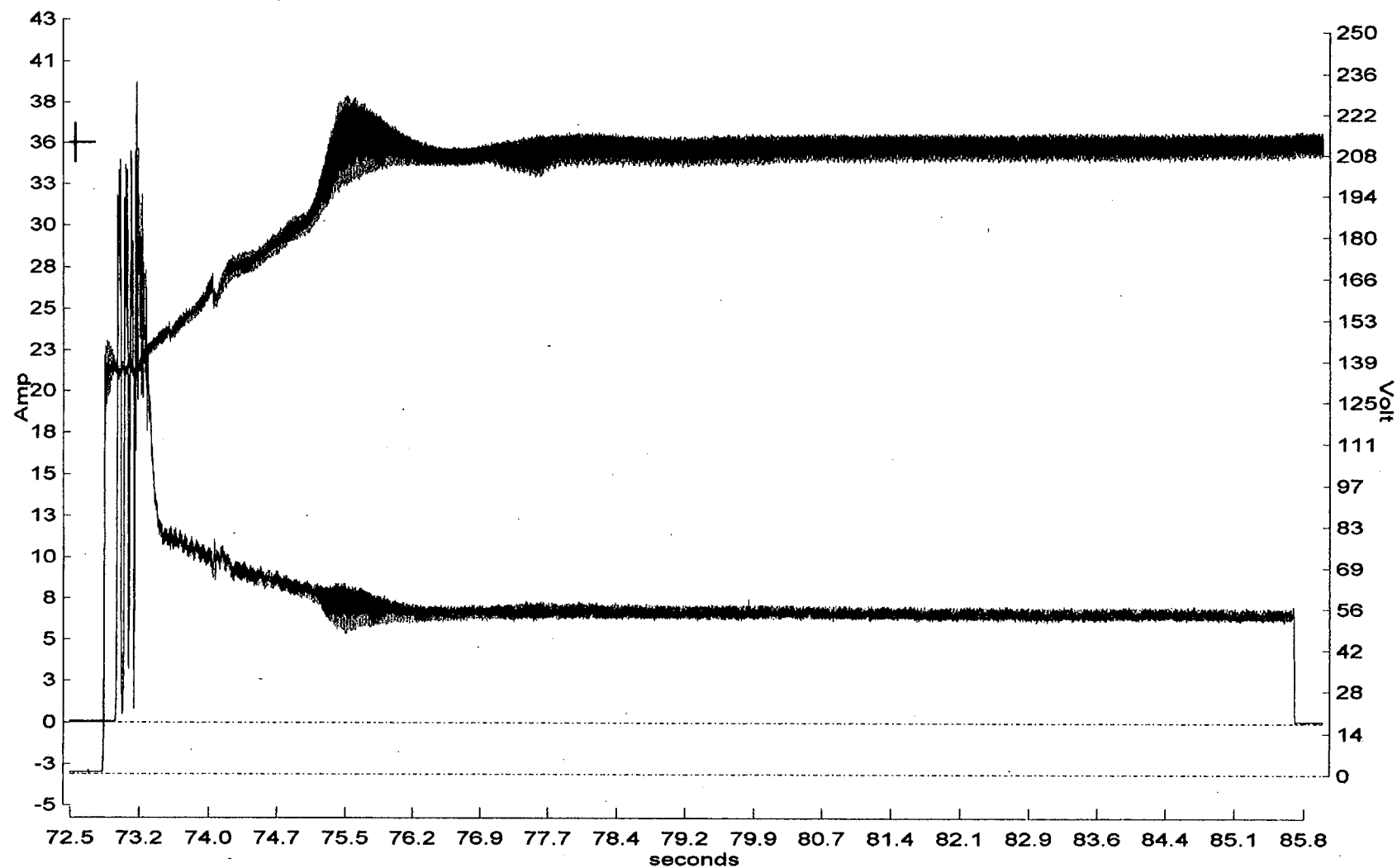
Cursor coordinates = 74.6seconds, 30.9kW

TRP

3HP-024
ES Test # 6
Full Stroke Total Real Power

Figure 4.6.9.1-3: Test 6, 3HP-24 Full Stroke Total Real Power (KW)

<1> MPM Test: Ocone 3 3HP026 1-5-97 4:02p 134.0 ES 6



Cursor coordinates = 72.5seconds, 35.6Amp

— V_{ab-rms} — I_{a-rms}

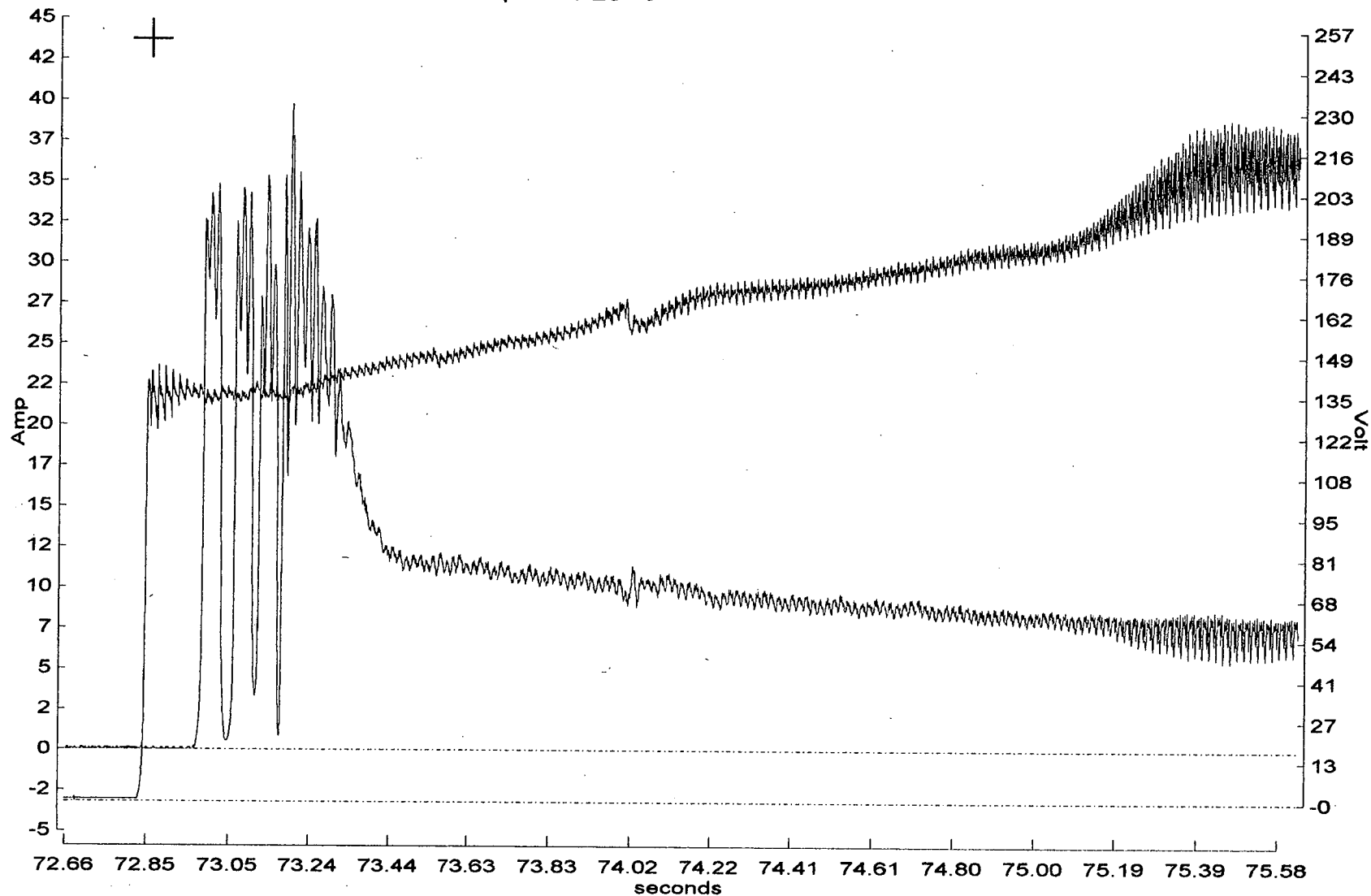
3HP-026

ES Test # 6

Full Stroke Voltage and Current

Figure 4.6.9-2-1: Test 6, 3HP-26 Full Stroke Voltage and Current

<1> MPM Test: Oconee 3 3HP026 1-5-97 4:02p 134.0 ES 6



Cursor coordinates = 72.9seconds, 43.3Amp

Vab-rms Ia-rms

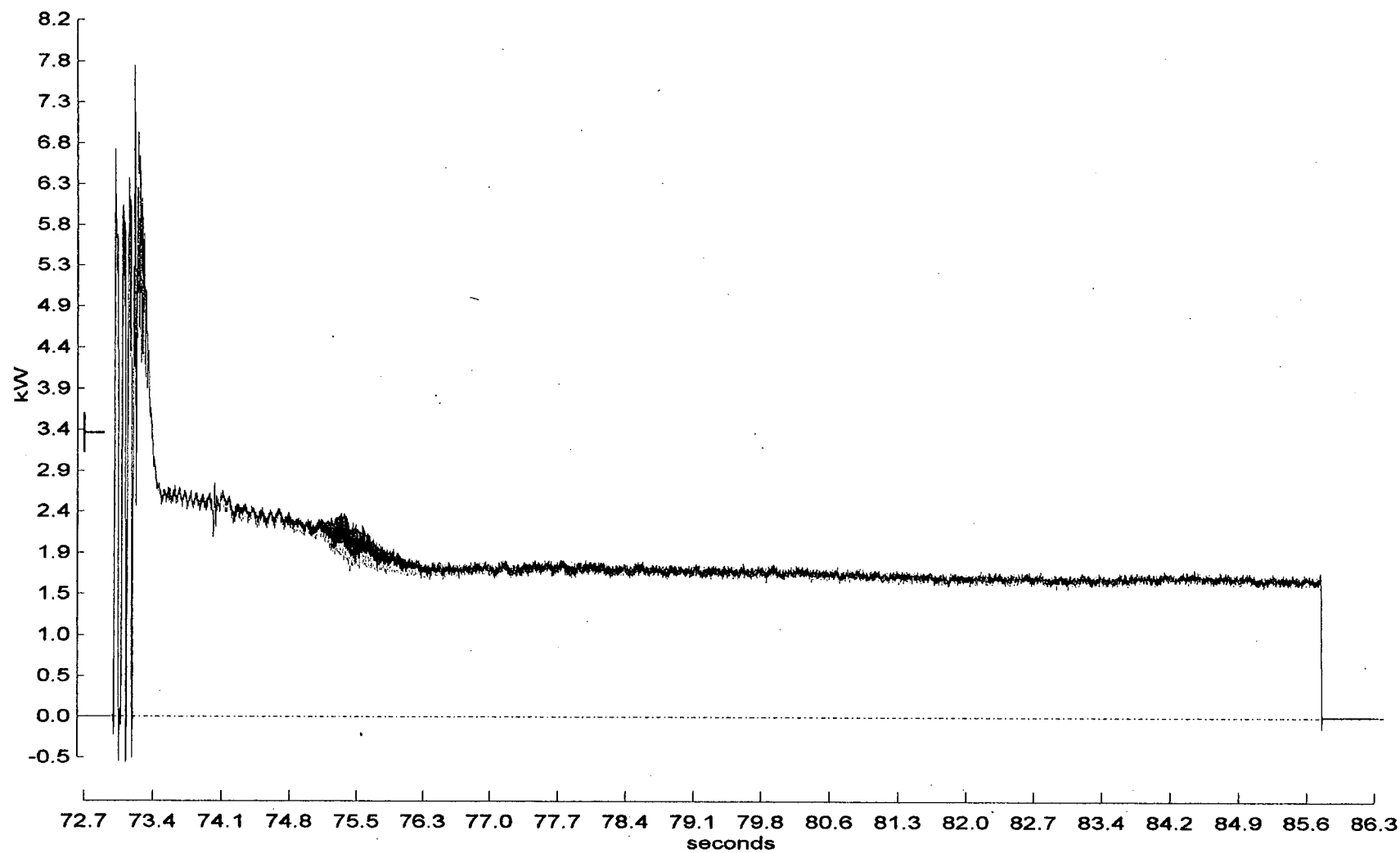
3HP-026

ES Test # 6

Inrush Voltage and Current

Figure 4.6.9.2-2: Test 6, 3HP-26 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3HP026 1-5-97 4:02p 134.0 ES 6



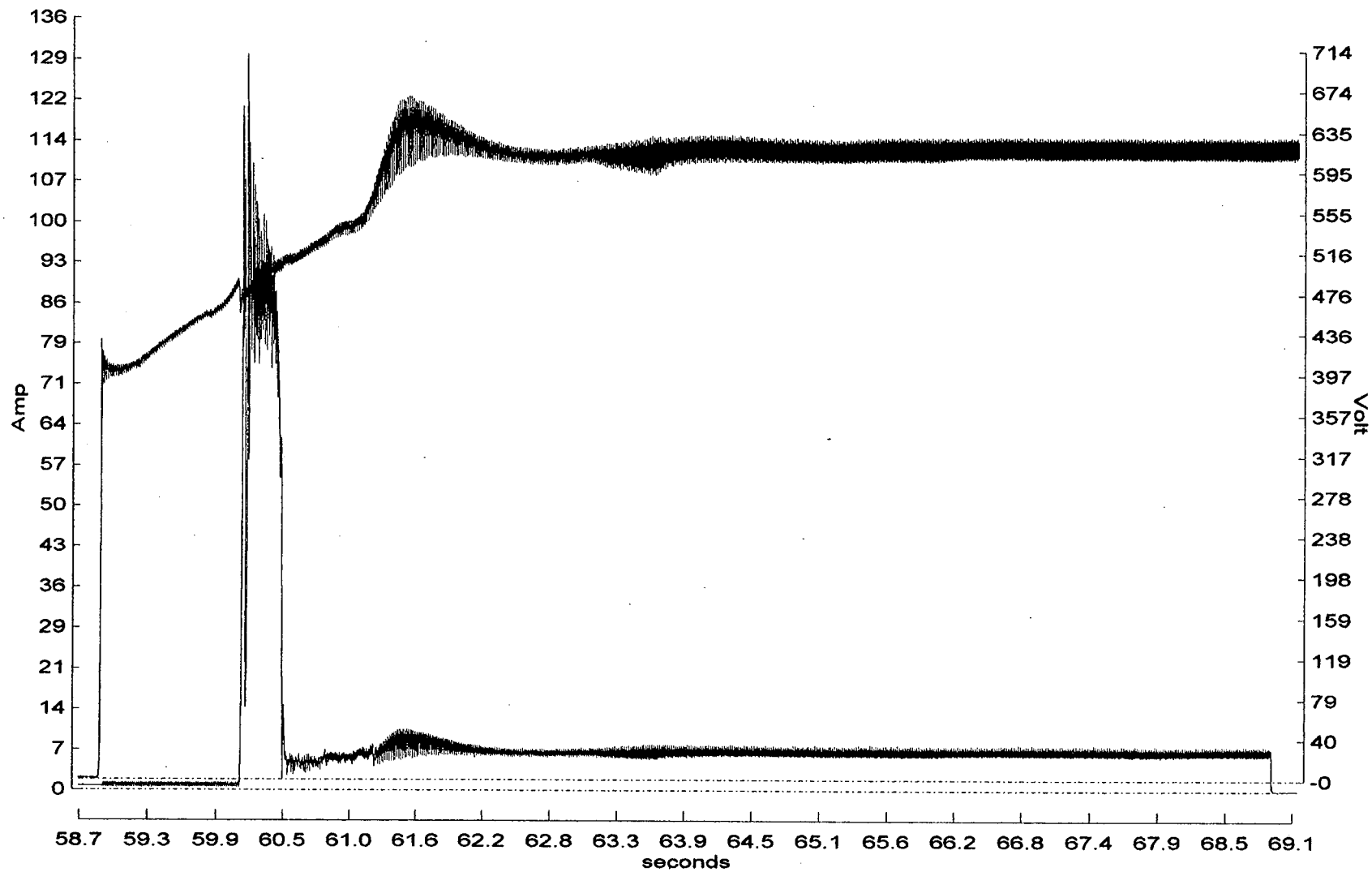
Cursor coordinates = 72.7seconds, 3.36kW

TRP

3HP-026
ES Test # 6
Full Stroke Total Real Power

Figure 4.6.9.2-3: Test 6, 3HP-26 Full Stroke Total Real Power (KW)

<1> MPM Test: Oconee 3 3LP017 1-4-97 4:01a 129.3 6 ES



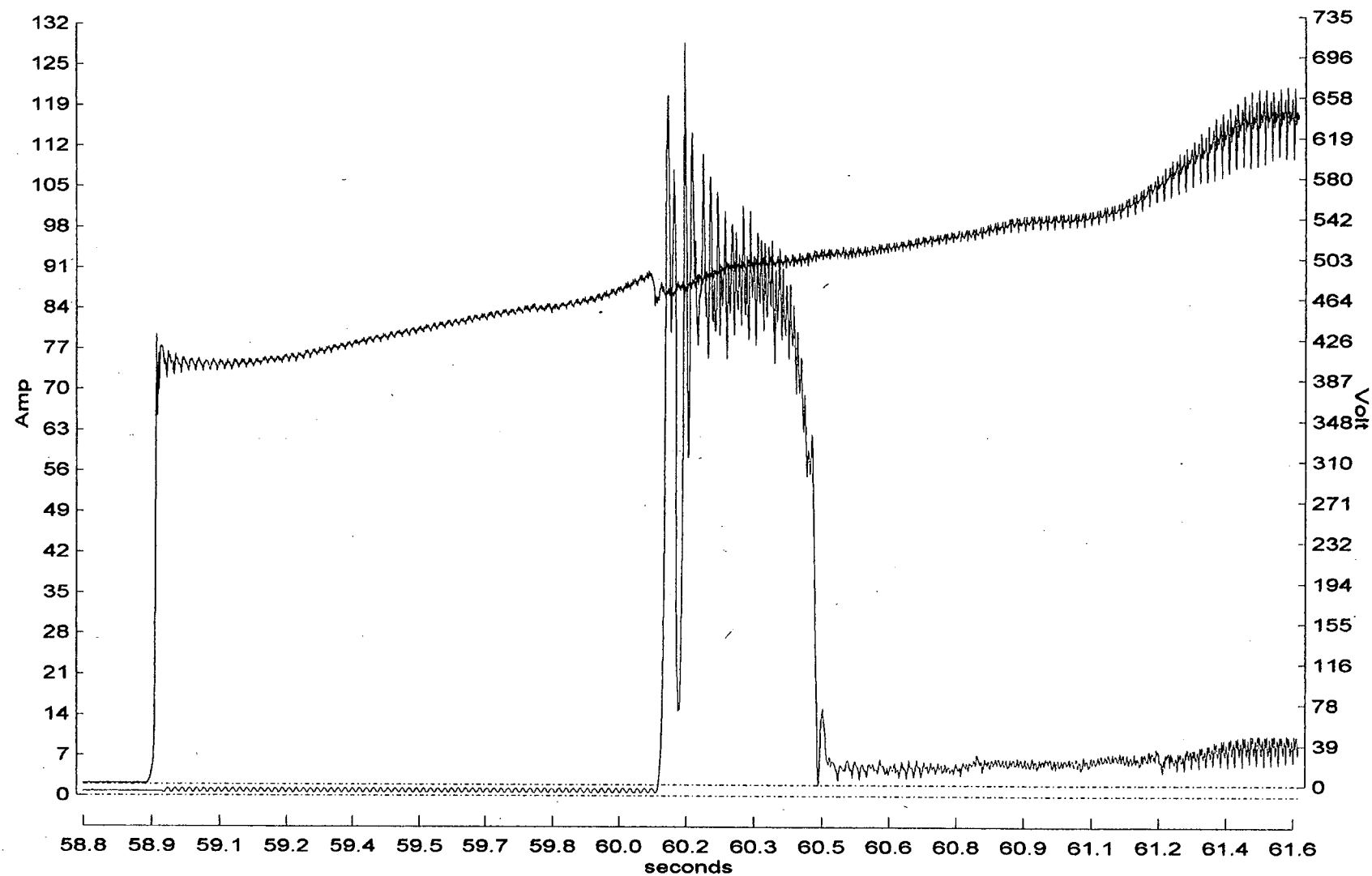
Cursor coordinates = 85.3seconds, 364Amp

— Vab-rms — Ia-rms

3LP-017
ES Test # 6
Full Stroke Voltage and Current

Figure 4.6.9-3-1: Test 6, 3LP-17 Full Stroke Voltage and Current

<1> MPM Test: Oconee 3 3LP017 1-4-97 4:01a 129.3 6 ES

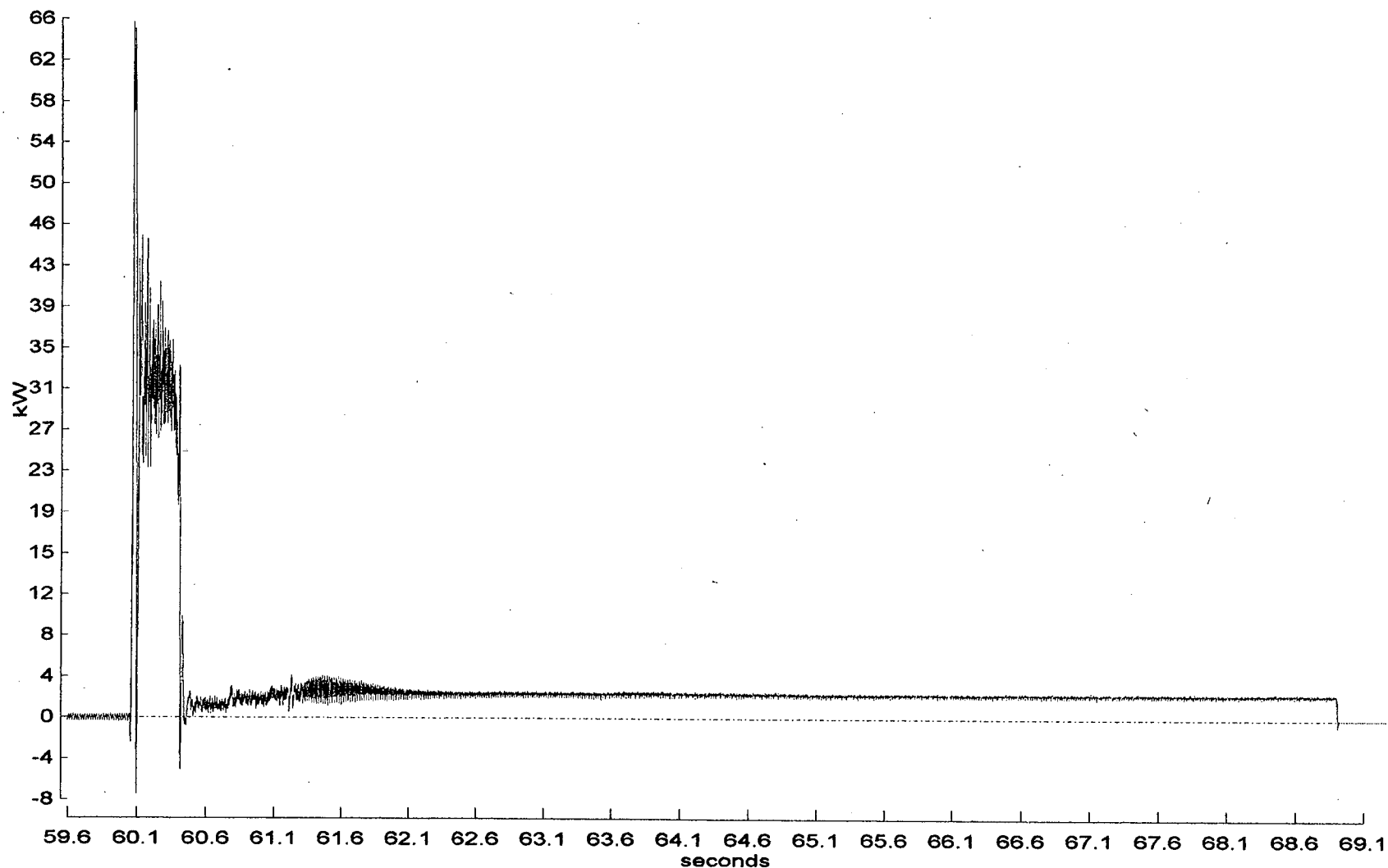


Cursor coordinates = 84.3seconds, 350Amp
——Vab-rms——Ia-rms

3LP-017
ES Test # 6
Inrush Voltage and Current

Figure 4.6.9.3-2: Test 6, 3LP-17 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3LP017 1-4-97 4:01a 129.3 6 ES



Cursor coordinates = 60.5seconds, 89.5kW

TRP

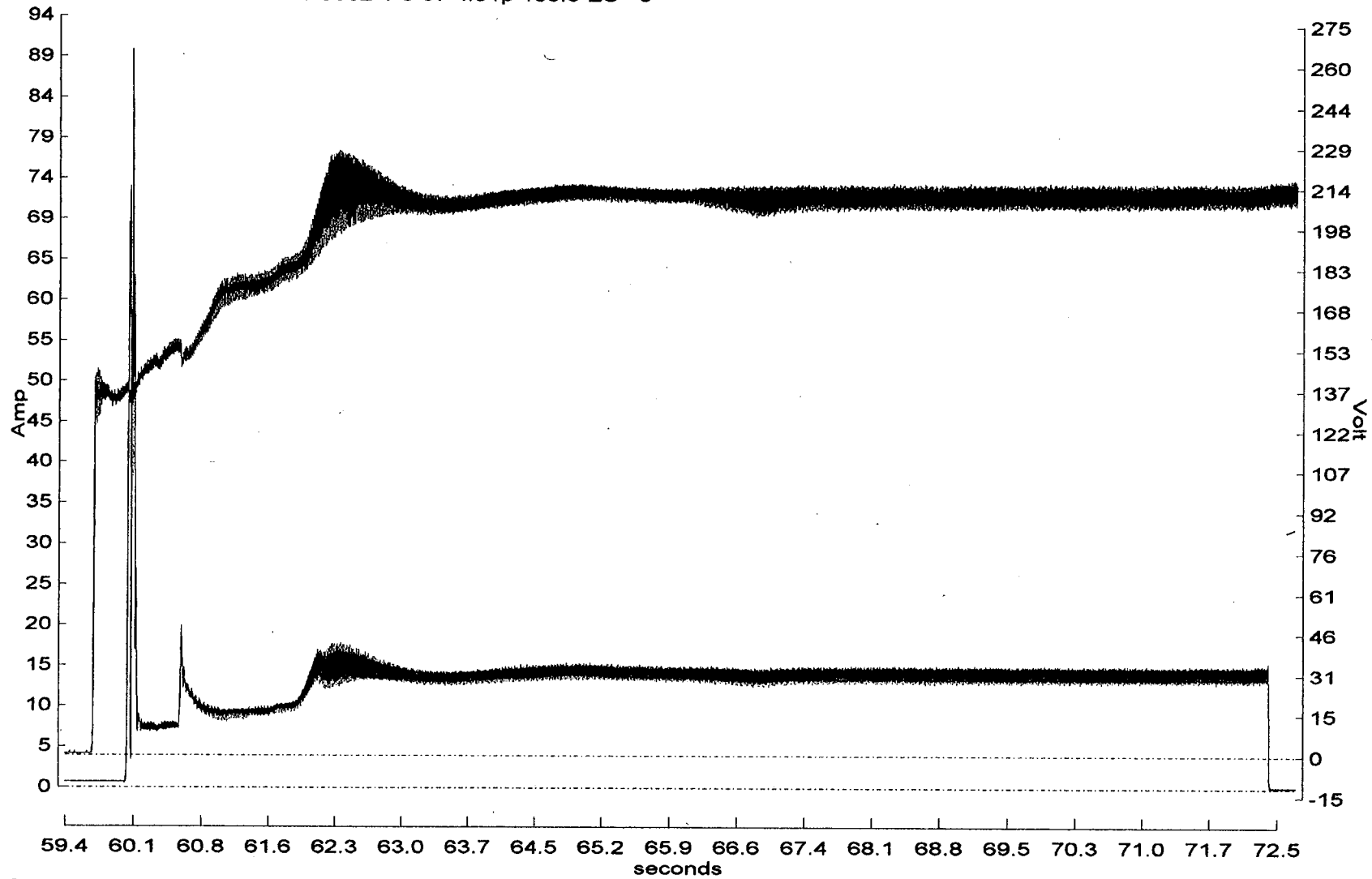
3LP-017

ES Test # 6

Full Stroke Total Real Power

Figure 4.6.9.3-3: Test 6, 3LP-17 Full Stroke Total Real Power (KW)

<1> MPM Test: Oconee 3 3BS002 1-5-97 4:01p 133.3 ES 6



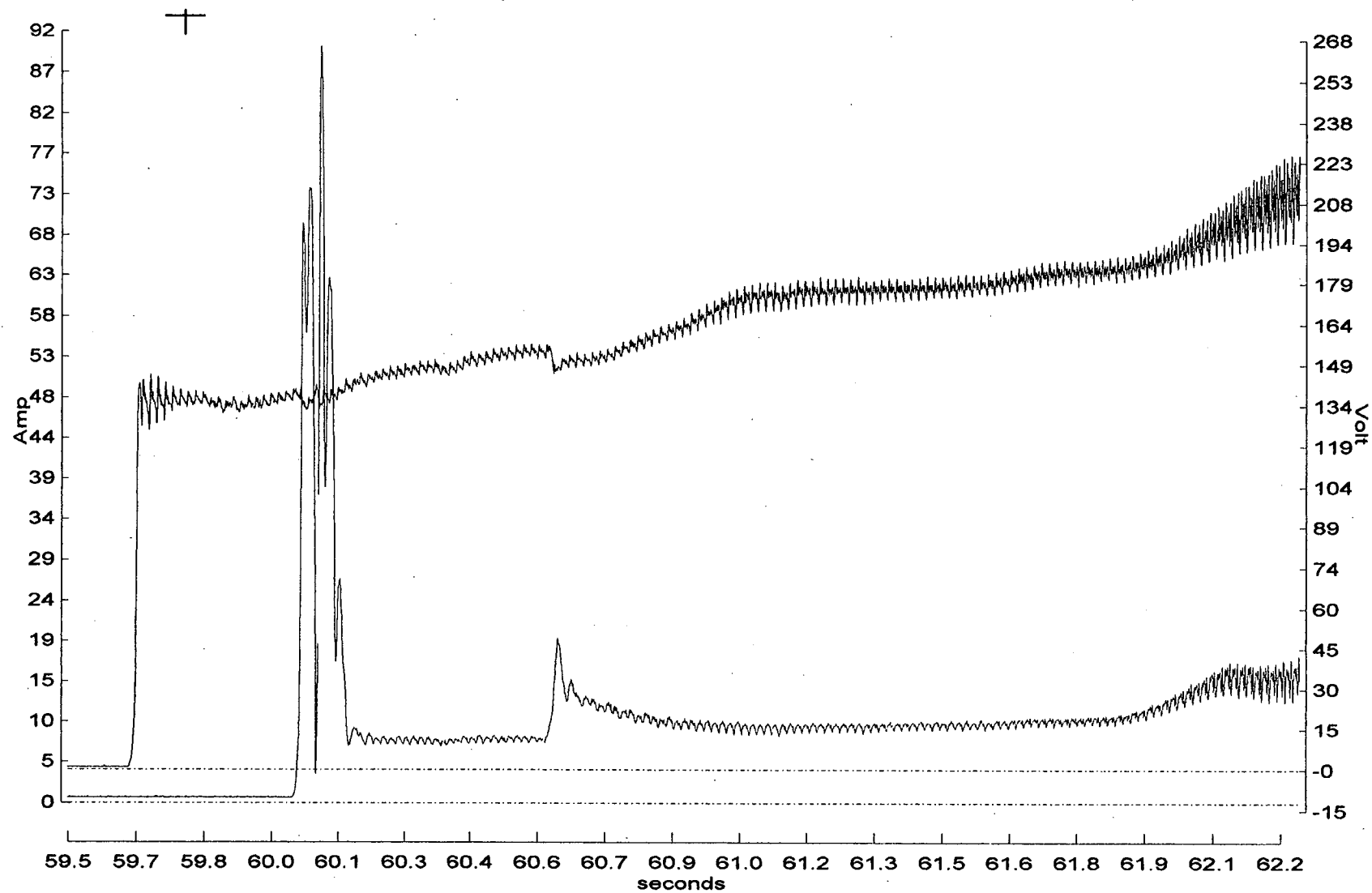
Cursor coordinates = 51.1seconds, 419Amp

V_{ab-rms} I_{a-rms}

3BS-002
ES Test # 6
Full Stroke Voltage and Current

Figure 4.6.9-4-1: Test 6, 3BS-2 Full Stroke Voltage and Current

<1> MPM Test: Ocone 3 3BS002 1-5-97 4:01p 133.3 ES 6

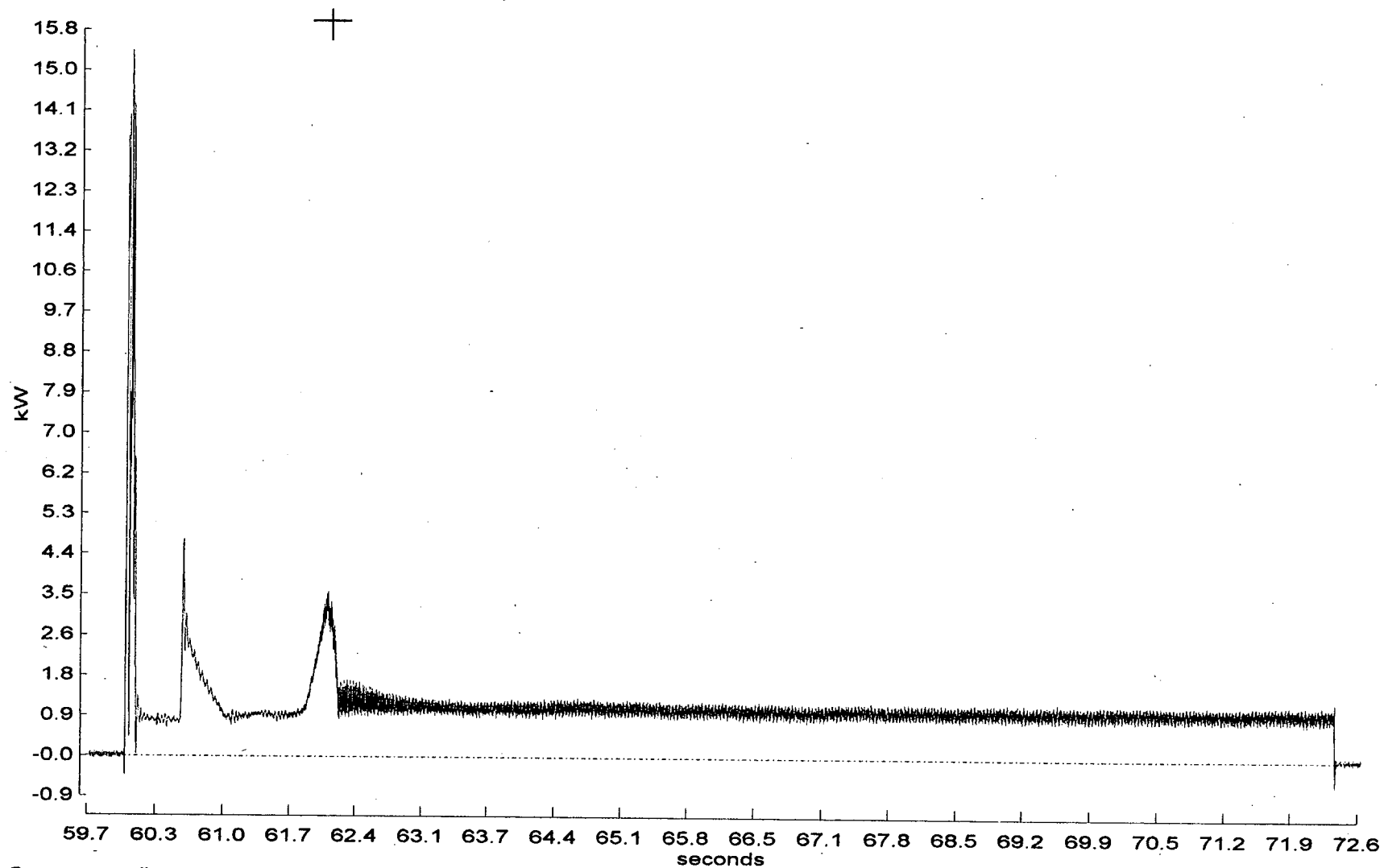


Cursor coordinates = 59.8seconds, 93.8Amp
——Vab-rms——Ia-rms

3BS-002
ES Test # 6
Inrush Voltage and Current

Figure 4.6.9.4-2: Test 6, 3BS-2 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3BS002 1-5-97 4:01p 133.3 ES 6



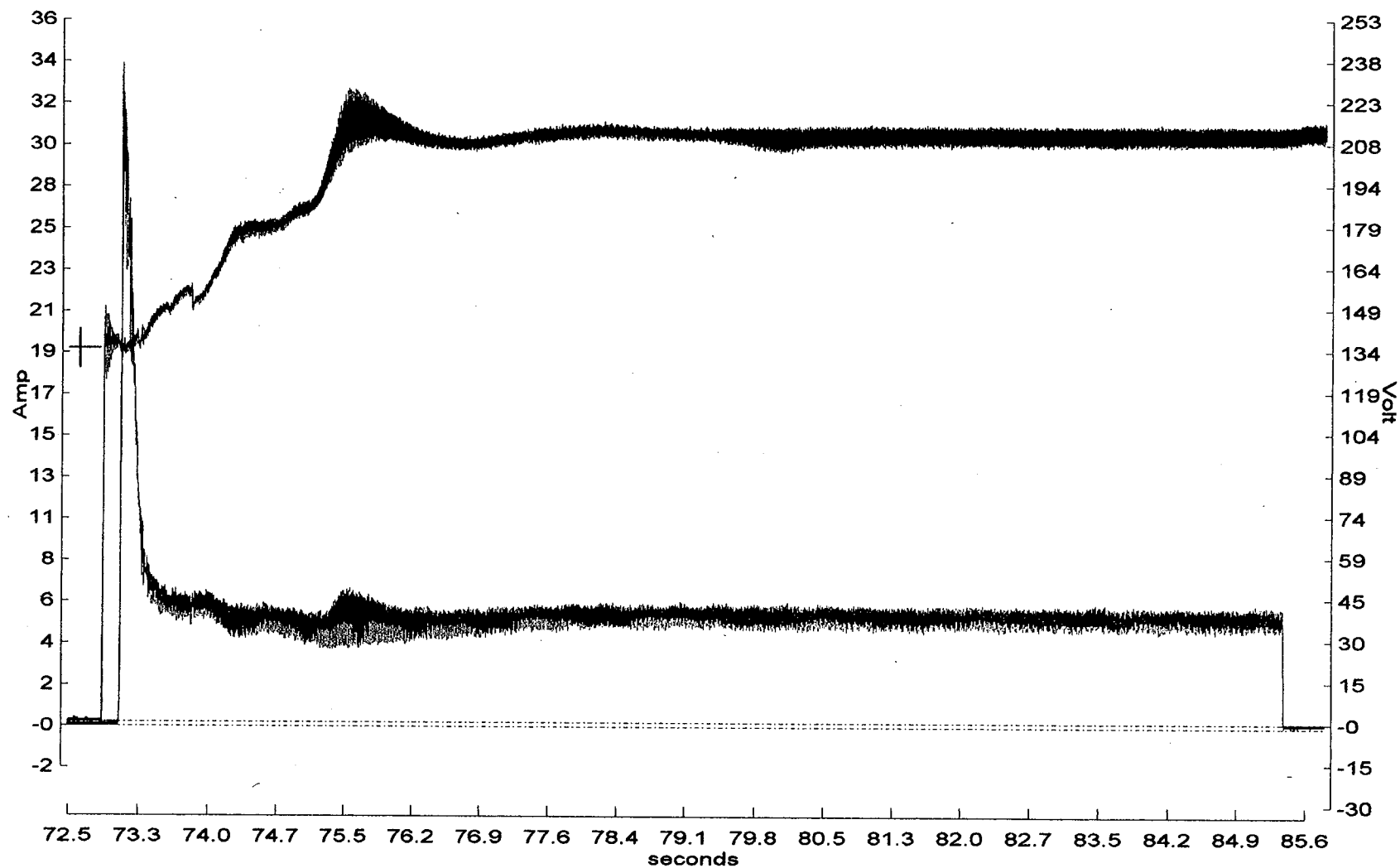
Cursor coordinates = 62.1seconds, 16.1kW

TRP

3BS-002
ES Test # 6
Full Stroke Total Real Power

Figure 4.6.9.4-3: Test 6, 3BS-2 Full Stroke Total Real Power (KW)

<1> MPM Test: Ocone 3 3HP27 1-5-97 4:02p 133.3 ES 6



Cursor coordinates = 72.7seconds, 19.3Amp

— V_{ab-rms} — I_{a-rms}

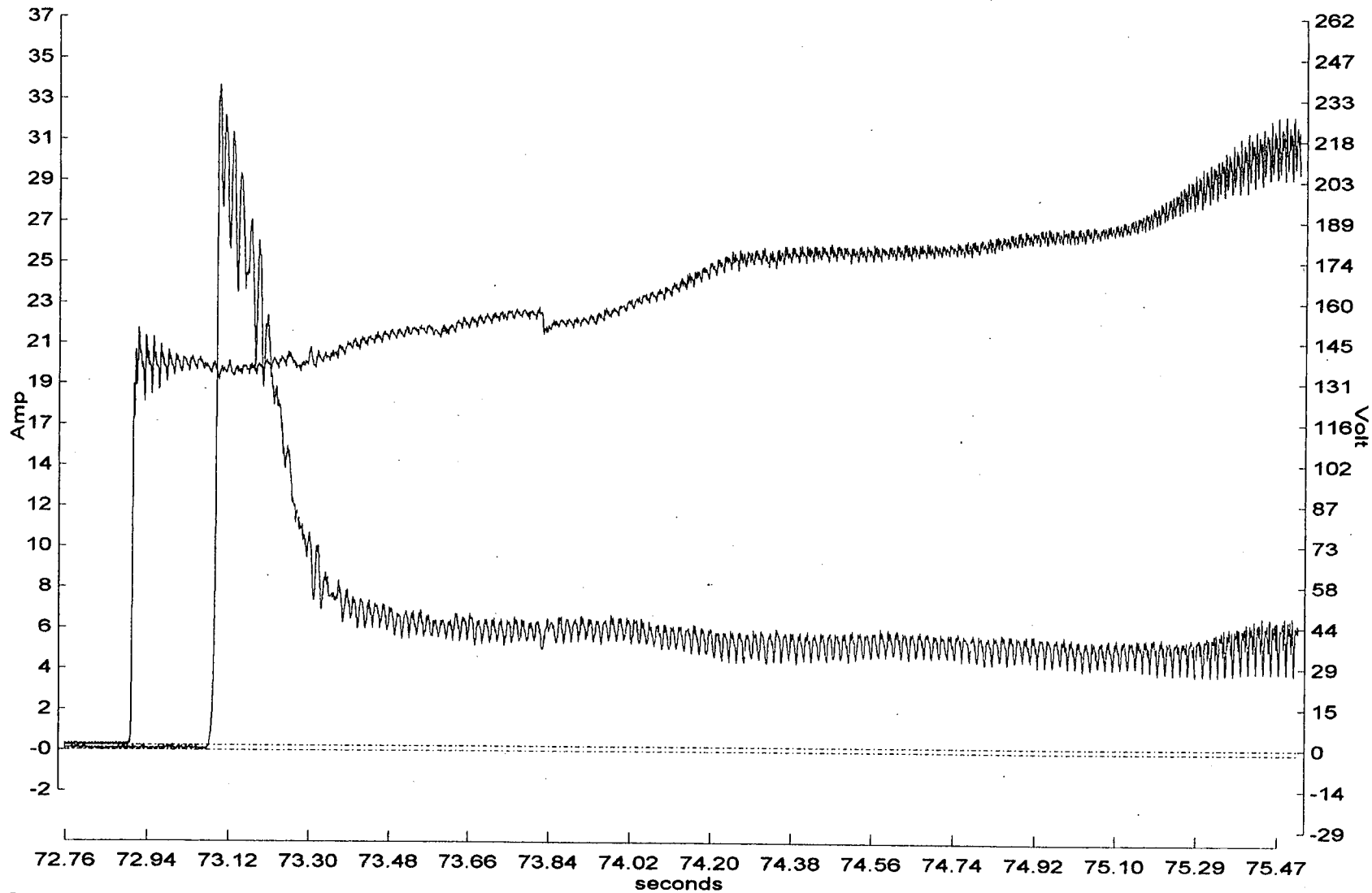
3HP-027

ES Test # 6

Full Stroke Voltage and Current

Figure 4.6.9.5-1: Test 6, 3HP-27 Full Stroke Voltage and Current

<1> MPM Test: Ocone 3 3HP27 1-5-97 4:02p 133.3 ES 6

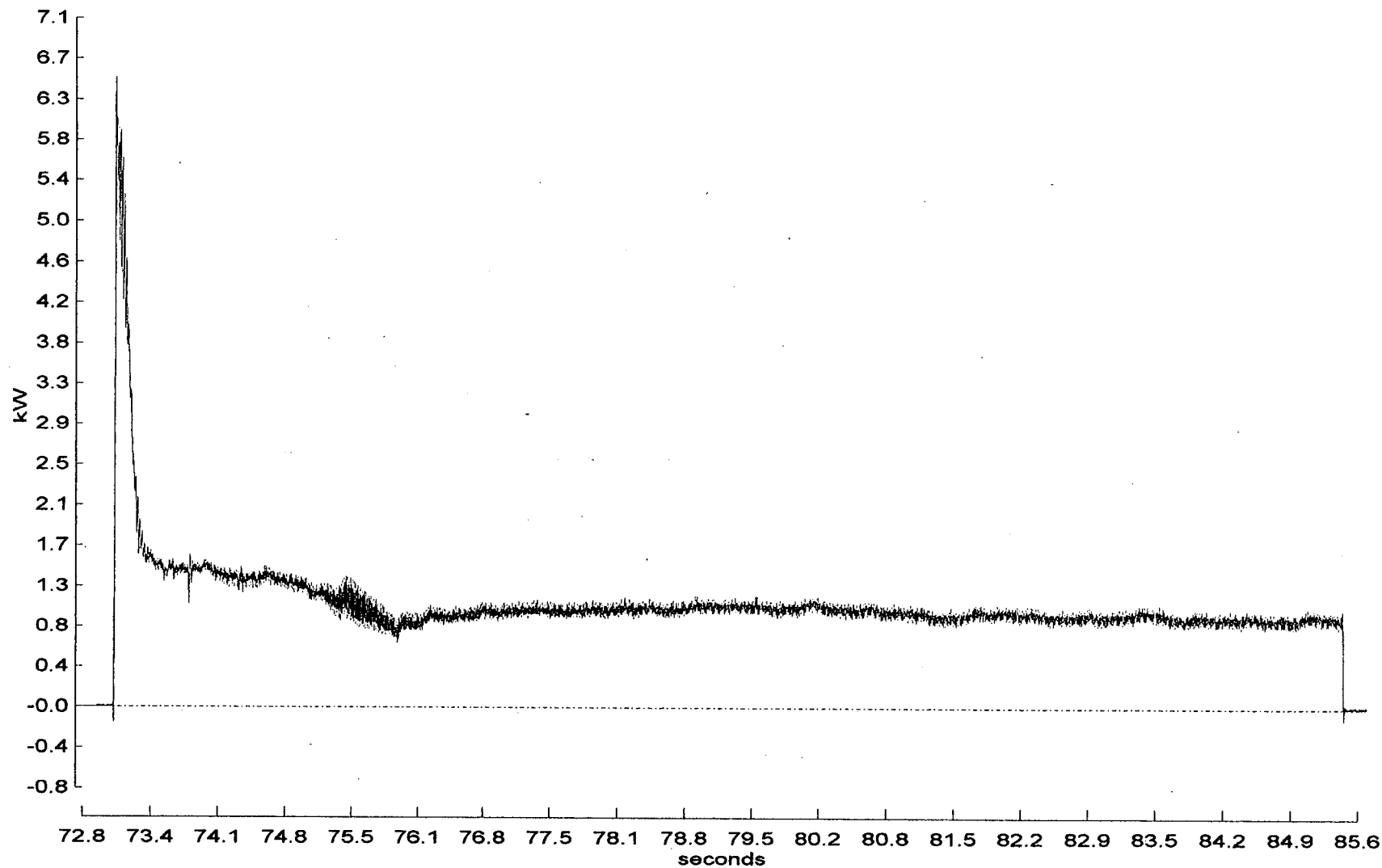


Cursor coordinates = 80.3seconds, 16.5Amp
——Vab-rms——Ia-rms

3HP-027
ES Test # 6
Inrush Voltage and Current

Figure 4.6.9.5-2: Test 6, 3HP-27 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3HP27 1-5-97 4:02p 133.3 ES 6



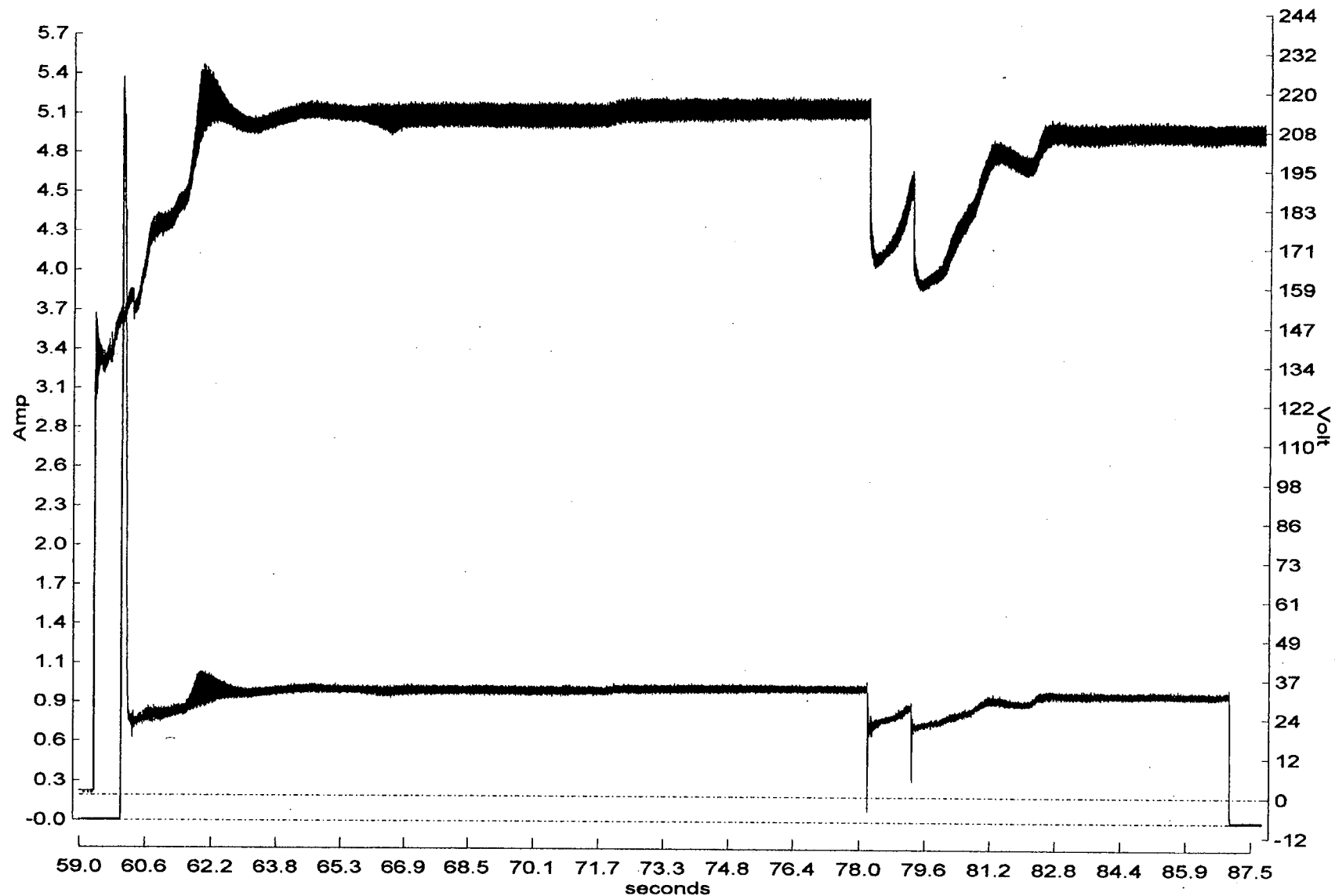
Cursor coordinates = 74.4seconds, 26.9kW

TRP

3HP-027
ES Test # 6
Full Stroke Total Real Power

Figure 4.6.9.5-3: Test 6, 3HP-27 Full Stroke Total Real Power (KW)

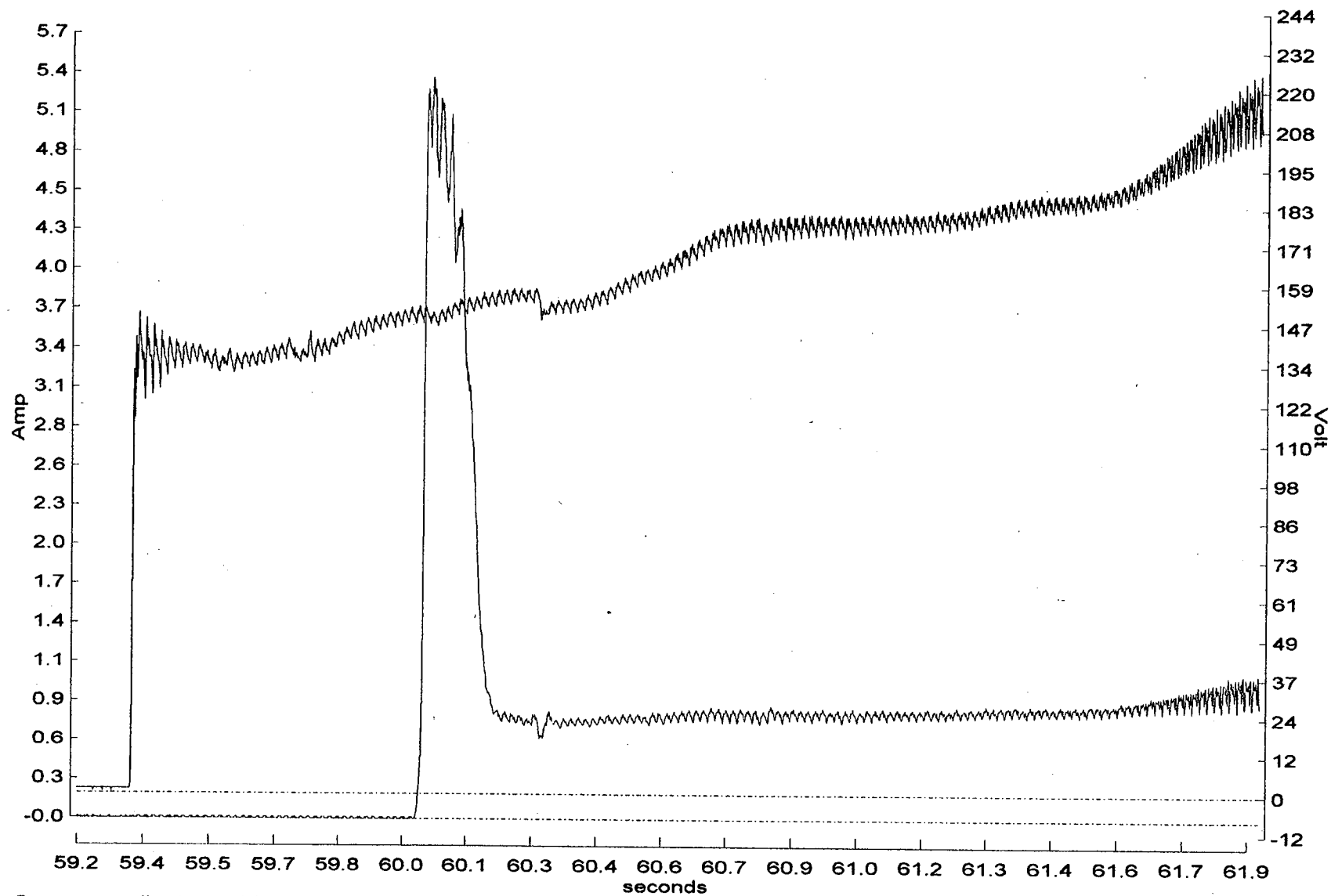
<1> MPM Test: Ocone 3 3LPS024 1-5-97 4:01p 147.5 ES 6



Cursor coordinates = 124seconds, 6.91Amp
— V_{ab-rms} — I_{a-rms}

3LPSW-024
ES Test # 6
Full Stroke Voltage and Current

Figure 4.6.9.6-1: Test 6, 3LPSW-24 Full Stroke Voltage and Current

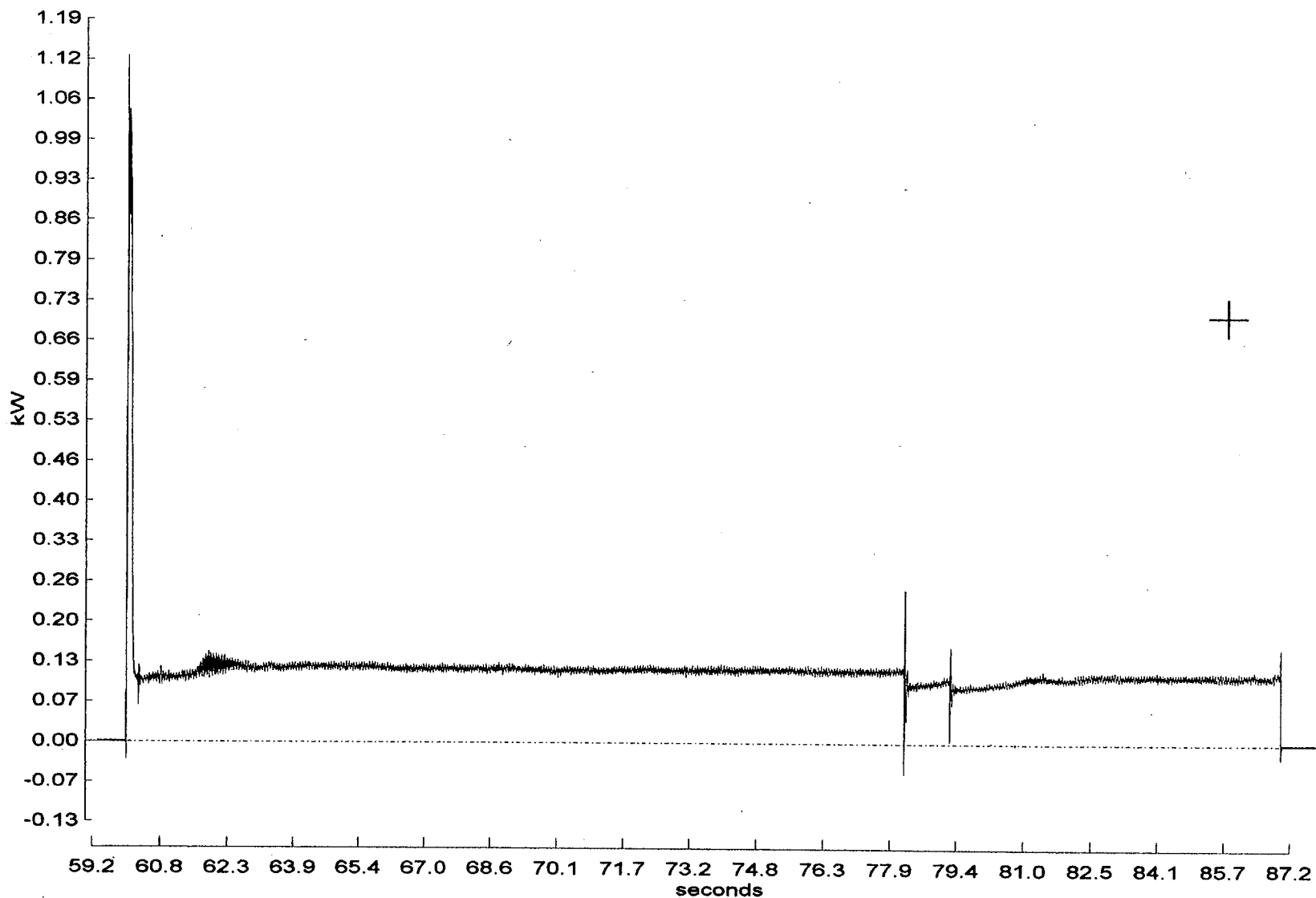


Cursor coordinates = 14.7seconds, 7.97Amp
 ———Vab-rms———Ia-rms

3LPSW-024
 ES Test # 6
 Inrush Voltage and Current

Figure 4.6.9.6-2: Test 6, 3LPSW-24 Inrush Voltage and Current

<1> MPM Test: Ocone 3 3LPS024 1-5-97 4:01p 147.5 ES 6



Cursor coordinates = 85.7seconds, 0.704kW

TRP

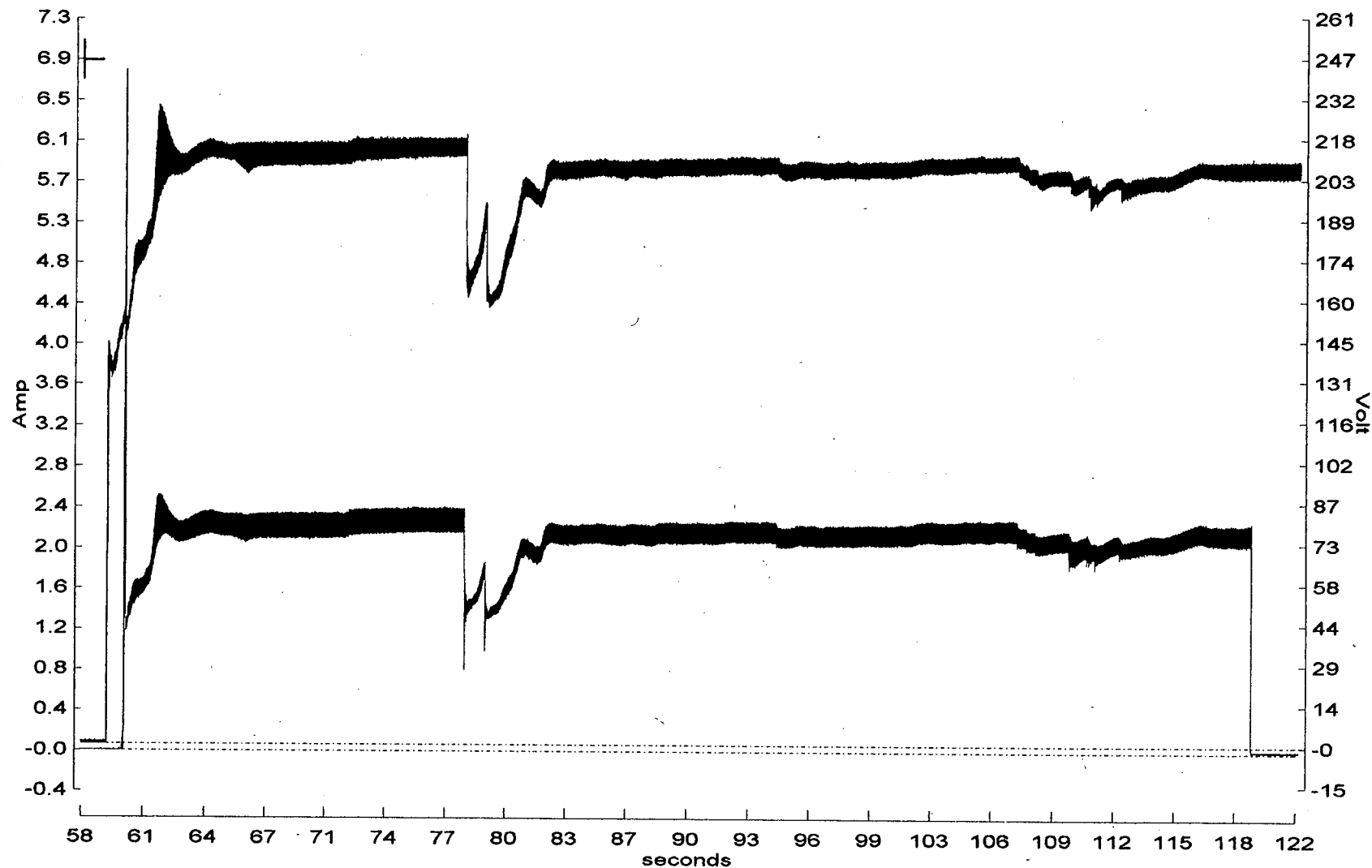
3LPSW-024

ES Test # 6

Full Stroke Total Real Power

Figure 4.6.9.6-3: Test 6, 3LPSW-24 Full Stroke Total Real Power (KW)

<1> MPM Test: Ocone 3 3PR019 1-5-97 3:59p 180.0 ES 6



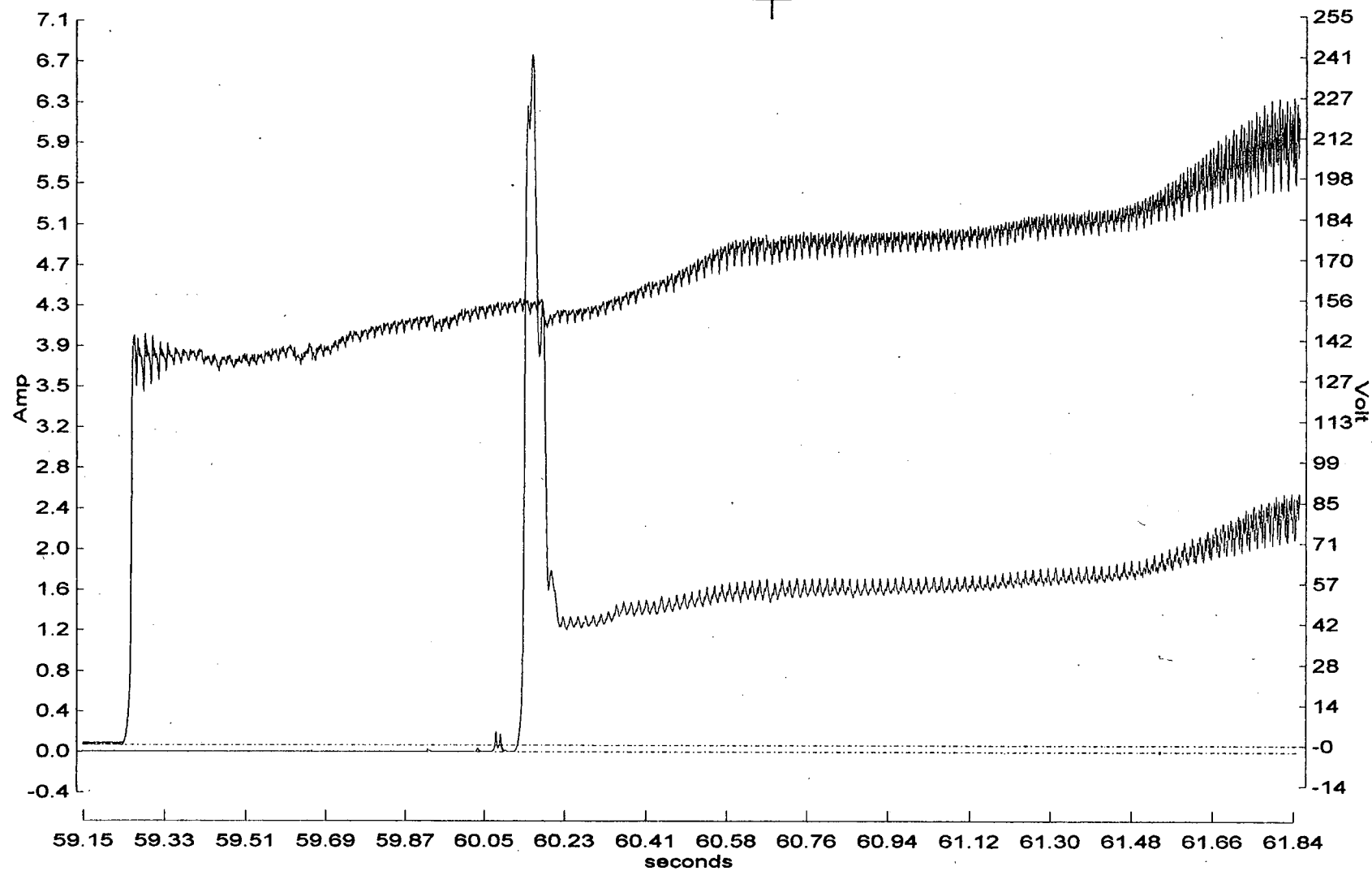
Cursor coordinates = 57.9seconds, 6.86Amp

— Vab-rms — Ia-rms

3PR-019
ES Test # 6
Full Stroke Voltage and Current

Figure 4.6.9-7-1: Test 6, 3PR-19 Full Stroke Voltage and Current

<1> MPM Test: Ocone 3 3PR019 1-5-97 3:59p 180.0 ES 6

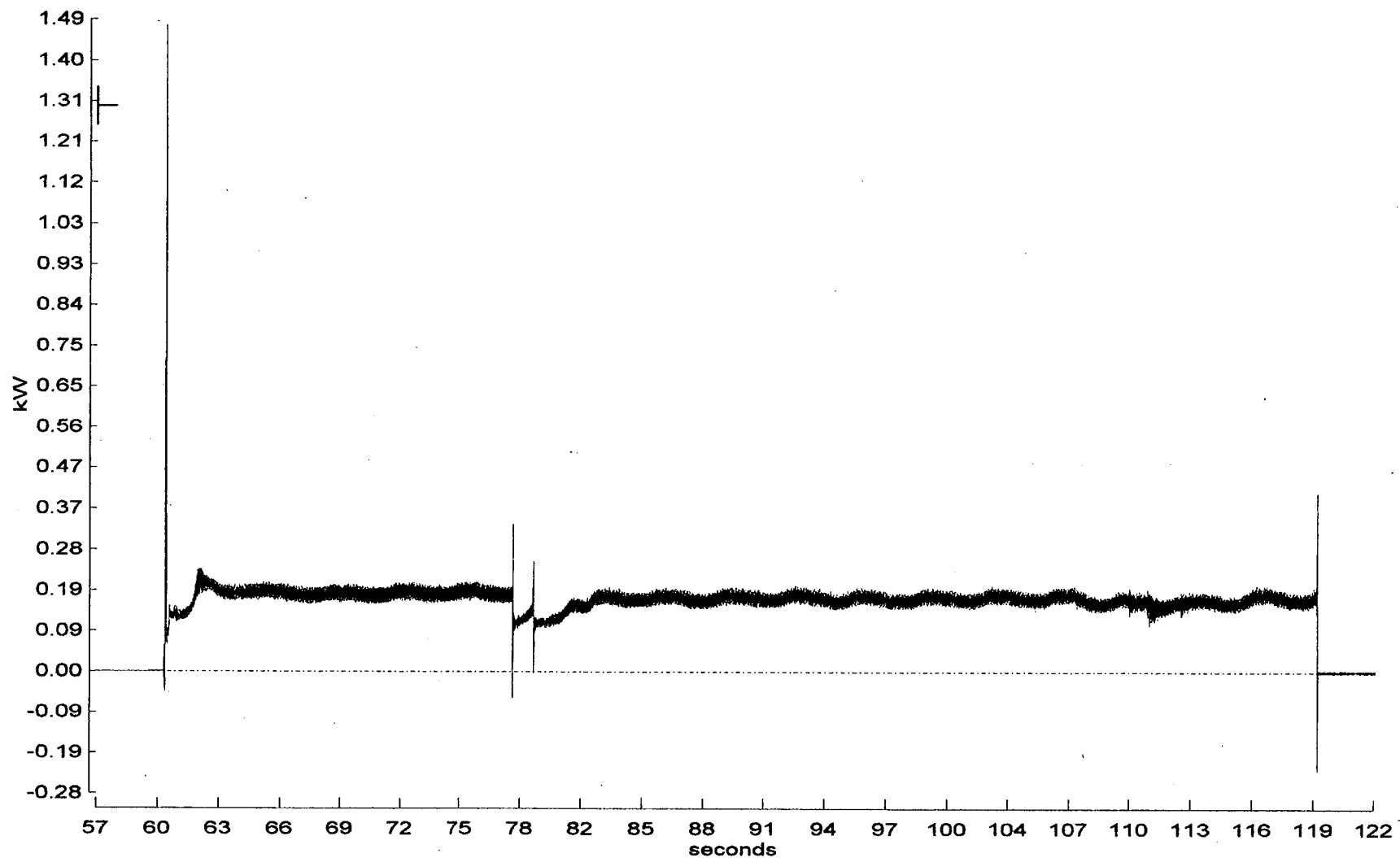


Cursor coordinates = 60.7seconds; 7.32Amp
——Vab-rms——Ia-rms

3PR-019
ES Test # 6
Inrush Voltage and Current

Figure 4.6.9.7-2: Test 6, 3PR-19 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3PR019 1-5-97 3:59p 180.0 ES 6



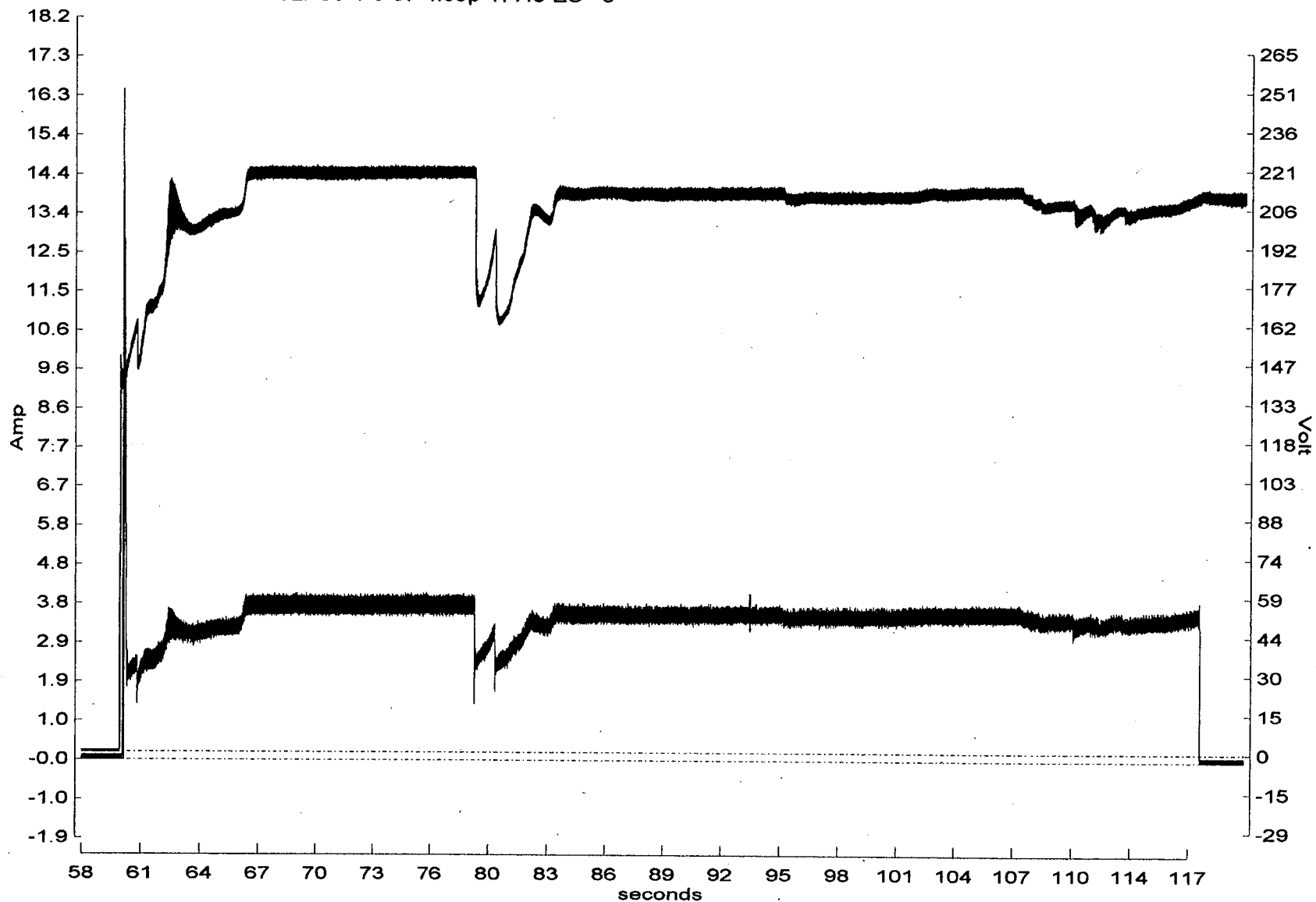
Cursor coordinates = 56.6seconds, 1.29kW

— TRP

3PR-019
ES Test # 6
Full Stroke Total Real Power

Figure 4.6.9.7-3: Test 6, 3PR-19 Full Stroke Total Real Power (KW)

<1> MPM Test: Oconee 3 3LPS6 1-5-97 4:53p 177.5 ES 6

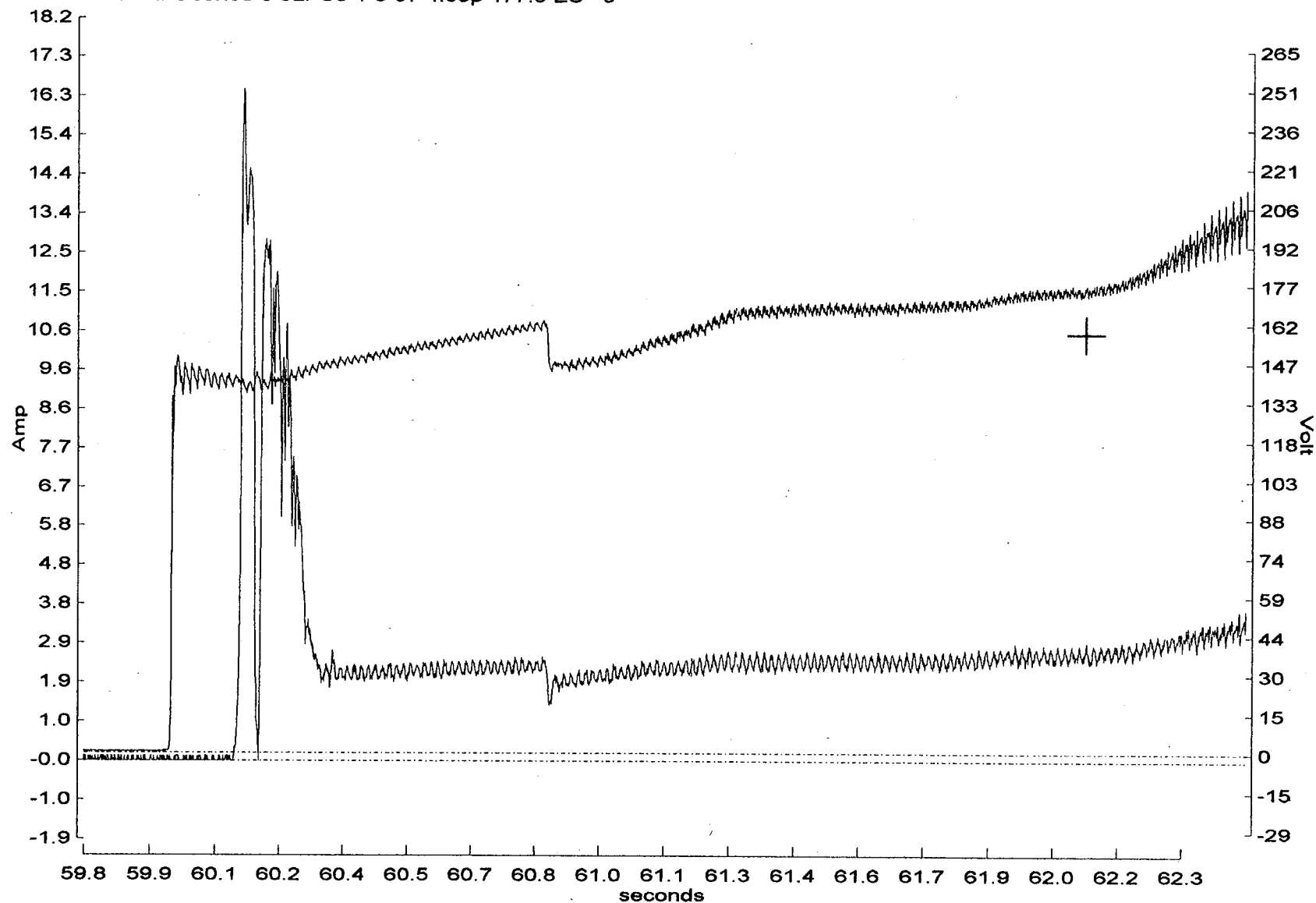


Cursor coordinates = 93.4seconds, 3.64Amp
— Vab-rms — Ia-rms

3LPSW-006
ES Test # 6
Full Stroke Voltage and Current

Figure 4.6.9.8-1: Test 6, 3LPSW-6 Full Stroke Voltage and Current

<1> MPM Test: Oconee 3 3LPS6 1-5-97 4:53p 177.5 ES 6



Cursor coordinates = 62.1seconds, 10.5Amp

—— Vab-rms ——— Ia-rms

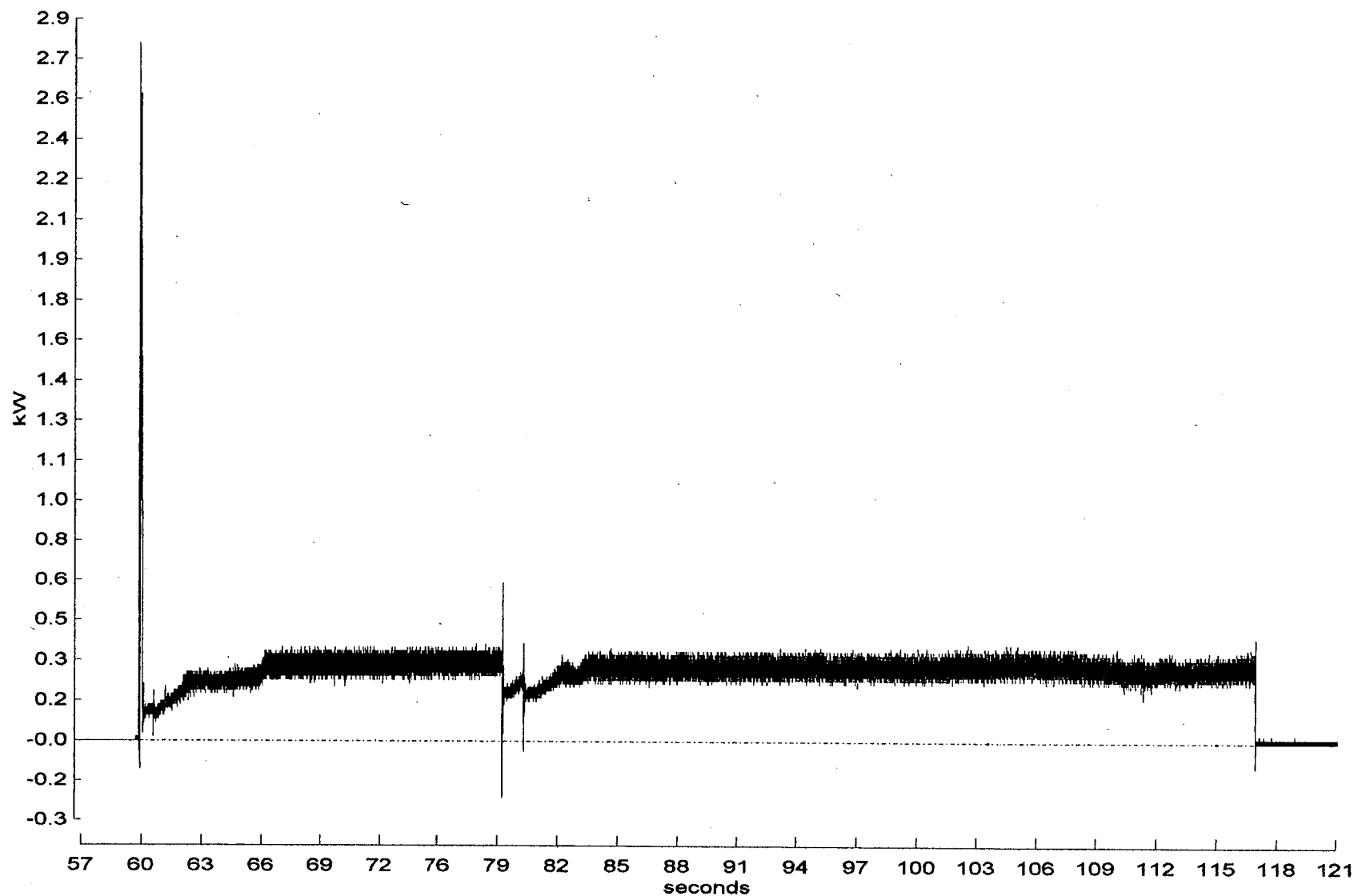
3LPSW-006

ES Test # 6

Inrush Voltage and Current

Figure 4.6.9.8-2: Test 6, 3LPSW-6 Inrush Voltage and Current

<1> MPM Test: Ocone 3 3LPS6 1-5-97 4:53p 177.5 ES 6



Cursor coordinates = 62.2seconds, 7.84kW

TRP

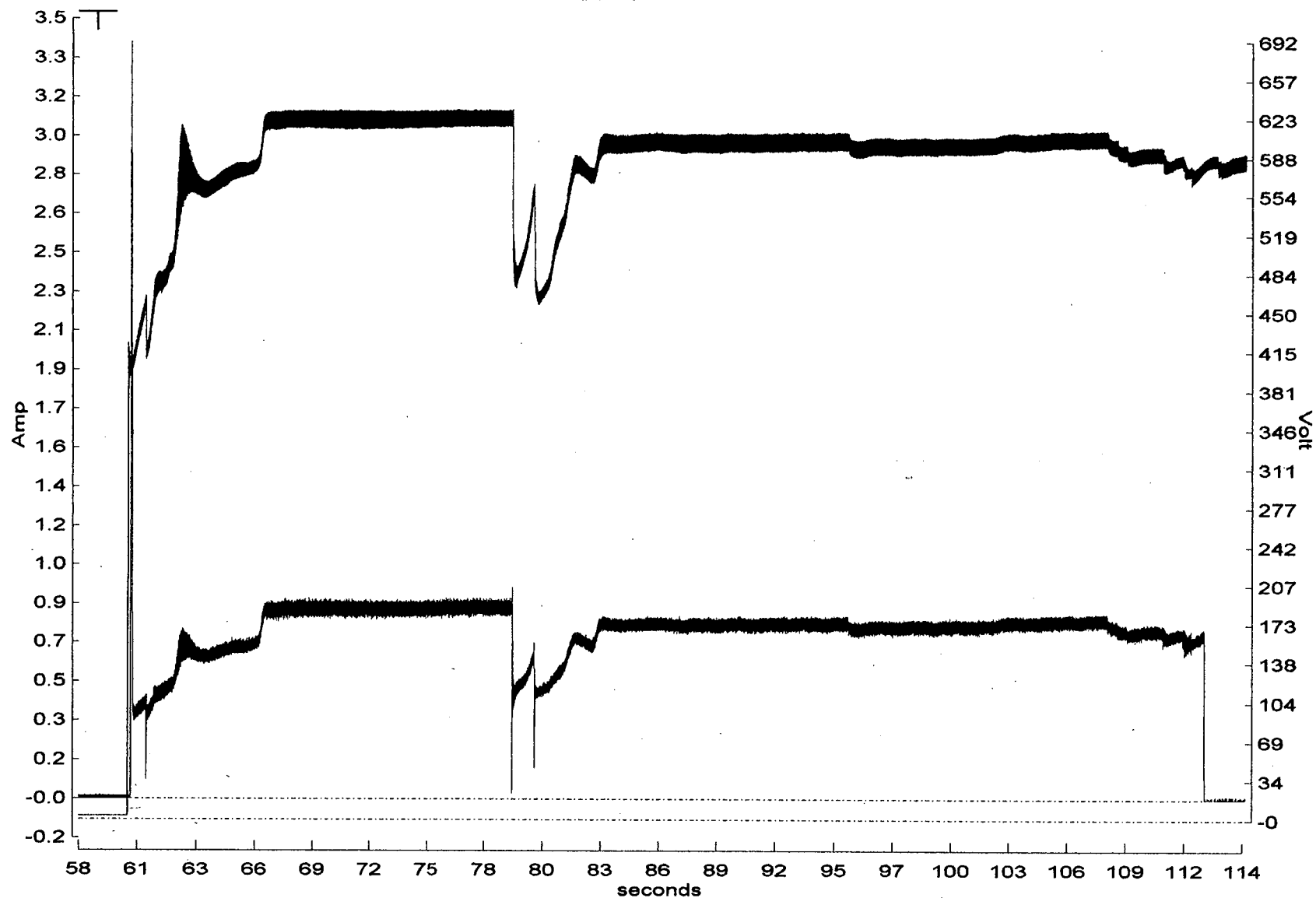
3LPSW-006

ES Test # 6

Full Stroke Total Real Power

Figure 4.6.9.8-3: Test 6, 3LPSW-6 Full Stroke Total Real Power (KW)

<1> MPM Test: Ocone 3 3LPS565 1-6-97 4:51a 173.0 ES 6

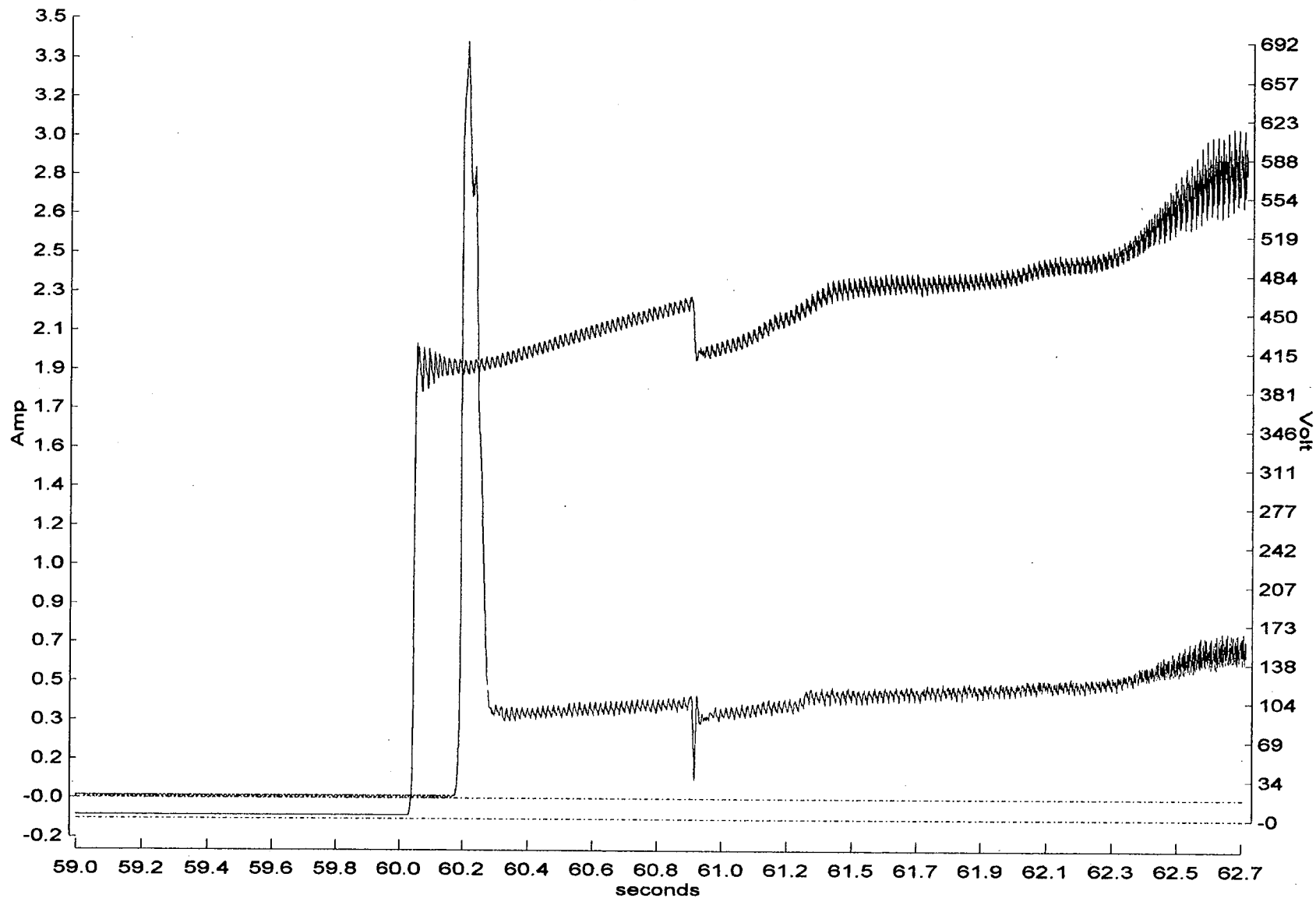


Cursor coordinates = 58.6seconds, 3.53Amp
— V_{ab-rms} — I_{a-rms}

3LPSW-565
ES Test # 6
Full Stroke Voltage and Current

Figure 4.6.9.9-1: Test 6, 3LPSW-565 Full Stroke Voltage and Current

<1> MPM Test: Ocone 3 3LPS565 1-6-97 4:51a 173.0 ES 6

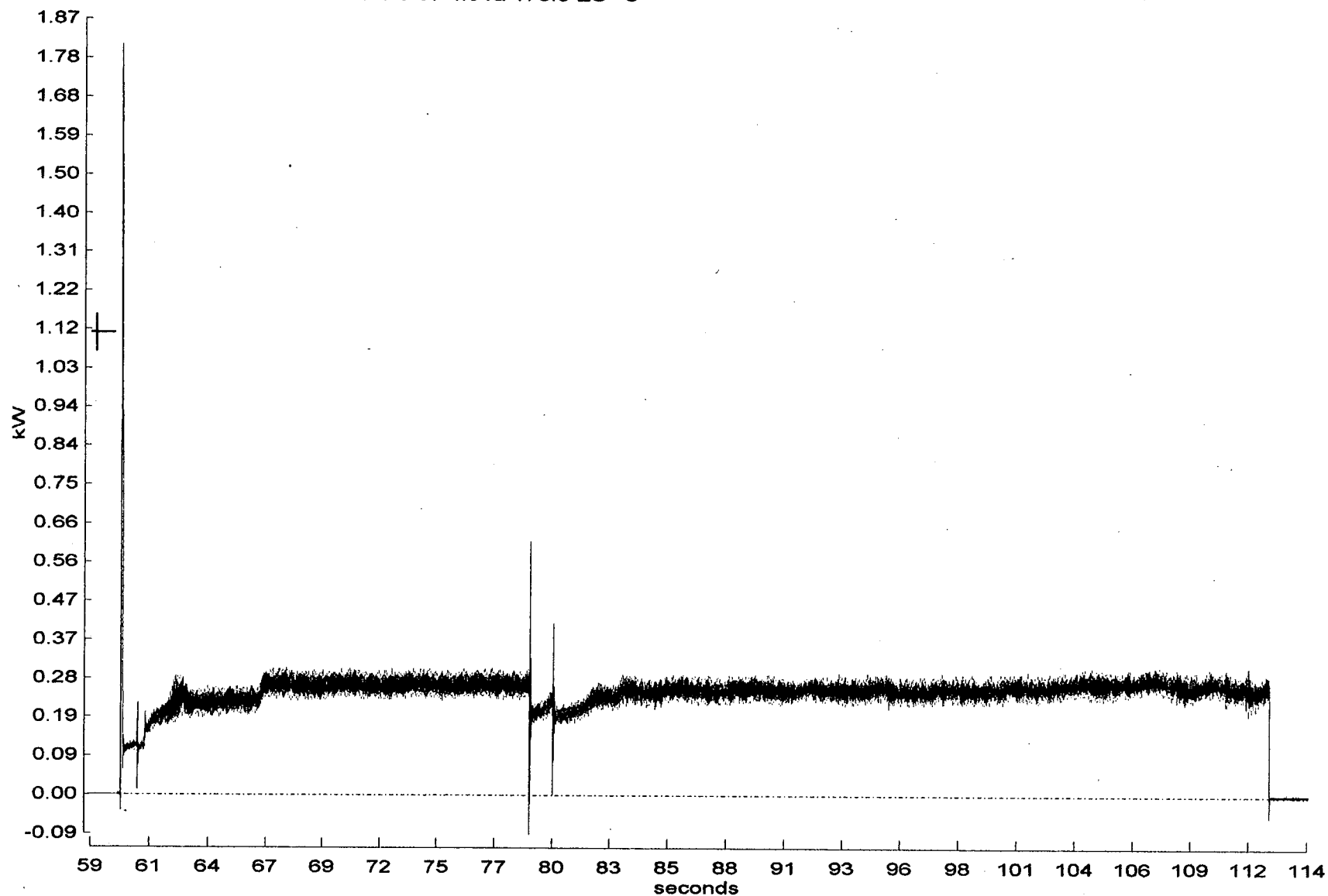


Cursor coordinates = 38.6seconds, 21.3Amp
—— V_{ab-rms} —— I_{a-rms}

3LPSW-565
ES Test # 6
Inrush Voltage and Current

Figure 4.6.9.9-2: Test 6, 3LPSW-565 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3LPS565 1-6-97 4:51a 173.0 ES 6



Cursor coordinates = 59.1seconds, 1.11kW

TRP

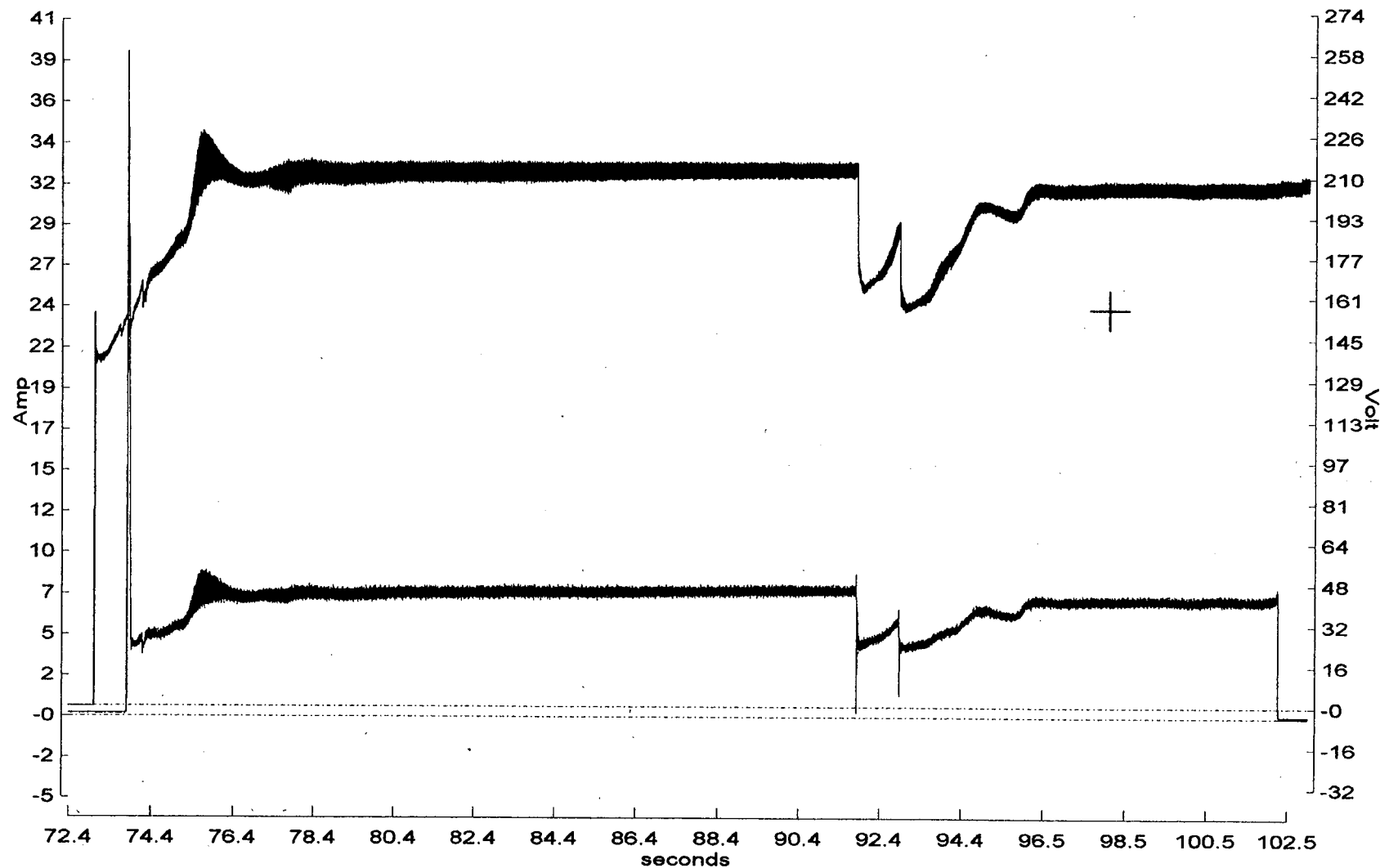
3LPSW-565

ES Test # 6

Full Stroke Total Real Power

Figure 4.6.9.9-3: Test 6, 3LPSW-565 Full Stroke Total Real Power (KW)

<1> MPM Test: Ocone 3 3HP004 1-5-97 3:16p 149.5 ES 6

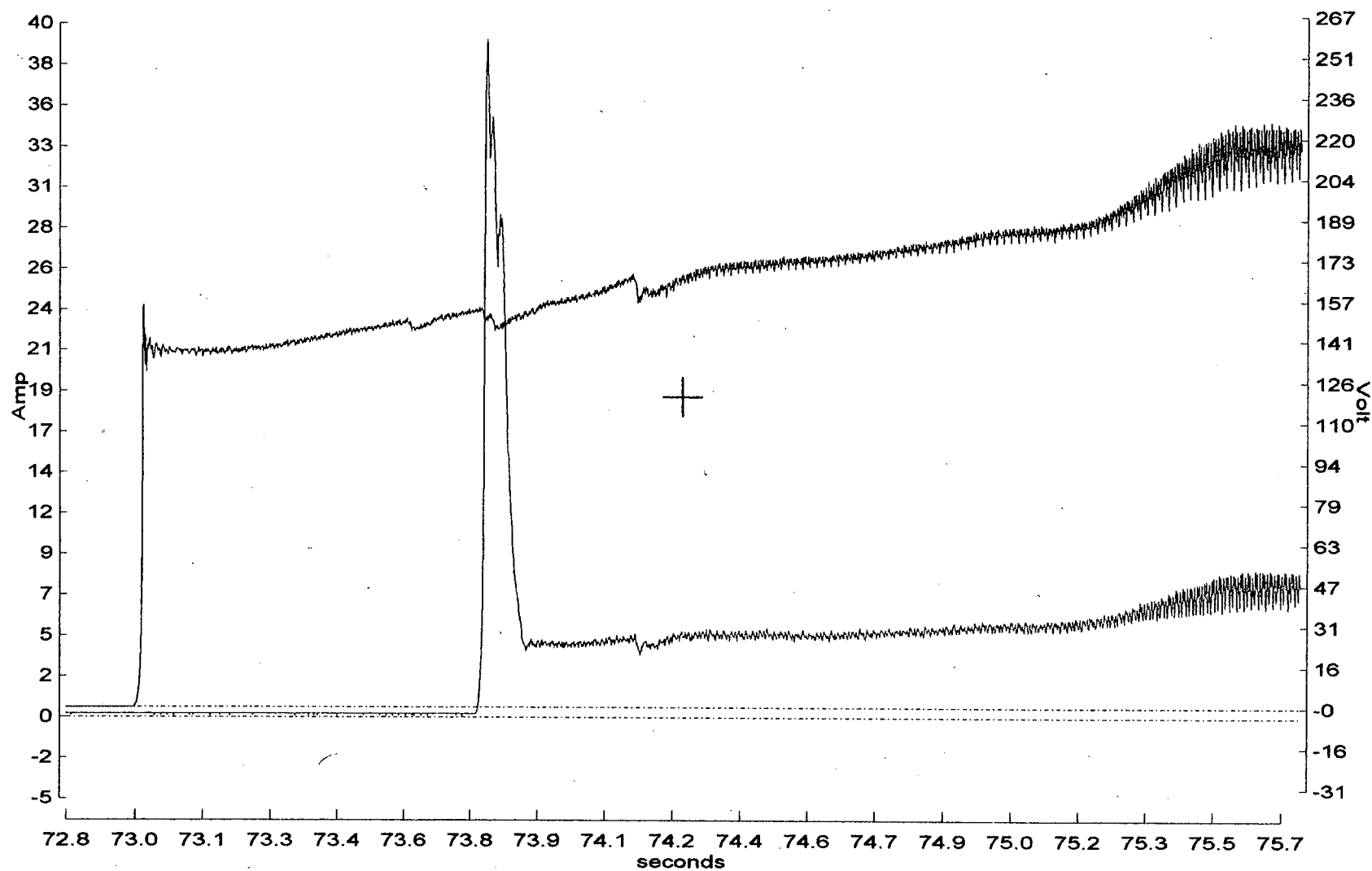


Cursor coordinates = 98.1seconds, 24.2Amp

— Vab-rms — Ia-rms

3HP-004
ES Test # 6
Full Stroke Voltage and Current

Figure 4.6.9.10-1: Test 6, 3HP-4 Full Stroke Voltage and Current



Cursor coordinates = 74.3seconds, 18.6Amp

— Vab-rms — Ia-rms

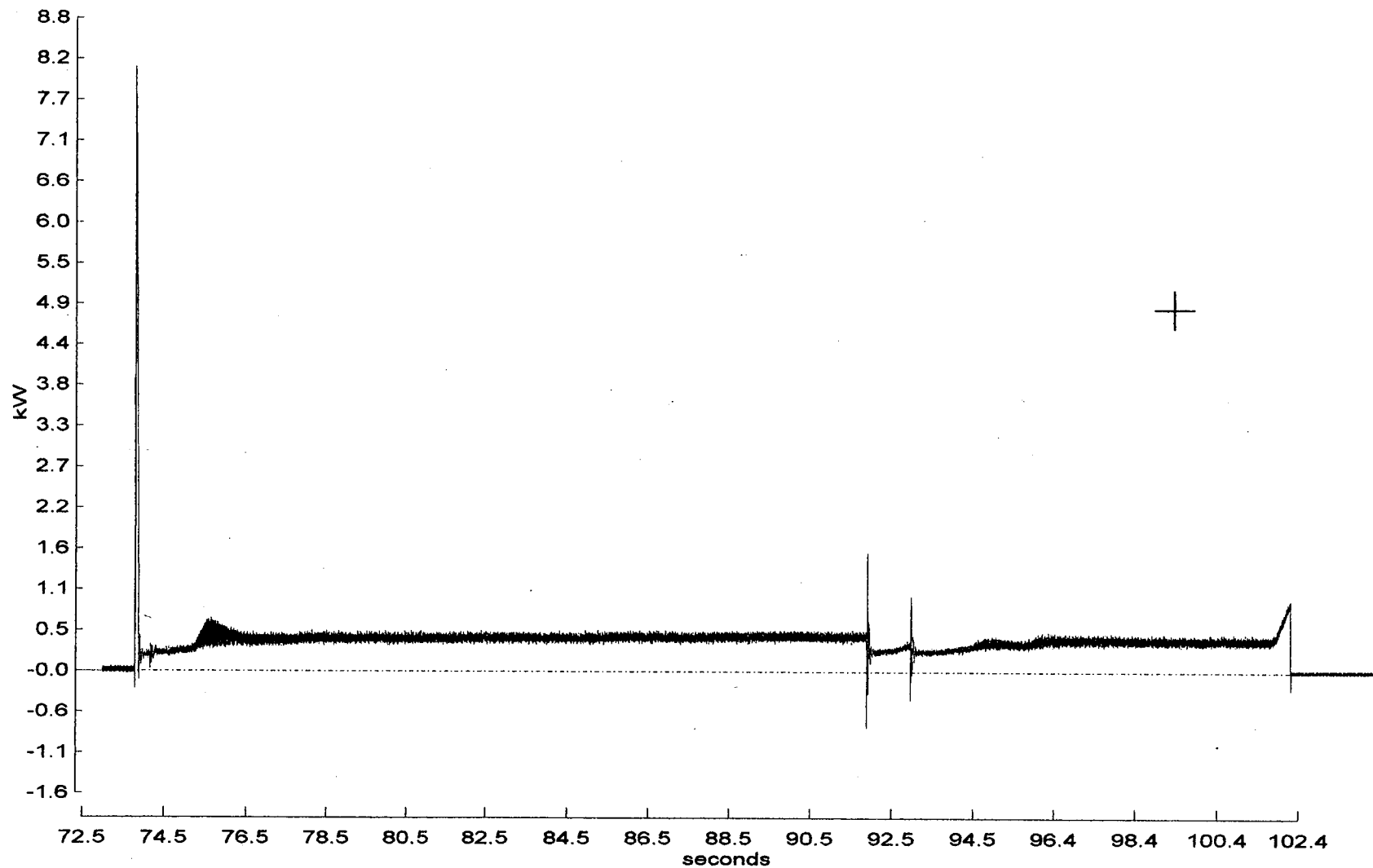
3HP-004

ES Test # 6

Inrush Voltage and Current

Figure 4.6.9.10-2: Test 6, 3HP-4 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3HP004 1-5-97 3:16p 149.5 ES 6

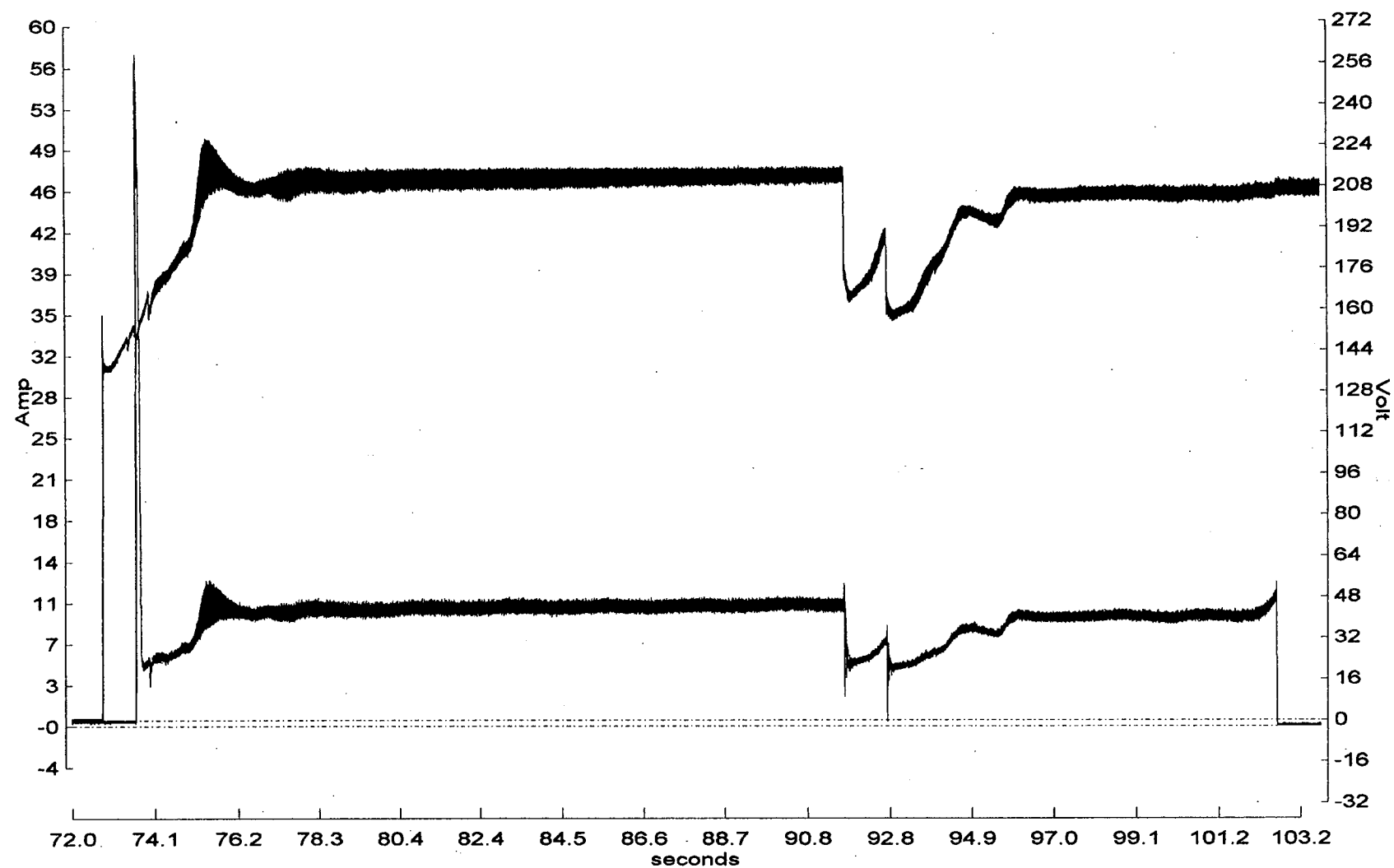


Cursor coordinates = 99.4seconds, 4.88kW

TRP

3HP-004
ES Test # 6
Full Stroke Total Real Power

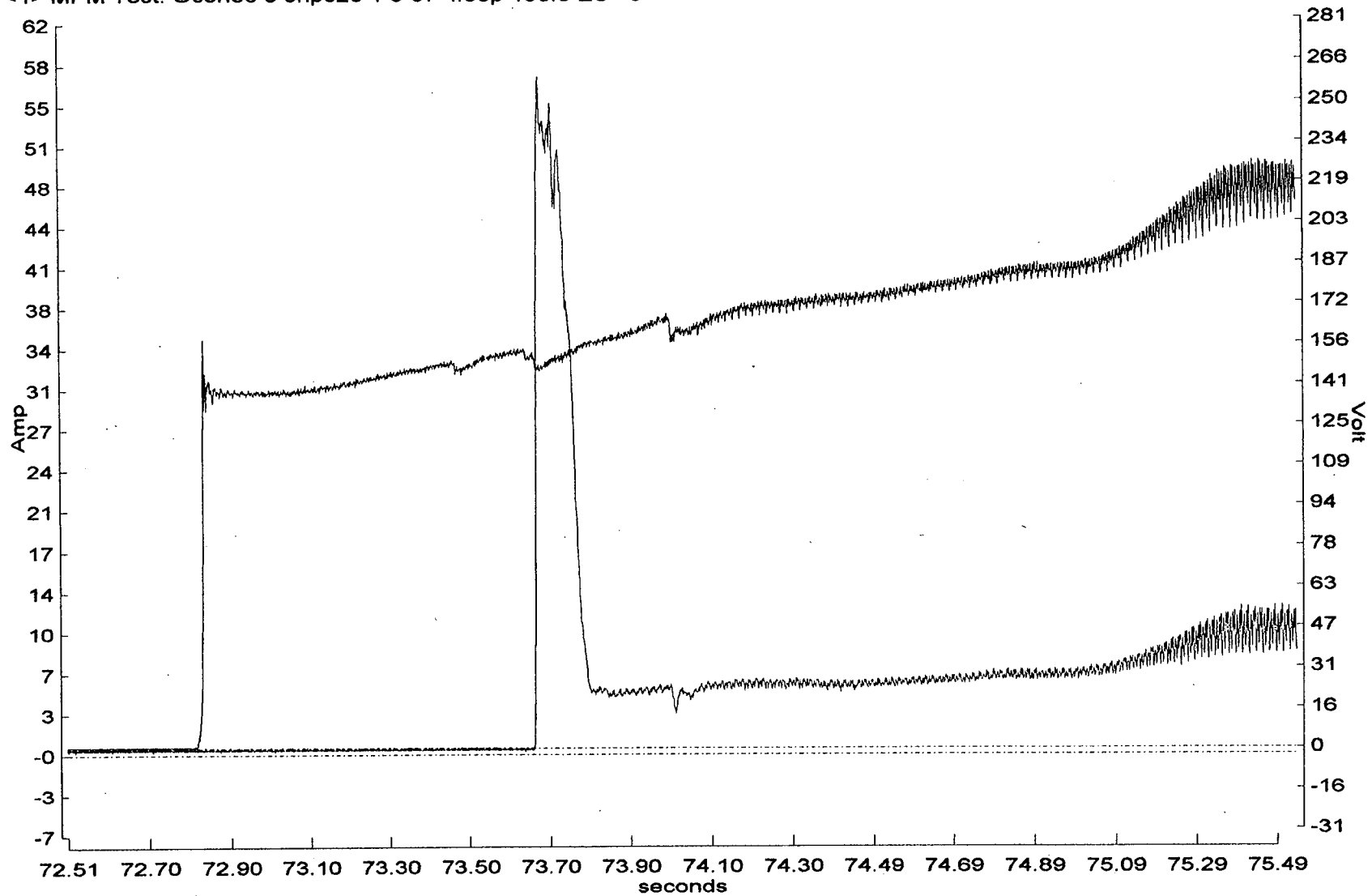
Figure 4.6.9.10-3: Test 6, 3HP-4 Full Stroke Total Real Power (KW)



3HP-020
ES Test # 6
Full Stroke Voltage and Current

Figure 4.6.9.11-1: Test 6, 3HP-20 Full Stroke Voltage and Current

<1> MPM Test: Ocone 3 3hp020 1-5-97 4:50p 150.0 ES 6



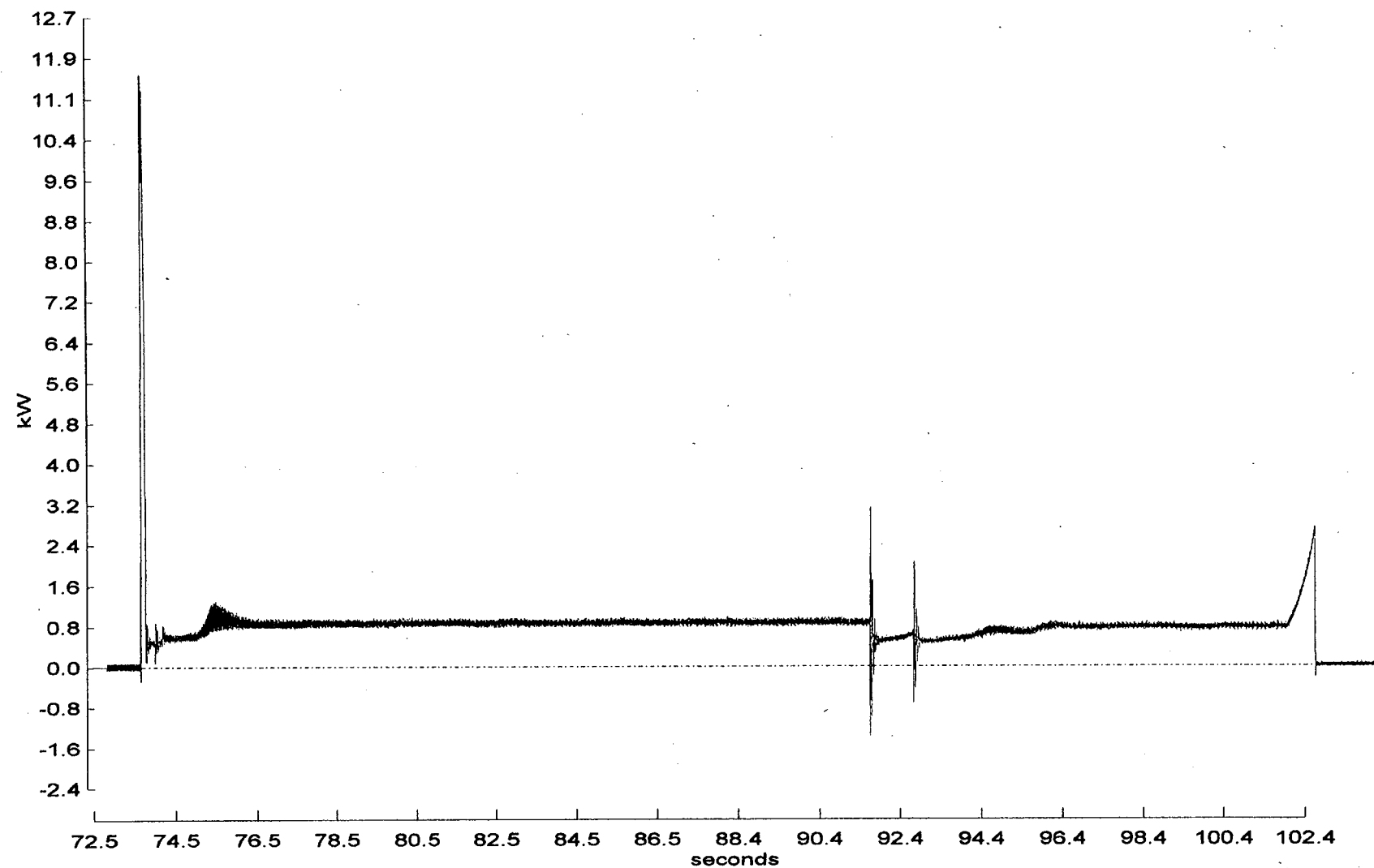
Cursor coordinates = 97.4seconds, 399Amp

— Vab-rms — Ia-rms

3HP-020
ES Test # 6
Inrush Voltage and Current

Figure 4.6.9.11-2: Test 6, 3HP-20 Inrush Voltage and Current

<1> MPM Test: Oconee 3 3hp020 1-5-97 4:50p 150.0 ES 6



Cursor coordinates = 74.5seconds, 45kW

TRP

3HP-020

ES Test # 6

Full Stroke Total Real Power

Figure 4.6.9.11-3: Test 6, 3HP-20 Full Stroke Total Real Power (KW)

Appendix 7 - Test 7, Figures of Results

APPENDIX 7: Figures for Test 7

<u>FIGURE</u>	<u>Page</u>
Figure 4.7.1-1: Test7, Keowee Voltage and Current.....	7-2
Figure 4.7.1-2, Test7, Keowee KVA.....	7-3
Figure 4.7.1-3, Test7, Keowee KW.....	7-4
Figure 4.7.1-4, Test7, Keowee Frequency.....	7-5
Figure 4.7.2-1: Test7, Unit 1 MFB Voltage and Current	7-6
Figure 4.7.2-2: Test7, Unit 1 MFB KVA and KW	7-7

Figure 4.7.1-1: Test7, Keowee Voltage and Current

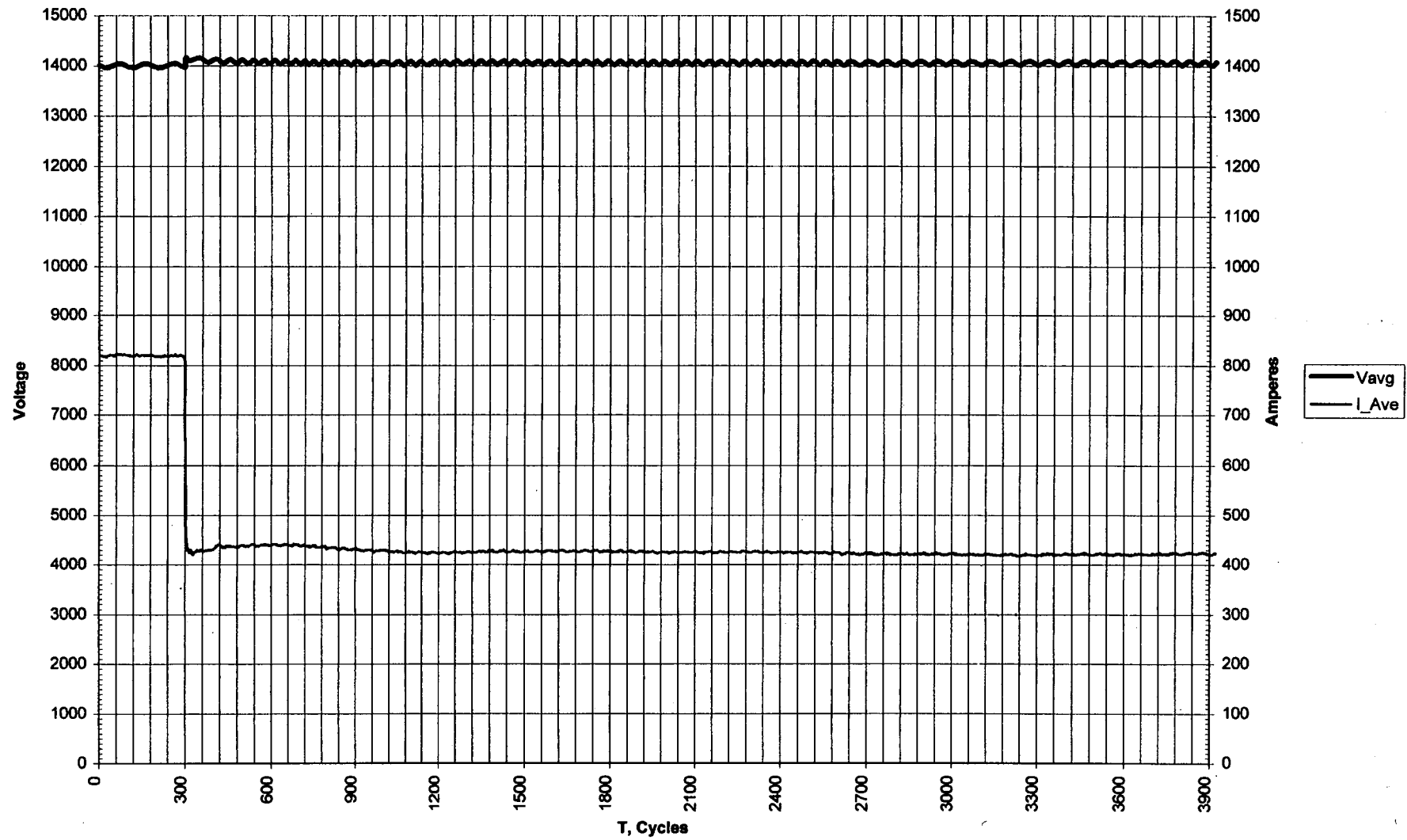


Figure 4.7.1-2, Test7, Keowee KVA

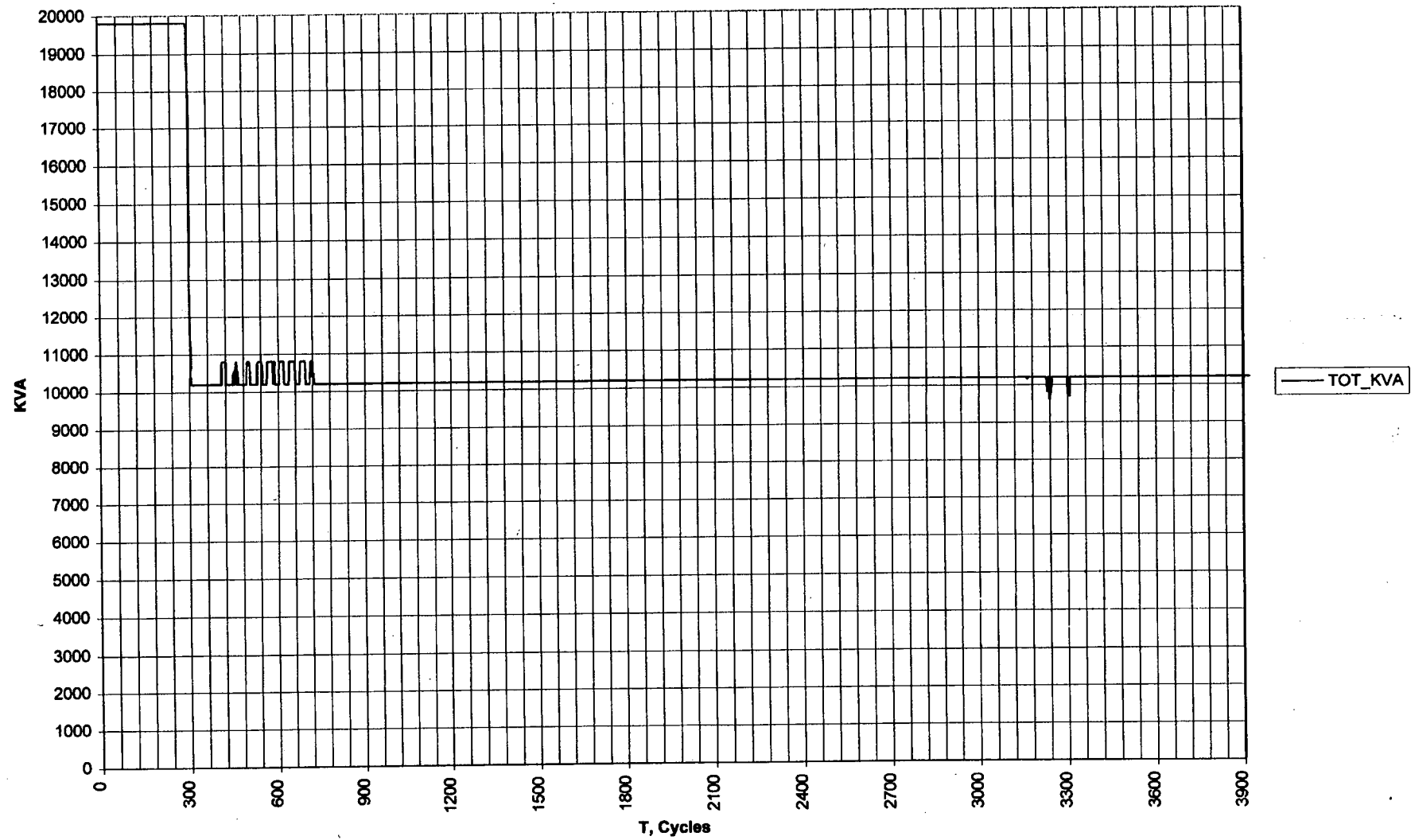


Figure 4.7.1-3, Test7, Keowee KW

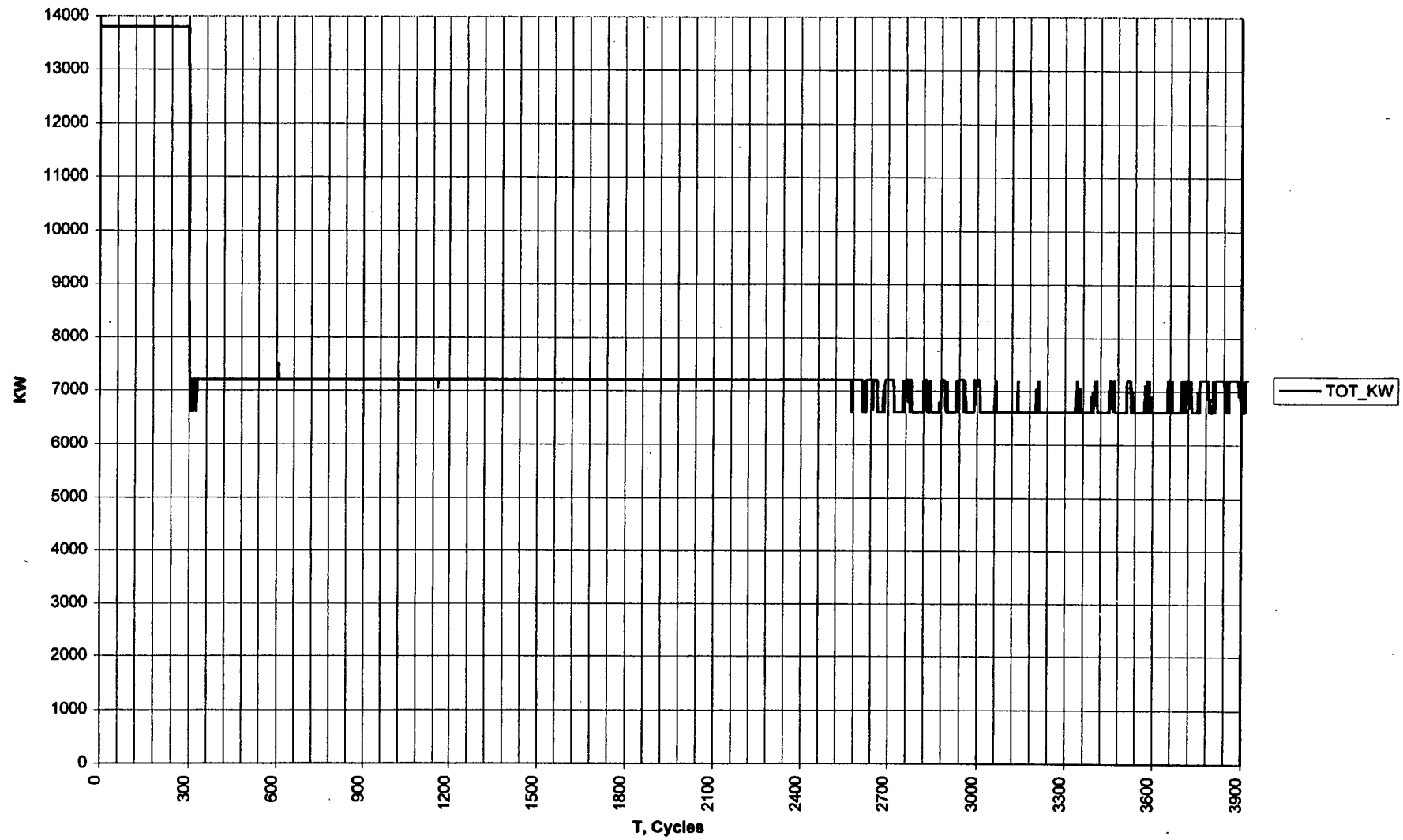


Figure 4.7.1-4, Test7, Keowee Frequency

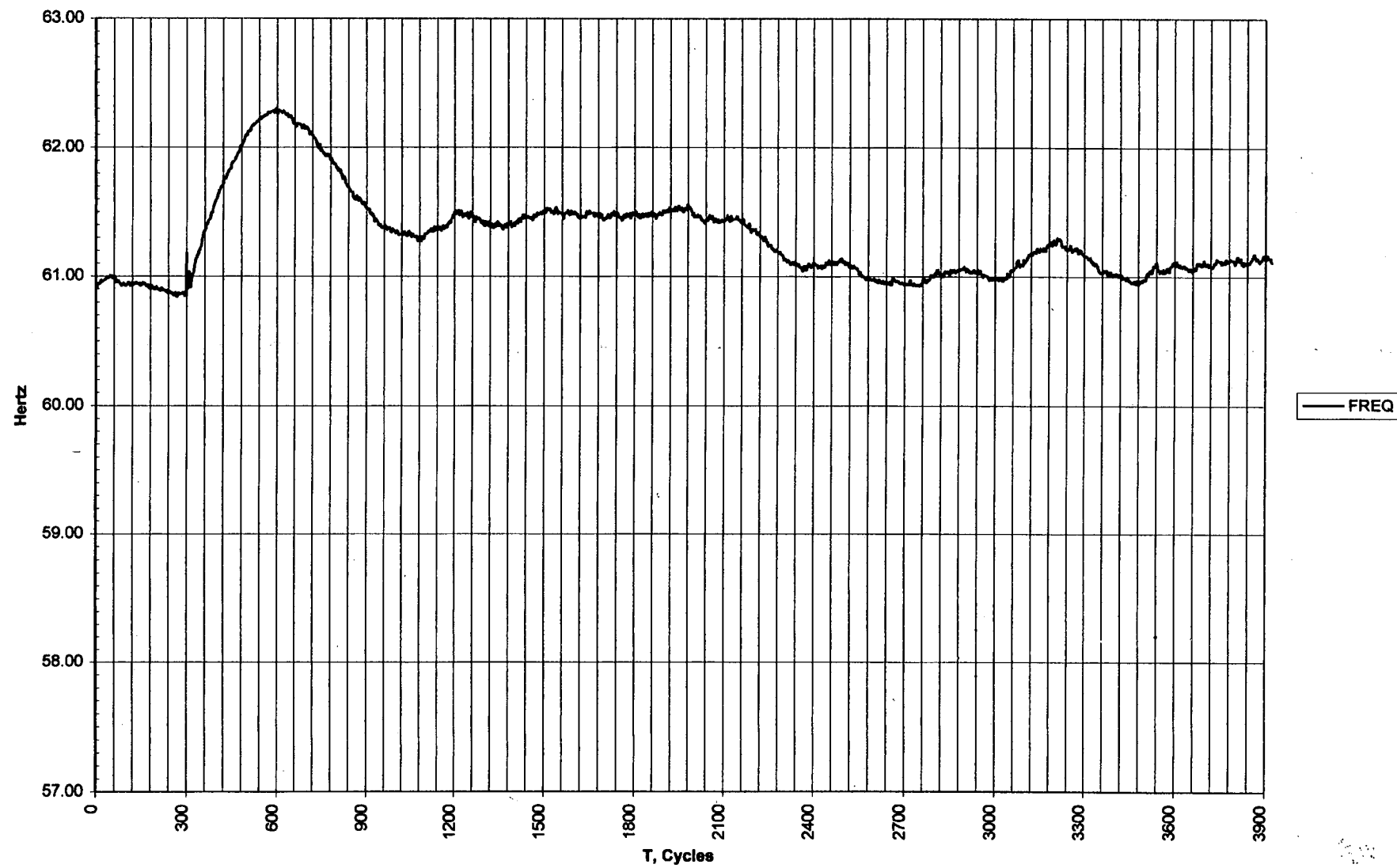


Figure 4.7.2-1: Test7, Unit 1 MFB Voltage and Current

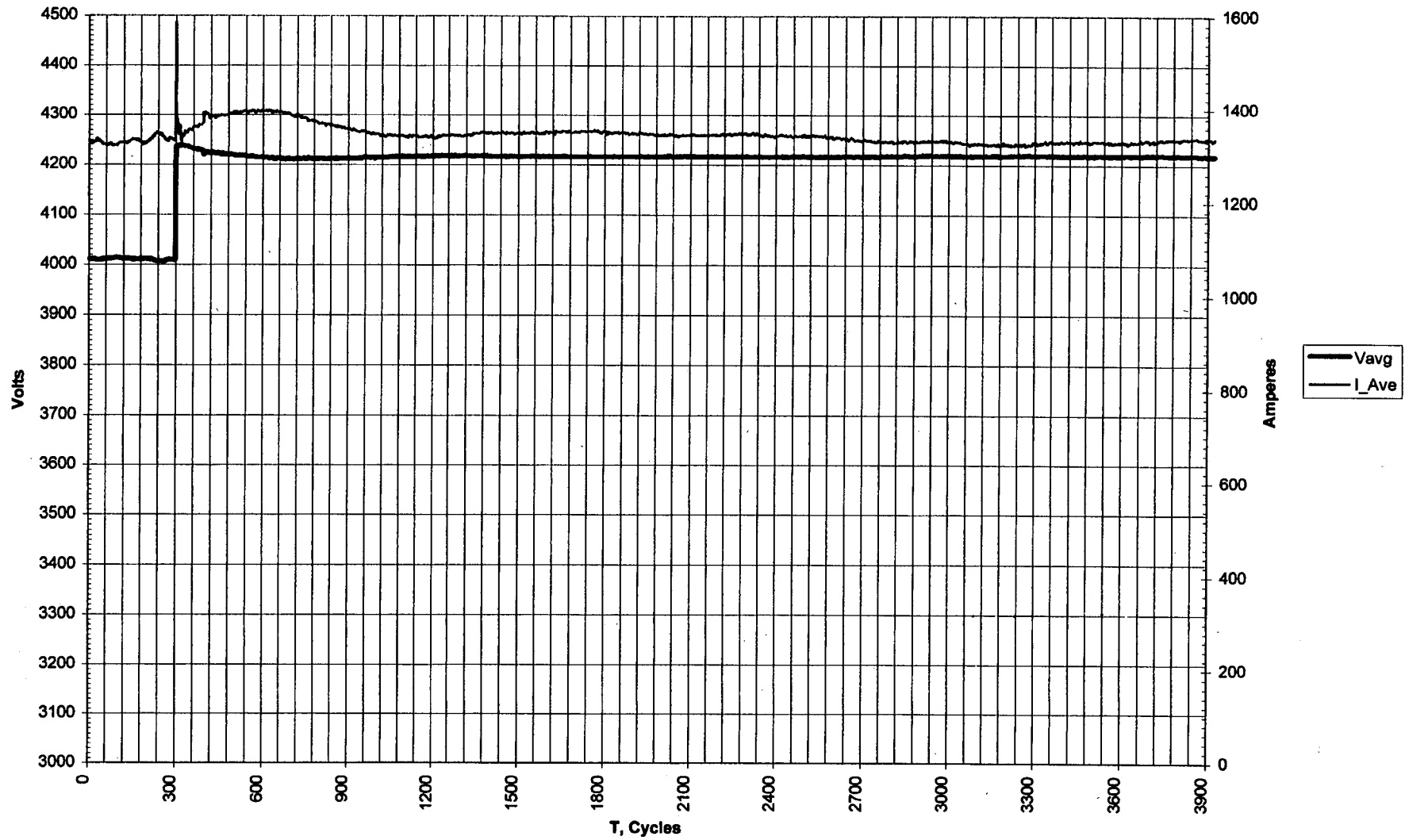
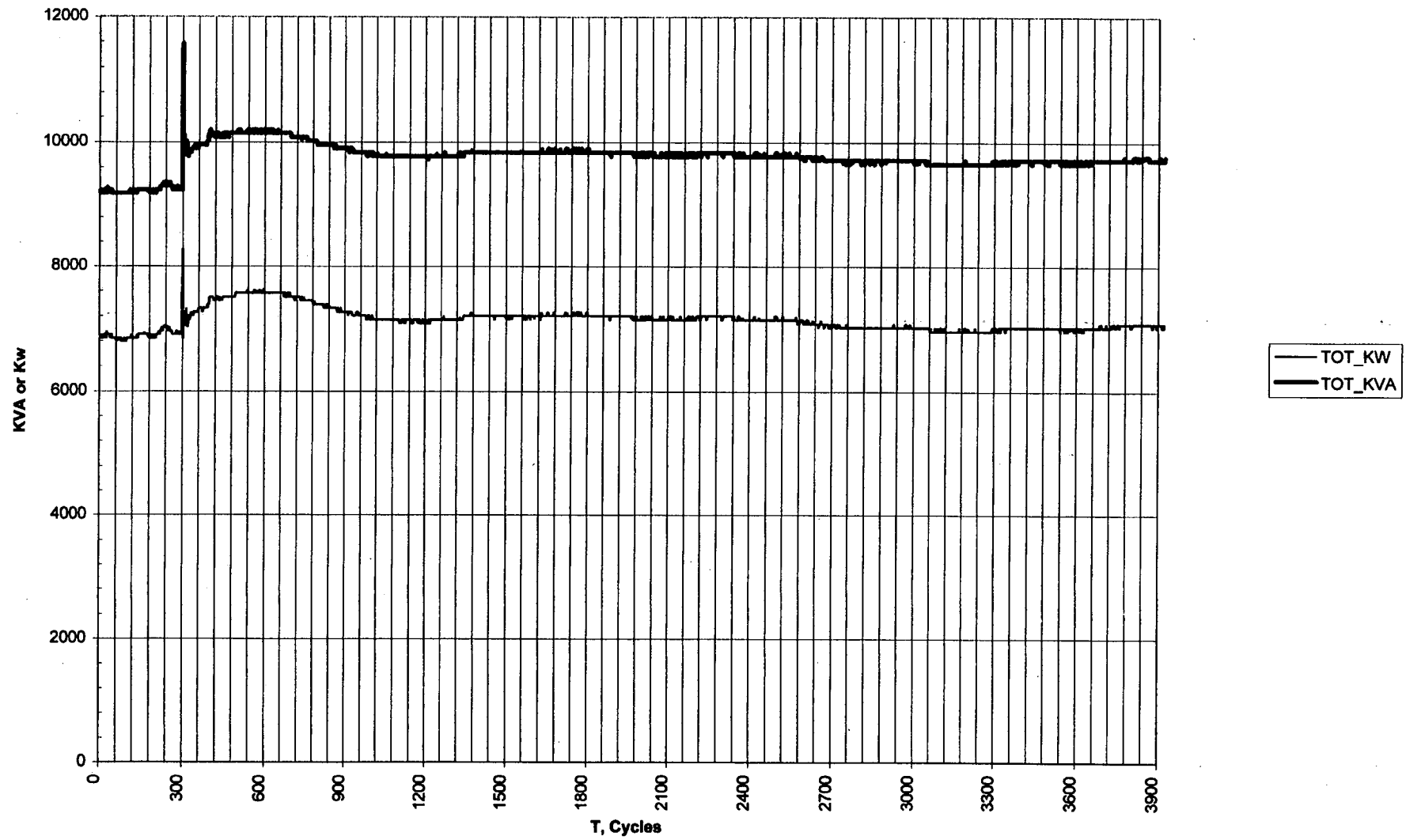


Figure 4.7.2-2: Test7, Unit 1 MFB KVA and KW



Attachment 1 - Management Oversight Briefing Package

OCONEE NUCLEAR STATION

NSD 213 INFREQUENTLY PERFORMED TESTS OR EVOLUTIONS

MANAGEMENT OVERSIGHT BRIEFING FOR

- TT/0/A/0610/025 -

EMERGENCY POWER and ENGINEERED SAFEGUARDS FUNCTIONAL TEST

Prepared by T. D. Curtis.

Approved by ONS PORC on 12/31/96 (PORC comments incorporated).

**Management Oversight Briefing
for
Emergency Power and Engineered Safeguards Functional Test**

NOTE: Except during the initial briefing, sections I - V may be summarized.

I. General Information: NSD 213 - Conduct of Infrequently Performed Tests or Evolutions

Nuclear System Directive 213 implements recommendations from INPO SOER 91-01 by requiring management oversight of certain infrequent tests and evolutions.

An activity requires increased management oversight if it is **performed infrequently**, and,

- puts the plant in an **unusual configuration**, or,
- requires **complex coordination**, or
- involves **major changes** to systems, components, or procedures, such that there is a **potential to degrade the margin of nuclear safety**.

For such activities, NSD 213 requires:

- Management Designee(s) for management oversight
- Test/Evolution Coordinator(s)
- Pre-Job Briefings to clarify management expectations and technical details
- Prior PORC review of the pre-job briefing and management oversight plans
- Special considerations for procedures, procedure validation, and training.

II. Brief Description of Testing

TT/0/A/0610/025, the Emergency Power and Engineered Safeguards Functional Test (EPESF Test), consists of six separate tests. Each test involves loss of power to multiple Oconee units. Four of the tests include concurrent ES actuations on Unit 3. In the first five tests, Keowee Unit 2 automatically restores power via the underground or overhead power path. In the last test, power is automatically restored from Lee Steam Station. The Test Coordinator's handout for Section VIII of this briefing describes these tests in more detail.

Tests will be conducted during the day shift only. Test recovery and alignment for the next test will be performed during day shift and night shift.

**Management Oversight Briefing
for
Emergency Power and Engineered Safeguards Functional Test**

III. Nuclear Safety Considerations

The EPESF Test was selected for management oversight because it triggers the NSD 213 criteria summarized in Section I. The test challenges the emergency power system for all three units in a manner not previously tested, and actuates mechanical Engineered Safeguards equipment in a manner not previously tested. The EPESF Test remains within the design basis of the plant, but the scope of the testing causes a marginal increase in the probability of a loss of power.

Because of the marginal increase in the probability of a loss of power, management designated that an Unreviewed Safety Question (USQ) existed. The NRC reviewed the planned testing as required by 10CFR50.59, and determined that the planned testing was acceptable.

The EPESF Test will be conducted with all three units shutdown, with relatively low decay heat. On Units 1 & 2, the steam generators will be available for natural circulation cooling. The Unit 3 core will be off-loaded to the SFP.

Should a sustained total loss of power occur, **there would be ample time to restore core cooling as follows:**

- To provide natural circulation cooling for Units 1&2:
 - MS atmospheric dump valves would need to be opened by about 13 hours after loss of power (LOP).
 - SSF ASW flow to the OTSGs would need to be established by about 24 hours after LOP.
 - The Unit 1&2 RCS would reach about 220°F & 130 psig, with no core boiling or PORV actuation.
- Action to provide cooling to the Unit 3 SFP by about 30 hrs after LOP would prevent the Unit 3 SFP from reaching boiling conditions.
- Action to provide cooling to the Unit 1&2 SFP by about 100 hrs after LOP would prevent the Unit 1&2 SFP from reaching boiling conditions.

**Management Oversight Briefing
for
Emergency Power and Engineered Safeguards Functional Test**

IV. Contingency Plans

For each of the six tests, should the planned power pathway fail on any unit:

- Another pathway would automatically be selected by the Main Feeder Bus Monitor Panel or the Emergency Power Switching Logic.
- TT/0/A/0610/025, Enclosure 13.12 (Contingency Actions for Power Restoration) provides verification steps and further planned actions (if needed) to restore power.

Should the above contingencies fail to restore power, in order to provide for core cooling as described in Section III above, TT/0/A/0610/025 Enclosure 13.12 would direct use of:

- AP/1,2,3/A/1700/26 (Loss of Decay Heat Removal)
- TT/0/A/0610/025 Enclosure 13.18 (Emergency Operation of SSF Systems)
- Direction from the TSC for alternate methods of cooling the SFP.

RP/0/B/1000/01 (Emergency Classification Procedure) requires that an ALERT be declared if power is lost to both main feeder buses on any unit for more than 15 minutes.

- A Site Assembly would be called.
- The TSC, OSC, and EOF would be activated.
- Actions directed from TT/0/B/0610/025 Enclosure 13.12 would continue.
- The Management Designee and Test Coordinator, as well as the mechanical system engineer and electrical system engineer in the test support organization, would report to the TSC. They would call in to their normal assembly location for accountability.
- All other members of the test support organization would respond to the Site Assembly and TSC/OSC activation. They would be re-deployed by the TSC/OSC as needed, likely in roles similar to their roles in the test support organization.

As described in Section III, time pressure should not be a factor even in the event of a prolonged loss of power. Contingency plan actions would be conducted in a deliberate, controlled manner.

**Management Oversight Briefing
for
Emergency Power and Engineered Safeguards Functional Test**

V. Management Oversight and Pre-Job Briefing Plans

A Management Designee and a backup Management Designee will be available. Only one Management Designee will be so designated at any point in time, though the backup may assist. A Test Coordinator and a backup Test Coordinator will be available. Only one Test Coordinator will be so designated, but the backup Test Coordinator will assist. The Management Designee and Test Coordinators are to cover day shift testing, but not night shift recovery and alignment. Backups are to avoid over-participation in testing or recovery actions so that they can perform their relief function when needed.

As qualifications, Management Designees and Test Coordinators must:

- be familiar with their responsibilities as stated in NSD-213 and NSD-408 (TCs only),
- be familiar with this briefing package,
- be familiar with the test procedure
- participate in operator training for the EPESF Test

Prior to each of the six tests, the Management Designee will lead the Management Oversight Pre-Job Briefing using this package. The Test Coordinator will assist in the Pre-Job Briefing, particularly in section VIII, Summary of Expected Activities. Attendance sheets will be taken for each of the Management Oversight Pre-Job Briefings, and will be retained by the Test Coordinator with other test documentation.

The Management Oversight Pre-Job Briefings will be conducted in the Technical Support Center (TSC). Additional pre-job briefings will be conducted by supervisory personnel at work locations as necessary to ensure that all test participants are briefed. Supervisory personnel performing these additional briefings must first participate in the TSC Pre-Job Briefing for each test, and must ensure that information is communicated as intended by the Management Designee. Should there be a significant delay or change of plans after the TSC Pre-Job Briefing for a test, the Management Designee will determine whether another briefing is needed before the test.

The Management Designee is required to provide continuous oversight only during final preparations for the test, during test actuation, and immediately after actuation until the plant is stabilized. The Management Designee must inform the OSM and the Test Coordinator whenever the management oversight role is suspended and resumed.

After the first test, two additional considerations will be applied for each subsequent test:

- The Management Designee, Test Coordinator, and OSM must confirm that problems encountered during previous test(s) have been addressed such that the next test may be safely conducted.
- For individuals who received the Pre-Job Briefing for previous test(s), the information in sections I - V of this package may be summarized.

**Management Oversight Briefing
for
Emergency Power and Engineered Safeguards Functional Test**

VI. Roles and Responsibilities

Operations Shift Manager*

The OSM is in charge of the plant, is responsible for plant safety, and may halt testing at any time. The OSM receives advice from the Management Designee.

Unit Shift Supervisors*

USS' are in charge of their units. They receive input from the Test Coordinator, then direct actions in accordance with TT/0/A/0610/025 through the CR SRO.

Control Room SROs*

CR SROs take direction from the USS in accordance with TT/0/A/0610/025, then coordinate Operations control room and field actions.

Control Room ROs*

CR ROs take direction from the CR SRO in accordance with TT/0/A/0610/025, manipulate controls, and assist the CR SRO in directing OPS field actions.

NLOs, Keowee operators, and OPS Test Technicians

These operators execute TT/0/A/0610/025 field actions as directed by the Control Room.

Test Coordinator

The TC manages the test support organization, and provides input to the USS as to Operations actions to be taken in the test. The TC does not directly command actions by control room personnel. The TC receives advice from the Management Designee. Other TC duties are addressed in NSD 408 and in Section V of this briefing package. The TC will halt testing if problems are encountered. The planned TC is Clark Curry, with Dave Deatherage as backup. (Other TCs may be assigned.)

Management Designee

The Management Designee ensures that management expectations are met for safe conduct of testing. He participates in the pre-job briefings for each test, and monitors the conduct of testing activities during actual testing. Based on this monitoring, he provides advice to the OSM and the TC regarding the conduct of testing. **The MD will recommend halting testing for a "time-out" if he observes that management expectations are not being met.** Section V of this briefing package provides additional details regarding the MD's functions. The planned MD is Ron Lingle, with Bob Dobson as backup. (Other qualified MDs may be assigned.)

*All licensed personnel are expected to halt testing if unsafe conditions are suspected.

Management Oversight Briefing for Emergency Power and Engineered Safeguards Functional Test

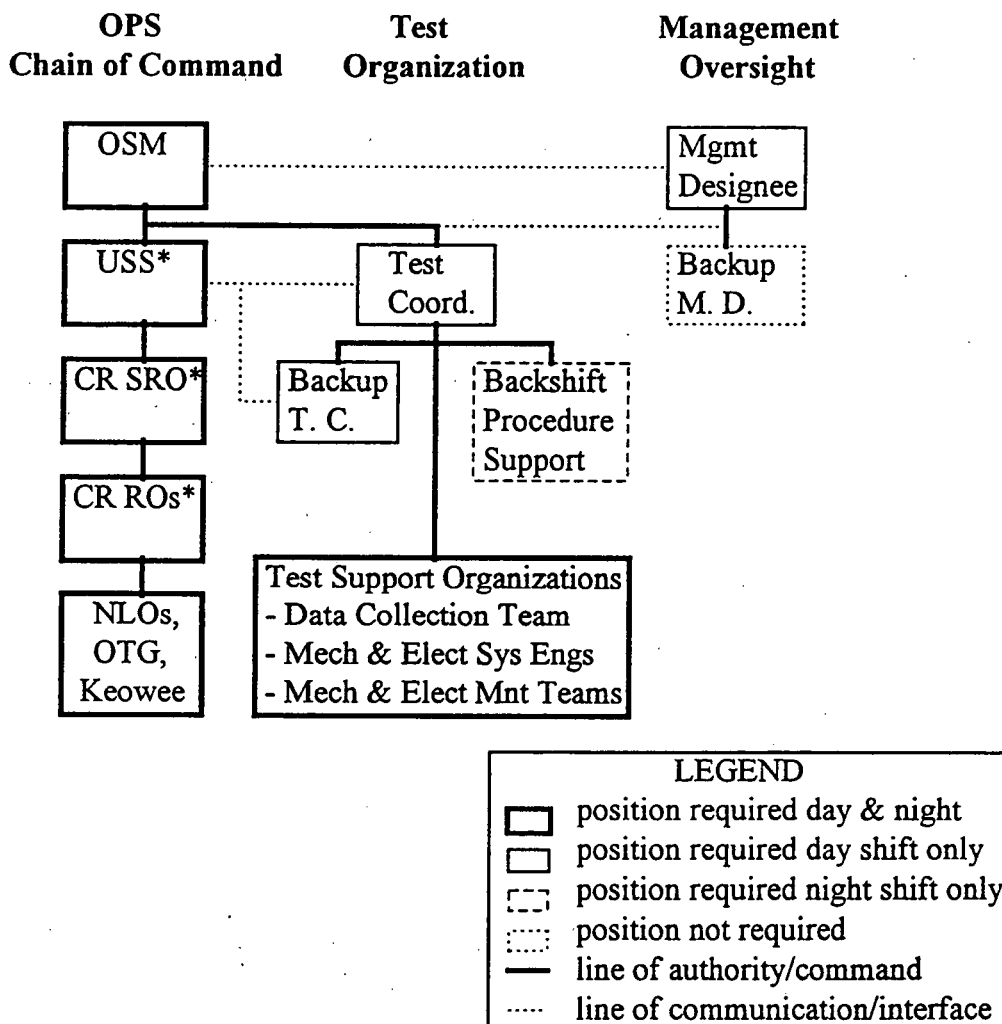
Other test support personnel

Support personnel include engineering support, maintenance support, data collection personnel, and backshift support for procedure changes. They report to the Test Coordinator, but remain under the control of the OSM.

Control Room access is controlled by Operations. No one should enter the Control Room unless a need is identified by the Test Coordinator and agreed upon by the OSM or his designee.

The chart below summarizes test support functions and their relation to the Operations chain-of-command.

KEY ROLES DURING EPESF TEST



*CR personnel are shown for only one unit; relationships shown apply to all three units.

**Management Oversight Briefing
for
Emergency Power and Engineered Safeguards Functional Test**

VII. Management Expectations for Test Participants

Individual Preparation

Ensure that you are trained, prepared, rested, and mentally fit to perform this work.

Questioning Attitude

Despite careful preparations, procedure problems or misunderstandings may exist.
Raise questions promptly to correct problems or clarify information.

Conservative Decision Making

Conduct all actions in a cautious, deliberate manner.
When questions or alternatives arise, choose a conservative approach.

Procedure Adherence

Understand the procedures, and their limits & precautions, before use.
If needed, change procedure(s) before use.
Follow procedures exactly.

Expected Response and Contingency Plans (See Section IV)

Understand the expected response of the plant and the contingency plan(s) for problems.
Recognize that time pressure should not be a factor even in a prolonged loss of power.

STAR

Use "stop, think, act, and review" for all actions.

Stop When Unsure

Bring activities to a halt, at an appropriate point, if expected results are not obtained.

Roles and Responsibilities (See Section VI)

Understand your individual role.
Understand and support the roles of others.

Communication Standards

Clarify details (phone #s; names, count-down methods, etc.) during pre-job briefings.
Use **three-way communications** when directing/receiving action instructions.
Use **unit designators and the phonetic alphabet** for unit and train.

Personnel Safety

Understand required personal protective equipment and use it.
Perform Level 1 Safety Assessments prior to going to the field.
Do not allow unnecessary personnel at transformers, switchgear, or load centers during actuations.

**Management Oversight Briefing
for
Emergency Power and Engineered Safeguards Functional Test**

VIII. Summary of Expected Activities (by Test Coordinator)

(See separate handout provided by Test Coordinator.)

For the test about to be conducted, the Test Coordinator will review:

- Applicable Limits & Precautions from TT/0/A/0610/025
- The test method
- Key technical points
- Practical effects of temporary power losses planned during the test, such as
 - lighting - have flashlights
 - loss of EDC & whole body friskers:
 - login on EDC **prior to the test** if RCA entry is planned
 - when entering/exiting the RCA, use dose cards if EDC is down; use the hand held frisker if the whole-body frisker is not available; pocket dosimeters will be provided if needed.
 - other

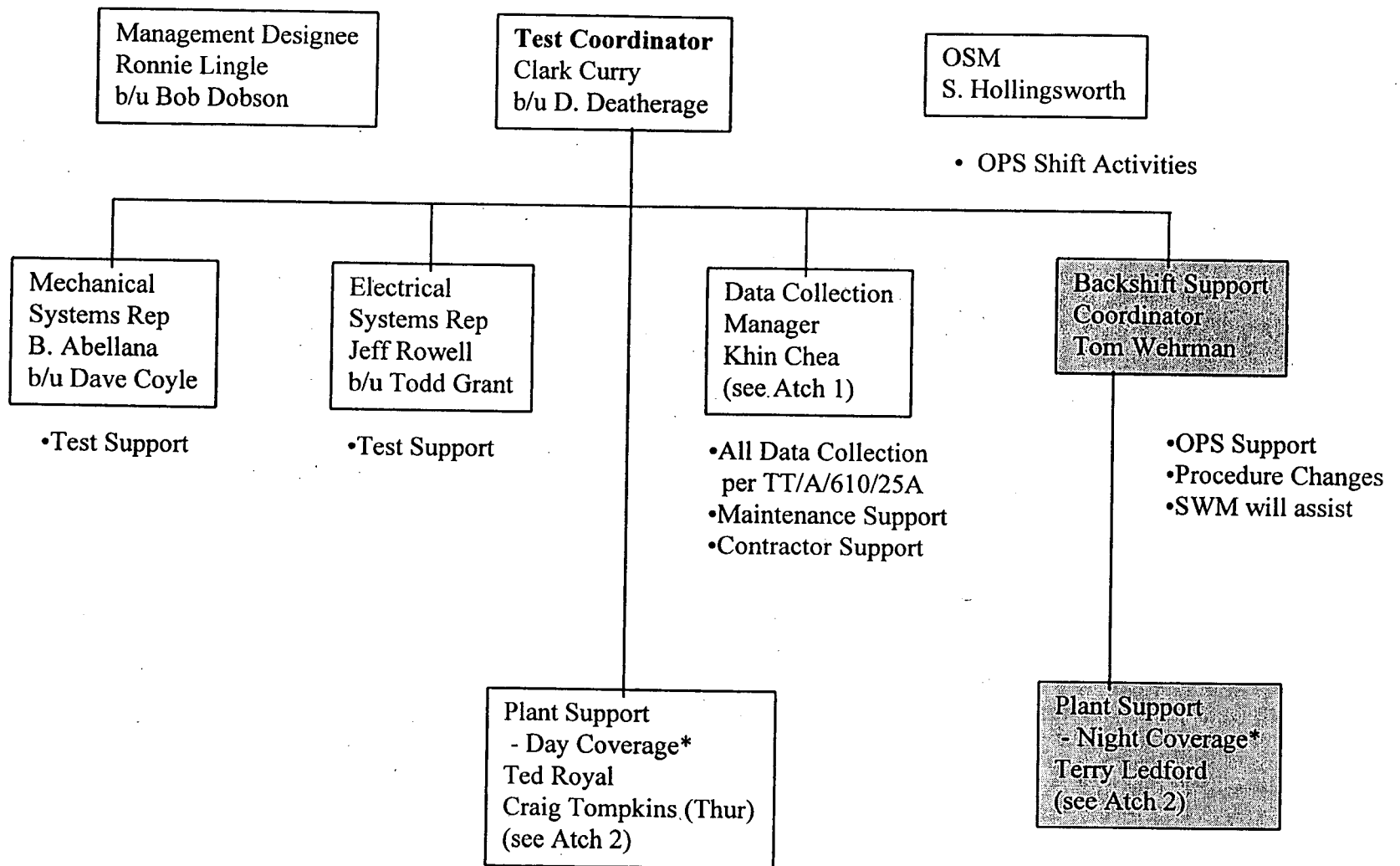
IX. Wrap Up (by Management Designee)

Now is the time that it is your job to ask questions and voice any concerns.

- Is everyone clear on what we are doing and their individual roles?
- Does everyone understand that nuclear safety and personnel safety are the top priorities?
- Does everyone understand the management expectations we've reviewed, such as procedure use and adherence, STAR, questioning attitude, conservative decision making, stop when unsure, communication standards, and personnel safety?
- Does everyone understand actions to take should something go wrong (halting testing; contingency plans; etc.)?

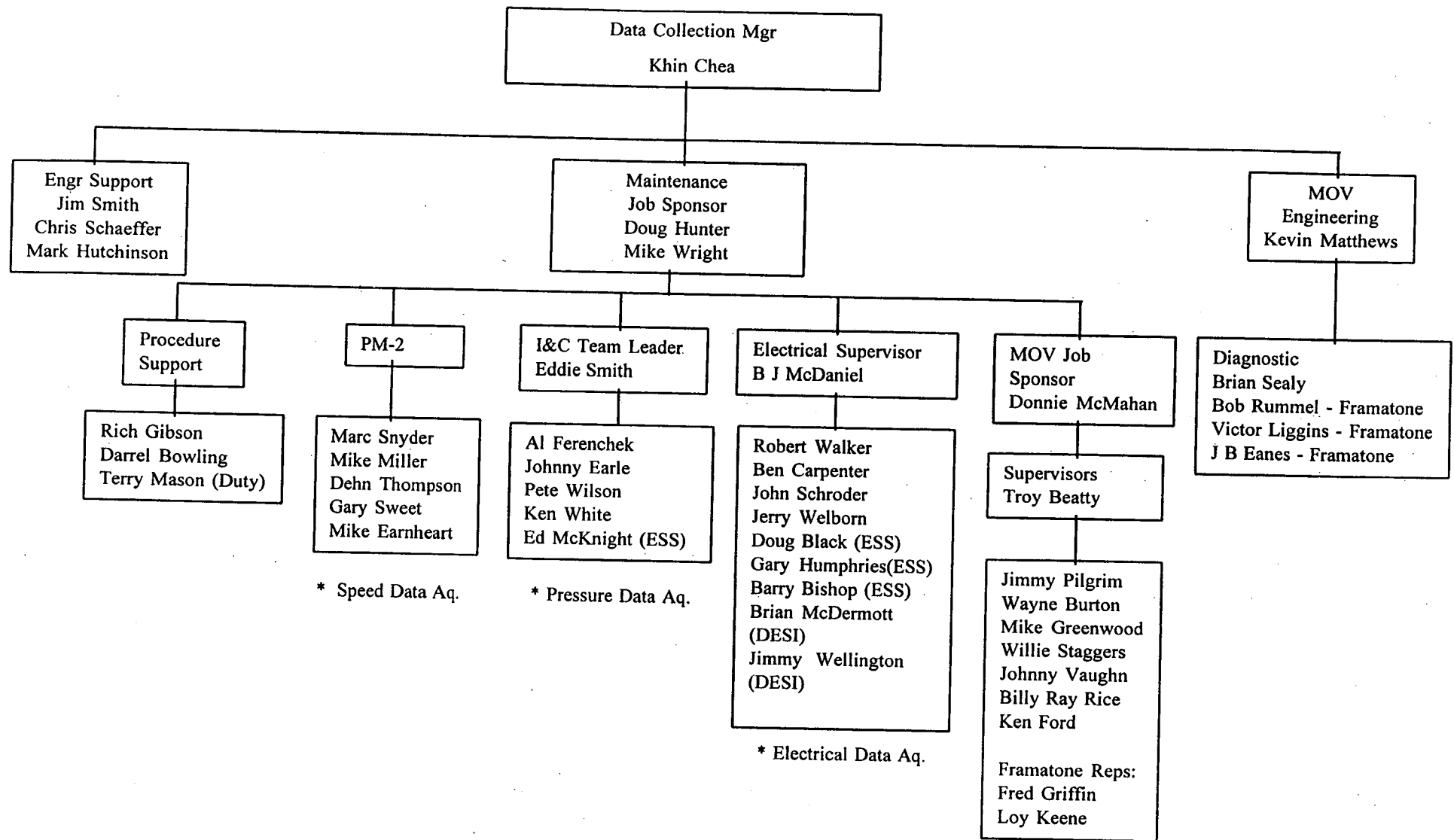
Attachment 2 - Personnel Support Organization Chart

EMERGENCY POWER AND ES FUNCTIONAL TEST



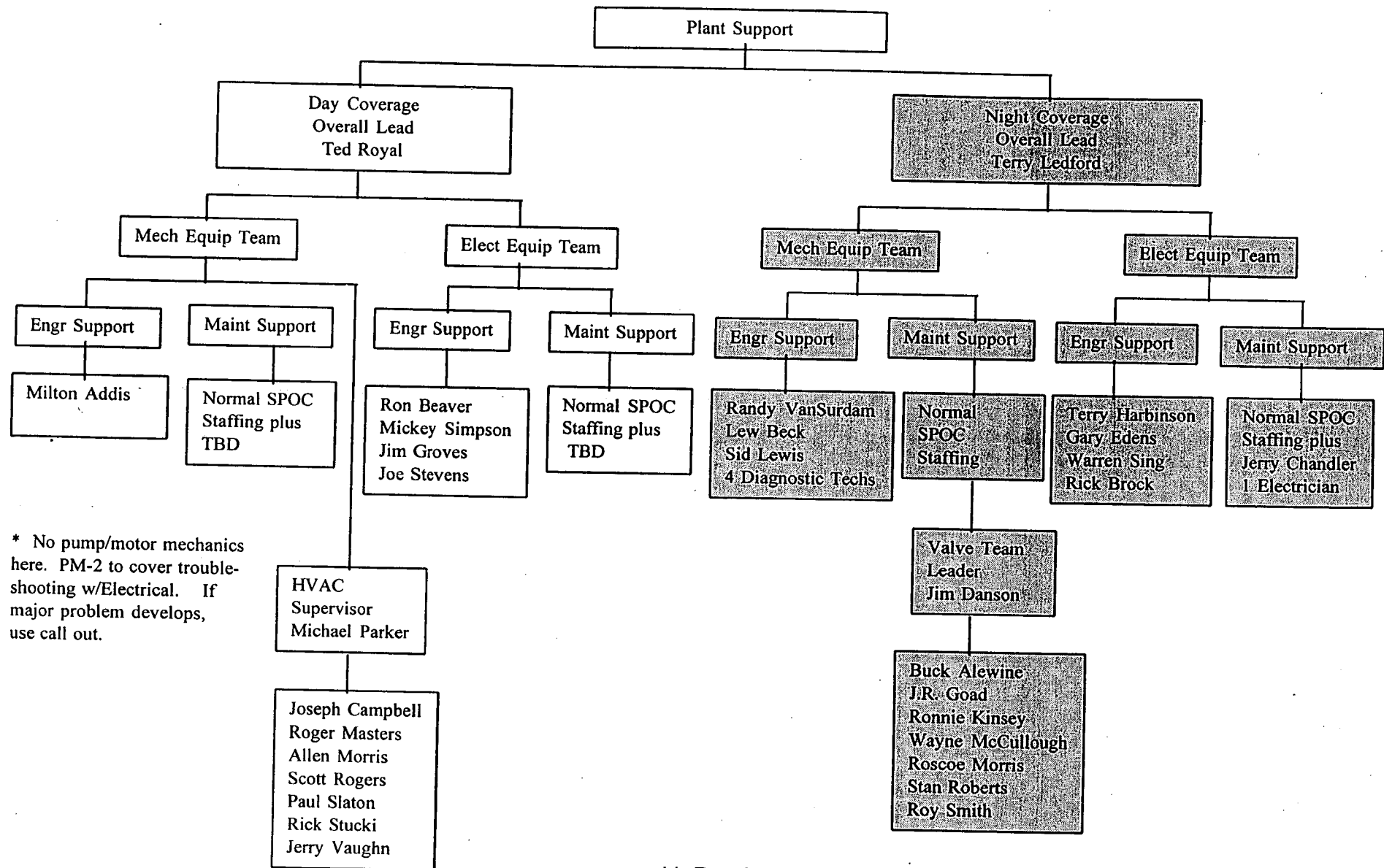
* Plant Support to provide coverage for Engineering and Maintenance to include MOVs, Pumps/Motors, Relays/Breakers, Instrumentation, Engineered Safeguards, and SPOC

EMERGENCY POWER AND ES FUNCTIONAL TEST ATTACHMENT 1



* Calibration Lab is on call to provide rapid turnaround on equipment if test equipment problems arise.

EMERGENCY POWER AND ES FUNCTIONAL TEST ATTACHMENT 2



**** Day Shift Coverage is from 7AM to 7PM plus turnover
Night Shift Coverage if from 7PM to 7AM plus turnover
Test Coordinator to have release authority**

12/31/96
REV. 2

Attachment 3 - Test Log Record Sheets

1-2-97 0900 Started pre-job briefing
 ≈1000 Completed pre-job briefing, personnel dispatched to assigned areas to begin EP&ESFT.
 1106 All personnel and equipment in place, commencing with EP&ESFT.
 1123 Received call in Control Room concerning backhoe digging at the inlet around vent valves for "C" and "D" CCWPs. Unit 2 Supervisor has called the WWM to stop work and will investigate.
 1143 Stopped procedure at step 12.1.8.4 until a resolution can be made concerning the CCW vent valves.
 1205 Test Coordinator has directed test personnel to standdown until scaffolds are built around 1CCW-26 & 28 & 2CCW-26 & 28. Called HVAC to start the "B" Chiller.
 1310 Held pre-job briefing for the restart of the EP&ESFT. Dispatched personnel to assigned areas. Scaffolding has been built around 1CCW-26 & 28 & 2CCW-26 & 28.
 1340 Dispatched HVAC personnel to verify "A" Chiller shutdown and to shutdown the "B" Chiller. Initialed step 12.1.3 for verify of Chillers shutdown. Verified communications between all test players per 12.1.4.
 1346 Received communications that Keowee computer is out of service. Investigation and restart in progress. (Source - Unit 1 computer alarm).
 1348 Received word that all scaffold work has been completed at the intake.
 1349 Keowee computer returned to service. No problems with computer.
 1407 Steps 12.1.3 through 12.1.8.3 status reverified.
 1407 Commenced with procedure at step 12.1.8.4.
 1439 PCBs 17, 26 and 28 opened (Step 12.1.8.16).
 1448 PCBs 18, 27 and 30 opened Keowee Emergency Start Channel "B" initiated. Experienced LOOP as expected. PCBs 17, 26, 28, 18, 27 and 30 closed.
 1454* Approximately 32 seconds power returned. Approximately one minute and 20 seconds for X4 and X7 to trip and reclose. (Unofficial times).
 1454* Momentarily lost communication with Keowee via bridge network.
 1454* 3A CC pump tripped and did not restart. No lights
 1500* Step 12.1.14 N/Aed by Test Coordinator. No additional loads required.
 1502* 2A RBCU tripped and did not restart. Switch lights indicate "OFF". Investigation in progress.
 *results of LOOP @ 1448
 1523 Completed Dead Bus Transfer on Unit 1.
 1529 Completed Dead Bus Transfer on Unit 2.
 1539 Completed Dead Bus Transfer on Unit 3.
 1544 Unit 2 EBOP resistors did not trip out. Investigation in progress.
 1545 2SA-4, A-1, 2X1 Power Failure statalarm did not clear when 2X1 was energized. 2X1 transformer indicates 600V (Normal). Investigation in progress concerning statalarm.
 1610 AHU 3-10 tripped during test. Investigation in progress.
 1650 Post job briefing Test 12.1.

Data Acquisition

All criteria was met for test # 1.

All data has been reviewed, yet.

Need to review hydraulic data for Unit 1 and 2.

Test Acceptance

*Met with the exception of 3A CC Pump. Engineering will take the lead in the investigation and SPOC will assist (R005).

*-Item to be completed prior to starting Test #2.

Lessons Learned

*Main Transformer cooling fans loss of power (Jim Stoner has the lead). All Units.
 Site Assembly Alarm initiated. (Jeff Rowell has the lead)
 Units 1, 2 and 3 CS-64 closed (BWST outlet) when power was lost. (Procedure change).
 Unit 1, 2 and 3 had to restart IPB Fans (procedure change)
 *KRA swapped from XO to XP. (procedure change) (Test # 5).
 BAMT Mix Tank Agitator restart (procedure change).
 *Unit 1, 2 and 3 MTEBOP needs to be placed in "OFF". (Unit 2 MTEBOP resistor problems) (R005).
 *2A RBCU Breaker thermal overload during restart. (Engineering).
 *2X1 statalarm did not reset. (R005)
 *LPM alarm on CF line B1 (Beau Abellano).
 BA purifier breaker tripped on both Unit 3 compressors (R005)
 *Perform Dead Bus Transfer on Unit 2 first. (procedure change)
 *Notified OPS Perf. prior to starting CWWPs
 Inform observers that MDEFDWPs and LPSWPs will be starting and stopping
 Measured net head for KHU (forbay and tailrace) for Test # 2 (12.4, 12.2, 12.5)
 Need to debrief with Keowee.
 DAS Recorder lost power during test
 Pre-job @ 0900, 1-3-97.
 Low voltage on KOAC (F Baldwin) (not a problem)
 TDEFDWP EBOP needs to be secured after start. (Locked out could not start)
 *Investigate noise during starting of the 3HPIP (R005).
 Announce that test is complete for the day.

*-Items to be completed prior to starting Test #2.

1-3-97 0600 Attached sheet titled Integrated ES Test Issues Resolution 1-2-97 - 1-3-97 documents actions taken as a results of testing performed 1-2-97. This attachment is Attachment #1.
 0730 The summary of procedure changes added as Attachment # 2 to the test log.
 1040 0915 Pre-job briefing was held with a review of previous test 12.1 and problem incurred. Procedure changes and equipment problem resolutions identified with corrections. Additional items identified: 2C RBCU dampers in mid position (R005), 3B HPIP PM2 will monitor during start and 2C CCW-28 scaffolding has to be rebuilt.
 1120 Commenced Test # 12.2.
 ~1305 3B HPIP was started without any problems. No unusual noises were heard.
 ~1316 2A RBCU tripped (2A RBCU tripped, then restarted in LOW, then shifted HIGH, then approximately 5 seconds tripped).
 1342 1C LPIP motor 50G relay activated. Investigation in progress. (Instantaneous over current)
 1440 Received information that the "C" Worthington Air Compressor started followed by the "B", then the "A", then all three shutdown. No IA alarms were received in the Control Room.
 1545 Post job briefing Test 12.2
 Data Acquisition
 All criteria was met for Test #2.
 Countdown method work better today.

Test Acceptance
 All criteria met.

Lessons Learned

2A RBCU tripped after restart in HIGH. T Royale will follow-up on this condition.

Investigation in progress.

IPB Fans dampers on "A" fans did not reposition. (R005)

Worthington Air Compressors started without a low pressure condition, then shutdown (R005)

Loss of SC Margin on loop "1B" alarm, then cleared (R005), also on Unit 2 (R005).

*1C LPI received a 50G relay light on the switchgear (R005)

PCB-15 statalarm reflashed, then extinguished (R005)

BT2-13 panel door was difficult to close (MFB-2, "E" BKR) (R005)

MT EBOP on Unit 2 resistors did not heatup, but did trip off as it should (R005 follow-up)

KOAC Inverter (PIP) concerning all units.

CWWP starts while on Keowee caused several alarms in the Control Room. (T. Royale)

3Z transformer alarms concerning flow switches (R005)

Unit 3 Moore Controller de-energized during Loss of Power; however, other controllers did not de-energize. Re-energized by the a normal state. (Auto @ setpoint) (PIP)

3B HPIP with discharge valve shut - no noise received during start. (Beau Abellano)

Unit 3 during LOOP statalarms flashed with no audible (Units 1 and 2's statalarms flashed and audible) (R005)

Announcement on PA were not heard at Keowee. Need to inform Keowee concerning items that are announced over page system.

Inform Keowee when securing bridge phone line.

Enclosure 13.10 - MTEBOP system was left "ON" enclosure did not shutdown EBOP (Unit 1 & 2) Procedure change - restore oil system to normal.

*Unit 3 KOAC Inverter fuse blown (power fuse) (R005) (Sync back across PCB-8) (T. Royale)

Enclosures 13.9 and 13.10 - change procedure to not prestage the Keowee DC oil pumps prior to Keowee start.

*-Items to be completed prior to starting Test #3.

- 1-4-97 0800 Pre-job briefing held to review previous test 12.2 problems and resolutions. Also, to brief upcoming test 12.3:
 - 1C LPI relay was replaced (50G)
 - Unit 3 KOAC Inverter fuse replaced. Investigation to continue.
 - Worthington Air Compressors start was not a problem.
 - Attachment has been updated and will continue to be throughout the test as problems and resolutions occur.
- 0900 During test 12.2 when completing enclosure 13.19, ERO90 did not print out on the events recorder. Point ERO38 (Keowee Unit 2 Emerg Start Channel B). This time provide the desired information. Todd Grant reviewed this and identified that for this test we should have used point ERO038 because the Swyd Isolation was initiated by actuating channel 2 of the SYD isolation circuit which actuates Unit 2 Emerg start Channel B
- ~0900 Test 12.3 started.
- 1025 1C RBCU did not restart after loss of power
 - 1X7 would not repower after loss of power
 - Clear Com Main Station loss power (related to 1X7)
 - Wireless Intercom system loss power (related to 1X7)
 - 3PR-2 through 5 lost "AUTO" indications
 - 3A RBCU damper stayed on after shutdown of fan.

1025 Procedure changes - add to 13.9 to start A, B & C SFP also place :Load Shed & STBY BKR 2" in manual in 12.4 also restart BWST Recirc Pump in 13.9.

1200 Test 12.3 Post -job briefing

Data Acquisition

All criteria was met for 12.3

Test Acceptance

All criteria met with a review of 1X7 repower and 1C RBCU trip.

Lessons Learned

1X7 procedure change

*1C RBCU restart problem (T Royale) (R005)

No Lo Range C/D indication (1X7)

*3PR-2 thru 5 lost their "AUTO" lights (All air-operated valves) Operations will reset all ES Channels, except Ch 2 (R005)

3A RBCU discharge damper initially would not close (to be observed during test 12.4)

*1C LPI 50 G actuated (BJ R005) (to be monitored during next test)

IRIA-44 alarms - cleared when GWD Compressor were started. (R005)

Lost of power alarms at the SSF (Need to be reset)

Computer alarm AMSAC alarm - cleared when 1X7 was repowered. (lost of AC swap to DC)

SF Cooling pumps restart and BWST recirc pump restarted (procedure change)

No problems at Keowee

Wireless phones lost power - related to 1X7. Power regained when 1X7 repowered.

No overload conditions on valves or pumps

Pre-job briefing for test 12.4 @ 1430 hours.

*-Items to be completed prior to starting Test #4.

1-4-97 1430 Commenced pre-job briefing for test 12.4. Resolution of previous identified problems will be covered in the continuing Attachment #1

1530 Commencing with test 12.4

1640 1C RBCU restarted in LOW, shift to HIGH, then tripped.

1640 1C LPI 50G tripped at the same time Unit 1's MFB was reset.

1745 Post job briefing for test 12.4

Data Acquisition

All Criteria met for Test # 4

Test Acceptance

All criteria met

Lessons Learned

1C RBCU tripped (R005)

3PR-2 thru 5 "AUTO" lights went out (R005)

Procedure sequence problem is reset of ES ditigals

1C LPI 50G tripped soon after resetting Load Shed (R005)

"A" LOOP SCM on OAC indicated saturation then cleared (R005)

3A RBCU dampers operated OK (R005)

No problems at Keowee

Pre-job briefing for test #5 @ 0800, 1-5-97

- 1-5-97 0715 Documentation of performance of test 12.3 concerning TAC. The failure of 1X7 to repower does not impact the TAC because this is a load shed load center with a time delay to auto repower after 60 seconds. At 60 seconds, voltage and frequency are at normal steady state values and the addition of this load has no impact on the operation of ES/nonES loads or the emergency power generator.
- 1-5-97 0715 The failure of 1C RBCU to continue to run during tests 12.3 and 12.4 does not impact the TAC. The 1C RBCU did actually start and run for a short term so the starting current was actually applied to the Main Feeder Bus. After running for a short time the thermals actuated which is not unusual for this testing configuration.
- 0800 Pre-job briefing held for test #5. Problems and resolutions covered in Attachment # 1 for test # 4.
1C LPI 50G relay light "ON". se attachment (not a problem)
1C RBCU restart/trip - reset timers - see attachment
3PR-2 thru 5 "AUTO" lights - need further investigation
3A RBCU damper position - will be monitored
- 0845 Commence setup for test #5
- 0907 Decision to wait until Test # 6 to run 1C RBCU. During Test # 5 1C RBCU will remained tagged for instrumentation hook-up. 1A & 1B RBCU will be ran for test # 5.
- 1042 2A RBCU tripped ~12-16 sec after shifting to HIGH speed.
1B RBCU tripped
3RC-7 did not get a closed indication (closed on initial setup)
1C LPI 50 G relay light "ON"
Unit 3 Analog Channel tripped on RB High Pressure (~1#)
- ~1125 2A, 2B & 2C CCWPs running for load rejection of Keowee Test. 1C CCWP running on Unit 1; also 1A & 1B CCWP running
- 1146 Completed Dead Bus Transfer on Unit 2. Keowee # 2 Freq. increased ~1Hz. Remained steady thereafter.
- 1300 Post job briefing for Test # 5
- Data Acquisition
All Criteria met for test # 5 (3 HPI rpm data was low but acceptable)
- Test Acceptance
All criteria met
- Lessons Learned
Loop B SCM alarm (R005)
"B" RCW tripped prior to test (R005)
1B RBCU tripped for going to HIGH (R005)
1C LPI 50G relay (R005)
Inverter trouble alarms (out of Sync). 1KOAC did not after Unit 2 Dead Bus Transfer. 1RIA-44 alarmed (ALERT) and Unit 2 2RIA-44 alarmed after auto power transfer; but not after Dead Bus Transfer. (Engineering to review)
Received Fire Alarm each time power is lost Slot 2 board type LJ. Need to investigate (PIP)
Inverter statalarms while starting CCWPs while power from CT-4 (PIP)
Out of Sync and out of frequency on KSF 1 and 2 alarms while on CT-4
Nuisance noise from light ballast while on CT-4 noise stopped after swap to CT-2 (DC relay for emergency lighting?) (R005)

Lessons Learned (cont'd)

Received AMSAC DSS trouble alarm that would not clear on Unit 2 (R005)

2A RBCU tripped after shifting to "HIGH" (R005)

LPM alarms after regaining power

1X4 control switch position to breaker (PIP)

Workers walking through barriers around test areas

*3PR-2 and 3 no auto lights, 3PR-4 and 5 received lights

After Dead Bus Transfer 3 DIC trouble alarm

*ES "A" analog, RB pressure trip "A"-3.5#, "B"-0#, "C"-0# (R005)

3CB Battery trouble when 2 CCWP started, negative ground, then cleared.

No Keowee problems

Instrumentation has been disconnected from Keowee and should be ready to perform

Test # 6 by 1600 hours

Pre-job briefing for test # 6 @ 1445.

*-Items to be completed prior to starting Test #6.

1445 Pre-job briefing for test # 6. Reviewed problems and resolutions for test # 5. Decision made to continue with test # 6.

1520 Commencing Test # 12.6

~1556 2A RBCU tripped after swapping to HIGH

3X5 and 3X6 600V Load Centers tripped when placed STBY BKR to manual.

3A Channel RB pressure tripped @ 3.5#

1815 Post job briefing for Test # 6

Data Acquisition

All Criteria met for test # 6

Test Acceptance

All criteria met

Lessons Learned

3PR-2 and 3 no auto light

3A ES Channel tripped on RB pressure 3.5 #

3X5 and 3X6 tripped and reclosed (procedure problem)

1RIA-37 and 38 lost and 1RIA-31 (R005)

1C RBCU tripped thermal (R005)

1C LPI 50G tripped (R005)

RB pressure high statalarm (R005) (Unit 2)

2A RBCU tripped thermal (R005)

Loop 2A SCM statalarm (R005)

3RIA-44 ALERT alarm trending down (R005)

- 1-6-97 1100 Disposition of deficiency on Test 12.1 were the 3A CC pump failed to start. Based on the cause of the 3A CC pump failure to start, the test results of test 12.1 are satisfactory because: 1) The cause of the 3A CC pump failure was the control power fuse blew because the one installed was the incorrect size (to low amperage). The failure to start was not related to the power supplied from the emergency power system. The fuse was replaced by WO PIP 97-0040 is in progress to determine additional action. and 2) The 3A CC pump is 50HP which is a relatively low load and does not impact the test results. Test 12.1 includes running 1A or 1B and 2A or 2B LPI pumps which are additional loads powered which are not "hot shutdown" loads. These 2 pumps provide an additional load of 660HP and also increase significantly the total starting current applied when the main feeder buses are re-energized. This additional starting current more than offsets the missing 3A CC pump current.
- 1200 The failure during the tests where RBCUs trip off after starting does not impact the TAC in any test. The failures are such that the RBCU start and run for a short time and then stop when the thermals "POP". Therefore, the starting current is always applied when the main feeder buses are energized. For LOOP units the RBCU failures only occurred on Unit 1 and 2 when restart in "HIGH". The starting current is the important aspect to properly test the emergency power system response. Prior to the test, it was known that RBUs on LOOP units may trip on "HIGH" speed, but the decision was made to allow them to attempt to run so that the starting current will be applied.
- 1200 Replaced Attachment #2 with latest info on test discrepancies.

Attachment 4 - Oconee Emergency Power System
Single Line Diagram