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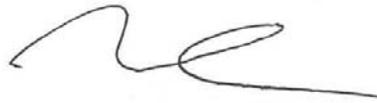
# **TYPE TEST REPORT FOR SURGE COUNTER SC12 AND SC13**

Report No. 080701 rev 1

**Test Objects:** Surge counter type SC12 and SC13

**Date:** 10<sup>th</sup> October 2008

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## **FORWARD**

**There is no type test procedure for surge arrester accessories prescribed in any national and international standards. This type test for surge counter SC12 and SC13 will subject the surge counter to all the impulse duties that will be applied to the surge arrester samples during a surge arrester type test as described in IEC60099-4, 2006**

## **Test Samples:**

3x SC13  
3x SC12

They were randomly chosen from a standard production batch recently delivered to Tyco HV laboratory.



SC13 on the left  
SC12 on the right



## **Test Setup and Procedures:**

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For SC13, the leakage current meter was tested in a standard calibrated test cell to check the leakage current meter is within the manufacturing tolerance specification.



SC12 and SC13 surge counters were tested in a dedicated impulse current test system which is designed for surge arrester development and type test.



A



small surge arrester section was used in series with the surge counter sample as blast to produce the correct impulse current magnitude and waveshape. The counter was checked after every impulse application for surge count registration.

The calibration of the leakage current meter of SC13 was repeated after the impulse current tests.

The surge counter samples will be subjected to the following impulse current duty:-

- 8/20 $\mu$ s lightning current discharge: 5kA, 10kA, 20kA and 40kA plus the threshold discharge current level that registered a surge count.
- 30/60 $\mu$ s switching current discharge: 125A, 500A, 1000A, 2000A and 3000A plus the threshold discharge current that registered a surge count
- 4/10 $\mu$ s high current discharge: 100kA.
- Long duration current discharge: approx 500A, 1000A, 1200A and 2000A 2ms plus the appropriate 2.4ms, 2.8ms and 3.2ms to simulate the different line discharge class waveshape. A simplified procedure, only a single group 3 consecutive discharges with 60s separation were applied to the test sample as the surge arrester standard allows the sample to recover after a group discharge. There will be no energy absorption by the surge counter as all the energy will be absorbed by the blast surge arrester.
- It is not necessary to perform the steep front current discharge as the surge counter itself is 1.) too large that cannot be fitted into the test cell and 2.) the long through connection of the surge counter generates large inductive voltage at steep front current discharge thus make the measurement meaningless.
- Lastly the ac voltage duty was also omitted because the straight through surge counter connection creates a virtual short circuit at 50Hz low frequencies.

## Results:

Sample	Lightning Discharge Current (kA)	Switching Discharge Current (A)	High Current (kA)	Long Duration Square wave (A) 3 shots at 60s between subsequent shot					Steep Current (kA)	Record	Surge count
				Shots	@2ms	@2.4ms	@2.8ms	@3.2ms			
SC13-1	5.91								8	+1	
	10.99								9	+1	
	20.01								10	+1	
	40.5								11	+1	
	0.177*								15	+1	
* Minimum threshold Lightning current to register a surge count											
		131.2							67	+1	
		237							69	+1	
		470							71	+1	
		945							72	+1	
		1917							73	+1	
		70.5*							75	+1	
* Minimum threshold switching current to register a surge count											
			104.5						1	+1	
				1	449.4				112	+1	
				2	449				113	+1	
				3	448				114	+1	
				1	1063				115	+1	
				2	1057				116	+1	
				3	1055				117	+1	
				1	1475				118	+1	
				2	1472				119	+1	
				3	1467				120	+1	
				1	2024				124	+1	

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2	2021					125	+1
3	2018					126	+1
1		886.6				222	+1
2		874.7				223	+1
3		862.8				224	+1
1			1025			198	+1
2			1022			200	+1
3			1023			201	+1
1				1278		242	+1
2				1273		243	+1
3				1272		244	+1
					10.06	13	+1
					20.12	15	+1

Sample	Lightning Discharge Current (kA)	Switching Discharge Current (Amps)	High Current (kA)	Long Duration Square wave (A) 3 shots at 60s between subsequent shot				Steep current (kA)	Record	Count
				Shots	@2ms	@2.4ms	@2.8ms			
SC13-2	6.06								24	+1
	11.09								25	+1
	18.29								26	+1
	38.6								27	+1
	0.189*								30	+1
* Minimum threshold Lightning current to register a surge count										
		130.5							76	+1
		259.4							77	+1
		553.2							78	+1
		987.7							79	+1
		2008							80	+1
		62.3*							81	+1
* Minimum threshold switching current to register a surge count										
			104.3						2	+1
				1	475				127	+1
				2	475				128	+1
				3	475				129	+1
				1	1075				130	+1
				2	1072				131	+1

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3	1069					132	+1
1	1436					133	+1
2	1435					134	+1
3	1432					135	+1
1	2023					136	+1
2	2021					137	+1
3	2325					138	+1
1		844.6				225	+1
2		847.8				226	+1
3		855.1				227	+1
1			1024			202	+1
2			1022			203	+1
3			1021			204	+1
1					1270	245	+1
2					1269	246	+1
3					1265	247	+1
						10.07	+1
						20.14	+1

Sample	Lightning Discharge Current (kA)	Switching Discharge Current (A)	High Current (kA)	Long Duration Square wave (A) 3 shots at 60s between subsequent shot					Steep Current (kA)	Record	Surge count (kA)
				Shots	@2ms	@2.4ms	@2.8ms	@3.2ms			

SC13-3	4.35								31	+1
	11.25								32	+1
	20.15								33	+1
	40.6								34	+1
	0.189*								37	+1

\* Minimum threshold Lightning current to register a surge count

130.5									82	+1
259.4									83	+1
553.2									85	+1
987.7									86	+1
2008									88	+1
62.3*									89	+1

\* Minimum threshold switching current to register a surge count

103.7

3

+1

1	509					141	+1
2	509.4					142	+1
3	509.1					143	+1
1	1067					144	+1
2	1063					145	+1
3	1060					146	+1
1	1453					147	+1
2	1452					148	+1
3	1448					149	+1
1	2040					150	+1
2	2036					151	+1
3	2034					152	+1
1		864				228	+1
2		857.5				229	+1
3		854.3				230	+1
1			1011			205	+1
2			1009			206	+1
3			1007			207	+1
1					1283	248	+1
2					1275	249	+1
3					1272	250	+1
						10.11	+1
						20.13	+1

Sample	Lightning Discharge Current (kA)	Switching Discharge Current (Amps)	High Current (kA)	Long Duration Square wave (A) 3 shots at 60s between subsequent shot				Steep Current (kA)	Record	Count
				Shots	@2ms	@2.4ms	@2.8ms			
SC12-1	5.84 11.01							38 39	+1 +1	

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20.01				41	+1
40.6				42	+1
0.194*				45	+1
<b>* Minimum threshold Lightning current to register a surge count</b>					
	135.2			93	+1
	261.1			91	+1
	553.8			94	+1
	991.5			95	+1
	2010			96	+1
	68.6*			97	+1
<b>* Minimum threshold switching current to register a surge count</b>					
	104.9			4	+1
		1	513	153	+1
		2	511	154	+1
		3	510	155	+1
		1	1070	156	+1
		2	1066	157	+1
		3	1064	158	+1
		1	1447	159	+1
		2	1446	160	+1
		3	1443	161	+1
		1	2030	162	+1
		2	2023	163	+1
		3	2029	164	+1
		1	861.4	231	+1
		2	858.6	232	+1
		3	855.4	233	+1
		1	1001	209	+1
		2	1009	210	+1
		3	1007	211	+1
		1	1278	251	+1
		2	1276	252	+1
		3	1273	253	+1

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10.19      21      +1  
 20.27      24      +1

Sample	Lightning Discharge Current (kA)	Switching Discharge Current (Amps)	High Current (kA)	Long Duration Square wave (A) 3 shots at 60s between subsequent shot					Steep current (kA)	Record	Count (kA)
				Shots	@2ms	@2.4ms	@2.8ms	@3.2ms			
SC12-2	5.91								46	+1	
	11								47	+1	
	20.2								48	+1	
	40.5								49	+1	
	0.185*								52	+1	
<b>* Minimum threshold Lightning current to register a surge count</b>											
		161.8							98	+1	
		296.4							99	+1	
		555							101	+1	
		1121							102	+1	
		2087							103	+1	
		53.03*							105	+1	
<b>* Minimum threshold Switching current to register a surge count</b>											
			107.7						5	+1	
				1	523				165	+1	
				2	519				166	+1	
				3	518				167	+1	
				1	1070				168	+1	
				2	1064				169	+1	
				3	1061			170	170	+1	
				1	1433			171	171	+1	
				2	1400			172	172	+1	
				3	1427			173	173	+1	
				1	2032			174	174	+1	
				2	2029			175	175	+1	
				3	2027			176	176	+1	
				1		859.6		234	234	+1	
				2		856.4		235	235	+1	

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3	852.9	236	236	+1
1	1025	213	213	+1
2	1025	214	214	+1
3	1023	215	215	+1
1	1278	254	254	+1
2	1276	255	255	+1
3	1273	256	256	+1
		10.16	25	+1
		20.16	26	+1

Sample	Lightning Discharge Current (kA)	Switching Discharge Current (Amps)	High Current (kA)	Long Duration Square wave (A) 3 shots at 60s between subsequent shot				Steep Current (kA)	Record	Count (kA)
				Shots	@2ms	@2.4ms	@2.8ms			
SC12-3	5.96							54	+1	
	11.18							55	+1	
	20.13							56	+1	
	40.7							58	+1	
	0.195*							60	+1	
* Minimum threshold Lightning current to register a surge count										
		130.1						106	+1	
		258.3						107	+1	
		521.3						108	+1	
		1080						109	+1	
		2052						110	+1	
		66.7*						111	+1	
* Minimum threshold switching current to register a surge count										
			104.3					6	+1	
				1	513			177	+1	
				2	511			178	+1	
				3	510			179	+1	
				1	1072			180	+1	
				2	1068			181	+1	
				3	1065			182	+1	

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1	1452			183	+1	
2	1452			184	+1	
3	1447			185	+1	
1	2024			186	+1	
2	2016			187	+1	
3	2343			188	+1	
1		861.5		237	+1	
2		857.3		238	+1	
3		854.2		239	+1	
1			1011	216	+1	
2			1009	217	+1	
3			1008	218	+1	
1			1274	257	+1	
2			1271	258	+1	
3			1268	259	+1	
				10.10	27	+1
				20.16	28	+1

## **Conclusion**

The SC12 and SC13 surge counter test samples have seen the similar impulses duties as the surge arrester during a type test condition as per IEC and JEC standard for surge arrester. The test samples correctly registered the surge count and for SC13, the repeat calibration of the leakage current meter shows no change to the measurement tolerance.

The test results are positive.

All new SC12/13 enquiries please contact: [sales@norrscope.com](mailto:sales@norrscope.com)