



Test Report for Resistors

O DA 08 02 003 - 2

Client: <b>ABB AB</b>	Reference: <b>457 01 81 301</b>
Project: <b>Siam Yamato Steel / Thailand</b>	
Manufacturer: <b>M.S. Resistances</b>	Reference: <b>O DA 08 02 003</b>

Type: <b>Harmonic Filter Damping Resistor</b>	Serial N°: <b>O DA 08 02 003 - 2 / 003</b>
Data: <b>24kV - 39 Ohms @ Hot - 48A/90kW - 125kV BIL</b>	Production: - Year <b>2008</b> - Week <b>38</b>

**Routine Test Measurements**

Visual Examination:  **Passed**      Dimensional Check:  **Passed**

Dielectric Withstand: **50 kV (1min/50Hz)**       **Passed**

Insulation Measurement: (> 200MΩ @ 1kV<sub>dc</sub>)      > 100 GOhms       **Passed**

Ohmic Value Measurement:

- Rated Values

- Path 1:	<b>26,3 Ohms</b>	at	<b>20 °c</b>	+ 7,5 %	⇒	28,27 Ohms
				- 7,5 %	⇒	24,33 Ohms
- Path 2:		at			⇒	-
					⇒	-

- Measured Values

- Path 1:	<b>26,65 Ohms</b>	at	<b>20 °c</b>	corrected to	<b>26,65 Ohms</b>	at 20 °c	<input checked="" type="checkbox"/> <b>Passed</b>
- Path 2:		at		corrected to	-	-	<input type="checkbox"/> <b>Passed</b>

Inductance Measurement:

- Path 1: **77,8 μH**

- Path 2:

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**Measuring Instruments**

Electronic Ohmmeter	<b>CROPICO DO4000</b>	(N° 0702 )
Dielectric Test Instruments	<b>RISATTI E6/PR</b>	(N° 0070 )
Electronic Megger	<b>METRISO 5000A</b>	(N° 0092 )
Inductance Measurement Unit	<b>LCR 189</b>	(N° 0093 )

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**Reference Standards**

**IEC 60529:** Degrees of protection provided by enclosures (IP Code)  
**IEC 62271-1:** High-voltage switchgear and controlgear (Common specifications)  
**IEC 62271-200:** A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV  
**IEEE-32:** Requirements, Terminology & Test Procedure for Neutral Grounding Devices

**Remarks / Deviations**

WE HEREBY DECLARE THAT THE ABOVE MENTIONED SUPPLY IS IN CONFORMITY WITH THE REQUIREMENTS. THE SUPPLY HAS BEEN INSPECTED AND TESTED WITH SATISFACTORY RESULTS. THE APPROVED DEVIATIONS ARE LISTED ABOVE  
THIS DOCUMENT IS IN CONFORMITY WITH THE INTERNATIONAL STANDARD UNI EN 10204 § 2.1 - 3.1 - 3.2. IF REQUIRED, A SPECIAL CE DECLARATION (DIRECTIVE BT AND EMC) WILL BE ISSUED.

Date  
18/09/2008

Test Operator  
  
**MICROELETTRICA SCIENTIFICA**  
**MILANO - ITALIA**

Customer Representative





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Temperature Rise Test

Power to be Injected during Test: **90 kW** at Steady State  
 - Approximate Voltage to be injected: **1873,5 V** - Approximate Current to be injected: **48 A**  
 - Target Temperature Rise: **350 °k**

Specified Rated Ohmic Value **39 Ohms** at **Hot** + 7,5 % ⇒ 41,93 Ohms  
 - 7,5 % ⇒ 36,08 Ohms

Recorded Values

- Voltage on Steady State: **1 826 V** ⇒ Power on Steady State **90,92 kW** + 1,02%  
 - Current on Steady State: **50 A**  
 - Average Measured Temperature on Sensors: **306 °k**

Calculated Values

Calculated Ohmic Value **36,66 Ohms** on Steady State ⇒ **-6,00%** from rated  **Passed**

After Test (1 hour after end of Test)

Measured Values

- Path 1: **26,77 Ohms** at **25 °c** corrected to **26,45 Ohms** at 20 °c  
 - Path 2: at corrected to -

Ohmic Value Variation (After / Before Test)

- Path 1: **-0,76%**  **Passed**  
 - Path 2: -  **Passed**

Reference Standards

No standard does clearly define how Harmonic Filter Damping Resistors are to be tested. The closest one are IEC 62271-1 & IEC 62271-200  
 As High Voltage Resistors a certainly the only high Voltage equipments where Temperatrue Rise can reach more than 350°c at Steady State, those standards cannot be taken word-by-word  
 Temperature Rise Test is carried out to:  
 - Check ohmic value on steady state  
 - Check that equipment's Temperatrue Rise is under control and will not affect the good work duration of assembly  
 .... Eventhough, IEEE-32 Standard does not apply to Harmonic Filter Damping Resistors, it provides limit concerning Temperatrue Rise on Steady State for Stainless Steel Resistors. This limit shall be 385°k

Notes / Remarks

See attached "Type Test Schedule"  
 See attached "Temperature Rise Curves"





**Test Report for Resistors**

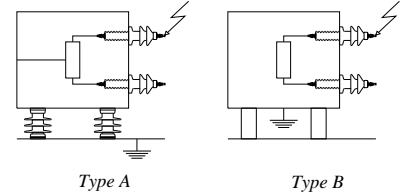
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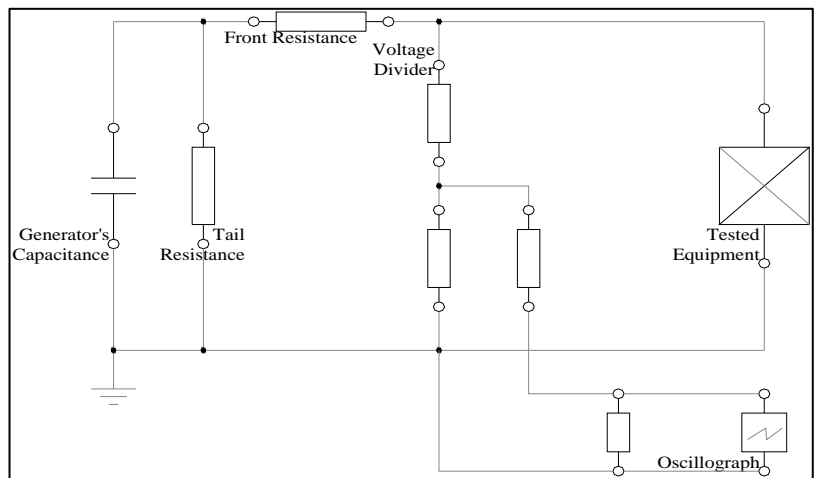
**Lightning Impulse Voltage Withstand Test:**

Configuration of the Item to be Tested: **A**  
 Test Withstand Voltage: **125** kV<sub>peak</sub>  
 Definition of Waves **6** Full Waves  
**3** Positive waves  
**3** Negative waves



**Test Circuit:**

Tail Resistance: **140 Ohms**  
 Front Resistance: **100 Ohms**  
 Peak Voltage: **125 kV**  
 Time of Front: **1 μs**  
 Time of Tail: **53,6 μs**  
 Voltage Divider (kV/V): **5003**



**Test Results**

High Voltage to Ground

Polarity	Requirement	Results			
		Voltage	125 kV	126 kV	123 kV
Positive	125 kV	Voltage	125 kV	126 kV	123 kV
		Comments	OK	OK	OK
Negative	125 kV	Voltage	125 kV	125 kV	122 kV
		Comments	OK	OK	OK

**Passed**

Low Voltage to Ground

Polarity	Requirement	Results			
		Voltage	126 kV	125 kV	125 kV
Positive	125 kV	Voltage	126 kV	125 kV	125 kV
		Comments	OK	OK	OK
Negative	125 kV	Voltage	124 kV	124 kV	124 kV
		Comments	OK	OK	OK

**Passed**

Across Terminals

Polarity	Requirement	Results			
		Voltage	126 kV	122 kV	123 kV
Positive	125 kV	Voltage	126 kV	122 kV	123 kV
		Comments	OK	OK	OK
Negative	125 kV	Voltage	125 kV	126 kV	123 kV
		Comments	OK	OK	OK

**Passed**

**Reference Standards**

**IEC 60 060 - 2:** High voltage test techniques - Part 2: Measuring systems

**Notes / Remarks**