

**Technical Construction File****EN IEC 60099-8:2018****Surge arresters****Part 8: Metal-oxide surge arresters with external series gap (EGLA) for overhead transmission and distribution lines of a.c. systems above 1 kV**

Report reference No.....: TLZJ24082661456

Compiled by (+ signature).....: Stephen Zhang / Test Engineer

Approved by (+ signature).....: Kosco Vent / Project Manager

Date of issue.....: September 06,2024



Reviewing laboratory.....: Shanghai Global Testing Services Co., Ltd.

Reviewing location.....: Floor 2nd, Building D-1, No. 128, Shenfu Road, Minhang District, Shanghai, China.

Applicant.....: Hangzhou Easy Electric Wire and Cable Co., LTD.

Address.....: Room 508, Building A5, No. 2-150, Yunlian Road, Hangzhou, Zhejiang, China

Manufacturer.....: Hangzhou Easy Electric Wire and Cable Co., LTD.

Address.....: Room 508, Building A5, No. 2-150, Yunlian Road, Hangzhou, Zhejiang, China

Factory.....: The same as applicant

Address.....:

Standard.....:  EN IEC 60099-8:2018

Review Report Form No.....: 60099-8

TRF originator.....: GTS

Master TRF.....: Reference No. EN IEC 60099-8:2018

Review procedure .....: GTS

Type of Review object.....: Surge Arrester

Trademark.....: -

Model/type reference.....: 3-36kV 5kA Metal-Oxide Surge Arrester

3-36kV 10kA Metal-Oxide Surge Arrester

Rating.....: See the annex

**Possible review case verdicts:**

- review case does not apply to the test object..... : N(.A.)
- review object does meet the requirement..... : P(ass)
- review object does not meet the requirement..... : F(ail)

**General remarks:**

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

The review results presented in this report relate only to the object reviewed.

This report shall not be reproduced except in full without the written approval of the third party.

**Testing:**

Date of receipt of review item:

August 26,2024

Date(s) of performance of review:

August 26,2024 to September 06,2024

**General product information:**

Surge Arrester

**Summary of reviewing:**

This review report includes:

Annex I: 1 page(s) of photo documentation.

**Copy of marking plate**

Surge Arrester,

Model: 3-36kV 5kA Metal-Oxide Surge Arrester  
3-36kV 10kA Metal-Oxide Surge Arrester

Marking



Hangzhou Easy Electric Wire and Cable Co., LTD.

EN IEC 60099-8:2018			
Cl.	Requirement – Test	Result	Verdict
4	Identification and classification		--
4.1	EGLA identification		--
	<p>An EGLA shall be identified by the following minimum information, which shall appear on a nameplate permanently attached to the arrester:</p> <ul style="list-style-type: none"> <li>• rated voltage <math>U_r</math> in kV;</li> <li>• rated frequency in Hz, only if it is less than 48 Hz or larger than 62 Hz;</li> <li>• classification series information (examples: "X1", "Y2");</li> <li>• rated short-circuit current <math>I_s</math> in kA;</li> <li>• manufacturer's name or trade mark;</li> <li>• year of manufacture;</li> <li>• serial number (at least for arresters for <math>U_s &gt; 52</math> kV);</li> <li>• lightning discharge capability (only charge value) in C; example: "0.4 C".</li> </ul> <p>Information on required gap spacing including tolerances shall be given in an appropriate way, for example in the manual.</p>		P
4.2	EGLA classification		--
	<p>EGLAs are classified by their nominal discharge currents and their high current impulse withstand capabilities as per Table 1, and they shall meet at least the test requirements and performance characteristics specified in Table 3. These arresters have no operating duties for slow-front surges and power-frequency over-voltages.</p>		P
5	Standard ratings and service conditions		--
5.1	Standard rated voltages		--
	Standard values of rated voltages (r.m.s. values) are specified in Table 2 in equal voltage steps within specified voltage ranges.		P
5.2	Standard rated frequencies		--
	The standard rated frequencies are 48 Hz to 62 Hz.		P
5.3	Standard nominal discharge currents		--
	The standard nominal discharge currents for 8/20 or 2/20 shapes are: 5 kA, 10 kA, 15 kA and 20 kA.		P
5.4	Service conditions		--
5.4.1	Normal service conditions		--

EN IEC 60099-8:2018			
Cl.	Requirement – Test	Result	Verdict
	<p>EGLAs which conform to this document shall be suitable for normal operation under the following normal service conditions:</p> <p>a) ambient air temperature within the range of - 40 °C to +40 °C;</p> <p>b) altitude not exceeding 1000 m;</p> <p>c) frequency of the a.c. power supply not less than 48 Hz and not more than 62 Hz;</p> <p>d) power-frequency voltage applied continuously between the terminals of the EGLA not exceeding its rated voltage;</p> <p>e) mechanical conditions: not specified (see NOTE);</p> <p>f) wind speed: not specified (see NOTE);</p> <p>g) pollution conditions: pollution by dust, smoke, corrosive gases, vapours or salt may occur; pollution does not exceed “heavy” as defined in IEC TS 60815-1.</p>		P
5.4.2	Special service conditions		--
	<p>Surge arresters subject to other than normal application or service conditions may require special consideration in design, manufacture or application. The use of this document in case of special service conditions is subject to agreement between the manufacturer and the purchaser. A list of possible special service conditions is given in Annex C.</p>		P
6	Requirements		--
6.1	Insulation withstand of the SVU and the complete EGLA		--
6.1.1	Insulation withstand of the housing of the SVU		--
	<p>The housing of the SVU shall withstand a lightning impulse voltage of</p> <p>a) for "Series X": 1,4 times the residual voltage at the nominal discharge current</p> <p>b) for "Series Y": 1,13 times the residual voltage at high current impulse, but not less than 1,3 times the residual voltage at nominal discharge current</p>		P
6.1.2	Insulation withstand of EGLA with shorted (failed) SVU		--
	<p>The EGLA shall have the following insulation withstand performance:</p> <p>a) the EGLA shall withstand the specified switching impulse withstand voltage level of the system even if the SVU has been shorted due to overloading (failure);</p>		P

EN IEC 60099-8:2018			
Cl.	Requirement – Test	Result	Verdict
	b) the EGLA shall be able to withstand the maximum temporary over-voltages phase to ground for their maximum durations even if the SVU has been shorted due to overloading (failure).		
6.2	Residual voltages		--
	<p>The purpose of the measurement of residual voltages is to obtain the maximum residual voltages for a given design for all specified currents and wave shapes. These are derived from the type test data and from the maximum residual voltage at a lightning impulse current used for routine tests as specified and published by the manufacturer.</p> <p>The maximum residual voltage of a given EGLA design for any current and wave shape is calculated from the residual voltage of SVU sections tested during type tests multiplied by a specific scale factor plus a calculated inductive voltage drop across the SVU, the gap and connection leads. The scale factor is equal to the ratio of the declared maximum residual voltage, as checked during the routine tests, to the measured residual voltage of the sections at the same current and wave shape.</p> <p>The value of the residual voltage of the EGLA at nominal discharge current and at high current impulse, respectively, multiplied by a factor as given in 6.1.1, shall be lower than the minimum flashover voltage of the insulator assembly to be protected.</p>		P
6.3	High current duty		--
	The capability of the SVU for discharging operations shall be demonstrated by injecting two high current impulses.		P
6.4	Lightning discharge capability		--
	The capability of the metal-oxide resistors including the series gap of the EGLA to withstand lightning discharges having current waveforms with durations of several tens of microseconds for arresters applied on shielded lines and several hundreds of microseconds for arresters on unshielded lines shall be demonstrated. The related test also covers effects of multiple lightning strikes.		P
6.5	Short-circuit performance of the SVU		--
	The manufacturer shall claim a short-circuit rating of the SVU. The short-circuit currents according to this rating shall not cause violent shattering of the SVU, and any open flames shall self-extinguish in a given time.		P

EN IEC 60099-8:2018			
Cl.	Requirement – Test	Result	Verdict
	The gap is not subject of the short-circuit tests on the SVU, and its short-circuit performance is recommended to be verified separately. The gap should be able to maintain its mechanical integrity after having been subjected to the rated short-circuit current of the EGLA, and its spark-over voltage should not be decreased.		
6.6	Mechanical performance		--
	For the EGLA to be mounted on transmission towers or poles, mechanical performance to withstand tensile, bending and/or vibration loads due to wind pressure, conductor vibration abnormal load during installation work and moisture ingress shall be demonstrated. The applicable values of tensile and bending loads shall be agreed between the manufacturer and the purchaser. The SVU shall be able to withstand the vibration load to be expected in service. The complete EGLA including gap assembly and mounting structure should be able to withstand at least the same mechanical stress.		P
6.7	Weather aging of SVU		--
	The SVU must be able to withstand the environmental stress expected in service. Environmental tests demonstrate by accelerated test procedures that the sealing mechanism and the exposed metal combinations of the SVU are not impaired by environmental conditions. For SVUs with polymer (composite and cast resin) housings, resistance to UV radiation has to be demonstrated in addition.		P
6.8	Reference voltage of the SVU		--
	The reference voltage (U ref ) of the SVU shall be measured at the reference current on sections and units when required. The measurement shall be performed at an ambient temperature of 20 ° C ± 15 K, and the actual temperature shall be recorded.		P
6.9	Internal partial discharges		--
	The level of internal partial discharges in the SVU in the tests according to 9.1 and 10.3 shall not exceed 10 pC.		P
6.10	Coordination between insulator withstand and EGLA protective level		--
	The correct coordination between flashover characteristics of the insulator assembly, the spark-over voltage of the EGLA with front-of-wave and standard lightning impulses and the residual voltage of the		P

EN IEC 60099-8:2018			
Cl.	Requirement – Test	Result	Verdict
	<p>EGLA at nominal discharge current and, for “Series Y” arresters, at high current impulse shall be demonstrated.</p> <p>Any spark-over operation for lightning impulse voltage shall occur in the external series gap of the EGLA, without causing any flashover of the insulator assembly to be protected.</p> <p>The value of</p> <ul style="list-style-type: none"> <li>• for "Series X": 1,4 times the residual voltage at the nominal discharge current according to Table 1 and 8.3.3;</li> <li>• for "Series Y": 1,13 times the residual voltage at high current impulse, but not less than 1,3 times the residual voltage at nominal discharge current according to Table 1 and 8.3.3 and 8.3.4. must be lower than <math>U_{50, Insulator} - X \times \sigma</math>, of the insulator assembly to be protected, where <math>\sigma = 0,03</math> and X is to be agreed upon between manufacturer and user, a recommended value being <math>X = 2,5</math>.</li> </ul>		
6.11	Follow current interrupting		--
	<p>Follow current interrupting operation of the EGLA under wet and polluted conditions shall be demonstrated by a test procedure which takes these operating conditions into account.</p> <p>Performing a follow current interrupting test is mandatory, either as a type test according to 8.8 or as an acceptance test according to 10.6.</p>		P
6.12	Electromagnetic compatibility		--
	<p>Arresters are not sensitive to electromagnetic disturbances, and therefore no immunity test is necessary.</p> <p>In normal working operating conditions, the EGLA shall not emit significant disturbances. A radio interference voltage test (RIV) shall be applied as an acceptance test to the complete EGLA (see 10.4). The maximum radio interference level of the EGLA energized at the maximum continuous phase to ground system voltage (<math>U_s / \sqrt{3}</math>) shall not exceed 2 500 <math>\mu V</math>.</p>		P
6.13	End of life		--
	<p>On request from users, each manufacturer shall give enough information so that all the arrester components may be scrapped and/or recycled in accordance with international and national regulations.</p>		P
7	General testing procedure		--
7.1	Measuring equipment and uncertainty		--

EN IEC 60099-8:2018			
Cl.	Requirement – Test	Result	Verdict
	<p>The measuring equipment shall meet the requirements of IEC 60060-2 and IEC 60099-4. The values obtained shall be accepted as uncertainty for the purpose of compliance with the relevant test clauses.</p> <p>Unless stated elsewhere, all tests with power-frequency voltages shall be made with an alternating voltage having a frequency between the limits of 48 Hz and 62 Hz and an approximately sinusoidal wave shape.</p>		P
7.2	Test samples		--
	<p>Unless otherwise specified, for each test item, the complete test sequence shall be carried out on the same test sample. The number of test samples is given in Table 3. The test samples shall be new, clean, completely assembled and arranged to simulate the condition in service.</p> <p>When tests are made on sections or units, the following shall be fulfilled:</p> <p>a) The ratio between rated voltage of the complete EGLA to the rated voltage of the section or unit is defined as n.</p> <p>b) The volume of the resistor elements used as test samples shall not be greater than the minimum volume of all resistor elements used in the complete EGLA divided by n.</p> <p>c) The reference voltage U ref of the SVU of the test section should be equal to the minimum reference voltage of the SVU of the EGLA divided by n. If the reference voltage of the SVU of the test section is greater than the minimum reference voltage of the SVU of the complete EGLA divided by n, the factor n shall be reduced correspondingly. If the reference voltage of the SVU of the test section is less than the minimum reference voltage of the SVU of the complete EGLA divided by n, the test section is not allowed to be used.</p> <p>The factor n of the test samples shall be recorded in the test report.</p>		P



ANNEX:  
3-36kV 5kA  
Metal-Oxide Surge Arrester

Type	MOA Rated voltage	MCOV	Current impulse residual voltage			2ms Rectangular current impulse withstand	4/10µs High current impulse withstand
			1/4µs Lightning current impulse	8/20µs Lightning current impulse	30/60µs Switching current impulse		
	kV(rms)	kV(rms)	kV(crest)	kV(crest)	kV(crest)	A(crest)	kA(crest)
YH5W-3	3	2.4	9	9	7.6	150	65
YH5W-6	6	4.8	21	18	15.3	150	65
YH5W-9	9	7.2	31	27	23	150	65
YH5W-12	12	9.6	41	36	30.6	150	65
YH5W-15	15	12	51	45	38	150	65
YH5W-18	18	14.4	62	54	46	150	65
YH5W-21	21	16.8	72	63	53	150	65
YH5W-24	24	19.2	82	72	62	150	65
YH5W-27	27	21.6	93	81	68.8	150	65
YH5W-30	30	24	103	90	76.5	150	65
YH5W-33	33	26.4	112	99	85	150	65
YH5W-36	36	28.8	123	108	92	150	65

## PHOTO DOCUMENTATION:

Type of equipment:	Surge Arrester
Model:	3-36kV 5kA Metal-Oxide Surge Arrester 3-36kV 10kA Metal-Oxide Surge Arrester

Details of:	
View: <input checked="" type="checkbox"/> general <input type="checkbox"/> front <input type="checkbox"/> rear <input type="checkbox"/> right <input type="checkbox"/> left <input type="checkbox"/> top <input type="checkbox"/> bottom	

Details of:	
View: <input checked="" type="checkbox"/> general <input type="checkbox"/> front <input type="checkbox"/> rear <input type="checkbox"/> right <input type="checkbox"/> left <input type="checkbox"/> top <input type="checkbox"/> bottom	