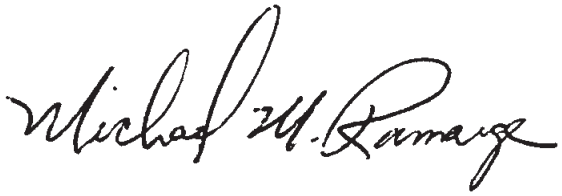
CERTIFIED TEST REPORT

VariSTAR™ Type AZG4 Surge Arrester, 20,000 A, Line Discharge Class 4 IEC 60099-4 (99-4)

CERTIFICATION

Statements made and data shown are, to the best of our knowledge and belief, correct and within the usual limits of commercial testing practice.

Frank Muench
Director of Engineering Development



Michael M. Ramarge
Design Engineer

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SECTION 1 – GENERAL INFORMATION

1.1 Scope

This document presents data summarizing the design test results for the AZG4 surge arrester, 20,000A, line discharge class 4, in accordance with the requirements of IEC 60099-4 (99-4).

1.2 Certification Statement

Design tests conducted and the data presented in this document are in accordance with all sections of IEC 60099-4 (99-4) pertaining to 20 kA nominal discharge classification current and line discharge class 4 arrester designs. The Cooper Power Systems VariSTAR® Type AZG4 arresters rated 3 - 360 kV, meet or exceed all applicable requirements of the above referenced standard in accordance with the following sections of this document.

1.3 Certification Summary

1.3.1 Insulation Withstand of the Arrester Housings:

Tests were conducted in accordance with sections 5.1, 6, & 7.2, of IEC 060099-4 (99-4) and IEC 60-1 on empty individual housing assemblies of each size of the design with and without grading rings (as applicable) to determine Lightning Impulse, Switching Surge Impulse, and 1 Minute Power Frequency (wet condition) withstand levels.

All arrester ratings have withstand levels exceeding IEC requirements. Withstand levels of arrester ratings using multiple housings are based on the summation of individual housing values. In those cases where the individual unit Continuous Operating Voltage (COV) is not proportional to the insulation withstand, the claimed withstand level has been appropriately reduced.

Table 1
Tested Insulation Withstand of Arrester Housings

Type AZG4 Surge Arrester Housing Insulation Characteristics					
Housing Designation*	Leakage Distance (mm)	Arc Distance (mm)	BIL - kV Pk 1.2/50 Wave	50/60 Hz Wet (60s)-kV rms	Switching-Wet (kV Pk)
41	234	144	130	35	**
42	406	208	170	60	**
43	665	303	230	90	**
44	922	399	265	125	**
45	1267	525	320	165	**
46	1646	615	365	170	**
47	1872	688	385	195	**
48	2540	905	505	250	**
49	3226	1122	650	285	**
51	3292	1230	725	345	**
52	3518	1303	735	360	**
53	3744	1375	770	395	**
54	4186	1520	865	415	**
55	4412	1592	880	450	**
56	4872	1737	985	450	**
57	3292	1166	705	335	**
58	3518	1234	780	370	**
59	3744	1306	790	385	**
60	4186	1455	850	400	**
61	4412	1523	920	440	**
62	4872	1564	925	440	750
63	5098	1636	930	480	810
64	5766	1853	1065	530	915
65	6452	2070	1185	545	1015
67	6744	2130	1265	625	1065
68	6970	2202	1300	655	1100
69	7412	2347	1375	675	1150
70	7638	2420	1405	705	1190
71	8098	2564	1475	710	1250
72	8306	2637	1515	760	1280
74	8992	2781	1440	760	1235
75	9677	2998	1535	810	1315

* Housing designation is indicated in the 6th and 7th position of the catalog number.

** IEC Standard 60099-4 (99-4) 1991 does not require Wet Switching Surge Withstand tests for arresters with rated voltage (U_r) below 200 kV. Housing designations 61 and below are not used in arresters rated above 198 kV.

Table 1 (continued)
Tested Insulation Withstand of Arrester Housings

Type AZG4 Surge Arrester Insulation Characteristics					
Housing Designation*	Leakage Distance (mm)	Arc Distance (mm)	BIL - kV Pk 1.2/50 Wave	50/60 Hz Wet (60s)-kV rms	Switching-Wet (kV Pk)
77	9970	3184	1630	890	1410
78	10178	3256	1665	925	1440
79	10638	3401	1730	945	1495
81	10864	3473	1760	960	1525
82	11323	3618	1785	990	1575
83	11532	3690	1815	1010	1600
85	12217	3908	1905	1060	1680
86	12903	4125	2000	1110	1760

* Housing designation is indicated in the 6th and 7th position of the catalog number.

** IEC Standard 60099-4 does not require Wet Switching Surge Withstand tests for arresters with rated voltage (U_r) below 200 kV. Housing designations 61 and below are not used in arresters rated above 198 kV.

1.3.2 Residual Voltage Tests:

Tests were conducted in accordance with sections 5.3, 6, & 7.3 of IEC 60099-4 (99-4) and IEC 60-3 on three equivalent arrester sections to determine prorata residual voltage values resulting from steep front, lightning and switching surge impulse tests.

Each test sample was constructed of a single zinc-oxide disk, the longest internal spacer utilized in an arrester unit and the spring, spring shunt and contact plates. Table 1 contains the results of the residual voltage tests for the individual zinc-oxide disk, the other arrester components, and their sum. Terminal-to-terminal arrester residual voltages for each applied current magnitude and waveform are determined as follows:

A. For each arrester unit COV, a fixed 10 kA 8/20 µs residual voltage is established.

B. The test sample residual voltage at each current magnitude and waveform is determined and expressed as a ratio of the 10 kA 8/20 µs value. The residual voltage, due to the zinc-oxide elements alone, is taken as the sum of the disks exhibiting the highest ratio.

C. A residual voltage is measured for each current magnitude and waveform, due solely to arrester construction, and added to that of the zinc-oxide disks. This results in the total residual voltage at each current magnitude and waveform for the arrester unit.

D. The total arrester terminal-to-terminal residual voltage for arresters composed of multiple units is the sum of the individual arrester units.

Figure 1 displays oscillograms typical of the samples. Expansion of these data results in the residual voltages for all standardized currents, waveforms and arrester ratings; maximum guaranteed protective characteristics for all AZG4 arrester ratings may be found in Table 8, "Residual Voltages".

Table 2
Residual Voltages - Test Sample Results

Residual Voltage of MOV Disks												
	Switching Impulse Residual Voltage (kV)				Lightning Impulse Residual Voltage (8/20 µsec, kV)						Steep Current	
	250 A	500 A	1000 A	2000 A	1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA	10 kA	20 kA
Sample 1	6.70	6.89	7.14	7.41	7.32	7.66	7.94	8.46	9.21	10.35	9.53	10.61
Sample 2	6.69	6.87	7.10	7.36	7.32	7.64	7.92	8.43	9.21	10.26	9.53	10.61
Sample 3	6.68	6.87	7.10	7.36	7.34	7.66	7.93	8.44	9.24	10.19	9.69	10.89
Residual Voltage due to other components												
	Switching Impulse Residual Voltage (kV)				Lightning Impulse Residual Voltage (8/20 µsec, kV)						Steep Current	
	250 A	500 A	1000 A	2000 A	1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA	10 kA	20 kA
Sample 1	0.00	0.00	0.01	0.18	0.03	0.06	0.10	0.24	0.42	1.38	2.78	5.77
Sample 2	0.00	0.06	0.00	0.19	0.03	0.06	0.10	0.26	0.38	1.30	3.68	6.47
Sample 3	0.00	0.05	0.02	0.16	0.03	0.07	0.10	0.26	0.33	1.41	4.71	6.10

* Housing designation is indicated in the 6th and 7th position of the catalog number.

** IEC Standard 60099-4 (99-4) 1991 does not require Wet Switching Surge Withstand tests for arresters with rated voltage (U_r) below 200 kV. Housing designations 61 and below are not used in arresters rated above 198 kV.

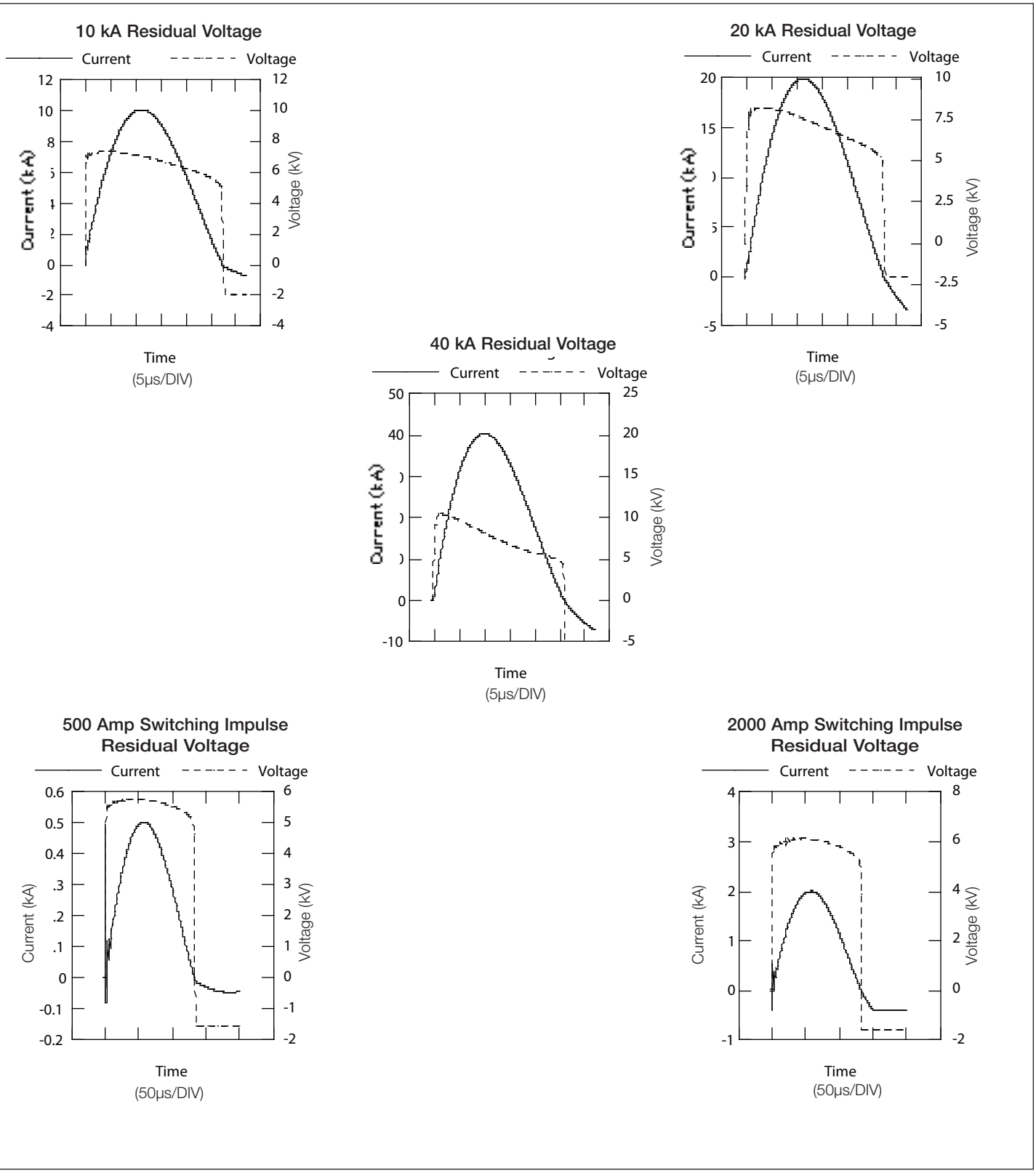

Figure 1
Residual Voltages for Sample #3 Measured Across the Arrester Section

1.3.3 Long Duration Current Impulse Withstand Test:

Tests were conducted in accordance with sections 5.8, 6.3, 7.1, and 7.4 in IEC 60099-4 (99-4) on disk samples. Test data is summarized in Table 2, and examples of the wave form are shown in Figure 2.

All disk samples exceeded the highest energy stress level utilized in the design as detailed in IEC 60099-4 (99-4), section 6.3 and summarized below:

a. The minimum V_{ref} = 1.23 x COV and Rating = 0.97 x V_{ref}, where V_{ref} is the rms power frequency voltage producing a reference current of 6 mA. Production tests utilize a DC V_{1mA} test on disks. Design limits by this method are COV = 0.552 V_{1mA} resulting in a limit of rating being 0.707 x V_{1mA}.

b. The minimum disk volume in the arrester is 41.0 cc per kV of COV or 32.0 cc per kV of rating.

The LDC wave form met the required criteria. Additionally, the minimum switching energy to be injected was calculated for each sample. In all cases, required energy levels were attained.

Residual voltage at rated current was measured before and after the LDC test series. In all cases, change in residual voltage was less than the 5% limit.

Table 3
Summary Data - Long Duration Current Impulse Withstand Test

Summary Data	Sample 1	Sample 2	Sample 3
V_{1mA}	5.53 kV	5.39 kV	5.36 kV
V_{ref}	4.05 kV	3.96 kV	3.92 kV
Maximum COV	3.05 kV	2.98 kV	2.96 kV
Maximum Rating	3.91 kV	3.81 kV	3.79 kV
Disk Volume	119.6 cc	119.5 cc	119.4 cc
Disk Volume Per Unit Rating	30.6 cc/kV	31.4 cc/kV	31.5 cc/kV
Specified Minimum Test Energy	20522 joules	20002 joules	19891 joules
Specified Maximum Test Energy	22574 joules	22002 joules	21880 joules
Actual Minimum Test Energy	21040 joules	20732 joules	20390 joules
Actual Maximum Test Energy	21307 joules	21065 joules	20905 joules
Pretest kV @ 20 kA	9.01 kV	8.83 kV	8.79 kV
Post Test kV @ 20 kA	8.79 kV	8.82 kV	8.78 kV
Percent Change kV @ 20 kA	-2.44%	-0.11%	0.11%

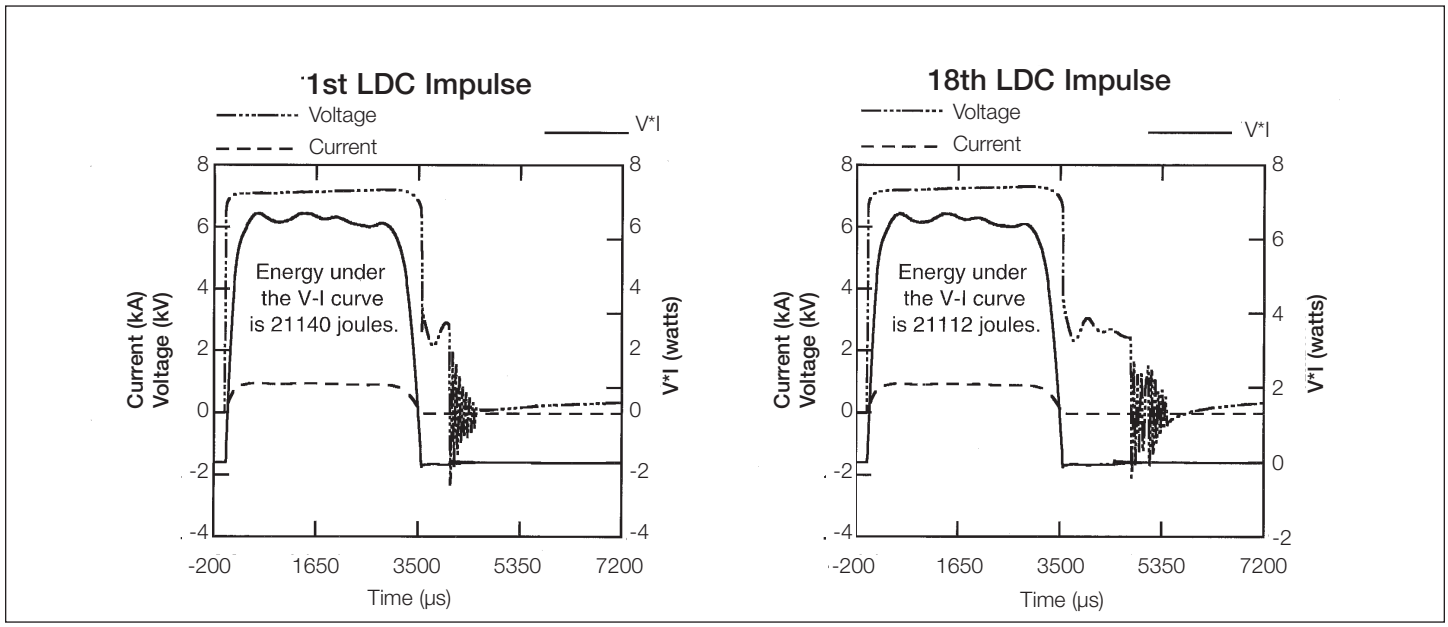

Figure 2
First and Final Long Duration Current Impulses

1.3.4 Operating Duty Test:

Tests were conducted in accordance with sections 5.9, 6.2, 6.3, 7.1, 7.3.2, and 7.5 of IEC 60099-4 (99-4) on prorated thermal sections. This test series includes accelerated aging tests, verification of thermal section, and the switching surge operating duty test with conditioning, operating duty test, and evaluation of thermal stability.

1.3.4.1 Accelerated Aging Test:

Tests were run on disk samples as required in section 7.5.2 of IEC 60099-4 (99-4).

Test voltage (U_{ct}) was determined to be 1.04 x U_c. This proration factor is representative of the highest field concentration area in the design family as determined through electric field modeling and tests of the voltage distribution along the disk column.

All MOV disks utilized in this design maintain a watts loss level lower than the initial watts loss when energized at U_c or U_{ct} for the life of the product. This has been verified by the accelerated aging procedure in section 7.5.2 of IEC 60099-4 (99-4). No elevation factors are required to be applied to COV (U_c) or Rating (U_r) during the operating duty tests.

Typical aging data is summarized in Table 4.

Table 4
Summary Data - Accelerated Aging Test

	V_{1mA}	COV (U_{sc})	Rating (U_{sr})	COV (U_{ct})	Watts Loss at 2.1 hr (P_{1ct})	Watts Loss at 1032 hr (P_{2ct})
Sample 1	5.26	2.90	3.71	3.01	1.36	1.31
Sample 2	5.18	2.86	3.66	2.97	1.23	1.10
Sample 3	5.40	2.98	3.81	3.09	1.20	1.16

1.3.4.2 Verification of Thermal Section:

Prorated thermal equivalent sections of the AZG4 design were built as required in section 7.5.3 of IEC 60099-4 (99-4).

In order to verify compliance with thermal proration requirements, tests were conducted with a thermal equivalent section and a 120 kV rated AZG4 arrester in identical manners. Power frequency voltage sources were used to heat MOV disks to 120°C. Thermocouples were placed at the top, middle and bottom of the arrester and the average temperature reading was calculated. For the thermal equivalent section, the thermocouple was located on the disk periphery. Figure 3 displays temperature data verifying heating rates and good correlation between the thermal equivalent section and the 120 kV arrester cooling rates.

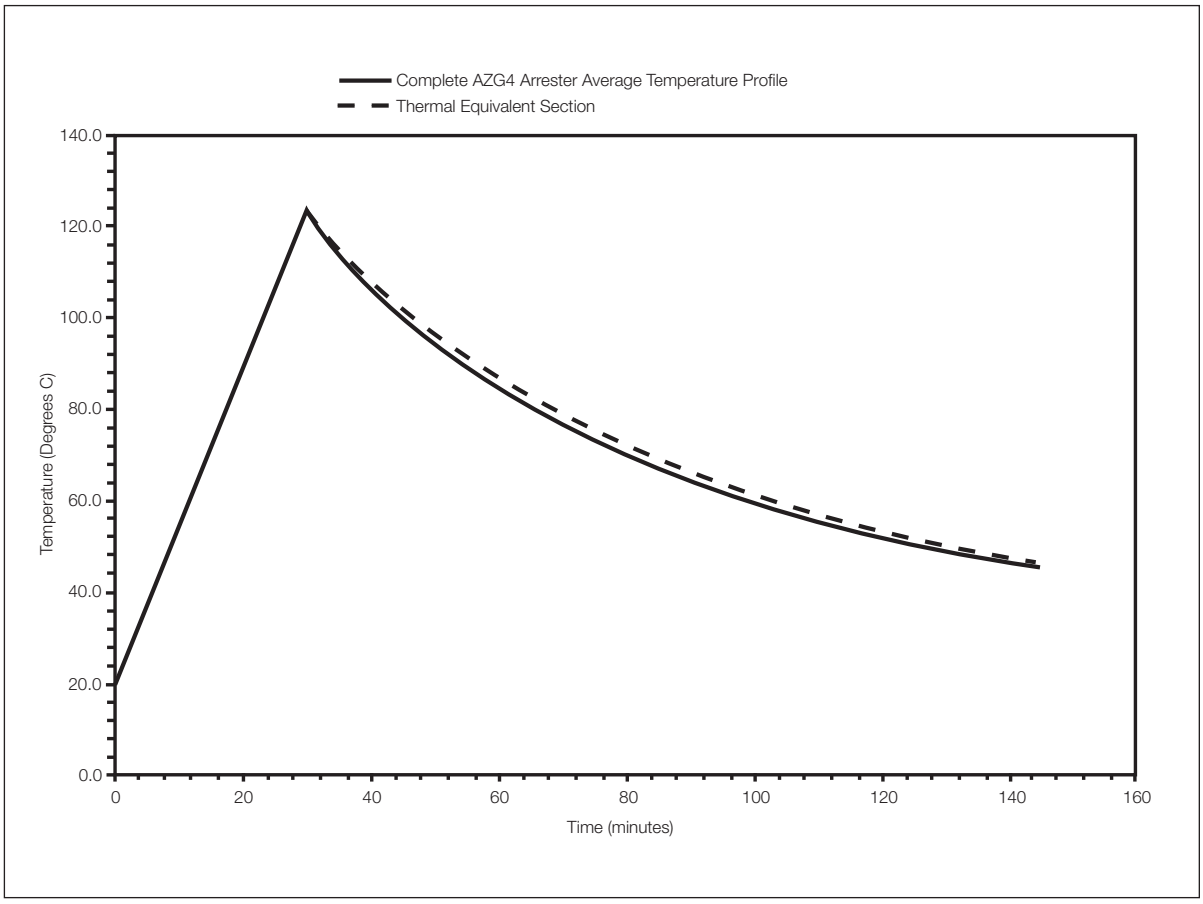

Figure 3
Thermal Performance Comparison Curves

1.3.4.3 Switching Surge Operating Duty Test

Tests were conducted on three prorated thermal equivalent sections constructed in accordance with criteria detailed in the above sections of 1.3.4 as well as in section 7.5.5 of IEC 60099-4 (99-4). The test proceeded as outlined below.

1. The residual voltage resulting from a 20 kA 8/20 µs lightning current impulse was measured across the disk to be used in each thermal equivalent section.
2. A conditioning test consisting of four groups of five 20 kA 8/20 µs lightning current impulses was applied to the disk used in each thermal equivalent section while the disk was energized at a 60 Hz voltage (U_r) = 1.282 x COV, where COV was determined as described in section 1.3.3 above. IEC allows a lower U_r = 1.20 x COV, however, a higher voltage level was chosen corresponding to the capabilities of the design. Time between impulses and groups of impulses conformed to the highest stressed requirements of 50-60 sec. and 25-30 min. respectively. Tests were in still air at 16-22°C. Impulses were applied at approximately 60°C before 60 Hz voltage peak. A summary of data recorded for a typical sample during this test is shown in Table 5.

Table 5
Summary Data - Conditioning

Impulse Number	Current (kA Crest)	Peak Current at Rated Voltage (mA)
1	19.8	18.9
2	20.0	20.4
3	19.8	22.2
4	20.0	22.9
5	19.8	25.3
6	20.2	16.0
7	20.4	17.8
8	20.2	19.9
9	19.8	21.9
10	20.0	24.2
11	20.2	17.2
12	20.2	21.1
13	20.2	24.1
14	20.2	26.8
15	19.8	28.5
16	19.8	16.8
17	19.8	19.0
18	20.2	22.7
19	19.8	25.7

3. The remaining conditioning tests consisting of two 100 kA 4/10 µs lightning impulses were performed on the complete thermal equivalent sections. Voltage and current traces for Sample 1 are shown in Figures 4A and 4B.
4. The complete, conditioned, prorated thermal equivalent sections were heated and stabilized at 63°C. Each stabilized prorated thermal equivalent section was placed in a room temperature test cell (16-22°C), and immediately subjected to a group of two long duration impulses, one minute apart, having wave characteristics as described in section 1.3.3 above. The current and voltage traces for the second LDC impulse are shown in Figure 4C.
5. Within 35-45 msec. of the last long duration impulse, rated voltage (U_r) was applied for 10 sec. immediately followed by COV (U_C) for 30 min. Where U_r = 1.282 x U_C and U_C = .552 x V_{1mA}, alternatively and equivalently U_C = .757 x V_{ref} . Figure 4D shows the transition from the impulse to U_r and Figure 4E shows the transition from U_r to U_C. Figure 4F illustrates 30 minute recovery of the sample at U_C.
6. The residual voltage resulting from a 20 kA 8/20 µs lightning current impulse was measured across the disk used in each thermal equivalent section.

7. The percent change in 20 kA 8/20 µs lightning current impulse residual voltage due to the operating duty test was calculated based on the initial and final residual voltage measurements. In all cases the change was less than the 5% limit.
8. A visual inspection verified that no damage occurred. See Table 6 for a complete summary of test data.

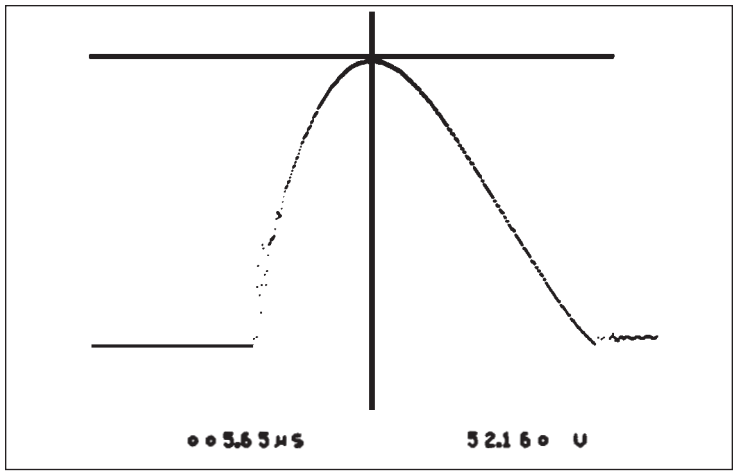

Figure 4A
100.2 kA (2nd Impulse)

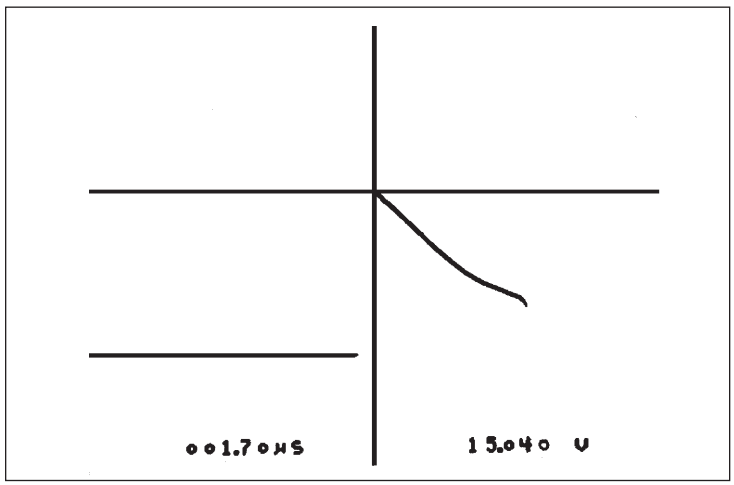

Figure 4B
15.6 kV (2nd Impulse)

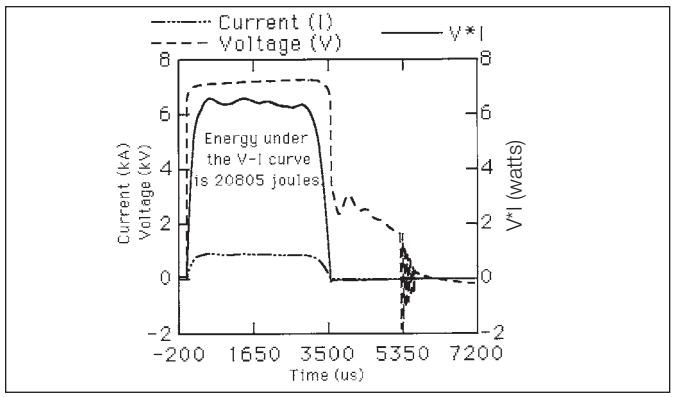

Figure 4C
Combined Duty Cycle (2nd LDC Impulse)

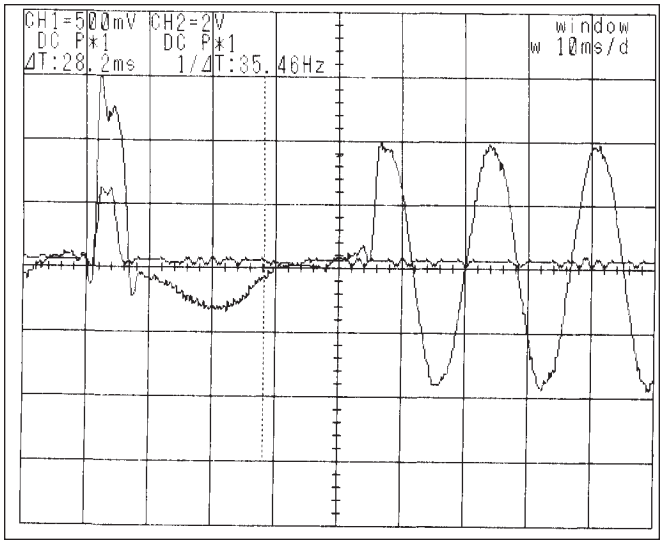

Figure 4D
Transition from Impulse to U_r

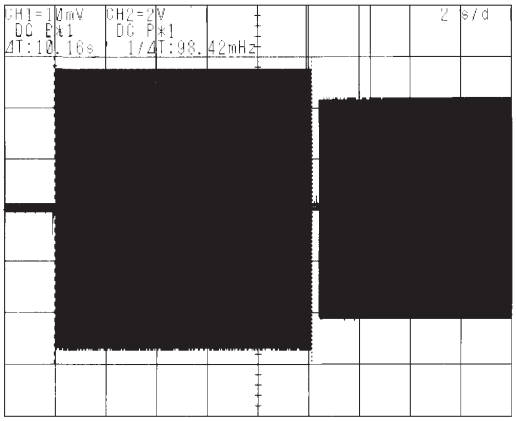

Figure 4E
Transition from U_r to U_C

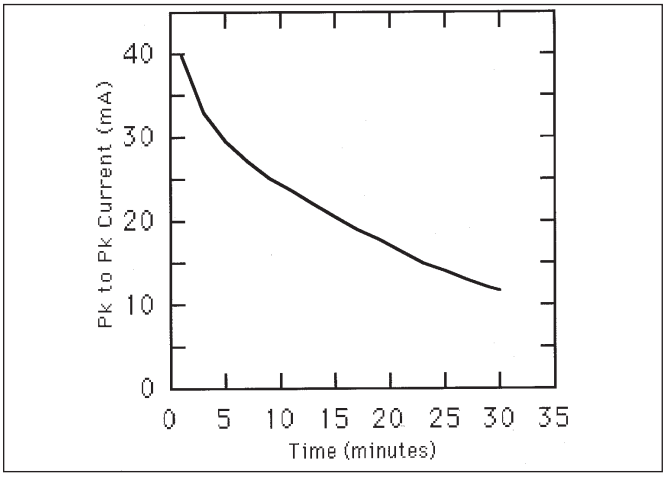

Figure 4F
Combined Duty Cycle Stability at COV

Table 6
Summary Data - Switching Surge Operating Duty Test

	Sample 1	Sample 2	Sample 3
V_{1mA}	5.47 kV	5.39 kV	5.38 kV
V_{ref}	4.01 kV	3.95 kV	3.94 kV
Maximum COV (Uc)	3.02 kV	2.98 kV	2.97 kV
Maximum Rating (Ur)	3.87 kV	3.81 kV	3.81 kV
Disk Volume	120.1 cc	119.6 cc	119.5 cc
Disk Volume / Ur	31.0 cc/kV	31.4 cc/kV	31.4 cc/kV
Initial Residual Voltage @ 20 kA 8/20 µs	8.93 kV	8.83 kV	8.85 kV
Leakage Current at Ur prior to Cond. Impulse 1	19.2 mA	21.2 mA	22.1 mA
Cond. Grp #1, Leakage Current at Ur after Impulse 5	25.3 mA	24.7 mA	26.2 mA
Cond. Grp #4, Leakage Current at Ur after Impulse 20	30.0 mA	30.2 mA	30.1 mA
High Current Impulse 1	99.5 kA, 15.4 kV	99.5 kA, 15.4 kV	98.9 kA, 15.1 kV
High Current Impulse 2	100.2 kA, 15.6 kV	100.8 kA, 15.7 kV	100.2 kA, 15.2 kV
Minimum Long Duration Energy (Design Basis)	20299 joules	20002 joules	19965 joules
Maximum Long Duration Energy (Design Basis)	22329 joules	22002 joules	21962 joules
Long Duration Energy (Test #1)	21016 joules	21573 joules	21290 joules
Long Duration Energy (Test #2)	20805 joules	21298 joules	21353 joules
Long Duration Current, Voltage (Test #1)	899 A, 7.00 kV	938 A, 6.89 kV	925 A, 6.87 kV
Long Duration Current, Voltage (Test #2)	882 A, 7.10 kV	931 A, 6.98 kV	915 A, 6.98 kV
Time Interval between end of LDC and U_r	37 msec	39 msec	43 msec
Duration of Ur	10.16 sec	10.20 sec	10.20 sec
Voltage Ur, Current peak-to-peak	3.87 kV, 0.80 A	3.87 kV, 1.0 A	3.87 kV, 1.0 A
Current @ Uc: initial, 15 min, 30 min	22, 11, 6.3 mA	21, 9.0, 4.7 mA	20, 8.1, 4.0 mA
Final Residual Voltage @ 20 kA 8/20 µs	9.20 kV	9.13 kV	9.16 kV
Percent Residual Voltage Change @ 20 kA 8/20 µs	3.02 %	3.40 %	3.50 %
Disk and Section Physical Condition	No Damage	No Damage	No Damage

1.3.5 Pressure Relief Tests:

High current and low current pressure relief tests were conducted as required in section 5.11 of IEC 60099-4 (99-4) 1991 as referenced to section 8.7 of IEC 60099-4 (99-4).

The AZG4 design was tested to, and meets criteria of, the 63 kA pressure relief class and the associated low current pressure relief test. Samples tested were of the longest single unit length utilized in the design either as a single or stacked arrester assembly. All samples vented properly, without expelling internal components and with no breakage of the porcelain housings.

1.3.6 Test of Arrester Disconnectors:

The AZG4 arrester design does not utilize disconnecting devices.

1.3.7 Artificial Pollution Tests:

Test requirements are not established in IEC 60099-4 (99-4). However, tests have been made on the highest arrester rating in accordance with ANSI/IEEE C62.11-1993 section 8.12. The AZG4 design meets all criteria of this test.

1.3.8 Partial Discharge Tests:

The AZG4 design meets the criteria of sections 5.4, 8.1c, and 8.2.1c of IEC 60099-4 (99-4). Routine tests are made on every manufactured arrester unit, satisfying the requirements.

1.3.9 Seal Leakage Tests:

Routine tests are performed on each manufactured arrester unit to verify seal integrity, satisfying the requirements.

1.3.10 Current Distribution Tests:

The AZG4 arrester design does not utilize elements connected in parallel; therefore, this requirement is not applicable [sections 5.6 and 8.1e of IEC 60099-4 (99-4)].

1.3.11 Temporary Overvoltage Tests:

Temporary overvoltage tests were conducted in accordance with section 5.10 of IEC 60099-4 (99-4) 1991. Temporary overvoltage capability of the AZG4 arrester has been established under both “No Prior Duty” conditions at 60°C and “Prior Duty” conditions at 60°C plus the temperature rise due to a single rated energy discharge of 8.9 kJ/kV of COV. Both “No Prior Duty” and “Prior Duty” curves expressed in per unit of arrester COV, are presented in Figure 5.

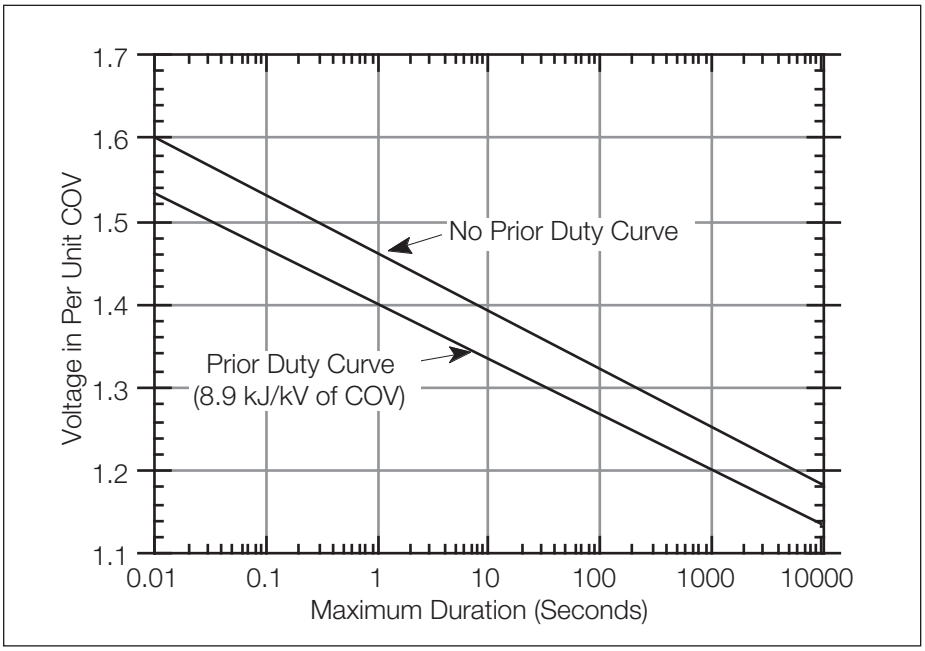

Figure 5
Temporary Overvoltage Characteristics

Note: 24 hour TOV with prior duty is 1.07 x COV

SECTION 2 - ARRESTER DATA

2.1 Protective Characteristics

Table 7
Residual Voltages - Maximum Guaranteed Protective Characteristics

Arrester Rating U_r (kV, rms)	Arrester MCOV U_c (kV, rms)	Steep Current Residual Voltage (kV Crest)		Lightning Impulse Residual Voltage (kV Crest) 8/20 µs Current Wave						Switching Impulse Residual Voltage (kV Crest) 30/60 Current Wave			
		10 kA	20 kA	1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA	250 A	500 A	1000 A	2000 A
3	2.55	14.1	16.3	6.8	7.2	7.4	8.1	9.0	10.9	6.2	6.4	6.6	7.0
6	5.10	23.4	26.1	13.6	14.2	14.8	15.9	17.5	20.4	12.4	12.8	13.2	13.9
9	7.65	32.7	35.8	20.3	21.2	22.0	23.6	25.9	29.8	18.5	19.0	19.7	20.6
10	8.40	35.4	38.7	22.3	23.3	24.2	25.9	28.5	32.6	20.3	20.9	21.6	22.6
12	10.2	42.0	45.6	27.1	28.3	29.3	31.4	34.5	39.4	24.7	25.4	26.3	27.4
15	12.7	51.2	55.2	33.7	35.2	36.5	39.0	42.8	48.6	30.7	31.6	32.7	34.1
18	15.3	60.8	65.3	40.7	42.5	44.0	47.0	51.6	58.4	37.1	38.1	39.4	41.1
21	17.0	67.0	71.8	45.2	47.2	48.9	52.2	57.3	64.7	41.2	42.4	43.8	45.7
24	19.5	76.1	81.4	51.8	54.1	56.0	59.8	65.6	74.0	47.2	48.6	50.2	52.3
27	22.0	85.2	90.9	58.4	61.0	63.2	67.4	73.9	83.3	53.3	54.7	56.7	59.0
30	24.4	94.0	100	64.8	67.6	70.0	74.7	81.9	92.2	59.1	60.7	62.8	65.4
33	27.5	105	112	73.0	76.3	79.0	84.2	92.3	104	66.6	68.4	70.8	73.7
36	29.0	111	118	77.0	80.4	83.3	88.8	97.3	109	70.3	72.2	74.7	77.7
39	31.5	120	128	83.6	87.3	90.4	96.4	106	119	76.3	78.4	81.1	84.4
42	34.0	123	130	85.6	89.3	92.5	98.6	108	121	78.1	80.2	83.0	86.3
45	36.5	131	139	91.8	95.9	99.3	106	116	130	83.8	86.0	89.1	92.6
48	39	140	148	98.1	102	106	113	124	139	89.5	91.9	95.1	98.9
54	42	150	159	106	110	114	122	133	150	96.4	99.0	103	107
60	48	171	181	121	126	131	139	152	171	110	113	117	122
66	53	189	199	133	139	144	154	168	188	122	125	129	134
72	57	202	214	143	150	155	165	181	202	131	134	139	145
78	62	220	232	156	163	169	180	197	220	142	146	151	157
84	68	241	254	171	179	185	197	216	241	156	160	166	172
90	70	248	261	176	184	190	203	222	248	161	165	171	177
96	76	268	283	191	200	207	220	241	269	174	179	185	193
108	84	296	312	211	221	228	243	266	298	193	198	205	213
120	98	345	363	246	257	266	284	311	347	225	231	239	248
132	106	377	399	267	278	288	307	336	377	243	250	259	269
138	111	394	417	279	292	302	321	352	394	255	262	271	281
144	115	408	431	289	302	313	333	365	408	264	271	281	292
162	130	460	486	327	341	353	376	412	461	298	306	317	330
168	131	464	490	329	344	356	379	415	465	301	309	320	332
172	140	495	522	352	368	381	405	444	497	321	330	342	355
180	144	509	537	362	378	391	417	457	511	330	339	351	365
192	152	537	566	382	399	413	440	482	539	349	358	371	385
198	160	564	595	402	420	435	463	507	567	367	377	390	405
204	165	582	613	415	433	448	477	523	585	379	389	403	418
216	174	613	646	438	457	473	504	552	616	399	410	425	441
228	182	641	675	458	478	495	527	577	645	418	429	444	461
240	190	668	704	478	499	516	550	602	673	436	448	463	481
258	209	739	780	526	549	568	605	663	741	480	493	510	530
264	212	749	791	533	557	576	614	672	752	487	500	517	537
276	220	777	820	553	578	598	637	698	780	505	518	537	558
288	230	812	856	578	604	625	666	729	815	528	542	561	583
294	235	829	875	591	617	639	680	745	833	539	554	573	596
300	239	843	889	601	628	650	692	758	847	549	563	583	606
312	245	864	911	616	643	666	709	777	868	562	577	598	621
330	267	940	991	671	701	726	772	846	946	613	629	651	676
336	269	947	998	676	706	731	778	853	953	617	634	656	682
360	289	1016	1071	727	759	785	836	916	1023	663	681	705	732

2.2 Dimensional Information

Table 8
Catalog Numbers and Dimensional Information

U_r Arrester Rating (kV, rms)	U_c Arrester COV (kV, rms)	Catalog Number	Dim A (mm)	Figure 6 View Number	Minimum Phase-to-Ground Clearance (mm)	Minimum Phase-to-Phase Clearance (mm)	Housing Leakage Distance (mm)	Arrester Mass (kg)
3	2.55	AZG4041G002003	471	1	163	308	234	19
6	5.10	AZG4041G005006	471	1	165	309	234	19
9	7.65	AZG4041G007009	471	1	173	317	234	20
10	8.40	AZG4042G008010	535	1	176	320	406	23
12	10.2	AZG4042G010012	535	1	186	330	406	24
15	12.7	AZG4042G012015	535	1	202	347	406	24
18	15.3	AZG4043G015018	630	1	223	367	665	28
21	17.0	AZG4043G017021	630	1	237	382	665	29
24	19.5	AZG4043G019024	630	1	241	385	665	30
27	22.0	AZG4044G022027	725	1	261	406	922	35
30	24.4	AZG4044G024030	725	1	282	426	922	35
33	27.5	AZG4044G027033	725	1	308	452	922	36
36	29.0	AZG4044G029036	725	1	320	465	922	36
39	31.5	AZG4045G031039	852	1	341	486	1267	43
42	34.0	AZG4045G034042	852	1	347	492	1267	43
45	36.5	AZG4045G036045	852	1	367	512	1267	44
48	39.0	AZG4045G039048	852	1	387	531	1267	44
54	42.0	AZG4046G042054	929	1	411	556	1646	52
60	48.0	AZG4046G048060	929	1	458	603	1646	53
66	53.0	AZG4047G053066	1002	1	499	644	1872	59
72	57.0	AZG4047G057072	1002	1	529	674	1872	59
78	62.0	AZG4048G062078	1219	1	571	715	2540	70
84	68.0	AZG4048G068084	1219	1	617	762	2540	72
90	70.0	AZG4048G070090	1219	1	634	778	2540	72
96	76.0	AZG4048G076096	1219	1	680	825	2540	73
108	84.0	AZG4049G084108	1436	1	743	888	3226	93
120	98.0	AZG4049G098120	1436	1	856	1001	3226	96
132	106	AZG4052G106132	1816	2	919	1064	3518	110
138	111	AZG4052G111138	1816	2	958	1102	3518	111
144	115	AZG4053G115144	1888	2	991	1135	3744	117
162	130	AZG4054G130162	2034	2	1109	1253	4186	125
168	131	AZG4055G131168	2106	2	1117	1261	4412	130
172	140	AZG4061G140172	2116	3	1374	1704	4412	136
180	144	AZG4062G144180	2261	3	1407	1737	4872	150
192	152	AZG4062G152192	2261	3	1470	1800	4872	152
198	160	AZG4063G160198	2333	3	1533	1863	5098	158
204	165	AZG4064G165204	2550	3	1571	1902	5766	169
216	174	AZG4064G174216	2550	3	1646	1976	5766	171
228	182	AZG4065G182228	2768	3	1709	2039	6452	191
240	190	AZG4065G190240	2768	3	1772	2102	6452	193
258	209	AZG4067G209258	3148	4	2126	2659	6744	214
264	212	AZG4067G212264	3148	4	2151	2684	6744	214
276	220	AZG4069G220276	3366	4	2214	2747	7412	226
288	230	AZG4069G230288	3366	4	2293	2827	7412	228
294	235	AZG4070G235294	3438	4	2332	2865	7638	237
300	239	AZG4070G239300	3438	4	2365	2898	7638	238
312	245	AZG4071G245312	3583	4	2412	2945	8098	253
330	267	AZG4074G267330	3873	5	2752	3451	8992	274
336	269	AZG4074G269336	3873	5	2766	3465	8992	275
360	289	AZG4075G289360	4090	5	2925	3624	9677	297

Notes:
1. Position #5 designates nameplate options: 0=English 1=Spanish 2=Portuguese
2. All arresters are available in grey (standard) or brown porcelain glaze. For brown glaze, substitute “B” for “G” in the eighth position of the catalog number.
3. Digits 6 and 7 housing designation may be modified for arresters requiring leakage distance other than the standard arresters shown. Extended leakage may require additional clearances for phase-to-phase and phase-to-earth. Contact your sales representative for this information.
4. Cantilever strength for all ratings is 10,200 NM. Maximum working load should not exceed 40% of this value.
5. Refer to Figure 6 for Dimension A.

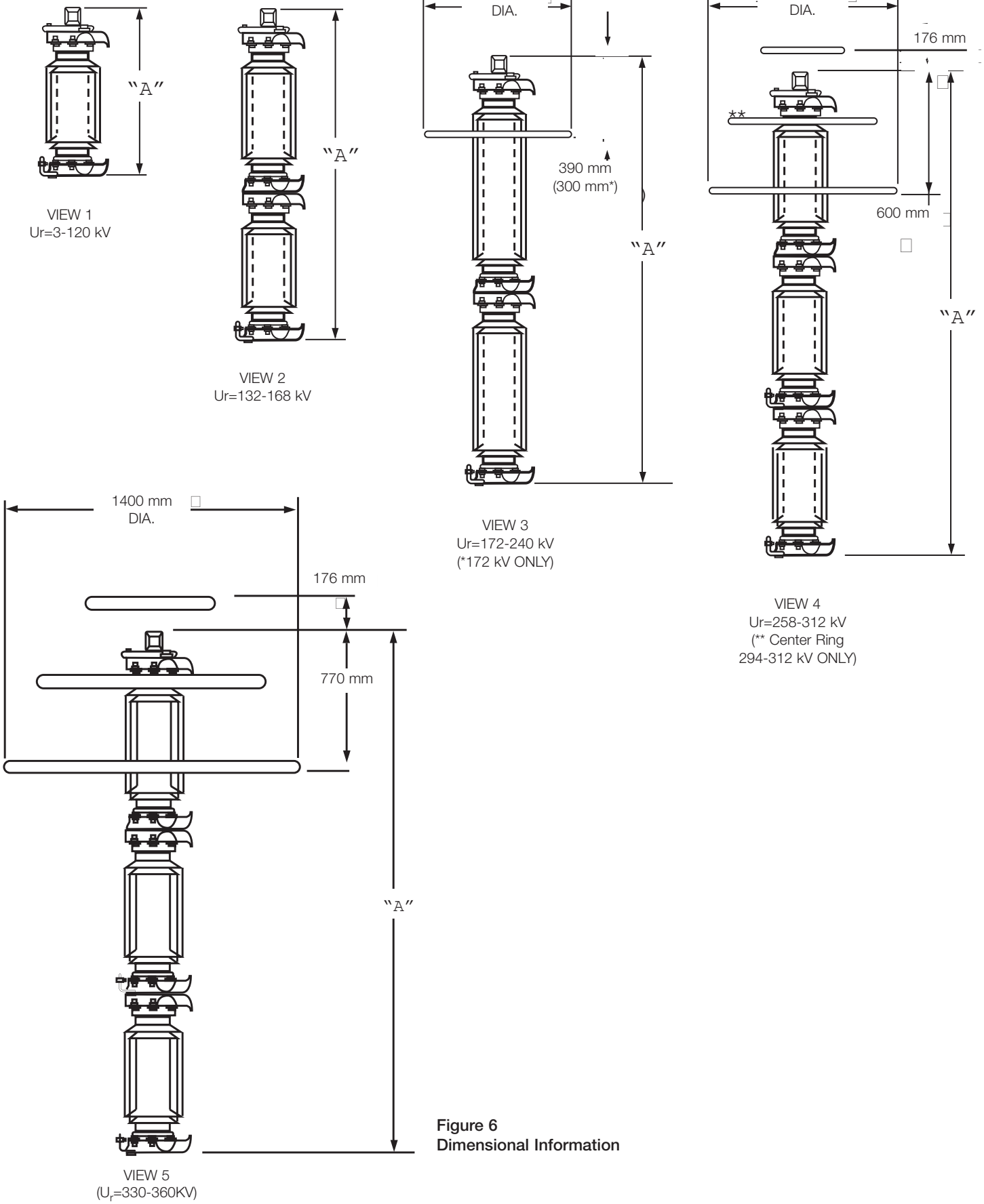

Figure 6
Dimensional Information

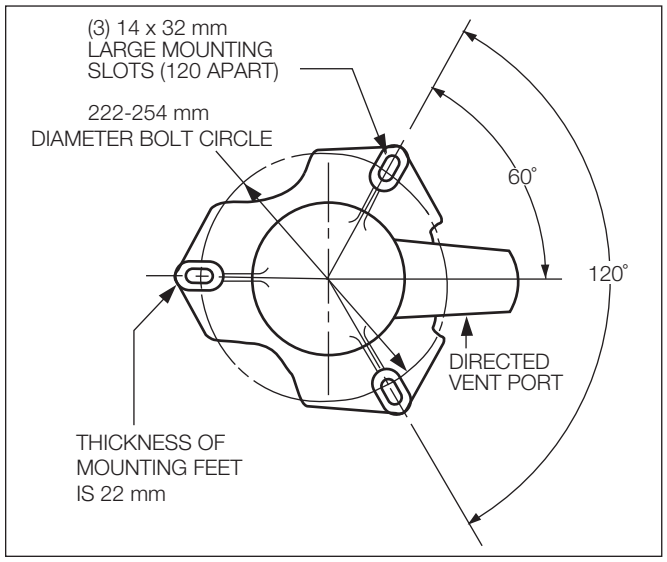

Figure 7
Base Mounting Details (All Ratings)

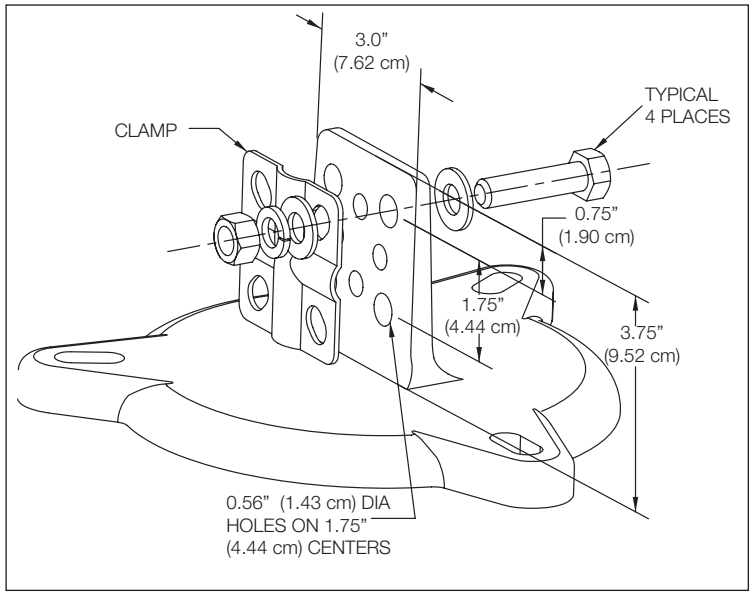

Figure 8a
Line Terminal

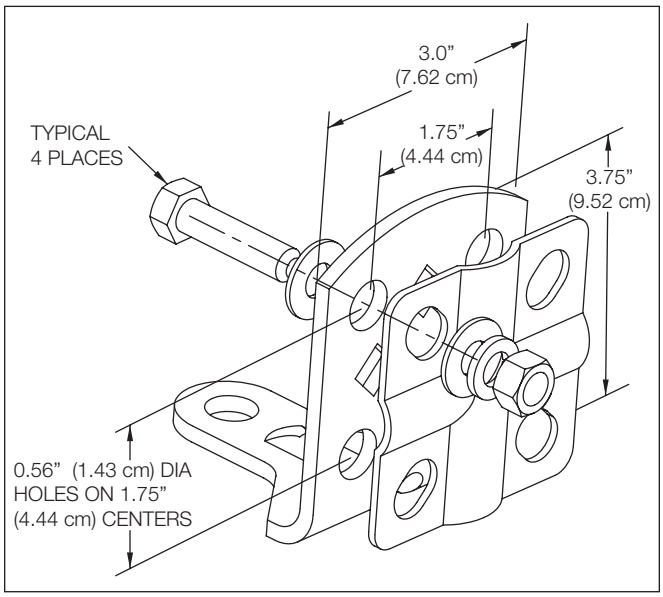

Figure 8b
Earth Terminal

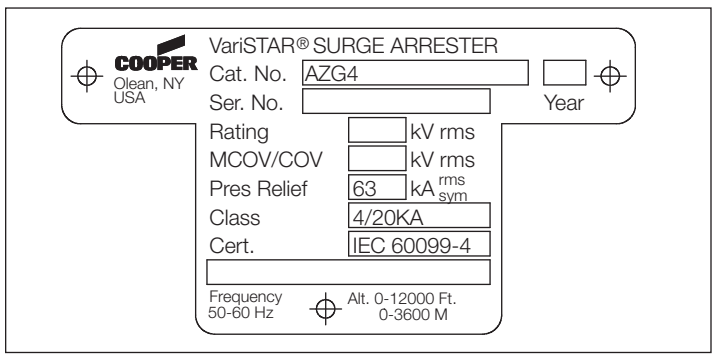

Figure 9
Unit Nameplate

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