Electrical Equipment Company

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Major Steel

Motor Analysis Report

Uninstalled F1 Hot Mill Stator
Siemens 10,000 HP Motor

Testing and Analysis Conducted 7/26/2012

Mike Rathbun

Reliability Program Manger

The following analysis is provided on the 10,000 HP Siemens stator removed from service as Hot Mill F1 Motor. Stator was presented with stator core damage due to contact with failed rotor bar, post recent refurbishment.

Stator testing conducted in accordance with Specification Rev. 1; Dated 6/30/09

Test data collected with respect to the designed open delta configuration of the stator. Data concludes that the damage to stator core has had no impact on winding insulation and condition at this time, please be aware that the stator core damage will result in localized overheating of the windings and insulation system and an increase of core losses that will adversely affect the performance and efficiency of the motor.

NOTE: Adverse insulation resistance (megger) and polarization index (PI) readings are due to storage of stator in a high humidity environment, (89%) at time of stator testing.

All though rotor bar/amortisseur winding failures are not common, these types of failures will typically result in significant repair requirements, if not catastrophic failure requiring replacement of the motor.

Motor testing technologies utilizing dynamic (online) current analysis provide exceptional predictive analysis of this condition. I would recommend a program of scheduled online data capture & analysis employed on all process critical or high value capital electrical apparatus on a semiannual basis to detect this condition prior to excessive motor damage similar to this situation.

The following detailed test data is provided for your review.

Please contact me if you have any questions or in need of any additional consulting and service.

Mike Rathbun
IMS Reliability Program Manager
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Nameplate Information		Motor ID: Uninstalled Hot Mill F1 Motor	
Location		Building	**Hot Mill**
Volts-Rating	**953**	Manufacturer	**Siemens**
Amps-Rating	**2775**	HP/KW	**10000**
RPM	**460**		

Results Summary F1 Stator (A Phase)		Test Date/Time 7/26/2012 11:29:53 AM	
Test ID:	**Special**	Repair/Job #	
Tested By	**Mike Rathbun**	Tested For	
Location	**CUSTOMER City**	Building	**Hot Mill**
Temp Status	**Tested**	**Step-Voltage**	**PASS**
Temp	**39.0 C**	Volts (V)	**2800**
Megohm Status	**PASS**	I(µA)	**44.00**
Volts (V)	**510**	Resist (Mohm)	**64**
I(µA)	**8.60**	**Surge Status**	**PASS**
Resist (Mohm) Temp Corrected To 40.C	**59**		
		Peak Volt(V) L1	**2900**
PI Status	**MIN PI**	Peak Volt(V) L2	**2900**
Volts (V)	**510**	Peak Volt(V) L3	**0**
DA Ratio	**0.9**	Max P-P EAR(%)	**3.1/3.1/--**
PI Ratio	**1.1**		

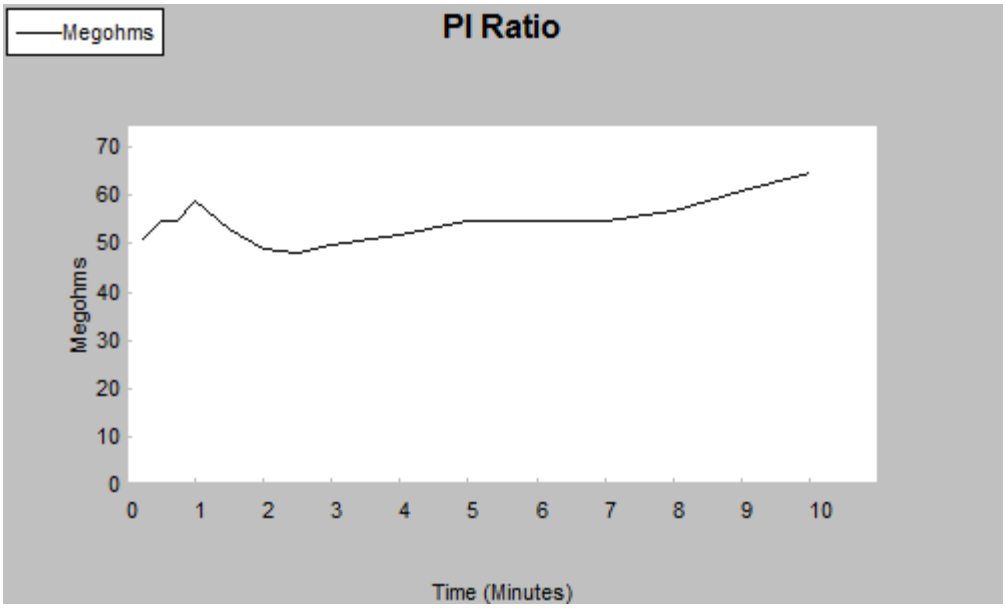
Results Summary F1 Stator (B Phase)		Test Date/Time 7/26/2012 11:29:53 AM	
Test ID:	**Customer Special**	Repair/Job #	
Tested By	**Mike Rathbun**	Tested For	
Location	**CUSTOMER City**	Building	**Hot Mill**
Temp Status	**Tested**	**Step-Voltage**	**PASS**
Temp	**39.0 C**	Volts (V)	**2800**
Megohm Status	**PASS**	I(µA)	**72.50**
Volts (V)	**510**	Resist (Mohm)	**39**
I(µA)	**11.40**	**Surge Status**	**PASS**
Resist Temp Corrected To 40.C (Mohm)	**44**		
		Peak Volt(V) L1	**2900**
PI Status	**MIN PI**	Peak Volt(V) L2	**2900**
Volts (V)	**510**	Peak Volt(V) L3	**0**
DA Ratio	**1.1**	Max P-P EAR(%)	**3.1/3.1/--**
PI Ratio	**1.1**		

Results Summary F1 Stator (C Phase)		Test Date/Time 7/26/2012 11:29:53 AM	
Test ID:	**Customer Special**	Repair/Job #	
Tested By	**Mike Rathbun**	Tested For	
Location	**CUSTOMER City**	Building	**Hot Mill**
Temp Status	**Tested**	**Step-Voltage**	**PASS**
Temp	**39.0 C**	Volts (V)	**2800**
Megohm Status	**PASS**	I(µA)	**26.60**
Volts (V)	**510**	Resist (Mohm)	**108**
I(µA)	**4.40**	**Surge Status**	**PASS**
Resist Temp Corrected To 40.C (Mohm)	**114**		
		Peak Volt(V) L1	**2900**
PI Status	**MIN PI**	Peak Volt(V) L2	**2900**
Volts (V)	**510**	Peak Volt(V) L3	**0**
DA Ratio	**1.3**	Max P-P EAR(%)	**3.2/3.1/--**
PI Ratio	**1.3**		

Detailed Analysis (A Phase)

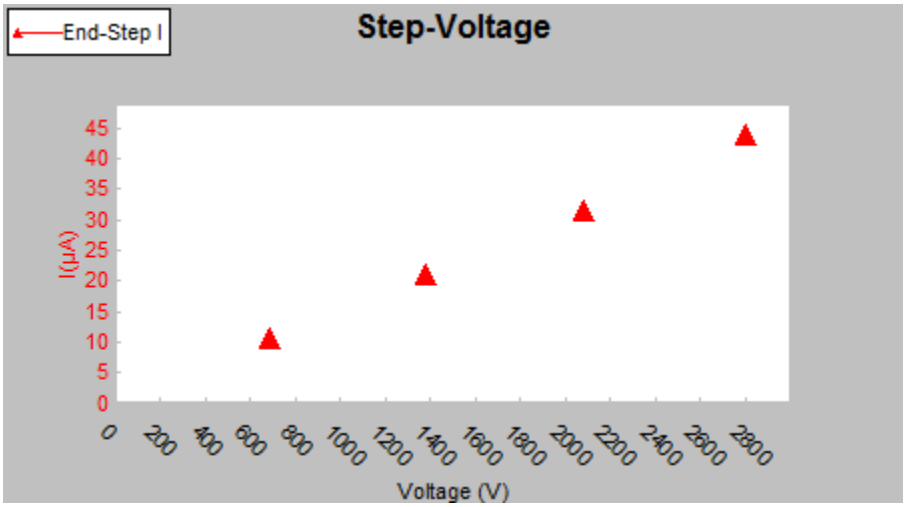
DA/PI		Motor ID	Uninstalled F1; A Phase
Test Date/Time	7/26/2012 11:25:54 AM	Voltage (V)	510
DA Ratio	0.9	PI Ratio	1.1
PI Status	MIN PI		

Time (Min)	I(µA)	Megohms
0:15	9.95	51
0:30	9.19	55
0:45	9.11	55
1:00	8.60	59
1:30	9.60	53
2:00	10.40	49
2:30	10.44	48
3:00	10.19	50
4:00	9.72	52
5:00	9.24	55
6:00	9.16	55
7:00	9.16	55
8:00	8.80	57
9:00	8.36	61
10:00	7.83	65

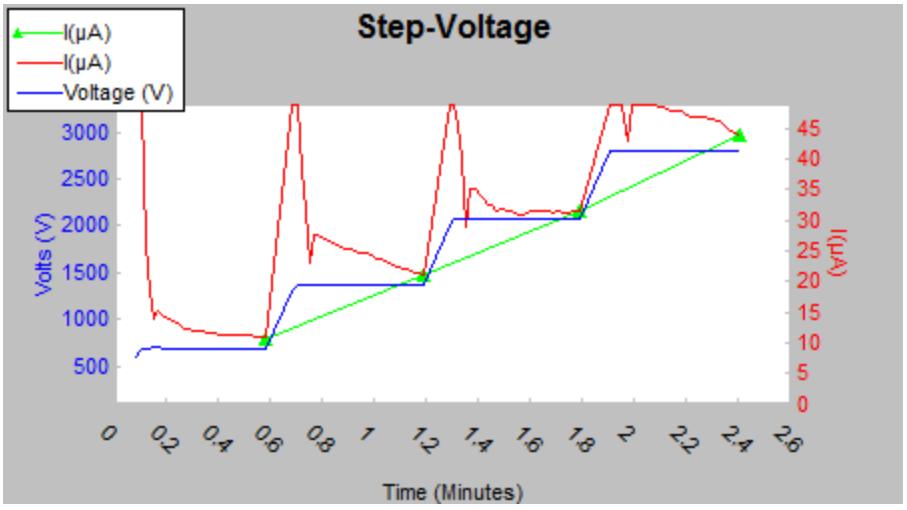


Detailed Analysis (A Phase)

Step-Voltage	Motor ID Uninstalled F1; A Phase
Test Date/Time	7/26/2012 11:28:54 AM
DC Status	PASS



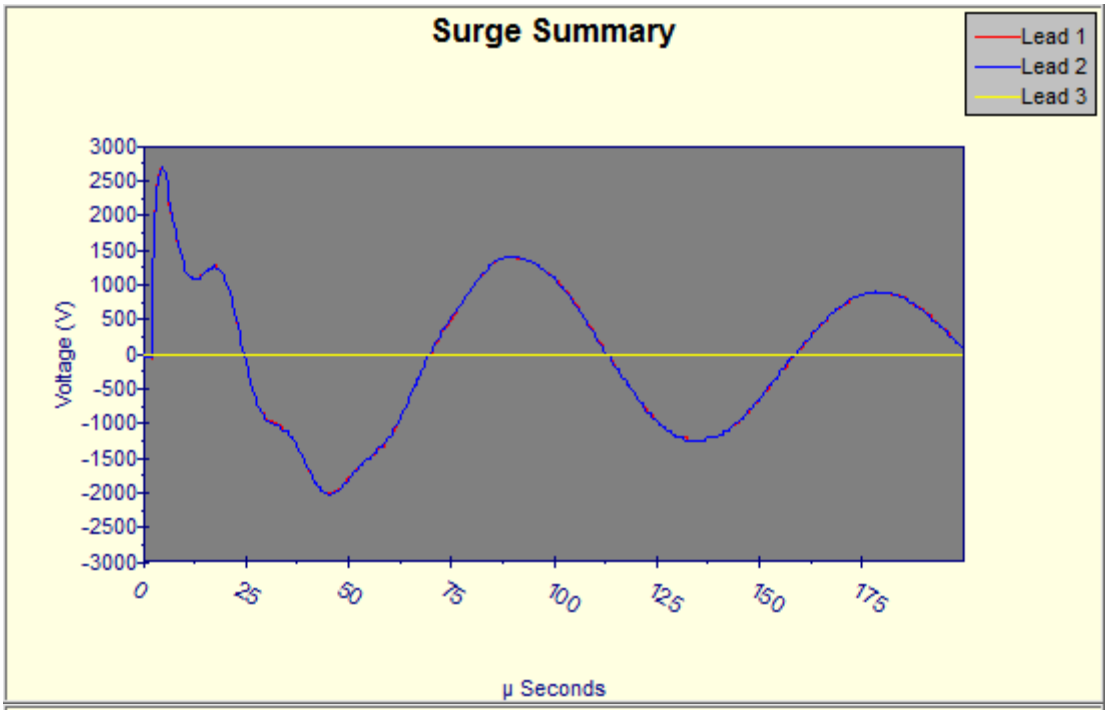
Step Length (Sec)	Volts (V)	I(µA)	Megohms
30	**690**	10.60	**65**
30	**1380**	21.00	**66**
30	**2080**	31.60	**66**
30	**2800**	44.00	**64**

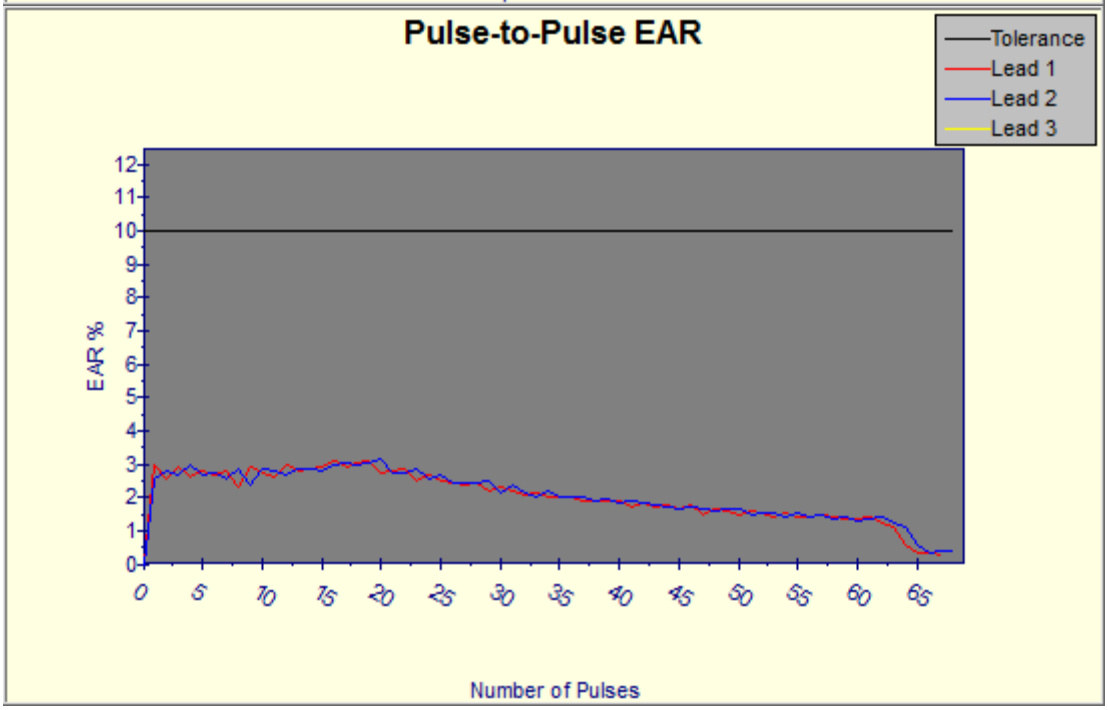


Detailed Analysis (A Phase)

Pulse-to-Pulse EAR		Motor ID	Old F1 APhase
Test Date/Time	7/26/2012 11:29:53 AM	Surge Status	PASS

Lead	Peak Voltage (V)	PP EAR Status	Max P-P EAR(%)
1	2900	PASS	3.1
2	2900	PASS	3.1
3		No Test	---

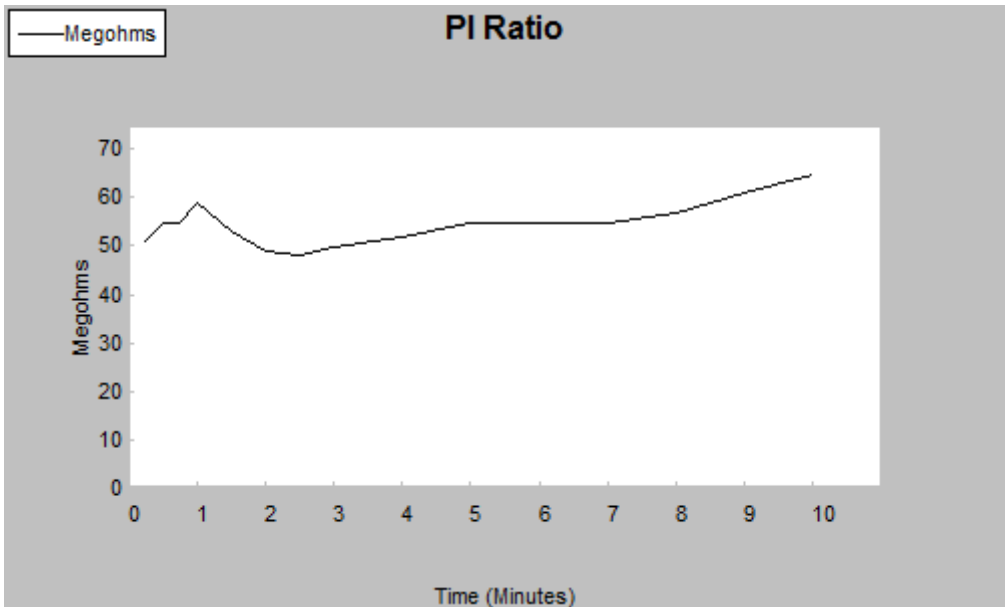




Detailed Analysis (B Phase)

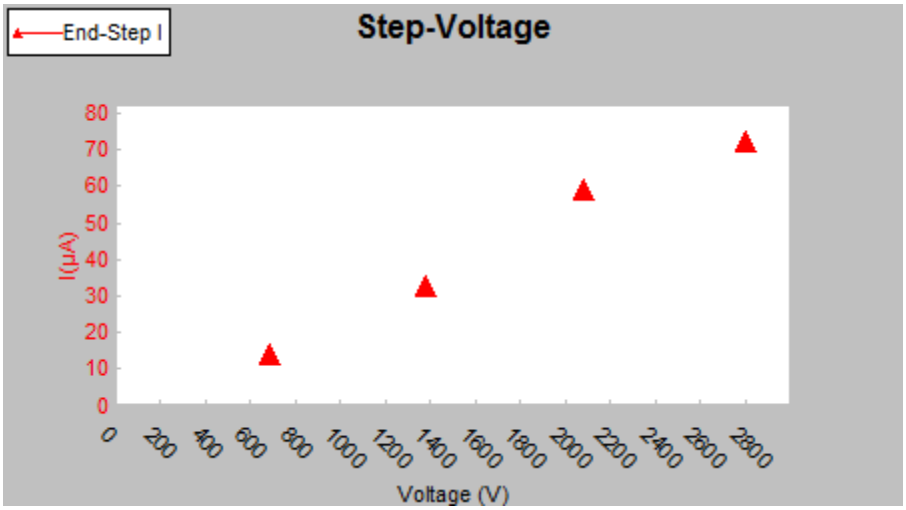
DA/PI		Motor ID	Old F1 APhase
Test Date/Time	7/26/2012 11:25:54 AM	Voltage (V)	510
DA Ratio	0.9	PI Ratio	1.1
PI Status	MIN PI		

Time (Min)	I(µA)	Megohms
0:15	9.95	51
0:30	9.19	55
0:45	9.11	55
1:00	8.60	59
1:30	9.60	53
2:00	10.40	49
2:30	10.44	48
3:00	10.19	50
4:00	9.72	52
5:00	9.24	55
6:00	9.16	55
7:00	9.16	55
8:00	8.80	57
9:00	8.36	61
10:00	7.83	65

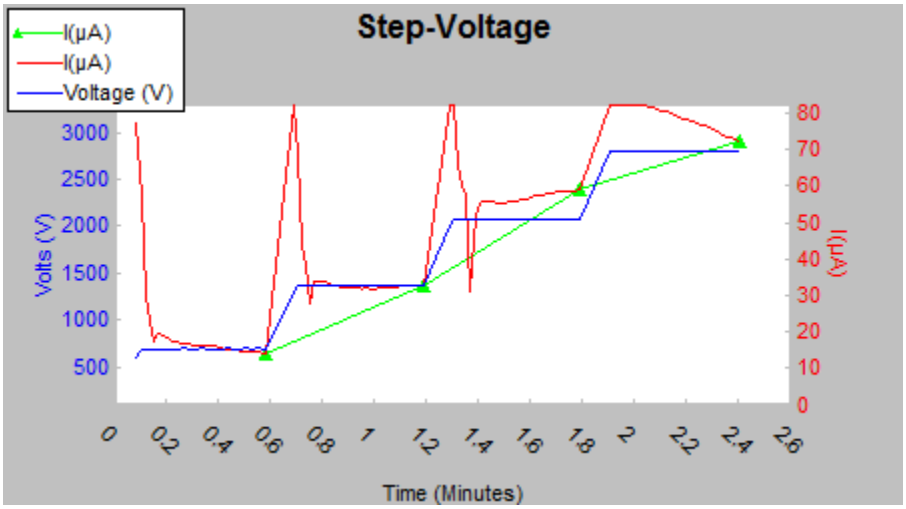


Detailed Analysis (B Phase)

Step-Voltage	Motor ID Old F1 Bphase
Test Date/Time	7/26/2012 11:54:13 AM
DC Status	PASS



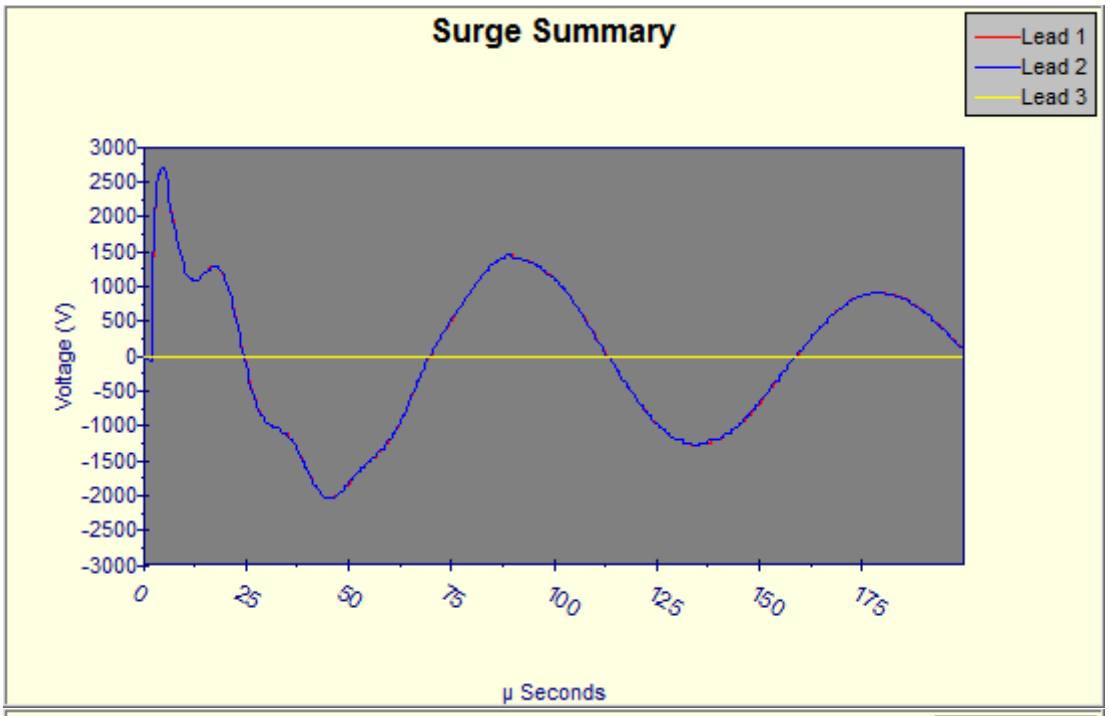
Step Length (Sec)	Volts (V)	I(µA)	Megohms
30	**690**	14.20	**49**
30	**1380**	32.80	**42**
30	**2080**	59.20	**35**
30	**2800**	72.50	**39**

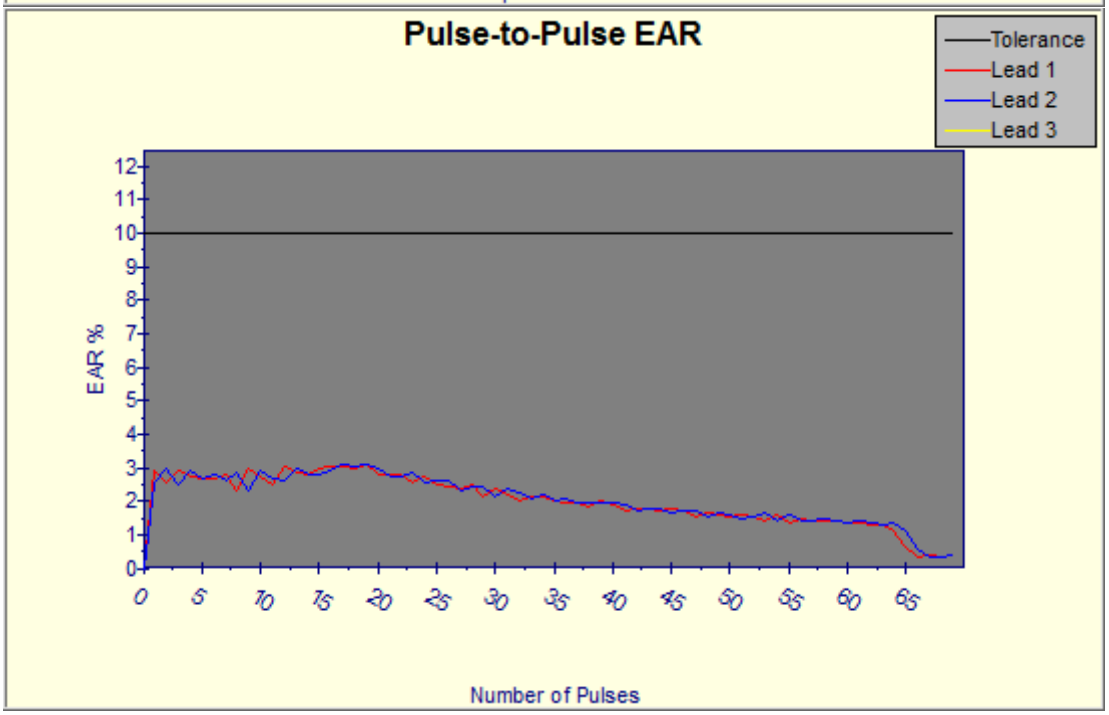


Detailed Analysis (B Phase)

Pulse-to-Pulse EAR		Motor ID	Old F1 Bphase
Test Date/Time	7/26/2012 11:55:14 AM	Surge Status	PASS

Lead	Peak Voltage (V)	PP EAR Status	Max P-P EAR(%)
1	2920	PASS	3.1
2	2920	PASS	3.1
3		No Test	---

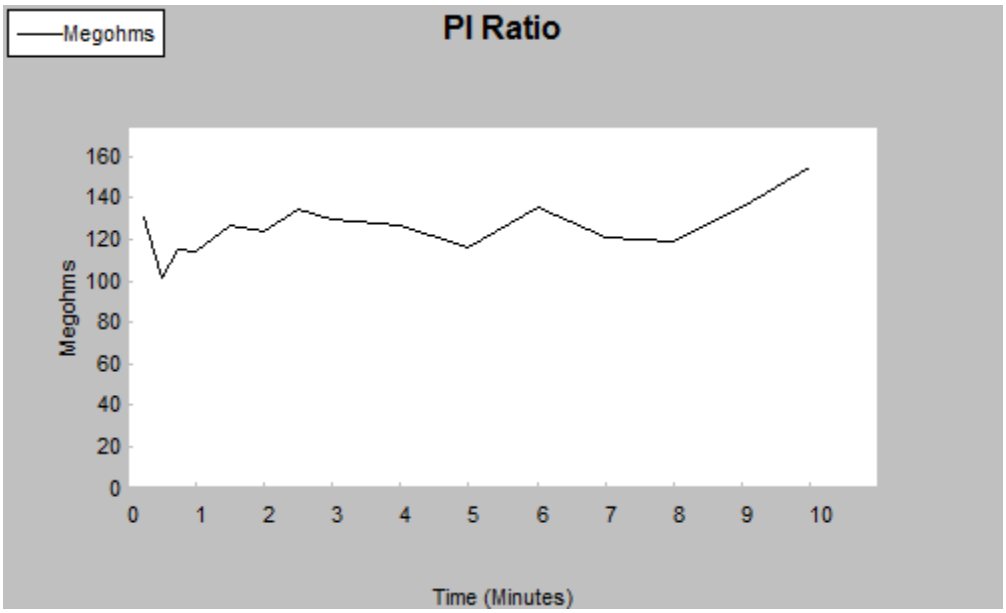




Detailed Analysis (C Phase)

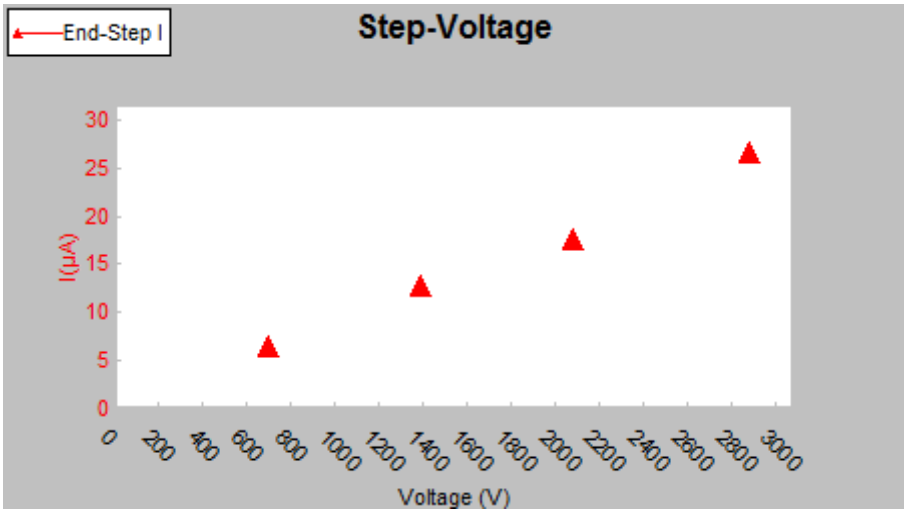
DA/PI		Motor ID	Old F1 C Phase
Test Date/Time	7/26/2012 12:11:09 PM	Voltage (V)	510
DA Ratio	1.3	PI Ratio	1.3
PI Status	PASS		

Time (Min)	I(µA)	Megohms
0:15	3.87	131
0:30	4.96	102
0:45	4.40	115
1:00	4.44	114
1:30	4.01	127
2:00	4.11	124
2:30	3.77	135
3:00	3.90	130
4:00	4.00	127
5:00	4.36	116
6:00	3.75	136
7:00	4.19	121
8:00	4.28	119
9:00	3.74	136
10:00	3.29	155

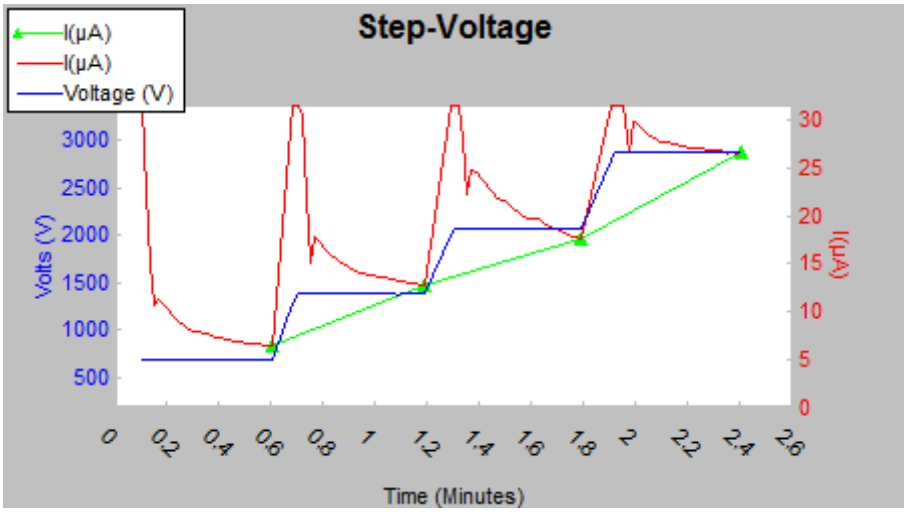


Detailed Analysis (C Phase)

Step-Voltage	Motor ID Old F1 C Phase
Test Date/Time	7/26/2012 12:14:49 PM
DC Status	PASS



Step Length (Sec)	Volts (V)	I(µA)	Megohms
30	**700**	6.40	**109**
30	**1390**	12.80	**109**
30	**2080**	17.60	**118**
30	**2880**	26.60	**108**



Detailed Analysis (C Phase)

Pulse-to-Pulse EAR		Motor ID	Old F1 C Phase
Test Date/Time	7/26/2012 12:15:41 PM	Surge Status	PASS

Lead	Peak Voltage (V)	PP EAR Status	Max P-P EAR(%)
1	2900	PASS	3.2
2	2900	PASS	3.1
3		No Test	---