IEEE/IEC Lightning Arrester

Arresters for AC and DC Applications

GE
Digital Energy

Overview

For more than a century, utilities have relied on GE to deliver electrical products and services to meet their reliability and operational performance needs. GE is a leading provider of transmission and distribution solutions as well as grid automation systems that maximize utilities operational efficiencies and provides their customers with reliable power.

Through an alliance with XD Electric, GE has extended its portfolio to include high and ultra-high voltage power equipment, supporting the highest transmission voltage levels in the world. XD Electric is one of China's largest high voltage equipment manufacturers dedicated to the research, application and development of critical transmission equipment and solutions. XD Electric has a broad range of products to transform and direct the flow of power for industrial, commercial and residential users. The XD|GE partnership brings end-to-end transmission solutions to meet the growing global demand for electricity. The combined portfolios of GE and XD provide a comprehensive range of technology solutions to address the unique challenges faced by the utility sector and energy intensive industries.

XDlGE IEEE/IEC Lightning Arresters

XD|GE provides a full range of porcelain and polymer housed IEEE and IEC rated arresters for AC and DC transmission, substation, and distribution applications.

XD|GE arresters are widely used in power plants, transmission substations, distribution substation and high voltage power equipment up to 1100kV.

Product Features

- Stringent tests on each MOV disk provide industry leading MOV performance and reliability
- Porcelain and silicon bushings are provided from vertically integrated, state-of-the-art manufacturing plants for optimal quality, performance and delivery
- Both porcelain and polymer arresters are guaranteed to resist moisture ingression and partial discharge under extreme environmental conditions
- Excellent aging resistance
- High mechanical strength
- Reliable pressure release capability

Quality

Quality is critical for XD|GE and this focus is evident throughout our manufacturing environment. Quality begins with an incoming inspection of all purchased and outsourced materials to ensure that before we begin the manufacturing process, we have the best possible inputs. Each production facility maintains working environment standards including controls of cleanliness, temperature and humidity.

Through production and assembly, there are multiple checkpoints for critical process steps, including both visual inspection as well as stopped flow inspection performed to documented test plans. Our production facilities follow a strict non-conforming procedure to identify and control and to avoid the use and delivery of the non-conformity.

In addition, XD|GE has a dedicated measuring and inspection department with certified, full-time inspectors in each of our manufacturing sites. This department provides a secondary cross-inspection for work in process and finished products, ensuring quality is achieved throughout the manufacturing process. First pass yield and cost of quality data is maintained and analyzed per product family.

HOUSING TYPE:
Porcelain
Polymer
ENERGY HANDLING CAPABILITY CLASSIFICATION:
Class 1 - 10,000 Amp Nominal Discharge Current /Distribution Class
Class 2 - 10,000 Amp Nominal Discharge Current/ Distribution Class/Intermediate Class
Class 3 - 10,000 Amp Nominal Discharge Current, Ur < = 420 kV/Station Class
Class 4 - 20,000 Amp Nominal Discharge Current, Ur <= 420 kV/ Station Class
Class 5 - 20,000 Amp Nominal Discharge Current , Ur >360 kV/ Station Class
POLLUTION LEVEL REQUIREMENT CLASSIFICATION:
Medium (>= 20mm/kV Um)
Heavy (>= 25 mm/kV Um)
Very Heavy (>= 31 mm/kV Um)
APPLICATION CLASSIFICATION:
Transmission line
Substation
GIS
HVDC
Railroad, generator, motor, reactor, capacitor and SVC protection

Advanced Test Facilities

XIHARI® is the Xi'an High Voltage Apparatus Research Institute and is an integral part of the XD|GE alliance. XIHARI has extensive testing capabilities at its facility sites, which include: High Power Laboratory, High Voltage Laboratory, Artificial Climate Laboratory, and EMC Laboratory and an Operational Test Circuit for HVDC Thyristor Valves. The testing hall meets the requirements of ISO™/IEC 17025, and boasts some of the largest test equipment in the world, creating capacity to test insulators as large as 1,100kV AC.

The high voltage apparatus laboratory in XIHARI is a government authorized national high voltage apparatus quality supervision and inspection test center. It is an independent third-party laboratory in type tests, routine tests, performance tests and certificate tests for high voltage apparatus. The testing facilities at XIHARI also include an extension environmental laboratory.

Testing capabilities here include high altitude testing, high humidity testing,
and temperature testing from -70° C up to +150° C.

Global Project Engineering Services

XD|GE is dedicated to the success of its customers and provides an array of services to help successfully deploy and maintain XD|GE products and business solutions globally. World-class post-sales support, professional services, and supportive resources are ready to ensure that you effectively leverage the technical power and business advantages that come with XD|GE products.

This support infrastructure covers the entire life cycle of the product. You can count on our XD|GE global services team from the coordination of transportation logistics through the completion of site acceptance testing and into warranty and support phases of the product life cycle.

Access to our XD|GE support team for post commissioning needs is simplified to a single phone number or email address. Our global support center will be staffed 24x7 to field any incoming concerns and ensure our customer needs are fulfilled as quickly as possible. Our experienced and qualified XD|GE field service team has significant reach and leverage across the globe. The field service team will also have access to significant high-voltage power equipment domain expertise within XD|GE.

Our dedicated global service team comprises of qualified service engineers, in addition to a global field service network to deliver world-class Installation, commissioning and post-sales support.

Specialized Installation & Commissioning

- Logistics including coordination of ocean and inland transportation
- Complete installation services include rigging, labor (mechanical, and electrical)
- Receiving, rigging, and unloading
- Testing system commissioning
- Site acceptance testing

Post-Sales / Installation Support

- 24/7 Global customer service
- Multilingual operators available to respond to customer requests
- Emergency response hotline
- Several customer support access points available to obtain support (telephone, e-mail, fax, or web)
- Warranty backed by the strength of GE
- Local spare parts availability reinforced by a global spare parts reserve
- We offer a global system of maintenance and repair facilities

Arrester Type Tests

All arresters are designed and tested per requirements in IEC 60099-4 and IEEE C62.11.

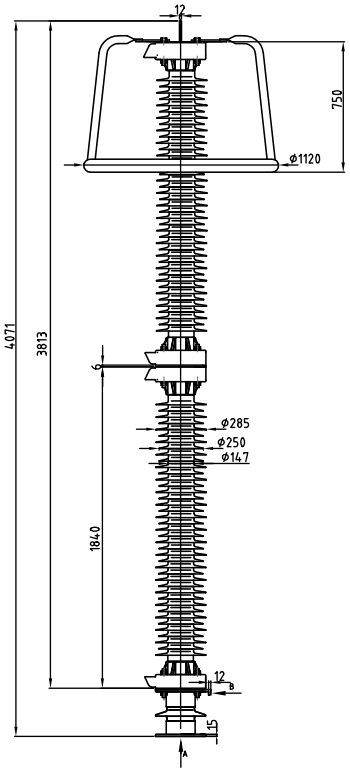
Testing Includes

- Insulation Withstand Test
- Residual Voltage Test
- Long Duration Current Withstand
- Accelerated Aging Procedure
- Heat Dissipation Behavior
- RIV
- Power Frequency Voltage vs Time
- Switching Surge Operation Duty
- Short Current Test
- Internal Partial Discharge
- Bending Moment
- Environmental
- Seal Leakage
- Artificial Pollution/ Weather Aging

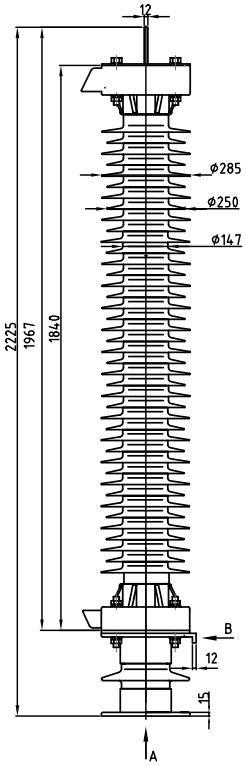
Worldwide Customer with Satisfaction

Products are widely used in power system up to 1000kV AC and ± 800kV DC with worldwide customers in Southeast Asia, America, Europe, Australia, Middle East, Africa and other regions. More than 350,000 products are on operation so far.

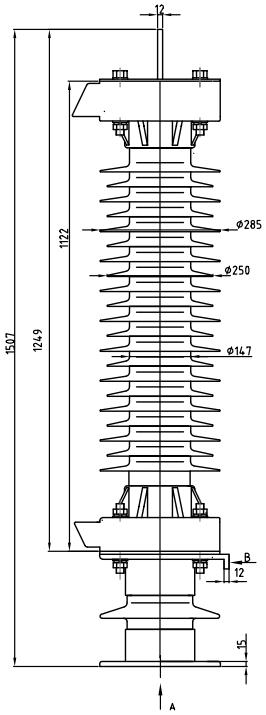
Polymer Arrester Outline Drawings (mm)



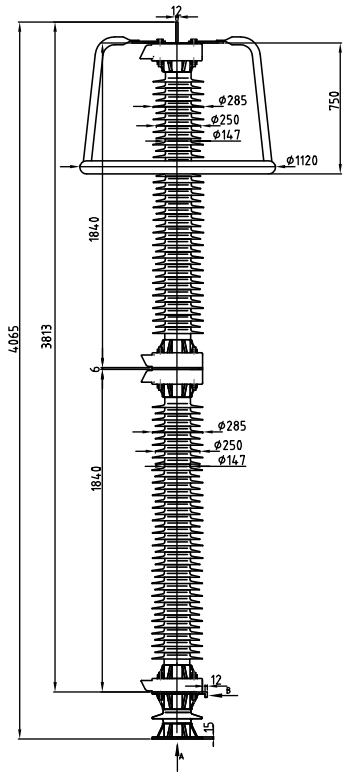
300kV



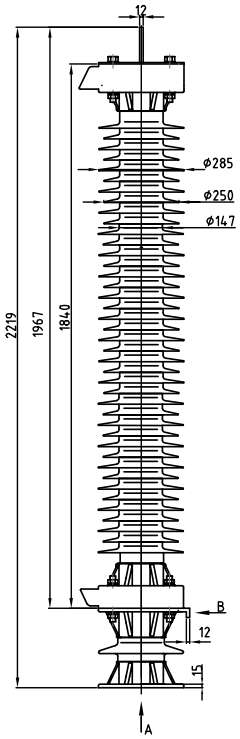
145kV



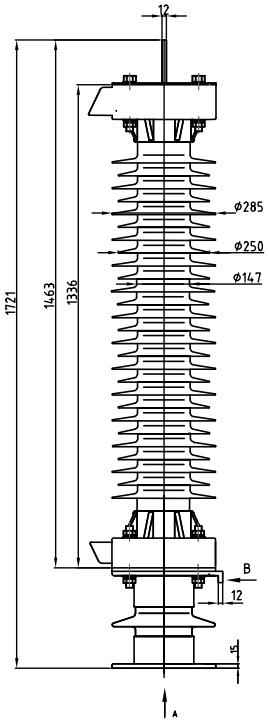
72kV



362kV



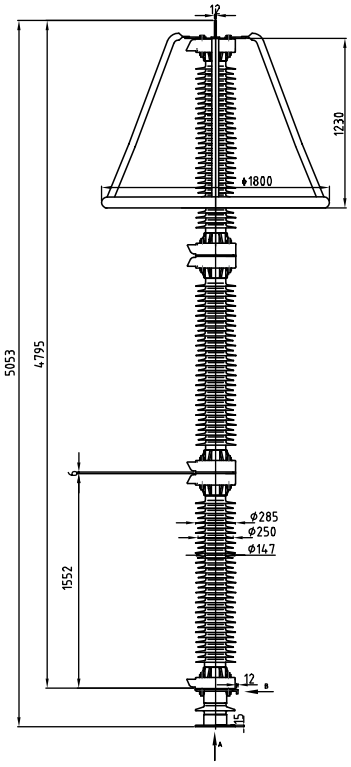
170kV



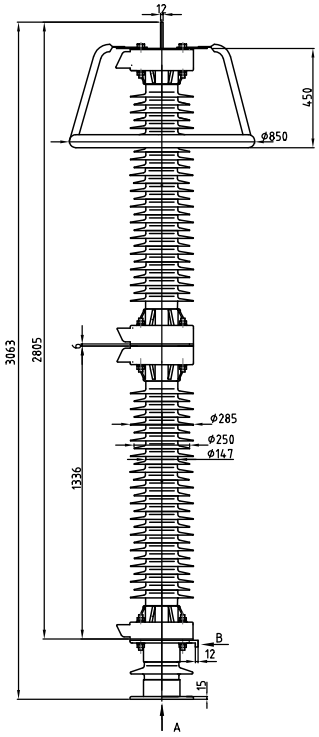
100kV

For specifications on class 3, 4 and 5 ratings, please refer to the tables on pages 7 to 15.

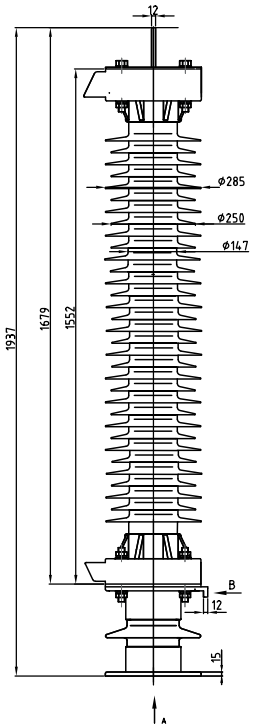
Polymer Arrester Outline Drawings (Cont'd)



420kV

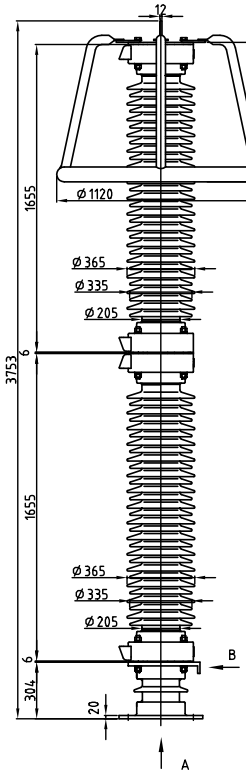


245kV

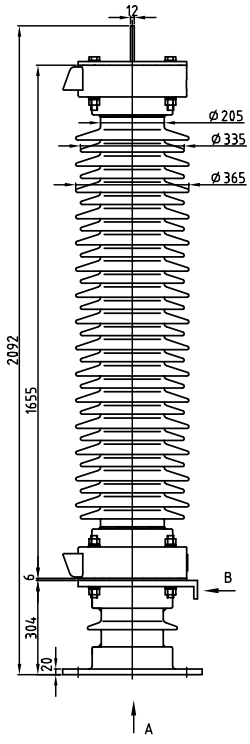


123kV

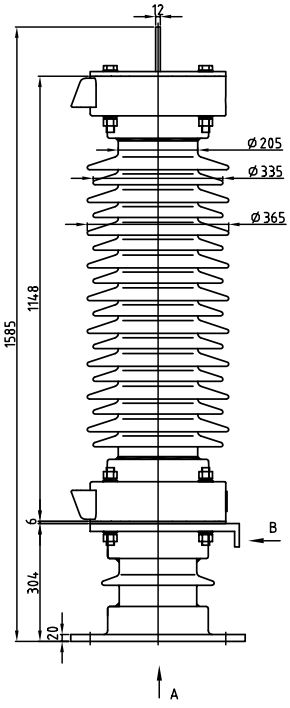
Porcelain Arrester Outline Drawings (mm)



300kV



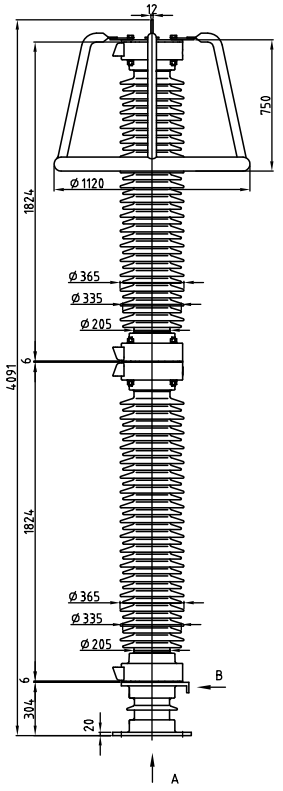
145kV



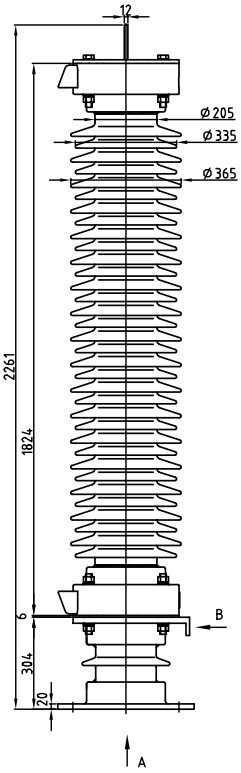
72kV

For specifications on class 3, 4 and 5 ratings, please refer to the tables on pages 7 to 15.

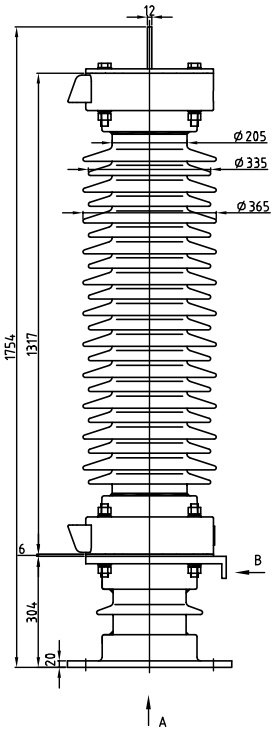
Porcelain Arrester Outline Drawings (Cont'd)



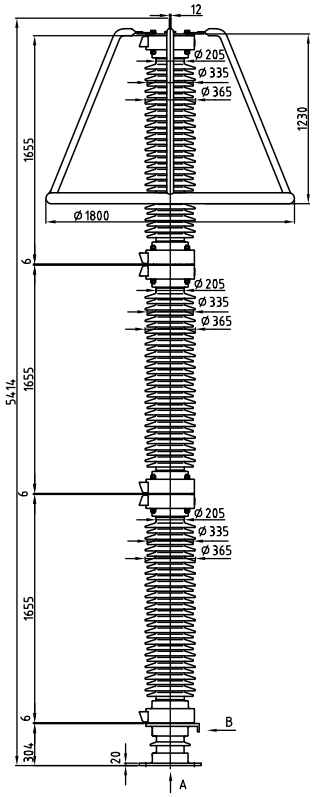
362kV



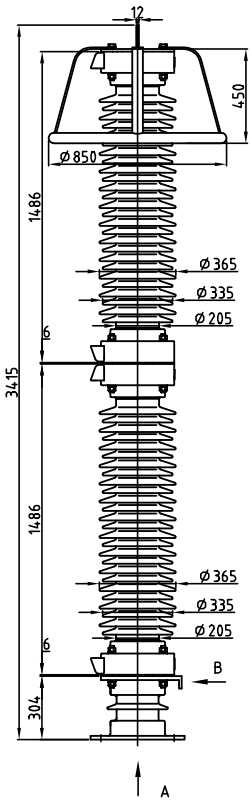
170kV



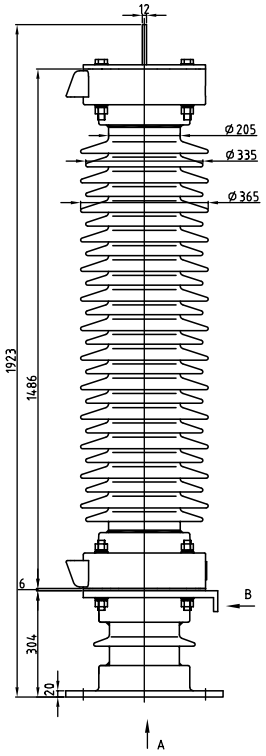
100kV



420kV



245kV



123kV

For specifications on class 3, 4 and 5 ratings, please refer to the tables on pages 7 to 15.

Class 3 Ratings (Porcelain and Polymer)

IEC60099-4 CLASS 3 IEEE C62.11 STATION CLASS			MINIMUM DESIGNED CREEP	ACTUAL DESIGNED CREEP	IEC PREVIOUS DUTY TOV		SWITCHING IMPULSE RESIDUAL VOLTAGE				FRONT OF WAVE .5 US	MAXIMUM 8/20 RESIDUAL VOLTAGE AT INDICATED CURRENT (KV)					
							.25 KA	.50 KA	1.0 KA	2.0 KA							
Um	Ur	Uc	mm	mm	1s kVrms	10s kVrms	kV	kV	kV	kV	kV	1.5 kA	2.5 kA	5 kA	10 kA	20 kA	40 kA
12	9	7.2	372	378	10.4	9.9	19.7	19.9	20.7	21.7	26.3	20.2	20.6	22.0	23.4	26.3	29.2
12	12	9.6	372	378	13.8	13.2	26.3	26.6	27.6	28.9	35.0	26.9	27.4	29.3	31.2	35.0	39.0
12	15	12	372	378	17.3	16.5	32.8	33.2	34.5	36.2	43.8	33.6	34.3	36.7	39.0	43.8	48.7
17.5	15	12	542.5	551	17.3	16.5	32.8	33.2	34.5	36.2	43.8	33.6	34.3	36.7	39.0	43.8	48.7
17.5	18	14.4	542.5	551	20.7	19.8	39.4	39.8	41.4	43.4	52.5	40.3	41.2	44.0	46.8	52.5	58.5
17.5	21	16.8	542.5	551	24.2	23.1	46	46.5	48.2	50.6	61.3	47.0	48.0	51.3	54.6	61.3	68.2
17.5	24	19.2	542.5	551	27.6	26.4	52.5	53.1	55.1	57.9	70.0	53.7	54.9	58.7	62.4	70.0	78.0
24	18	14.4	744	755	20.7	19.8	39.4	39.8	41.4	43.4	52.5	40.3	41.2	44.0	46.8	52.5	58.5
24	21	16.8	744	755	24.2	23.1	46	46.5	48.2	50.6	61.3	47.0	48.0	51.3	54.6	61.3	68.2
24	24	19.2	744	755	27.6	26.4	52.5	53.1	55.1	57.9	70.0	53.7	54.9	58.7	62.4	70.0	78.0
24	27	21.6	744	755	31.1	29.7	59.1	59.7	62	65.1	78.8	60.5	61.7	66.0	70.3	78.8	87.7
24	30	24	744	755	34.5	33.0	65.6	66.4	68.9	72.3	87.5	67.2	68.6	73.3	78.1	87.5	97.5
30	24	19.2	930	944	27.6	26.4	52.5	53.1	55.1	57.9	70.0	53.7	54.9	58.7	62.4	70.0	78.0
36	27	21.6	1116	1133	31.1	29.7	59.1	59.7	62	65.1	78.8	60.5	61.7	66.0	70.3	78.8	87.7
36	30	24	1116	1133	34.5	33.0	65.6	66.4	68.9	72.3	87.5	67.2	68.6	73.3	78.1	87.5	97.5
36	33	26.4	1116	1133	38.0	36.3	72.2	73	75.8	79.6	96.3	73.9	75.5	80.7	85.9	96.3	107
36	36	28.8	1116	1133	41.4	39.6	78.8	79.7	82.7	86.8	105	80.6	82.3	88.0	93.7	105	117
36	39	31.2	1116	1133	44.9	42.9	85.3	86.3	89.6	94	114	87.3	89.2	95.4	101	114	127
36	42	33.6	1116	1133	48.3	46.2	91.9	92.9	96.5	101.3	123	94.0	96.0	103	109	123	136
36	45	36	1116	1133	51.8	49.5	98.5	99.6	103.4	108.5	131	101	103	110	117	131	146
36	48	38.4	1116	1133	55.2	52.8	105	106	110.3	115.7	140	107	110	117	125	140	156
48	36	28.8	1488	1510	41.4	39.6	78.8	79.7	82.7	86.8	105	80.6	82.3	88.0	93.7	105	117
48	39	31.2	1488	1510	44.9	42.9	85.3	86.3	89.6	94	114	87.3	89.2	95.4	101	114	127
52	42	33.6	1612	1636	48.3	46.2	91.9	92.9	96.5	101	123	94.0	96.0	103	109	123	136
52	45	36	1612	1636	51.8	49.5	98.5	100	103	109	131	101	103	110	117	131	146
52	48	38.4	1612	1636	55.2	52.8	105	106	110	116	140	107	110	117	125	140	156
52	51	40.8	1612	1636	58.7	56.1	112	113	117	123	149	114	117	125	133	149	166
52	54	43.2	1612	1636	62.1	59.4	119	119	124	130	158	121	123	132	141	158	175
52	60	48	1612	1636	69.0	66.0	132	133	138	145	175	134	137	147	156	175	195
52	63	50.4	1612	1636	72.5	69.3	139	139	145	152	184	141	144	154	164	184	205
52	66	52.8	1612	1636	75.9	72.6	145	146	152	159	193	148	151	161	172	193	214
72	54	43.2	2232	2265	62.1	59.4	119	119	124	130	158	121	123	132	141	158	175
72	60	48	2232	2265	69.0	66.0	132	133	138	145	175	134	137	147	156	175	195
72	63	50.4	2232	2265	72.5	69.3	139	139	145	152	184	141	144	154	164	184	205
72	66	52.8	2232	2265	75.9	72.6	145	146	152	159	193	148	151	161	172	193	214
72	72	57.6	2232	2265	82.8	79.2	158	159	165	174	210	161	165	176	187	210	234
72	75	60	2232	2265	86.3	82.5	165	166	172	181	219	168	172	183	195	219	244
72	78	62.4	2232	2265	89.7	85.8	172	173	179	188	228	175	178	191	203	228	253
72	81	64.8	2232	2265	93.2	89.1	178	179	186	195	236	181	185	198	211	236	263

Class 3 Ratings (Porcelain and Polymer) (Cont'd)

IEC60099-4 CLASS 3 IEEE C62.11 STATION CLASS			MINIMUM DESIGNED CREEP	ACTUAL DESIGNED CREEP	IEC PREVIOUS DUTY TOV		SWITCHING IMPULSE RESIDUAL VOLTAGE				FRONT OF WAVE .5 US	MAXIMUM 8/20 RESIDUAL VOLTAGE AT INDICATED CURRENT (KV)					
							.25 KA	.50 KA	1.0 KA	2.0 KA							
Um	Ur	Uc	mm	mm	1s kVrms	10s kVrms	kV	kV	kV	kV	kV	1.5 kA	2.5 kA	5 kA	10 kA	20 kA	40 kA
72	84	67.2	2232	2265	96.6	92.4	185	186	193	203	245	188	192	205	219	245	273
72	87	69.6	2232	2265	100	95.7	191	193	200	210	254	195	199	213	226	254	283
72	90	72	2232	2265	104	99.0	198	199	207	217	263	202	206	220	234	263	292
72	93	74.4	2232	2265	107	102.3	205	206	214	224	271	208	213	227	242	271	302
72	96	76.8	2232	2265	110	105.6	211	212	221	231	280	215	220	235	250	280	312
100	75	60	3100	3147	86.3	82.5	165	166	172	181	219	168	172	183	195	219	244
100	78	62.4	3100	3147	89.7	85.8	172	173	179	188	228	175	178	191	203	228	253
100	81	64.8	3100	3147	93.2	89.1	178	179	186	195	236	181	185	198	211	236	263
100	84	67.2	3100	3147	96.6	92.4	185	186	193	203	245	188	192	205	219	245	273
100	87	69.6	3100	3147	100	95.7	191	193	200	210	254	195	199	213	226	254	283
100	90	72	3100	3147	104	99.0	198	199	207	217	263	202	206	220	234	263	292
100	93	74.4	3100	3147	107	102	205	206	214	224	271	208	213	227	242	271	302
100	96	76.8	3100	3147	110	106	211	212	221	231	280	215	220	235	250	280	312
123	90	72	3813	3870	104	99.0	198	199	207	217	263	202	206	220	234	263	292
123	93	74.4	3813	3870	107	102	205	206	214	224	271	208	213	227	242	271	302
123	96	76.8	3813	3870	110	106	211	212	221	231	280	215	220	235	250	280	312
123	102	81.6	3813	3870	117	112	224	226	234	246	298	228	233	249	265	298	331
123	108	86.4	3813	3870	124	119	238	239	248	260	315	242	247	264	281	315	351
123	114	91.2	3813	3870	131	125	251	252	262	275	333	255	261	279	297	333	370
123	120	96	3813	3870	138	132	264	266	276	289	350	269	274	293	312	350	390
123	126	100.8	3813	3870	145	139	277	279	289	304	368	282	288	308	328	368	409
145	114	91.2	4495	4562	131	125	251	252	262	275	333	255	261	279	297	333	370
145	120	96	4495	4562	138	132	264	266	276	289	350	269	274	293	312	350	390
145	126	100.8	4495	4562	145	139	277	279	289	304	368	282	288	308	328	368	409
145	132	105.6	4495	4562	152	145	290	292	303	318	385	296	302	323	343	385	429
145	138	110.4	4495	4562	159	152	304	305	317	333	403	309	316	337	359	403	448
145	144	115.2	4495	4562	166	158	317	319	331	347	420	322	329	352	375	420	468
170	132	105.6	5270	5349	152	145	290	292	303	318	385	296	302	323	343	385	429
170	138	110.4	5270	5349	159	152	304	305	317	333	403	309	316	337	359	403	448
170	144	115.2	5270	5349	166	158	317	319	331	347	420	322	329	352	375	420	468
170	150	120	5270	5349	173	165	330	332	345	362	438	336	343	367	390	438	487
170	162	129.6	5270	5349	186	178	356	358	372	391	473	363	370	396	422	473	526
170	168	134.4	5270	5349	193	185	370	372	386	405	490	376	384	411	437	490	546
245	180	144	7595	7709	207	198	396	398	414	434	525	403	412	440	468	525	585
245	186	148.8	7595	7709	214	205	409	412	427	449	543	416	425	455	484	543	604
245	192	153.6	7595	7709	221	211	422	425	441	463	560	430	439	469	500	560	624
245	198	158.4	7595	7709	228	218	435	438	455	477	578	443	453	484	515	578	643
245	210	168	7595	7709	242	231	462	465	482	506	613	470	480	513	546	613	682
245	216	172.8	7595	7709	248	238	475	478	496	521	630	484	494	528	562	630	702
245	222	177.6	7595	7709	255	244	488	491	510	535	648	497	508	543	578	648	721
245	228	182.4	7595	7709	262	251	501	505	524	550	665	511	521	557	593	665	741

Class 4 Ratings (Porcelain and Polymer)

IEC60099-4 CLASS 4 IEEE C62.11 STATION CLASS			MINIMUM DESIGNED CREEP	ACTUAL DESIGNED CREEP	IEC PREVIOUS DUTY TOV		SWITCHING IMPULSE RESIDUAL VOLTAGE				FRONT OF WAVE .5 US	MAXIMUM 8/20 RESIDUAL VOLTAGE AT INDICATED CURRENT (KV)					
							.25 KA	.50 KA	1.0 KA	2.0 KA							
Um	Ur	Uc	mm	mm	1s kVrms	10s kVrms	kV	kV	kV	kV	kV	1.5 kA	2.5 kA	5 kA	10 kA	20 kA	40 kA
12	12	9.6	372	378	13.8	13.2	23.2	23.6	24.7	25.7	37.1	25.1	25.7	27.5	29.2	32.5	36.0
12	15	12	372	378	17.3	16.5	29.0	29.6	30.9	32.1	46.4	31.4	32.1	34.3	36.5	40.6	44.9
17.5	15	12	542.5	551	17.3	16.5	29.0	29.6	30.9	32.1	46.4	31.4	32.1	34.3	36.5	40.6	44.9
17.5	18	14.4	542.5	551	20.7	19.8	34.7	35.5	37.1	38.5	55.6	37.7	38.5	41.2	43.8	48.7	53.9
17.5	21	16.8	542.5	551	24.2	23.1	40.5	41.4	43.3	45.0	64.9	44.0	44.9	48.1	51.2	56.8	62.9
17.5	24	19.2	542.5	551	27.6	26.4	46.3	47.3	49.5	51.4	74.2	50.3	51.3	54.9	58.5	64.9	71.9
24	18	14.4	744	755	20.7	19.8	34.7	35.5	37.1	38.5	55.6	37.7	38.5	41.2	43.8	48.7	53.9
24	21	16.8	744	755	24.2	23.1	40.5	41.4	43.3	45.0	64.9	44.0	44.9	48.1	51.2	56.8	62.9
24	24	19.2	744	755	27.6	26.4	46.3	47.3	49.5	51.4	74.2	50.3	51.3	54.9	58.5	64.9	71.9
24	27	21.6	744	755	31.1	29.7	52.1	53.2	55.6	57.8	83.5	56.5	57.8	61.8	65.8	73	80.9
24	30	24	744	755	34.5	33.0	57.9	59.1	61.8	64.2	92.7	62.8	64.2	68.6	73.1	81.1	89.9
30	24	19.2	930	944	27.6	26.4	46.3	47.3	49.5	51.4	74.2	50.3	51.3	54.9	58.5	64.9	71.9
36	27	21.6	1116	1133	31.1	29.7	52.1	53.2	55.6	57.8	83.5	56.5	57.8	61.8	65.8	73	80.9
36	30	24	1116	1133	34.5	33.0	57.9	59.1	61.8	64.2	92.7	62.8	64.2	68.6	73.1	81.1	89.9
36	33	26.4	1116	1133	38.0	36.3	63.7	65.0	68.0	70.7	102	69.1	70.6	75.5	80.4	89.2	98.9
36	36	28.8	1116	1133	41.4	39.6	69.5	70.9	74.2	77.1	111	75.4	77.0	82.4	87.7	97.4	108
36	39	31.2	1116	1133	44.9	42.9	75.3	76.8	80.4	83.5	121	81.7	83.4	89.2	95.0	105	117
36	42	33.6	1116	1133	48.3	46.2	81.1	82.8	86.6	89.9	130	88	89.9	96.1	102	114	126
36	45	36	1116	1133	51.8	49.5	86.9	88.7	92.7	96.4	139	94.2	96.3	103	110	122	135
36	48	38.4	1116	1133	55.2	52.8	92.7	94.6	98.9	103	148	101	102.7	110	117	130	144
48	36	28.8	1488	1510	41.4	39.6	69.5	70.9	74.2	77.0	111	75.4	77.0	82.4	87.7	97	108
48	39	31.2	1488	1510	44.9	42.9	75.3	76.8	80.4	84.0	121	81.7	83.4	89.2	95.0	105	117
52	42	33.6	1612	1636	48.3	46.2	81.1	82.8	86.6	90.0	130	88.0	89.9	96.1	102	114	126
52	45	36	1612	1636	51.8	49.5	86.9	88.7	92.7	96.0	139	94.2	96.3	103	110	122	135
52	48	38.4	1612	1636	55.2	52.8	92.7	94.6	98.9	103	148	101	103	110	117	130	144
52	51	40.8	1612	1636	58.7	56.1	98.4	100	105	109	158	107	109	117	124	138	153
52	54	43.2	1612	1636	62.1	59.4	104	106	111	116	167	113	116	124	132	146	162
52	60	48	1612	1636	69.0	66.0	116	118	124	128	185	126	128	137	146	162	180
52	63	50.4	1612	1636	72.5	69.3	122	124	130	135	195	132	135	144	153	170	189
52	66	52.8	1612	1636	75.9	72.6	127	130	136	141	204	138	141	151	161	178	198
72	54	43.2	2232	2265	62.1	59.4	104	106	111	116	167	113	116	124	132	146	162
72	60	48	2232	2265	69.0	66.0	116	118	124	128	185	126	128	137	146	162	180
72	63	50.4	2232	2265	72.5	69.3	122	124	130	135	195	132	135	144	153	170	189
72	66	52.8	2232	2265	75.9	72.6	127	130	136	141	204	138	141	151	161	178	198
72	72	57.6	2232	2265	82.8	79.2	139	142	148	154	223	151	154	165	175	195	216
72	75	60	2232	2265	86.3	82.5	145	148	155	161	232	157	160	172	183	203	225
72	78	62.4	2232	2265	89.7	85.8	151	154	161	167	241	163	167	178	190	211	234
72	81	64.8	2232	2265	93.2	89.1	156	160	167	173	250	170	173	185	197	219	243
72	84	67.2	2232	2265	96.6	92.4	162	166	173	180	260	176	180	192	205	227	252
72	87	69.6	2232	2265	100	95.7	168	171	179	186	269	182	186	199	212	235	261

Class 4 Ratings (Porcelain and Polymer) (Cont'd)

IEC60099-4 CLASS 4 IEEE C62.11 STATION CLASS			MINIMUM DESIGNED CREEP	ACTUAL DESIGNED CREEP	IEC PREVIOUS DUTY TOV		SWITCHING IMPULSE RESIDUAL VOLTAGE				FRONT OF WAVE .5 US	MAXIMUM 8/20 RESIDUAL VOLTAGE AT INDICATED CURRENT (KV)					
							.25 KA	.50 KA	1.0 KA	2.0 KA							
Um	Ur	Uc	mm	mm	1s kVrms	10s kVrms	kV	kV	kV	kV	kV	1.5 kA	2.5 kA	5 kA	10 kA	20 kA	40 kA
72	90	72	2232	2265	104	99.0	174	177	185	193	278	188	193	206	219	243	270
72	93	74.4	2232	2265	107	102.3	180	183	192	199	287	195	199	213	227	252	279
72	96	76.8	2232	2265	110	106	185	189	198	206	297	201	205	220	234	260	288
100	75	60	2500	2538	86.3	82.5	145	148	155	161	232	157	160	172	183	203	225
100	75	60	3100	3147	86.3	82.5	145	148	155	161	232	157	160	172	183	203	225
100	78	62.4	2500	2538	89.7	85.8	151	154	161	167	241	163	167	178	190	211	234
100	78	62.4	3100	3147	89.7	85.8	151	154	161	167	241	163	167	178	190	211	234
100	81	64.8	2500	2538	93.2	89.1	156	160	167	173	250	170	173	185	197	219	243
100	81	64.8	3100	3147	93.2	89.1	156	160	167	173	250	170	173	185	197	219	243
100	84	67.2	2500	2538	96.6	92.4	162	166	173	180	260	176	180	192	205	227	252
100	84	67.2	3100	3147	96.6	92.4	162	166	173	180	260	176	180	192	205	227	252
100	87	69.6	2500	2538	100	95.7	168	171	179	186	269	182	186	199	212	235	261
100	87	69.6	3100	3147	100	95.7	168	171	179	186	269	182	186	199	212	235	261
100	90	72	2500	2538	104	99.0	174	177	185	193	278	188	193	206	219	243	270
100	90	72	3100	3147	104	99.0	174	177	185	193	278	188	193	206	219	243	270
100	93	74.4	2500	2538	107	102	180	183	192	199	287	195	199	213	227	252	279
100	93	74.4	3100	3147	107	102	180	183	192	199	287	195	199	213	227	252	279
100	96	76.8	2500	2538	110	106	185	189	198	206	297	201	205	220	234	260	288
100	96	76.8	3100	3147	110	106	185	189	198	206	297	201	205	220	234	260	288
123	90	72	3075	3121	104	99.0	174	177	185	193	278	188	193	206	219	243	270
123	90	72	3813	3870	104	99.0	174	177	185	193	278	188	193	206	219	243	270
123	93	74.4	3075	3121	107	102	180	183	192	199	287	195	199	213	227	252	279
123	93	74.4	3813	3870	107	102	180	183	192	199	287	195	199	213	227	252	279
123	96	76.8	3075	3121	110	106	185	189	198	206	297	201	205	220	234	260	288
123	96	76.8	3813	3870	110	106	185	189	198	206	297	201	205	220	234	260	288
123	102	81.6	3075	3121	117	112	197	201	210	218	315	214	218	233	248	276	306
123	102	81.6	3813	3870	117	112	197	201	210	218	315	214	218	233	248	276	306
123	108	86.4	3075	3121	124	119	208	213	223	231	334	226	231	247	263	292	324
123	108	86.4	3813	3870	124	119	208	213	223	231	334	226	231	247	263	292	324
123	114	91.2	3075	3121	131	125	220	225	235	244	352	239	244	261	278	308	342
123	114	91.2	3813	3870	131	125	220	225	235	244	352	239	244	261	278	308	342
123	120	96	3075	3121	138	132	232	236	247	257	371	251	257	275	292	325	360
123	120	96	3813	3870	138	132	232	236	247	257	371	251	257	275	292	325	360
123	126	100.8	3075	3121	145	139	243	248	260	270	389	264	270	288	307	341	377
123	126	100.8	3813	3870	145	139	243	248	260	270	389	264	270	288	307	341	377
145	114	91.2	3625	3679	131	125	220	225	235	244	352	239	244	261	278	308	342
145	114	91.2	4495	4562	131	125	220	225	235	244	352	239	244	261	278	308	342
145	120	96	3625	3679	138	132	232	236	247	257	371	251	257	275	292	325	360
145	120	96	4495	4562	138	132	232	236	247	257	371	251	257	275	292	325	360
145	126	100.8	3625	3679	145	139	243	248	260	270	389	264	270	288	307	341	377

Class 4 Ratings (Porcelain and Polymer) (Cont'd)

IEC60099-4 CLASS 4 IEEE C62.11 STATION CLASS			MINIMUM DESIGNED CREEP	ACTUAL DESIGNED CREEP	IEC PREVIOUS DUTY TOV		SWITCHING IMPULSE RESIDUAL VOLTAGE				FRONT OF WAVE .5 US	MAXIMUM 8/20 RESIDUAL VOLTAGE AT INDICATED CURRENT (KV)					
							.25 KA	.50 KA	1.0 KA	2.0 KA							
Um	Ur	Uc	mm	mm	1s kVrms	10s kVrms	kV	kV	kV	kV	kV	1.5 kA	2.5 kA	5 kA	10 kA	20 kA	40 kA
145	126	100.8	4495	4562	145	139	243	248	260	270	389	264	270	288	307	341	377
145	132	105.6	3625	3679	152	145	255	260	272	283	408	276	282	302	322	357	395
145	132	105.6	4495	4562	152	145	255	260	272	283	408	276	282	302	322	357	395
145	138	110.4	3625	3679	159	152	266	272	284	296	427	289	295	316	336	373	413
145	138	110.4	4495	4562	159	152	266	272	284	296	427	289	295	316	336	373	413
145	144	115.2	3625	3679	166	158	278	284	297	308	445	302	308	329	351	389	431
145	144	115.2	4495	4562	166	158	278	284	297	308	445	302	308	329	351	389	431
170	132	105.6	4250	4314	152	145	255	260	272	283	408	276	282	302	322	357	395
170	132	105.6	5270	5349	152	145	255	260	272	283	408	276	282	302	322	357	395
170	138	110.4	4250	4314	159	152	266	272	284	296	427	289	295	316	336	373	413
170	138	110.4	5270	5349	159	152	266	272	284	296	427	289	295	316	336	373	413
170	144	115.2	4250	4314	166	158	278	284	297	308	445	302	308	329	351	389	431
170	144	115.2	5270	5349	166	158	278	284	297	308	445	302	308	329	351	389	431
170	150	120	4250	4314	173	165	290	296	309	321	464	314	321	343	365	406	449
170	150	120	5270	5349	173	165	290	296	309	321	464	314	321	343	365	406	449
170	162	129.6	4250	4314	186	178	313	319	334	347	501	339	347	371	395	438	485
170	162	129.6	5270	5349	186	178	313	319	334	347	501	339	347	371	395	438	485
170	168	134.4	4250	4314	193	185	324	331	346	360	519	352	359	384	409	454	503
170	168	134.4	5270	5349	193	185	324	331	346	360	519	352	359	384	409	454	503
245	180	144	6125	6217	207	198	347	355	371	385	556	377	385	412	438	487	539
245	180	144	7595	7709	207	198	347	355	371	385	556	377	385	412	438	487	539
245	186	148.8	6125	6217	214	205	359	366	383	398	575	389	398	426	453	503	557
245	186	148.8	7595	7709	214	205	359	366	383	398	575	389	398	426	453	503	557
245	192	153.6	6125	6217	221	211	371	378	396	411	594	402	411	439	468	519	575
245	192	153.6	7595	7709	221	211	371	378	396	411	594	402	411	439	468	519	575
245	198	158.4	6125	6217	228	218	382	390	408	424	612	415	424	453	482	535	593
245	198	158.4	7595	7709	228	218	382	390	408	424	612	415	424	453	482	535	593
245	210	168	6125	6217	242	231	405	414	433	450	649	440	449	481	512	568	629
245	210	168	7595	7709	242	231	405	414	433	450	649	440	449	481	512	568	629
245	216	172.8	6125	6217	248	238	417	426	445	463	668	452	462	494	526	584	647
245	216	172.8	7595	7709	248	238	417	426	445	463	668	452	462	494	526	584	647
245	222	177.6	6125	6217	255	244	429	437	458	475	686	465	475	508	541	600	665
245	222	177.6	7595	7709	255	244	429	437	458	475	686	465	475	508	541	600	665
245	228	182.4	6125	6217	262	251	440	449	470	488	705	477	488	522	555	617	683
245	228	182.4	7595	7709	262	251	440	449	470	488	705	477	488	522	555	617	683
300	216	172.8	7500	7613	248	238	417	426	445	463	668	452	462	494	526	584	647
300	216	172.8	9300	9440	248	238	417	426	445	463	668	452	462	494	526	584	647
300	222	177.6	7500	7613	255	244	429	437	458	475	686	465	475	508	541	600	665
300	222	177.6	9300	9440	255	244	429	437	458	475	686	465	475	508	541	600	665
300	228	182.4	7500	7613	262	251	440	449	470	488	705	477	488	522	555	617	683

Class 4 Ratings (Porcelain and Polymer) (Cont'd)

IEC60099-4 CLASS 4 IEEE C62.11 STATION CLASS			MINIMUM DESIGNED CREEP	ACTUAL DESIGNED CREEP	IEC PREVIOUS DUTY TOV		SWITCHING IMPULSE RESIDUAL VOLTAGE				FRONT OF WAVE .5 US	MAXIMUM 8/20 RESIDUAL VOLTAGE AT INDICATED CURRENT (KV)					
							.25 KA	.50 KA	1.0 KA	2.0 KA							
Um	Ur	Uc	mm	mm	1s kVrms	10s kVrms	kV	kV	kV	kV	kV	1.5 kA	2.5 kA	5 kA	10 kA	20 kA	40 kA
300	228	182.4	9300	9440	262	251	440	449	470	488	705	477	488	522	555	617	683
300	240	192	7500	7613	276	264	463	473	495	514	742	503	513	549	585	649	719
300	240	192	9300	9440	276	264	463	473	495	514	742	503	513	549	585	649	719
300	258	206.4	7500	7613	297	284	498	508	532	552	798	540	552	590	628	698	773
300	258	206.4	9300	9440	297	284	498	508	532	552	798	540	552	590	628	698	773
300	264	211.2	7500	7613	304	290	510	520	544	565	816	553	565	604	643	714	791
300	264	211.2	9300	9440	304	290	510	520	544	565	816	553	565	604	643	714	791
300	276	220.8	7500	7613	317	304	533	544	569	591	853	578	590	632	672	746	827
300	276	220.8	9300	9440	317	304	533	544	569	591	853	578	590	632	672	746	827
362	258	206.4	9050	9186	297	284	498	508	532	552	798	540	552	590	628	698	773
362	258	206.4	11222	11390	297	284	498	508	532	552	798	540	552	590	628	698	773
362	264	211.2	9050	9186	304	290	510	520	544	565	816	553	565	604	643	714	791
362	264	211.2	11222	11390	304	290	510	520	544	565	816	553	565	604	643	714	791
362	276	220.8	9050	9186	317	304	533	544	569	591	853	578	590	632	672	746	827
362	276	220.8	11222	11390	317	304	533	544	569	591	853	578	590	632	672	746	827
362	288	230.4	9050	9186	331	317	556	567	594	617	890	603	616	659	702	779	863
362	288	230.4	11222	11390	331	317	556	567	594	617	890	603	616	659	702	779	863
420	312	249.6	10500	10658	359	343	602	615	643	668	964	653	667	714	760	844	935
420	312	249.6	13020	13215	359	343	602	615	643	668	964	653	667	714	760	844	935
420	330	264	10500	10658	380	363	637	650	680	707	1020	691	706	755	804	892	989
420	330	264	13020	13215	380	363	637	650	680	707	1020	691	706	755	804	892	989
420	336	268.8	10500	10658	386	370	649	662	692	719	1039	704	719	769	818	909	1007
420	336	268.8	13020	13215	386	370	649	662	692	719	1039	704	719	769	818	909	1007
420	342	273.6	10500	10658	393	376	660	674	705	732	1057	716	732	783	833	925	1025
420	342	273.6	13020	13215	393	376	660	674	705	732	1057	716	732	783	833	925	1025
420	360	288	10500	10658	414	396	695	709	742	771	1113	754	770	824	877	974	1079
420	360	288	13020	13215	414	396	695	709	742	771	1113	754	770	824	877	974	1079
420	372	297.6	10500	10658	428	409	718	733	767	797	1150	779	796	851	906	1006	1114
420	372	297.6	13020	13215	428	409	718	733	767	797	1150	779	796	851	906	1006	1114
420	378	302.4	10500	10658	435	416	730	745	779	809	1168	792	809	865	921	1022	1132
420	378	302.4	13020	13215	435	416	730	745	779	809	1168	792	809	865	921	1022	1132
420	390	312	10500	10658	449	429	753	768	804	835	1206	817	834	892	950	1055	1168
420	390	312	13020	13215	449	429	753	768	804	835	1206	817	834	892	950	1055	1168
420	396	316.8	10500	10658	455	436	764	780	816	848	1224	829	847	906	965	1071	1186
420	396	316.8	13020	13215	455	436	764	780	816	848	1224	829	847	906	965	1071	1186
420	420	336	10500	10658	483	462	811	828	866	899	1298	880	899	961	1023	1136	1258
420	420	336	13020	13215	483	462	811	828	866	899	1298	880	899	961	1023	1136	1258
550	420	336	13750	13956	483	462	811	828	866	899	1298	880	899	961	1023	1136	1258
550	420	336	17050	17306	483	462	811	828	866	899	1298	880	899	961	1023	1136	1258

Class 5 Ratings (Porcelain and Polymer)

IEC60099-4 CLASS 4 IEEE C62.11 STATION CLASS			MINIMUM DESIGNED CREEP	ACTUAL DESIGNED CREEP	IEC PREVIOUS DUTY TOV		SWITCHING IMPULSE RESIDUAL VOLTAGE				FRONT OF WAVE .5 US	MAXIMUM 8/20 RESIDUAL VOLTAGE AT INDICATED CURRENT (KV)					
							.25 KA	.50 KA	1.0 KA	2.0 KA							
Um	Ur	Uc	mm	mm	1s kVrms	10s kVrms	kV	kV	kV	kV	kV	1.5 kA	2.5 kA	5 kA	10 kA	20 kA	40 kA
170	150	120	4250	4314	173	165	288	292	300	306	418	300	299.4	323	343	374	411
170	150	120	5270	5349	173	165	288	292	300	306	418	300	299.4	323	343	374	411
170	168	134.4	4250	4314	193	185	322	327	336	343	468	336	335.3	362	384	418	460
170	168	134.4	5270	5349	193	185	322	327	336	343	468	336	335.3	362	384	418	460
170	174	139.2	4250	4314	200	191	334	339	348	355	485	348	347.3	375	398	433	476
170	174	139.2	5270	5349	200	191	334	339	348	355	485	348	347.3	375	398	433	476
245	180	144	6125	6217	207	198	345	351	360	368	502	360	359.3	388	411	448	493
245	180	144	7595	7709	207	198	345	351	360	368	502	360	359.3	388	411	448	493
245	186	148.8	6125	6217	214	205	357	362	372	380	518	372	371.3	401	425	463	509
245	186	148.8	7595	7709	214	205	357	362	372	380	518	372	371.3	401	425	463	509
245	192	153.6	6125	6217	221	211	368	374	384	392	535	384	383.2	414	439	478	525
245	192	153.6	7595	7709	221	211	368	374	384	392	535	384	383.2	414	439	478	525
245	198	158.4	6125	6217	228	218	380	386	396	404	552	396	395.2	427	453	493	542
245	198	158.4	7595	7709	228	218	380	386	396	404	552	396	395.2	427	453	493	542
245	210	168	6125	6217	242	231	403	409	420	429	585	420	419.2	453	480	523	575
245	210	168	7595	7709	242	231	403	409	420	429	585	420	419.2	453	480	523	575
245	216	172.8	6125	6217	248	238	414	421	432	441	602	432	431.1	466	494	538	591
245	216	172.8	7595	7709	248	238	414	421	432	441	602	432	431.1	466	494	538	591
245	219	175.2	6125	6217	252	241	420	427	438	447	610	438	437.1	472	501	545	599
245	219	175.2	7595	7709	252	241	420	427	438	447	610	438	437.1	472	501	545	599
245	228	182.4	6125	6217	262	251	437	444	456	466	635	456	455.1	491	521	568	624
245	228	182.4	7595	7709	262	251	437	444	456	466	635	456	455.1	491	521	568	624
300	216	172.8	7500	7613	248	238	414	421	432	441	602	432	431.1	466	494	538	591
300	216	172.8	9300	9440	248	238	414	421	432	441	602	432	431.1	466	494	538	591
300	219	175.2	7500	7613	252	241	420	427	438	447	610	438	437.1	472	501	545	599
300	219	175.2	9300	9440	252	241	420	427	438	447	610	438	437.1	472	501	545	599
300	228	182.4	7500	7613	262	251	437	444	456	466	635	456	455.1	491	521	568	624
300	228	182.4	9300	9440	262	251	437	444	456	466	635	456	455.1	491	521	568	624
300	240	192	7500	7613	276	264	460	468	480	490	669	480	479	517	549	598	657
300	240	192	9300	9440	276	264	460	468	480	490	669	480	479	517	549	598	657
300	246	196.8	7500	7613	283	271	472	479	492	503	686	492	491	530	562	613	673
300	246	196.8	9300	9440	283	271	472	479	492	503	686	492	491	530	562	613	673
300	258	206.4	7500	7613	297	284	495	503	516	527	719	515	515	556	590	643	706
300	258	206.4	9300	9440	297	284	495	503	516	527	719	515	515	556	590	643	706
300	264	211.2	7500	7613	304	290	506	514	528	539	736	527	526.9	569	603	657	722
300	264	211.2	9300	9440	304	290	506	514	528	539	736	527	526.9	569	603	657	722
300	276	220.8	7500	7613	317	304	529	538	552	564	769	551	550.9	595	631	687	755
300	276	220.8	9300	9440	317	304	529	538	552	564	769	551	550.9	595	631	687	755

Class 5 Ratings (Porcelain and Polymer) (Cont'd)

IEC60099-4 CLASS 4 IEEE C62.11 STATION CLASS			MINIMUM DESIGNED CREEP	ACTUAL DESIGNED CREEP	IEC PREVIOUS DUTY TOV		SWITCHING IMPULSE RESIDUAL VOLTAGE				FRONT OF WAVE .5 US	MAXIMUM 8/20 RESIDUAL VOLTAGE AT INDICATED CURRENT (KV)					
							.25 KA	.50 KA	1.0 KA	2.0 KA							
Um	Ur	Uc	mm	mm	1s kVrms	10s kVrms	kV	kV	kV	kV	kV	1.5 kA	2.5 kA	5 kA	10 kA	20 kA	40 kA
362	258	206.4	9050	9186	297	284	495	503	516	527	719	515	515	556	590	643	706
362	258	206.4	11222	11390	297	284	495	503	516	527	719	515	515	556	590	643	706
362	264	211.2	9050	9186	304	290	506	514	528	539	736	527	526.9	569	603	657	722
362	264	211.2	11222	11390	304	290	506	514	528	539	736	527	526.9	569	603	657	722
362	276	220.8	9050	9186	317	304	529	538	552	564	769	551	550.9	595	631	687	755
362	276	220.8	11222	11390	317	304	529	538	552	564	769	551	550.9	595	631	687	755
362	288	230.4	9050	9186	331	317	552	561	576	588	803	575	574.8	621	658	717	788
362	288	230.4	11222	11390	331	317	552	561	576	588	803	575	574.8	621	658	717	788
420	330	264	10500	10658	380	363	633	643	660	674	920	659	658.7	711	754	822	903
420	330	264	13020	13215	380	363	633	643	660	674	920	659	658.7	711	754	822	903
420	336	268.8	10500	10658	386	370	644	655	672	686	936	671	670.7	724	768	837	920
420	336	268.8	13020	13215	386	370	644	655	672	686	936	671	670.7	724	768	837	920
420	342	273.6	10500	10658	393	376	656	666	684	699	953	683	682.6	737	782	852	936
420	342	273.6	13020	13215	393	376	656	666	684	699	953	683	682.6	737	782	852	936
420	360	288	10500	10658	414	396	690	701	720	735	1003	719	718.6	776	823	897	985
420	360	288	13020	13215	414	396	690	701	720	735	1003	719	718.6	776	823	897	985
420	366	292.8	10500	10658	421	403	702	713	732	748	1020	731	730.5	789	837	912	1002
420	366	292.8	13020	13215	421	403	702	713	732	748	1020	731	730.5	789	837	912	1002
420	372	297.6	10500	10658	428	409	714	725	744	760	1037	743	742.5	802	850	926	1018
420	372	297.6	13020	13215	428	409	714	725	744	760	1037	743	742.5	802	850	926	1018
420	378	302.4	10500	10658	435	416	725	737	756	772	1053	755	754.5	815	864	941	1034
420	378	302.4	13020	13215	435	416	725	737	756	772	1053	755	754.5	815	864	941	1034
420	381	304.8	10500	10658	438	419	731	742	762	778	1062	761	760.5	821	871	949	1043
420	381	304.8	13020	13215	438	419	731	742	762	778	1062	761	760.5	821	871	949	1043
420	390	312	10500	10658	449	429	748	760	780	797	1087	779	778.4	841	891	971	1067
420	390	312	13020	13215	449	429	748	760	780	797	1087	779	778.4	841	891	971	1067
420	396	316.8	10500	10658	455	436	760	772	792	809	1104	791	790.4	854	905	986	1084
420	396	316.8	13020	13215	455	436	760	772	792	809	1104	791	790.4	854	905	986	1084
420	416	332.8	10500	10658	478	458	798	811	832	850	1159	831	830.3	897	951	1036	1138
420	416	332.8	13020	13215	478	458	798	811	832	850	1159	831	830.3	897	951	1036	1138
420	420	336	10500	10658	483	462	806	818	840	858	1170	839	838.3	905	960	1046	1149
420	420	336	13020	13215	483	462	806	818	840	858	1170	839	838.3	905	960	1046	1149
550	396	316.8	13750	13956	455	436	760	772	792	809	1104	791	790.4	854	905	986	1084
550	396	316.8	17050	17306	455	436	760	772	792	809	1104	791	790.4	854	905	986	1084
550	420	336	13750	13956	483	462	806	818	840	858	1170	839	838.3	905	960	1046	1149
550	420	336	17050	17306	483	462	806	818	840	858	1170	839	838.3	905	960	1046	1149
550	444	355.2	13750	13956	511	488	852	865	888	907	1237	887	886.2	957	1015	1106	1215
550	444	355.2	17050	17306	511	488	852	865	888	907	1237	887	886.2	957	1015	1106	1215

Class 5 Ratings (Porcelain and Polymer) (Cont'd)

IEC60099-4 CLASS 4 IEEE C62.11 STATION CLASS			MINIMUM DESIGNED CREEP	ACTUAL DESIGNED CREEP	IEC PREVIOUS DUTY TOV		SWITCHING IMPULSE RESIDUAL VOLTAGE				FRONT OF WAVE .5 US	MAXIMUM 8/20 RESIDUAL VOLTAGE AT INDICATED CURRENT (KV)					
							.25 KA	.50 KA	1.0 KA	2.0 KA							
Um	Ur	Uc	mm	mm	1s kVrms	10s kVrms	kV	kV	kV	kV	kV	1.5 kA	2.5 kA	5 kA	10 kA	20 kA	40 kA
800	570	456	20000	22330	656	627	1077	1094	1123	1147	1603	1128.6	1137.7	1217.5	1291.1	1406.8	1545.8
800	570	456	24800	27689	656	627	1077	1094	1123	1147	1603	1128.6	1137.7	1217.5	1291.1	1406.8	1545.8
800	588	470.4	20000	22330	676	647	1111	1129	1158	1184	1654	1164.2	1173.6	1256	1331.8	1451.2	1594.7
800	588	470.4	24800	27689	676	647	1111	1129	1158	1184	1654	1164.2	1173.6	1256	1331.8	1451.2	1594.7
800	612	489.6	20000	22330	704	673	1157	1175	1206	1232	1722	1211.8	1221.6	1307.2	1386.2	1510.4	1659.7
800	612	489.6	24800	27689	704	673	1157	1175	1206	1232	1722	1211.8	1221.6	1307.2	1386.2	1510.4	1659.7
800	624	499.2	20000	22330	718	686	1179	1198	1229	1256	1755	1235.5	1245.5	1332.9	1413.4	1540	1692.3
800	624	499.2	24800	27689	718	686	1179	1198	1229	1256	1755	1235.5	1245.5	1332.9	1413.4	1540	1692.3

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