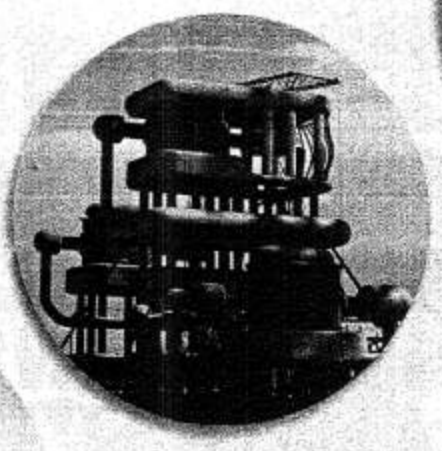
جمهورية مصر العربية
وزارة الكهرباء والطاقة
الشركة القابضة لكهرباء مصر

مركز أبحاث الجهد الفائق



التقرير الفنى رقم (٢٠٠٩/١٠١)
بتاريخ ٢٩ /٤/ ٢٠٠٩
بخصوص
اختبار كابل نحاس جهد ٦٦ ك.ف – قطاع (٦٣٠ مم٢)
مركب عليه نهايتين بورسلين ونهايتين (SF6)
ووصلتين

الموقع : الكيلو ٢٧ طريق القاهـرة – الاسكندرية الصحـراوى
الموقع على شبكة الانترنت : www.pehvrc.com
بريد إليكترونى : pehvrc@pehvrc.com
تليفون : ٥٣٩٠٩٢٦ – ٥٣٩٠٧٣١ فاكس : ٥٣٩٠٧٢٨

المراسلة: قطـاع البحـوث والتصميمات
الشركة القابضة لكهرباء مصـر
تليفون : ٢٦١٦٥٣٥-٤٠٢٩٨١٤
فاكس : ٤٠١١٦٣٠

TEST REPORT

REPORT No. (101/2009)

- **CLIENT: ELSEWEDY CABLES CO.**

- ***Report Date:*** 29 / 04 / 2009

- ***Place:***

  - *Laboratories of Extra High Voltage Research Center.*
  - Internal code : *TO – AC - 08 – 08 – 26 - 01*

- ***Requirements:***

  - Loop type tests according to IEC 60840.

- ***Standard Specification:***

  - ***IEC 60840 "Power cables with extruded insulation and their accessories for rated voltages above 30 kV (Um= 36 kV) up to 150 kV (Um = 170 kV).***

- ***Description of the Specimen :***

- Loop systems, cable and accessories consist of the following:

1- 38/66 kV Power cable with the following specification:

- Manufacturer	: **ELSEWEDY CABLES CO.**, Cairo, Egypt.
- Type	: 38/66 kV/CU/XLPE/CW/LEAD/HDPE /630 mm^2
- No. of Phases	: 1
- Insulation	: XLPE
- Conductor Material	: Copper
- Conductor cross-section	: 630 mm^2
- Metallic sheath Material	: Lead
- Over sheath Material	: HDPE (ST_7)
- Sheath Color	: Black
- Rated Frequency	: 50 Hz
- Water Penetration Design	: A barriers are included which prevents longitudinal water penetration along the conductor (swelling tape), the outer surface of the conductor (water blocking tape), the gap between the outer surface of the insulation screen and the metallic screen and over the metallic screen (water blocking tape).

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2- *Two 66 kV Porcelain outdoor cable termination with the following specifications*:

- Manufacturer : Sefag ixosil Ltd, Switzerland.
- Type : ESP72.5.C39
- Creepage distance : 4100 mm.
- Arc distance : 1190 mm.
- No. of sheds : 15 large and 14 small.
- Termination housing material: Porcelain.
- Stress control Type : pre-molded.
- Stress control material : silicone rubber.

3- *Plug-in Joint Box for GIS Cable Terminations :*

- Manufacturer : PFISTERER.
- Type : CONNEX – HV – Joint – Size 6.

4- *Two 66 kV GIS Cable Termination with the following specifications*:

- Manufacturer : PFISTERER.
- Type : ESG72-H

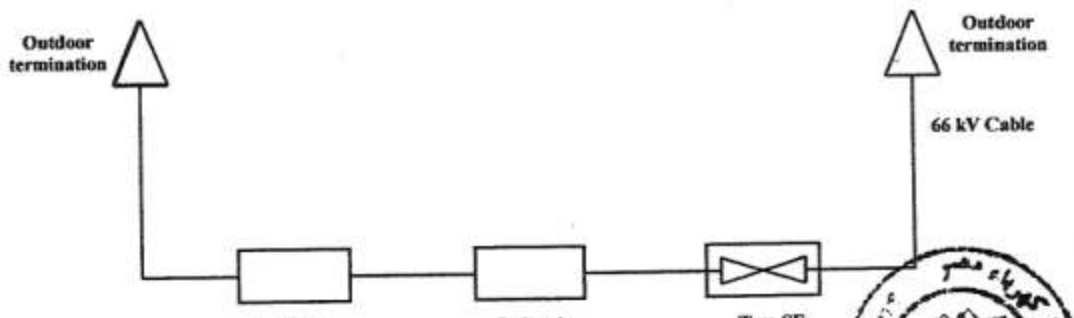
5- *One 66 kV straight cable joint with the following specifications:*

- Manufacturer : ELASTIMOLD EGYPT .
- Type : 69TCJ.

6- *One 66 kV isolated cable joint with the following specifications:*

- Manufacturer : ELASTIMOLD EGYPT.
- Type : 69TCJ.

- The loop system was assembled as the following figure



- ***Description of the Equipment:***

  - High voltage reactor – 400 kV – 5000 kVA – 50 Hz – Type: (RSK) – Serial No. 204322/99.
  - PD detector – Type: (TE57).
  - Tan δ measurement devise – Type: 254/321/02 Serial No. 144281.
  - Standard capacitor – Type: NK400 Serial No. 434321.
  - Impulse voltage generator 800 kV – 20 kJ – Type SGSA 800-20.
  - Air oven up to 300 °C – Type: BINDER - Serial No. 02-32772.
  - Universal testing machine 25 kN – Type TABLE TOP – Model APEX-T5000 Serial No. 2095.

- ***Test Samples:***

  - Test samples were chosen under the responsibility of the client.

- ***Tests:***

  1. Electrical Type Tests

  1.1 Check on insulation thickness of cable for electrical type tests
  1.2 Bending test on the cable followed by installation of accessories and partial discharge test at ambient temperature.
  1.3 ***Tan δ*** measurement.
  1.4 Heating cycle voltage test.
  1.5 Partial discharge test:
  - At ambient temperature.
  - At high temperature

  1.6 Lightning impulse voltage test followed by a power frequency voltage test.
  1.7 Tests of outer protection for buried joint.
  1.8 Resistivity of semi-conducting screens.
  1.9 Examination of the test assembly.

  2. Non-Electrical Type Tests:

  2.1 Check of cable construction.
  2.2 Tests for determining the mechanical properties of insulation before and after ageing
  2.3 Tests for determining the mechanical properties of non-metallic sheaths before and after ageing
  2.4 Ageing tests on pieces of complete cable to check compatibility of materials
  2.5 Hot set test for XLPE insulation.
  2.6 Shrinkage test for XLPE insulation.
  2.7 Water penetration test.

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- ***Test Method and Results:***

1- Electrical Type Tests:

1.1 Check on insulation thickness before electrical type tests:

- Prior to the electrical type tests the insulation thickness was measured in accordance with clause 11.3.1 of IEC 60840.
- The measured value of the insulation thickness is shown in the following table:

Average thickness (mm)	Specified thickness (mm)	Requirement
11.09	11	The average thickness of the insulation doesn't exceed the specified value by more than 5%

1.2 Bending test on the cable followed by partial discharge test:

1.2.1 *Bending test*:

- The test cable was subjected to a bending test at ambient temperature in accordance with clause 11.3.4 of IEC 60840. The test cable was bent around a test cylinder. The diameter of the cylinder was 2.8 m. The test consisted of three cycles. The test object was bent for one complete turn. It was then unwound. The process repeated, except that the bending of the sample was in the reverse direction..

Outer diameter of cable D (mm)	Diameter of conductor d (mm)	Requirement of bending diameter < 25(D+d)+5% (mm)	Hub diameter of drum (mm)
76.8	30.05	< 2805	2800

1.2.2 Partial discharge test:

- After bending test the terminations were installed on the cable and the test assembly was subjected to a partial discharge test at ambient temperature in accordance with clause 11.3.5 of IEC 60840. The test voltage was raised gradually to and held at 1.75 U_o for 10 s and then slowly reduced to 1.5 U_o.
- The measured value of the partial discharge level is shown in the following table

Applied voltage (kV)	Duration (S)	Max. PD level (PC)	PD level (PC)
66.5	10	–	–
57	–	≤ 5	3.9

- The Figure of the PD- Scope is illustrated in page (13) of this report.
- ***The test results met the requirements.***

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1.3 Tan δ measurement:

- Another sample test cable was subjected to a tanδ measurement in accordance with clause 11.3.6 of IEC 60840. The test assembly was heated by passing a current through the conductor until it reached a steady temperature, which was 97 °C. The tan δ was measured at a power frequency voltage of U_o at the temperature specified above.
- The measured value of the partial discharge level is shown in the following table

Applied voltage (kV)	Maximum allowable value for *tan δ* (x 10^{-4})	*tan δ* (x 10^{-4}) [Measured value]
38	10	3.09

- ***The test results met the requirements.***

1.4 Heating Cycle Voltage Test:

- The test assembly was subjected to a heating cycle voltage test in accordance with clause 11.3.7 of IEC 60840. The test assembly was heated by passing a current through the conductor until it reached a steady temperature, which was 97 °C. The heating was applied for 8 h. The conductor temperature was maintained within the stated temperature limits for 2 h of each heating period. This was followed by 16 h of natural cooling. The cycle of heating and cooling was carried out 20 times. During the whole of the test period a voltage of $2U_o$ was applied to the test object.
- The result of the heating cycle voltage test is shown in the following table.

No. of heating cycles	Required conductor temperature (°C)	Heating		Cooling time (h)	Applied voltage continuously (kV)
		Total heating time (h)	Duration of heating at 97 °C (h)		
20	95 ≤ t ≤ 100	8	2	16	76

- ***The test results met the requirements.***

1.5 Partial discharge test:

1.5.1 At ambient temperature:

- After the last heat cycle, partial discharge was measured for the test assembly at ambient temperature in accordance with clause 11.3.5 of IEC 60840. The measurement was carried out as mentioned above under item 1.2.2. The measured value of the partial discharge level is shown in the following table.

Applied voltage (kV)	Duration (S)	Max. PD level (PC)	PD level (PC)
66.5	10	--	--
57	--	≤ 5	< 1.2

- The Figure of the PD- Scope is illustrated in page (14) of this report.
- ***The test results met the requirements.***

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1.5.2 *At high temperature:*

- After test assembly was subjected to a partial discharge test at ambient temperature, partial discharge was measured for the test assembly at the conductor temperature 97°C in accordance with clause 11.3.5 of IEC 60840. The measurement was carried out as mentioned above under item 2.2.
- The measured value of the partial discharge level is shown in the following table:

Applied voltage (kV)	Duration (S)	Max. PD level (PC)	PD level (PC)
66.5	10	--	--
57	--	≤ 5	< 1.3

- The Figure of the PD- Scope is illustrated in page (15) of this report.
- ***The test results met the requirements.***

1.6 *Lightning impulse voltage test followed by a power frequency voltage test:*

1.6.1 *Lightning impulse voltage test:*

- The test assembly was subjected to a lightning impulse voltage withstand test in accordance with clauses 11.3.8 of IEC 60840. The test was performed on the test assembly at a conductor temperature of 97 °C. The cable withstood 10 positive and 10 negative voltage impulses with crest value of 325 kV without failure.
- The results were illustrated by the Figures in pages No. (16 : 19) of this report.
- ***The test results met the requirements.***

1.6.2 *Power frequency voltage test:*

- After the impulse voltage test, the test assembly was subjected to power frequency voltage test of $2.5U_o$ for 15 min. in accordance with clause 11.3.8 of IEC 60840.
- The result of the power frequency voltage test is shown in the following table

Applied voltage (kV)	Frequency (Hz)	Duration (min)	Observations
95	50	15	No breakdown

- ***The test results met the requirements.***

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1.7 Tests of outer protection for buried joints

- After completion the above tests the isolated joint that still on the cable was immersed in water to a depth of 1m at the highest point of the outer protection in accordance with clause D.3 (Annex D) of IEC 60840 and KAHRAMAA requirements. The total of 7 heating/cooling cycles was applied by raising the water temperature to 77°C and maintained at this temperature for 5 hours and then permitted to cool to 10 °C above the ambient temperature. The result of the test is shown in the following table :

Water immersion and heat cycling		
No. of heating cycles	**Required water temperature (°C)**	**Duration of heating at 77 °C (h)**
7	$75 \leq t \leq 80$	5

- After completion the heating cycles and with the joint still immersed in the water, the following tests were carried out:

a- DC voltage test:

- The test voltage of 25 kV d. c. was applied for 5 min. in accordance with KAHRAMAA requirements between the metallic sheath (Lead) of the power cable, at either end of the accessory and also between the metallic sheath and the earthed exterior of the joint outer protection (the water). The result of the test is shown in the following table:

d. c voltage test		
Applied voltage (kV)	**Duration (min)**	**Observations**
25	5	No breakdown

- The test results met the requirements.

b- Impulse voltage test

- After completion the DC voltage test the isolated joint that still on the cable was immersed in water, the joint withstood 10 positive and 10 negative voltage impulses with crest value of 17.5 kV between the metallic sheath and the earthed exterior of the joint outer protection (the water) without failure.
- After the previous test the joint was removed from the water, the joint withstood 10 positive and 10 negative voltage impulses with crest value of 35 kV between each metallic sheath
- The results were illustrated by the Figures in pages No. (20 : 23) of this report.

- The test results met the requirements.

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1.8 Resistivity of semi-conducting screens:

- The measurement of the resistivity of the semi-conducting screens was carried out in accordance with clause 11.3.9 of IEC 60840. The resistivity of extruded semi-conducting screens applied over the conductor and over the insulation was determined by measurements on test pieces taken from the core of a sample of cable as manufactured and a sample of cable which has been subjected to the ageing treatment to test the compatibility of component materials specified in IEC 60840. The measurements were made at a temperature of 90 °C.

- The resistivity of the semi-conducting screens are shown in the following table:

Item	Unit	Requirement	Measured / Determined
Conductor screen			
- without ageing	Ωm	≤ 1000	25.96
- after ageing	Ωm	≤ 1000	9.86
Insulation screen			
- without ageing	Ωm	≤ 500	0.76
- after ageing	Ωm	≤ 500	0.28

- ***The test results met the requirements.***

1.9 Examination of the test assembly.

- The examination of the terminations were carried out after completion of the electrical type test mentioned above in accordance with clause 12.3.2 of IEC 60840.

- The terminations were revealing no signs of degradation, leakage, corrosion or harmful shrinkage.

- ***The test results met the requirements.***

2- Non-Electrical Type Tests:

2.1. Check of Cable Construction:

- The examination of the conductor and measurements of insulation and sheath thickness was carried out in accordance with clause 11.4.1 of IEC 60840. The results are shown in the following table:

No.	Items	Unit	requirement	Measured Values
1	Cable Marking		-----	66000V – ELECTRIC CABLE – ELSEWEDY CABLES - 1×630 mm^2 – 2008 – PROPERTY OF KAHRAMAA
2	Color of the outer sheath		Black	Black
3	Conductor: - Material - Diameter (Av.) - Number of wires - Water blocking	 mm No.	 ----- ----- ≥ 53 -----	 Copper 30.42 60 Swelling tape
4	Extruded semi-conducting - thickness (Av.)	mm	-----	1.46
5	Insulation - minimum thickness - $(t_{max} - t_{min}) / t_{max}$	mm	≥ 15.3 ≤ 0.15	10.84 0.036
6	Extruded semi-conducting - thickness (Av.)		-----	1.29
7	Diameter over insulation	mm	-----	58
8	Semi-conductive water blocking tape - No. × Width - Thickness (Av.)	 mm mm	-----	 1 × 70 0.5
9	Screaning - Number of wires - Diameter of wires - Copper tape (No.×width×thick.)	 mm		 85 1.77 1 × 19.5 × 0.16
10	Metallic sheath - material - diameter (Av.) - minimum thickness	 mm mm	 ----- ----- ≥ 2.085	 Lead 70 2.87
11	Oversheath - material - diameter (Av.) - minimum thickness.	 mm mm	 ----- ----- ≥ 2.493	 High Density Poly Ethylene (HDPE) – ST_7 78 4.47

- ***The test results met the requirements.***

2.2. *Tests for determining the mechanical properties of insulation before and after ageing:*

- The mechanical properties of insulation before and after ageing were determined in accordance with clause 11.4.2 of IEC 60840.
- The results of the mechanical properties of insulation before and after ageing are

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- shown in the following table:

Item	Unit	Requirement	Measured/ determined
Without ageing			
-Min. tensile strength	N/mm^2	12.5	28.49
-Min. elongation at break	%	200	567
after ageing in air oven			
-Min. tensile strength	N/mm^2	---	28.91
-Max. variation with samples without ageing	%	± 25	+ 1.47
-Min. elongation at break	%	---	560.2
-Max. variation with samples without ageing	%	± 25	- 1.2

- ***The test results met the requirements.***

2.3. *Tests for determining the mechanical properties of non-metallic sheaths before and after ageing:*

- The mechanical properties of the outer sheath before and after ageing were determined in accordance with clause 11.4.3 of IEC 60840.
- The results of the mechanical properties of non-metallic sheaths before and after ageing are shown in the following table:

Item	Unit	Requirement	Measured / determined
Without ageing			
-Min. tensile strength	N/mm^2	12.5	29.89
-Min. elongation at break	%	300	755
after ageing			
-Min. elongation at break	%	300	695

- ***The test results met the requirements.***

2.4. *Ageing Tests on Pieces of Completed Cable to Check Compatibility of Materials:*

- Ageing tests on pieces of completed cable were carried out in accordance with clause 11.4.4 of IEC 60840.
- The results of the mechanical properties of completed cable are shown in the following table:

Item	Unit	Requirement	Measured /determined
Insulation			
-Min. tensile strength	N/mm^2	----	21.89
-Max. variation with samples without ageing	%	± 25	- 23.13
-Min. elongation at break	%	----	529
-Max. variation with samples without ageing	%	± 25	- 6.7
Sheath			
- Min. elongation at break	%	300	810

- ***The test results met the requirements.***

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2.5. Hot set test for XLPE insulation:

- A hot set test for the XLPE insulation was carried out in accordance with clause 12.5.10 of IEC 60840.
- The results of the hot set test for the XLPE insulation are shown in the following table:

Item	Unit	Requirement	Measured
-elongation under load -permanent elongation	% %	≤ 175 ≤ 15	40.5 2.5

- ***The test results met the requirements.***

2.6. Shrinkage test for XLPE insulation

- A shrinkage test for XLPE insulation was carried out in accordance with clause 11.4.13.16 of IEC 60840.
- The result of the shrinkage test for XLPE insulation is shown in the following table.

Distance L (mm)	Air oven temp. (°C)	Duration (hour)	Max. shrinkage (%)	Shrinkage measurement (%)
200	130	6	4	3.25

- ***The test results met the requirements.***

2.7. *Water penetration test :*

- The water penetration test was carried out in accordance with clause 12.5.14 of IEC 60840. In total 3m cable was used for this test. The cable was tested for longitudinal water tightness along the conductor, the outer surface of the conductor, and the gap between the outer surface of the insulation screen and the metallic screen.

No. of heating cycles	Required conductor temp. (°C)	Heating		Cooling time (h)
		Total heating time (h)	Duration at 98 °C (h)	
10	95 ≤ t ≤ 100	8	2	16

- After completion of the 10 heating cycles no water emerged from the ends of the cable
- ***The test results met the requirements.***

▪ Conclusion :

- ***The loop system, 38/66 kV Power cable - CU/XLPE/CW/LEAD/HDPE /1 x 630 mm² manufactured by ELSEWEDY CABLES CO., 66 kV Porcelain outdoor cable termination manufactured by Sefag ixosil Ltd, 66 kV GIS Cable Termination manufactured by PFISTERER, 66 kV straight & isolated cable joint manufactured by ELASTIMOLD EGYPT fulfilled the requirements of tests mentioned in this report according to IEC (60840).***

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- ***Notes:***

  - Tests were carried out on the above specimens only without any responsibility concerning other untested specimens.
  - The tests were carried out without any obligation on Egyptian Electricity Holding Company.
  - This test report shall not be reproduced except in full, without written approval of EHVRC.

- ***TEST ENGINEERS:***

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GENERAL MANGER

2009

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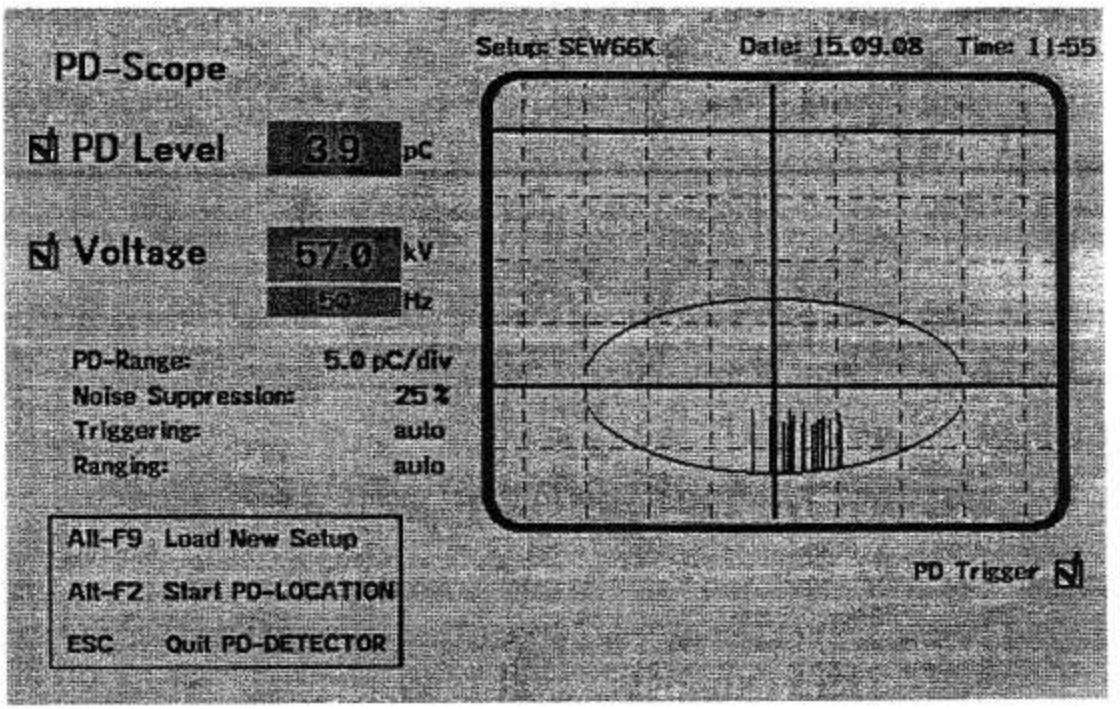
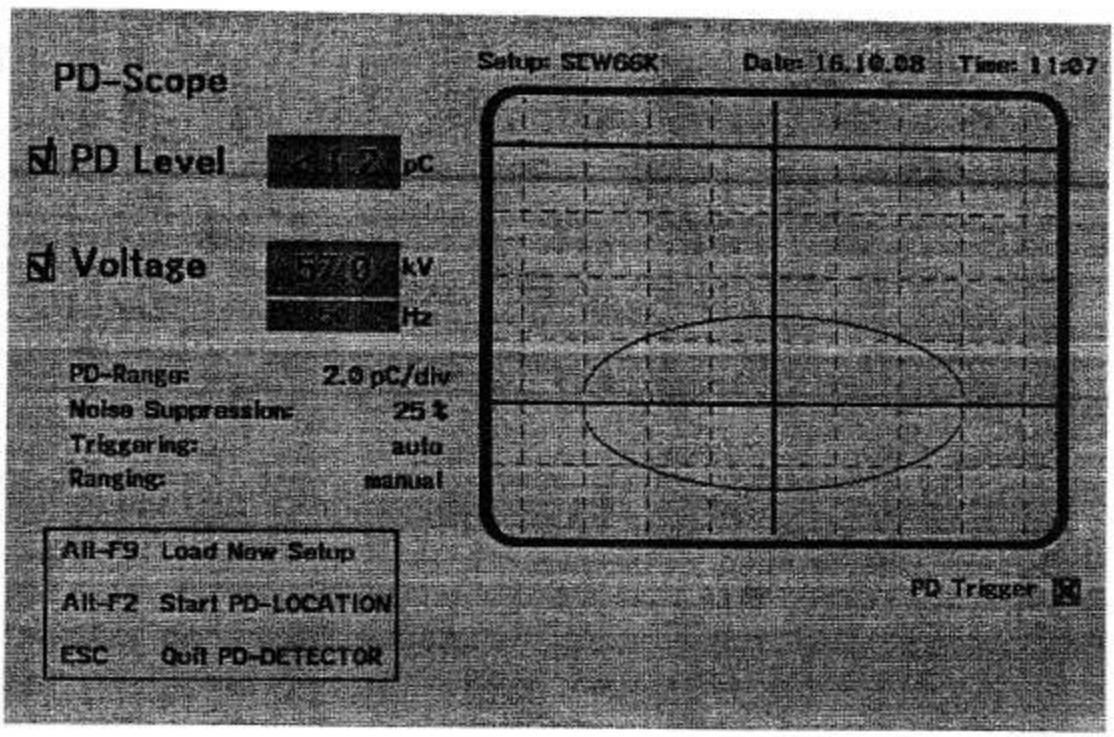
Measurement Results of Partial Discharge
For 38/66 kV- 1 × 630 mm^2 loop system, cable, joints and terminations
[ELSEWEDY CABLES CO.]



- **Case: Before heat cycle at ambient temperature**
- **Ambient temperature : 29 °C**
- **Calibration at : 5 PC**

- ***TEST ENGINEERS:***

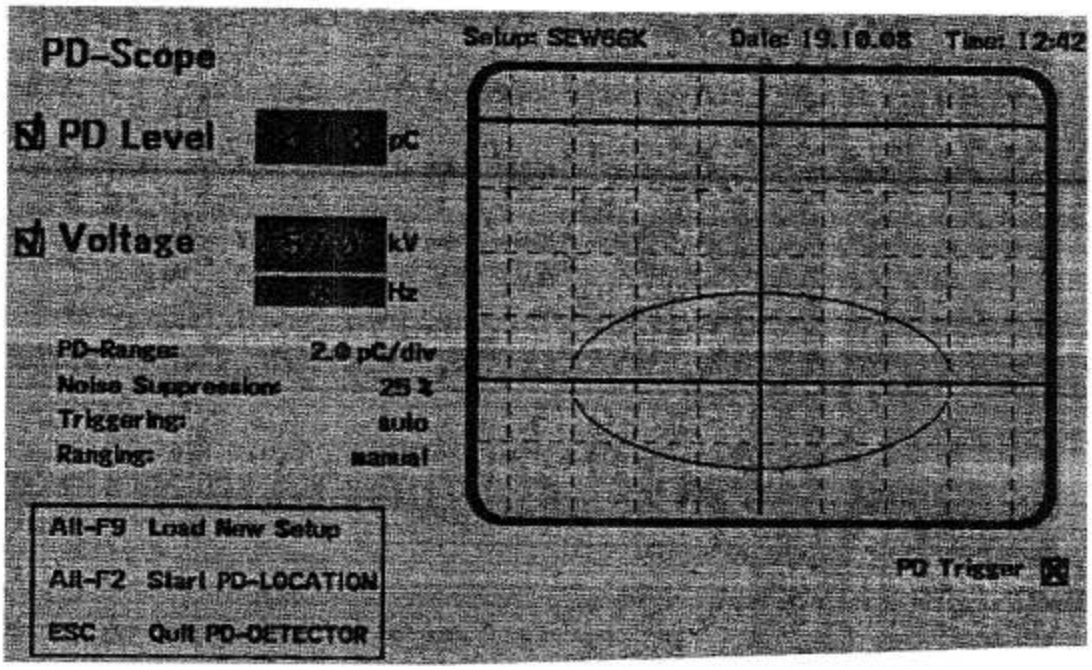
Measurement Results of Partial Discharge
For 38/66 kV- 1 × 630 mm^2 loop system, cable, joints and terminations
[ELSEWEDY CABLES CO.]



- **Case: After heat cycle at ambient temperature**
- **Ambient temperature : 28 °C**
- **Calibration at : 5 PC**

▪ ***TEST ENGINEERS:***

Measurement Results of Partial Discharge
For 38/66 kV- 1 × 630 mm² loop system, cable, joints and terminations
[ELSEWEDY CABLES CO.]



- **Case: After heat cycle at conductor temperature 97°C**
- **Ambient temperature : 28 °C**
- **Calibration at : 5 PC**

- ***TEST ENGINEERS:***

66kV loop system – ELSEWEDY CABLES +ve TO-AC-08-08-26-01

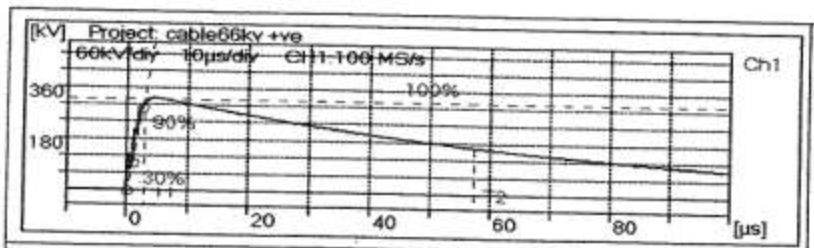


Fig. 1

(Ch1)
Up = 325.2 kV
T1 = 2.842 µs
T2 = 57.37 µs

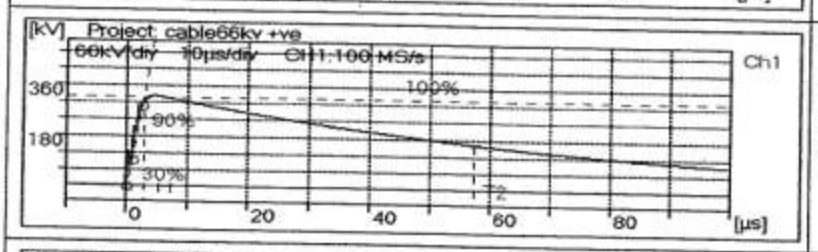


Fig. 2

(Ch1)
Up = 324.9 kV
T1 = 2.843 µs
T2 = 57.34 µs

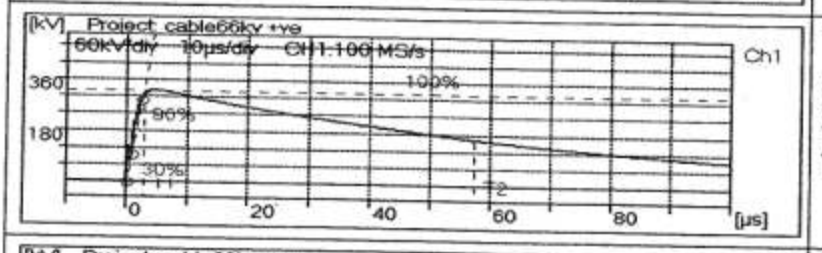


Fig. 3

(Ch1)
Up = 324.4 kV
T1 = 2.837 µs
T2 = 57.32 µs

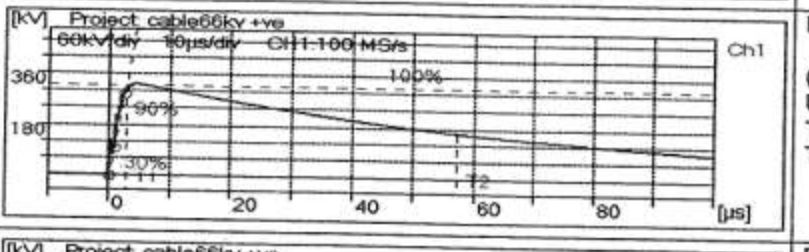


Fig. 4

(Ch1)
Up = 325.1 kV
T1 = 2.841 µs
T2 = 57.40 µs

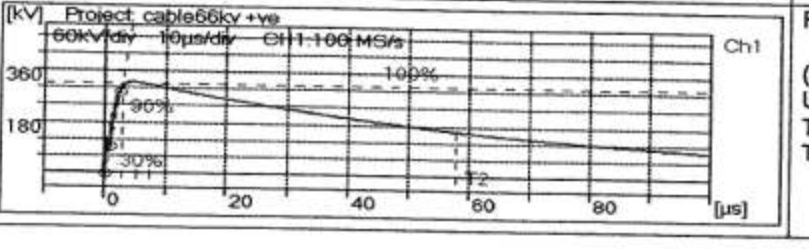


Fig. 5

(Ch1)
Up = 322.6 kV
T1 = 2.858 µs
T2 = 57.87 µs

27-10-08

66kV loop system – ELSEWEDY CABLES +ve TO-AC-08-08-26-01

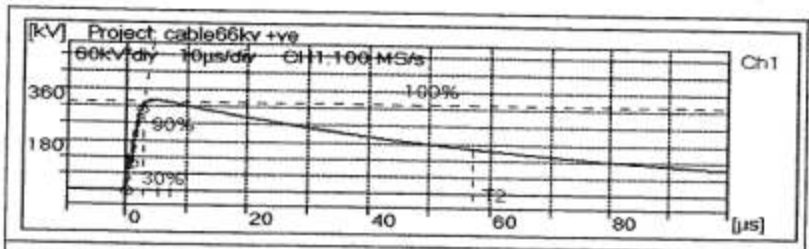


Fig. 6

(Ch1)
Up = 323.9 kV
T1 = 2.860 µs
T2 = 57.22 µs

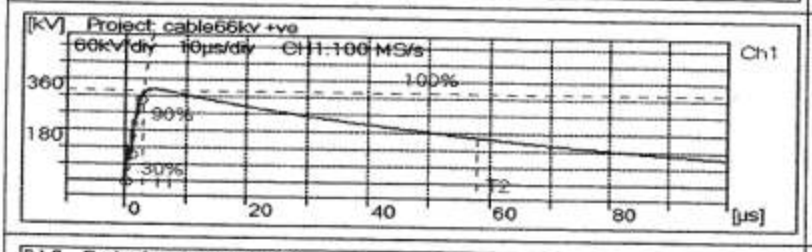


Fig. 7

(Ch1)
Up = 326.5 kV
T1 = 2.855 µs
T2 = 57.93 µs

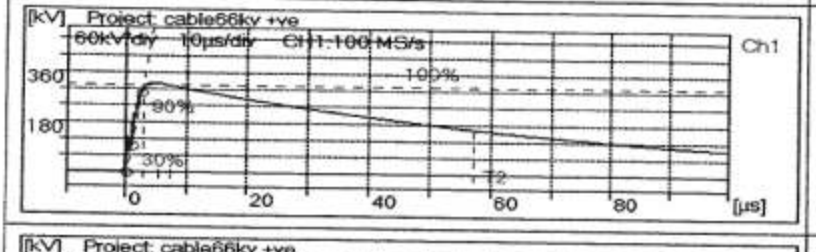


Fig. 8

(Ch1)
Up = 323.8 kV
T1 = 2.851 µs
T2 = 57.28 µs

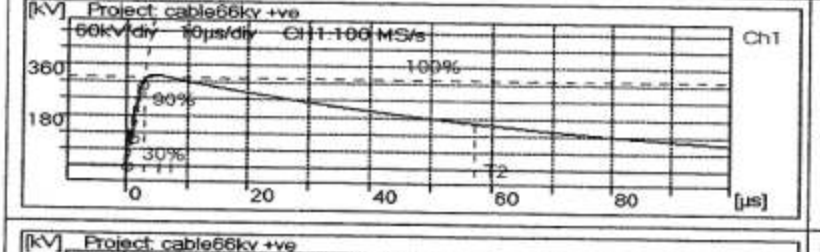


Fig. 9

(Ch1)
Up = 323.6 kV
T1 = 2.853 µs
T2 = 57.19 µs

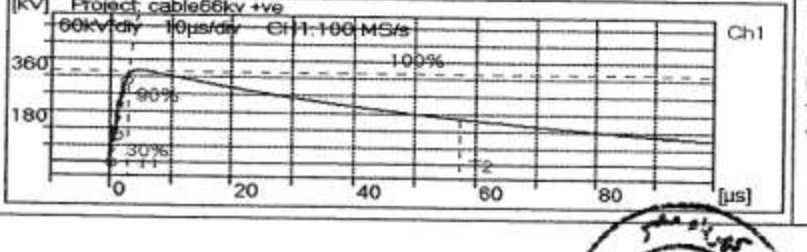


Fig. 10

(Ch1)
Up = 324.2 kV
T1 = 2.853 µs
T2 = 57.36 µs

27-10-08

66kV loop system – ELSEWEDY CABLES -ve TO-AC-08-8-26-01

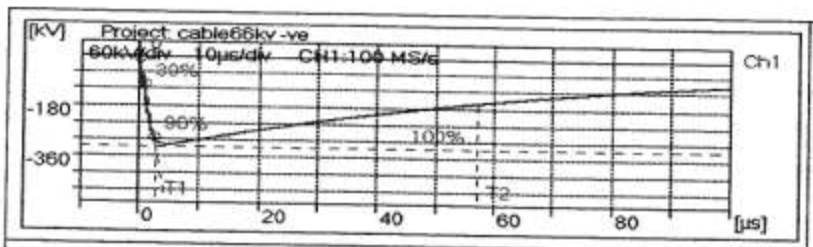


Fig. 1

(Ch1)
Up = -321.8 kV
T1 = 2.848 µs
T2 = 57.27 µs

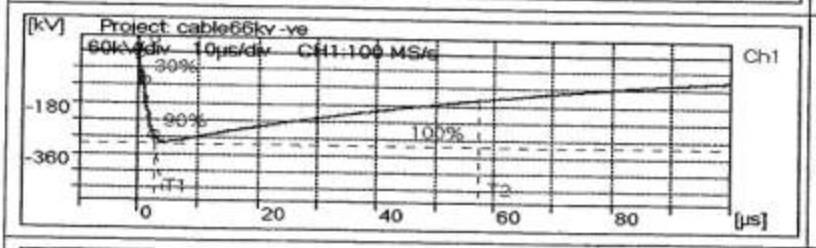


Fig. 2

(Ch1)
Up = -318.4 kV
T1 = 2.854 µs
T2 = 57.33 µs

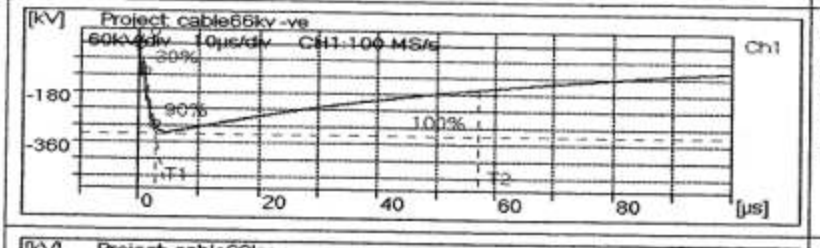


Fig. 3

(Ch1)
Up = -325.0 kV
T1 = 2.848 µs
T2 = 57.23 µs

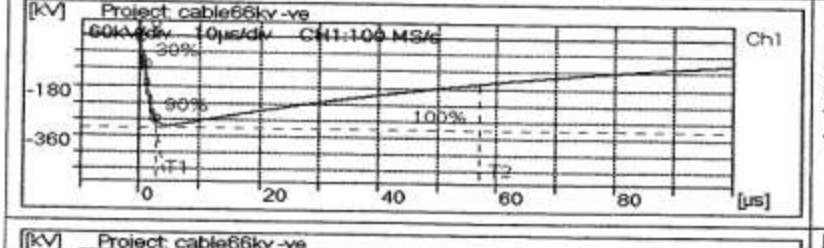


Fig. 4

(Ch1)
Up = -325.0 kV
T1 = 2.842 µs
T2 = 57.22 µs

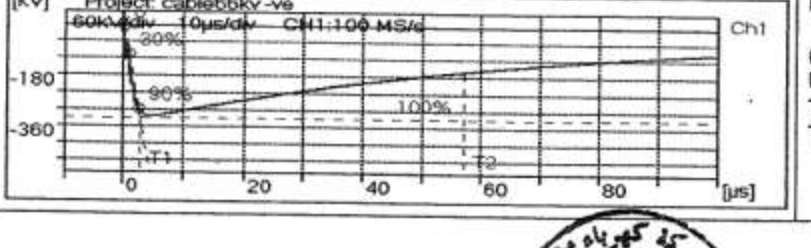


Fig. 5

(Ch1)
Up = -324.6 kV
T1 = 2.848 µs
T2 = 57.25 µs

27-10-08

66kV loop system – ELSEWEDY CABLES -ve TO-AC-08-8-26-01

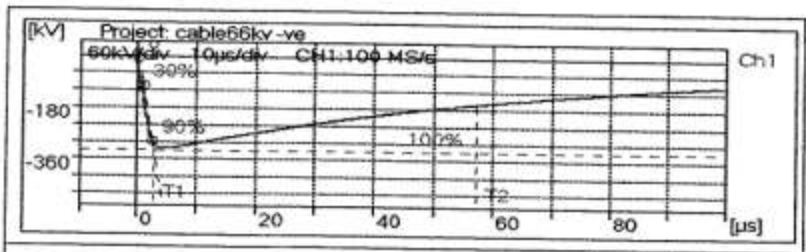


Fig. 6

(Ch1)
Up = -324.9 kV
T1 = 2.847 µs
T2 = 57.30 µs

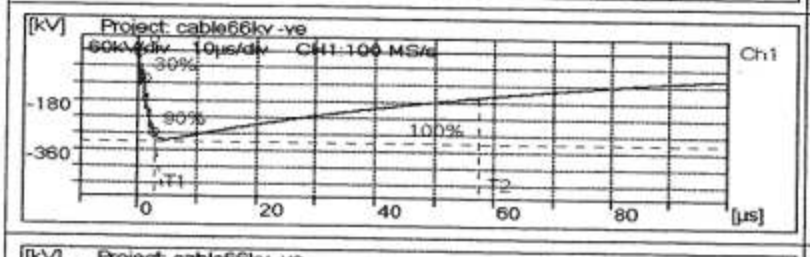


Fig. 7

(Ch1)
Up = -325.1 kV
T1 = 2.845 µs
T2 = 57.35 µs

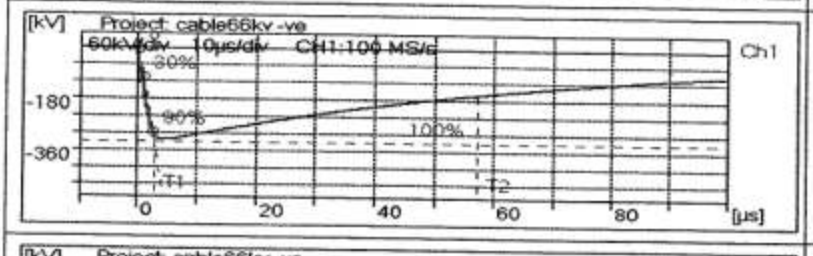


Fig. 8

(Ch1)
Up = -324.8 kV
T1 = 2.844 µs
T2 = 57.14 µs

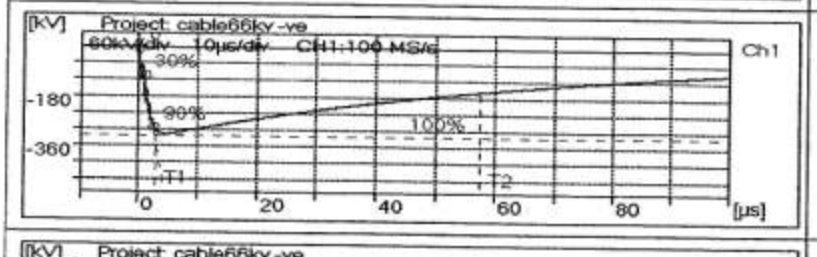


Fig. 9

(Ch1)
Up = -318.2 kV
T1 = 2.852 µs
T2 = 57.33 µs

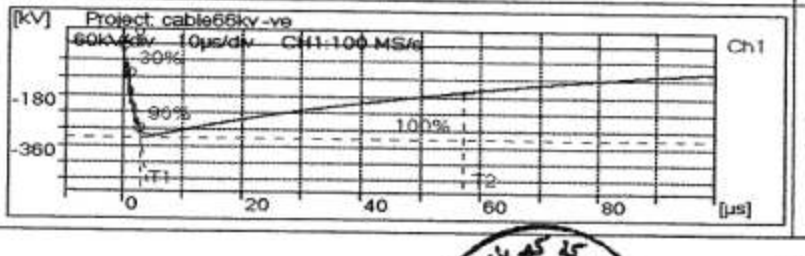
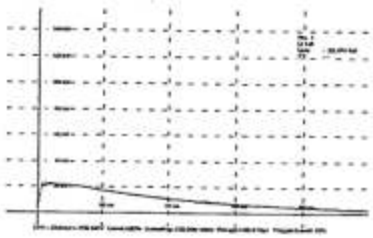
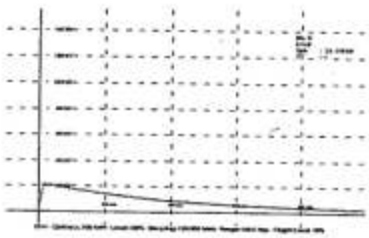
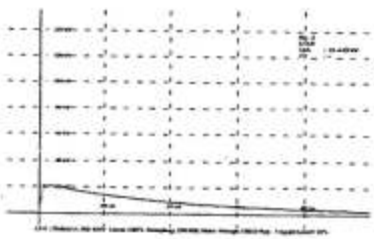
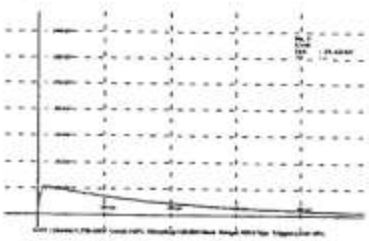
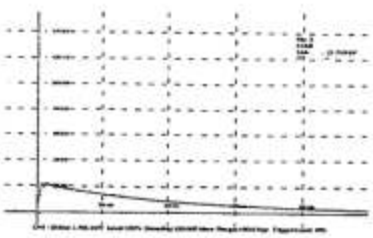
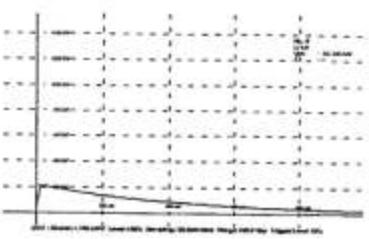
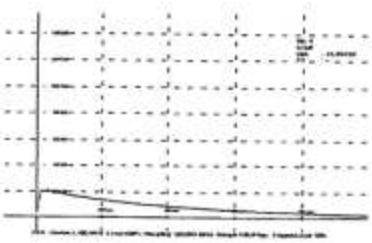
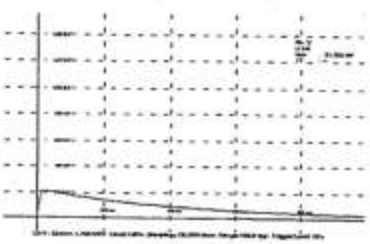
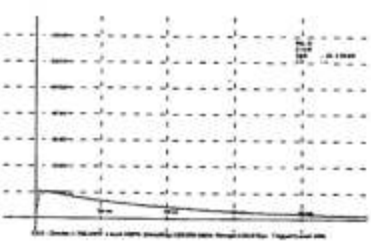
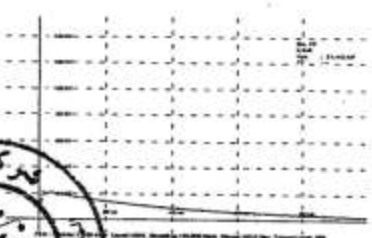


Fig. 10

(Ch1)
Up = -324.7 kV
T1 = 2.848 µs
T2 = 57.18 µs

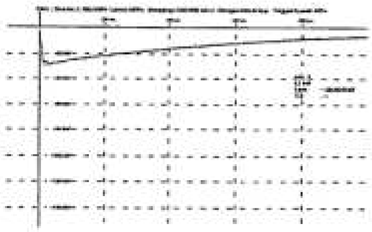
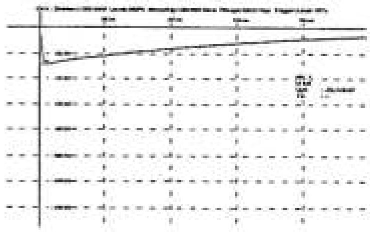
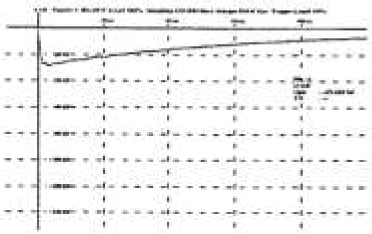
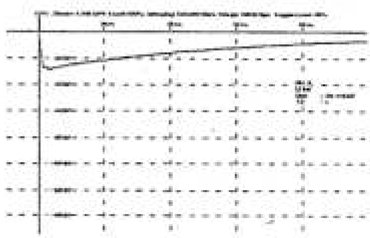
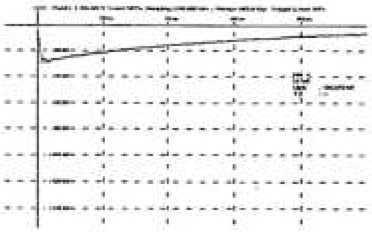
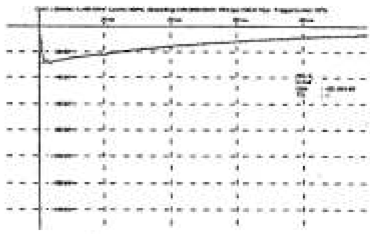
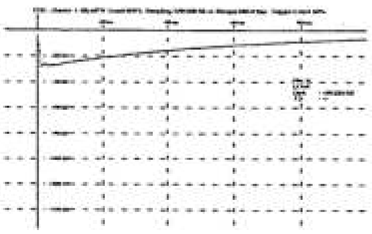
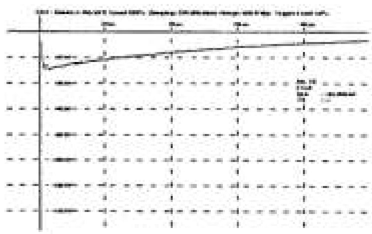
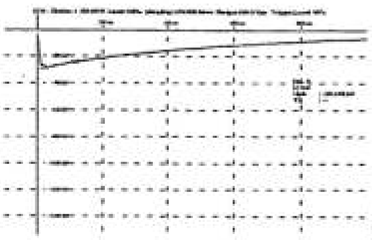
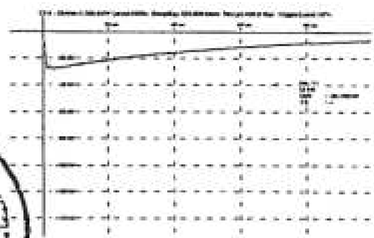
27-10-08

Isolated cable joint ,type69TCJ, for Cable 66KV,1x630mm2
Between each part to earth Polaritty: +ve Internal Code: TO-AC-08-08-26-01

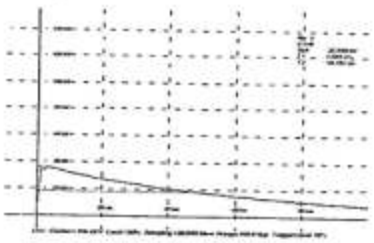
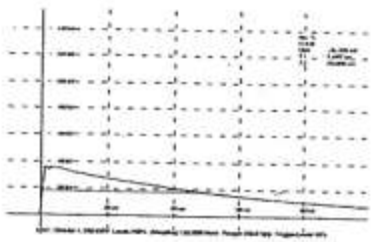
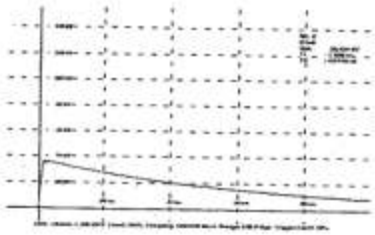
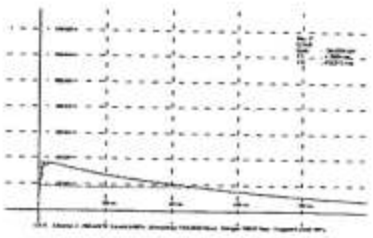
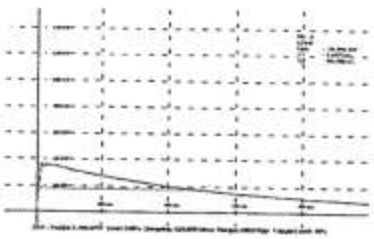
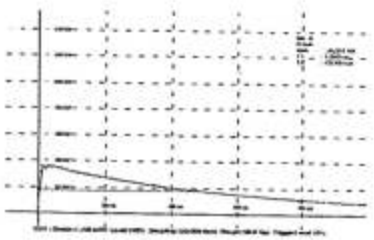
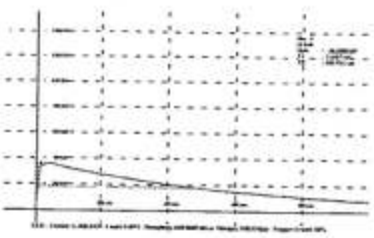
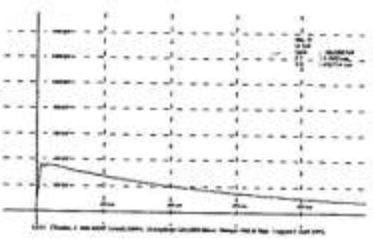
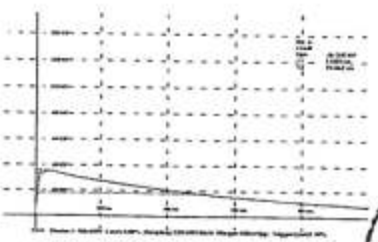
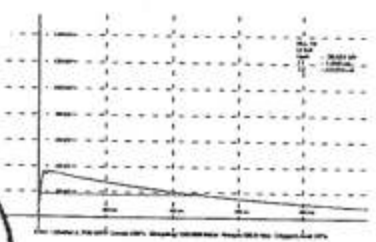
M. Ahmed

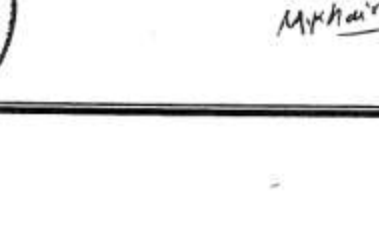
Isolated cable joint ,type69TCJ, for Cable 66KV,1x630mm2
Between each part to earth Polaritty: -ve Internal Code: TO-AC-08-08-26-01

N.Khairy

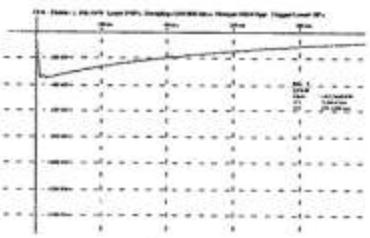
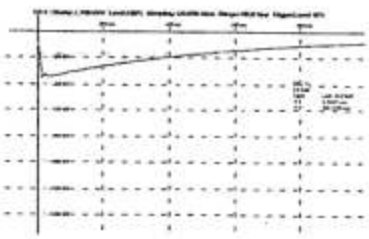
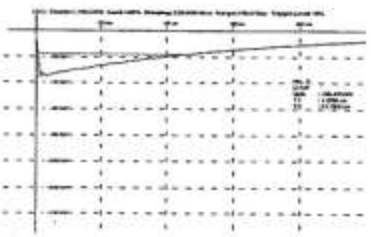
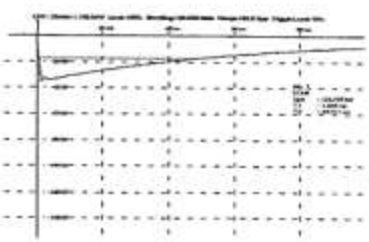
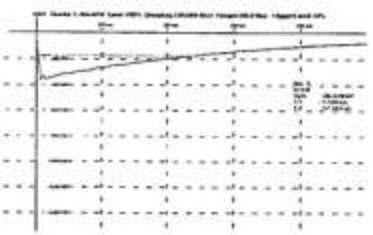
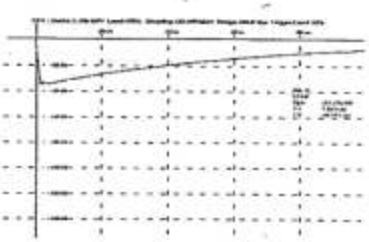
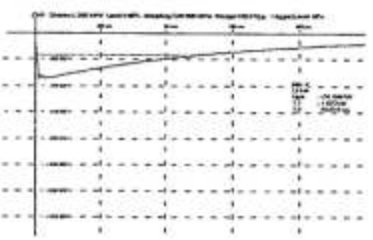
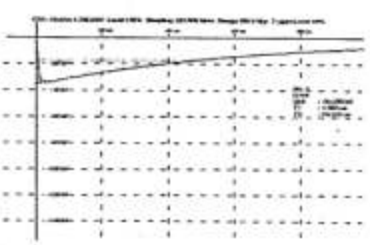
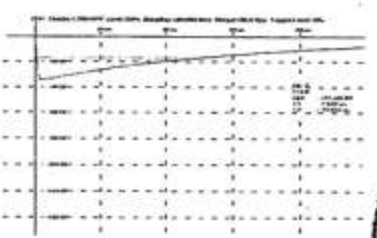
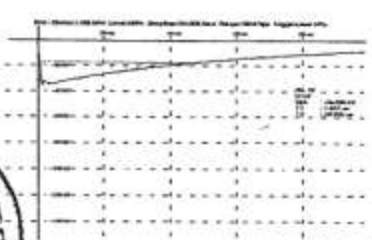
Isolated cable joint ,type69TCJ, for Cable 66KV,1x630mm2
Between two parts Polaritty: +ve Internal Code: TO-AC-08-08-26-01



Mkhairy

Isolated cable joint ,type69TCJ, for Cable 66KV,1x630mm2
Between two parts Polaritty: -ve Internal Code: TO-AC-08-08-26-01

M. Khairy

ELSEWEDY CABLES

فاكس

التاريخ : 27/7/2008
عدد الصفحات: 1

عناية السادة / مركز أبحاث الجهد الفائق
الشركة القابضة كهرباء مصر
السيد المهندس | أحمد الحال
مدير عام مركز أبحاث الجهد الفائق
رقم الفاكس: 02/ 35390728

من : مهندس | مصطفى عبد المنعم
مدير إدارة الجودة
رقم التليفون: 015 | 411350
رقم الفاكس: 015 | 411360

للعلم: ☒ للدراسة والإفادة بالرأي ☒ للاتخاذ اللازم ☒ للعلم ☐ مطلوب الرد ☒ هام وعاجل ☐

الموضوع بخصوص : إجراء اختبارات نوعية (LOOP TEST)

السيد المهندس / مدير عام مركز أبحاث الجهد الفائق ((الفاضل))
((هيئة كهرباء مصر))

تحية طيبة .....وبعد،

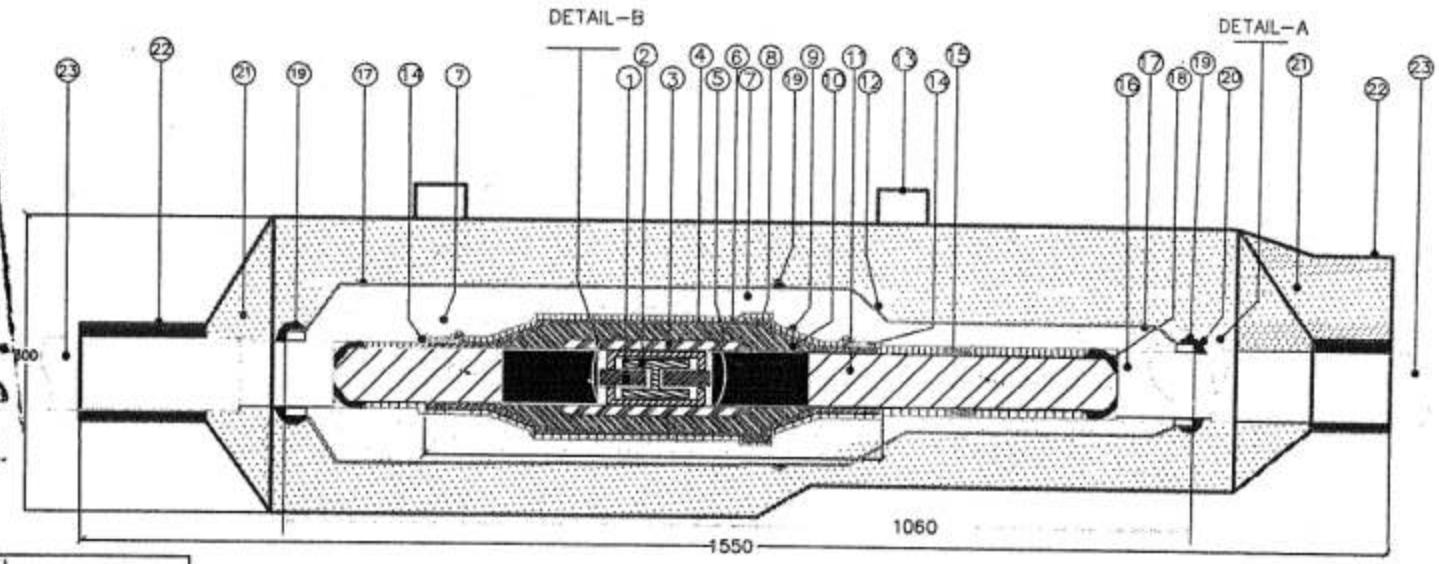
بخصوص الموضوع عاليه .نرجو من سيادتكم التكرم بعمل الاختبارات النوعية على الكابل 1X630 mm2 66 k.V

* مرفق رسم .

وتفضلوا سيادتكم بقبول فائق الاحترام والتقدير

مهندس : مصطفى عبد المنعم
مدير إدارة الجودة

مركز أبحاث الجهد الفائق
مرفق رقم (١١١)
للتقرير الفني رقم (١٠٩/٠٨)



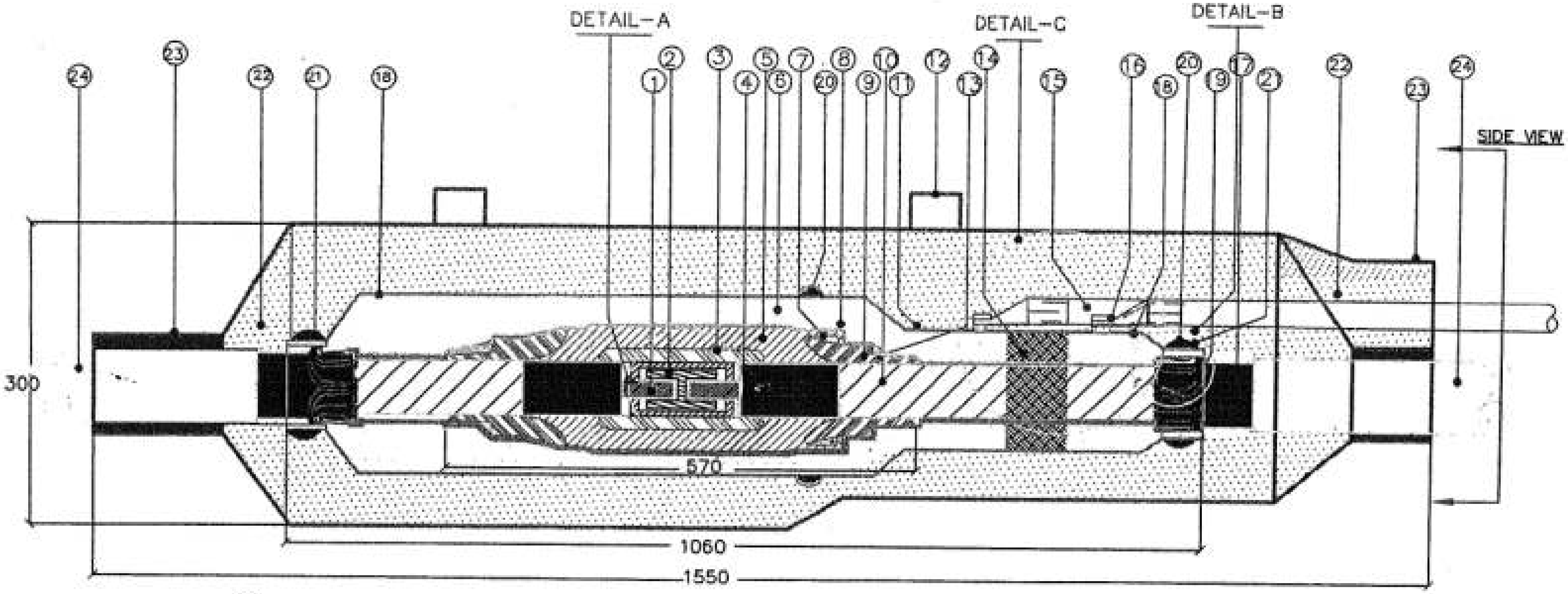
ITEM	DESCRIPTION
1	CABLE CONDUCTOR
2	COPPER CONNECTOR 500MM2(DIE42)
3	JOINT HOUSING CONDUCTIVE INSERT
4	CABLE INSULATION
5	JOINT HOUSING INSULATION
6	CABLE COPPER WIRES
7	FILLER COMPOUND
8	JOINT OUTER CONDUCTIVE BAND
9	HEAT SHRINK TUBE
10	JOINT HOUSING STRESS CONE
11	CABLE INSULATION SHIELD
12	HEAT SHRINK TUBE
13	BITUMEN INLET
14	JOINT GROUNDING CU WIRE
15	COPPER CONNECTOR 50MM2 (DIE14)
16	LEAD SHEATH
17	COPPER TUBE THICKNESS 1.5MM
18	METALLIC SCREEN COPPER WIRE
19	PLUMBING
20	BLACK MASTIC FOR SEALING
21	FILLER COMPOUND
22	COFFIN BOX FIBERGLASS 3-4MM THICKNESS
23	CABLE OUTER JACKET

REV.	DESCRIPTION	DATE	DWN	CHKD	APPD	APPD
1	ISSUED FOR APPROVAL	5-9-08				
0	ISSUED FOR COMMENTS	31-5-08	SAMY	BELAL		

TITLE

ELASTIMOLD EGYPT STRAIGHT CABLE JOINT 69TCJ
FOR 66 KV-1X630 MM2 CABLE

69TCJ Straight JOINT	SCALE N.A ORG. DWG SIZE A4	REV.
	Sheet NO.1	1



ITEM	DESCRIPTION
1	CABLE CONDUCTOR
2	COPPER CONNECTOR 630MM2(DIE44)
3	JOINT HOUSING CONDUCTIVE INSERT
4	CABLE INSULATION
5	JOINT HOUSING INSULATION
6	FILLER COMPOUND
7	JOINT OUTER INSULATED BAND
8	HEAT SHRINK TUBE
9	JOINT HOUSING STRESS CONE
10	CABLE INSULATION SHIELD
11	HEAT SHRINK TUBE
12	BITUMEN INLET
13	JOINT GROUNDING CU WIRE
14	INSULATED BAND FOR COPPER TUBE
15	CONCENTRIC COPPER CABLE
16	COPPER LUG 300MM2 (DIE32)
17	LEAD SHEATH
18	COPPER TUBE THICKNESS 1.5MMWIRE
19	METALLIC SCREEN COPPER WIRE
20	PLUMBING
21	BLACK MASTIC FOR SEALING
22	FILLER COMPOUND
23	COFFIN BOX FIBERGLASS 3-4MM THICKNESS
24	CABLE OUTER JACKET

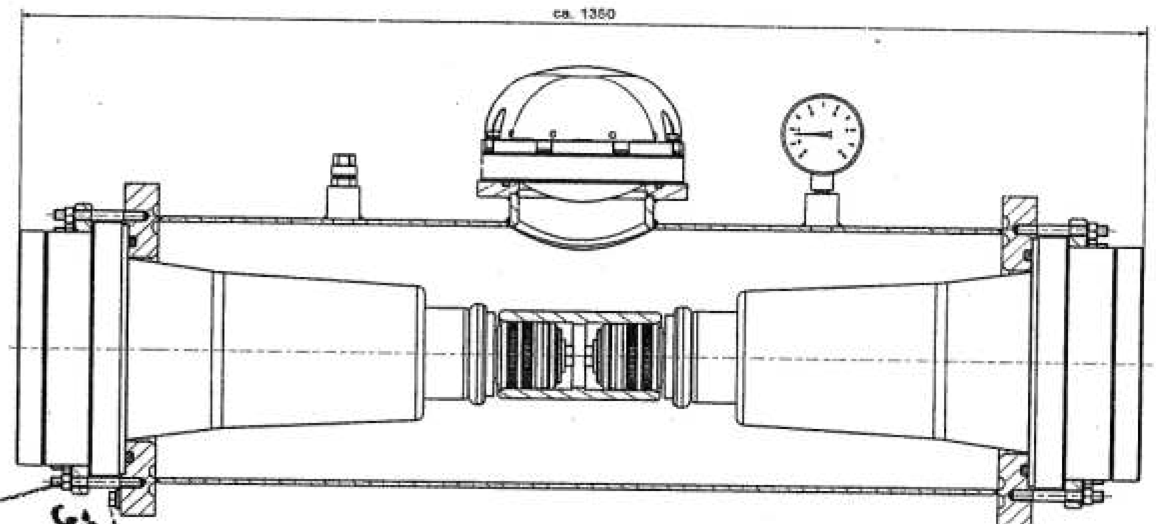
مركز أبحاث الجهد الفائق
مرفق رقم / (٢)(٦)
التقرير الفني رقم (١١٨-٩-٢)

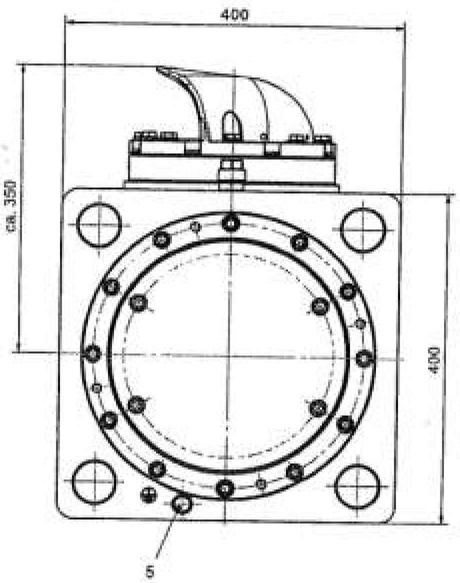
REV.	DESCRIPTION	DATE	DWN	CHKD	APPD	APPD
1	ISSUED FOR APPROVAL	5-9-08				
0	ISSUED FOR COMMENTS	31-5-08	SAMY	BELAL		

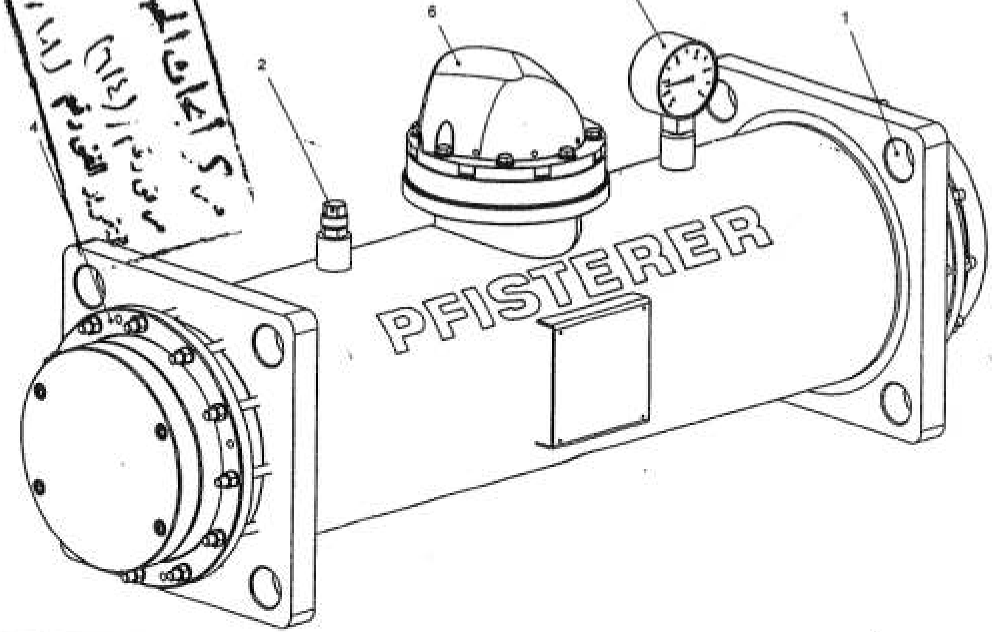
TITLE

ELASTIMOLD EGYPT ISOLATED CABLE JOINT 69TCJ
FOR 66 KV-1X630 MM2 CABLE

69TCJ ISOLATED JOINT	SCALE N.A	ORG. DWG SIZE A4	REV.
	Sheet NO.1		1







مركز أبحاث الجهد الفائق
مرفق رقم / (٦١٤)
بتقرير الفني رقم (١/١٠/٩[illegible])

CONNEX - HV - Muffe - Gr. 6 - 170 kV
mit Buchsen Gr. 6
CONNEX - HV - joint - size 6 - up to 170 kV
with bushing size 6

1 Hebeöse
lifting eye

2 Füllventil
filling/venting coupling

3 Manometer
pressure gauge

4 Flansch
flange/bushing

5 Erdungspunkt
earth point

6 Berstschutz
venting cover

Gefüllt mit SF_6-Gas
filled with SF_6-gas

Druck beim Transport: 0,5 - 1 bar
Pressure during shipment: 0,5 - 1 bar

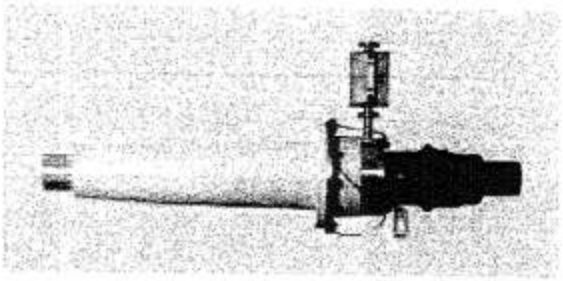
Druck im Betrieb: 4,2 $bar_{absolut}$
Pressure in operation: 4,2 $bar_{absolute}$

	Leonhardt	2007-02-26	1:4
	Dobler	2007-03-06	HV-Muffe Gr. 6 / 170 kV
	Ferenci	2007-03-06	Standard mit Berstschutz

PFISTERER
Kontaktsysteme GmbH & Co. KG

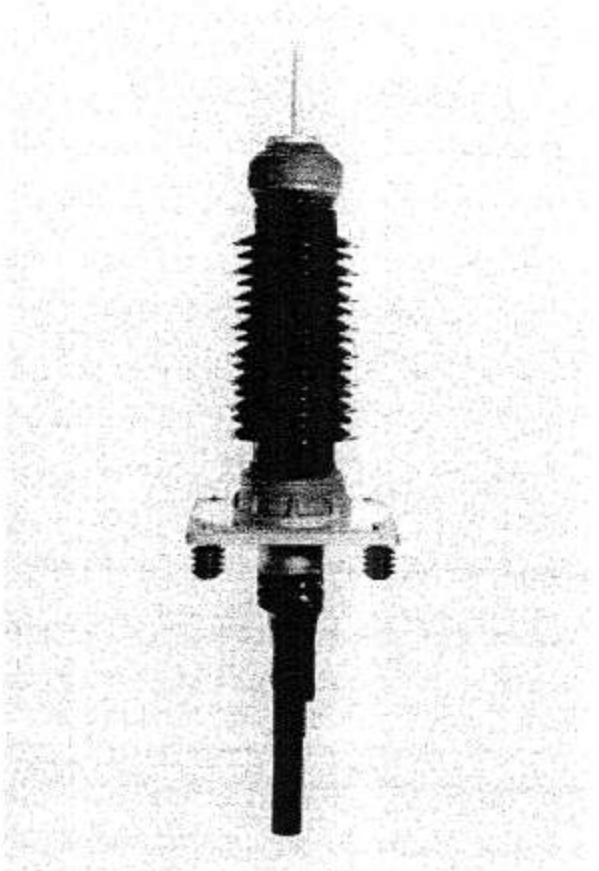
2007-03-06 | Ferenci | 01 | 827053010A

ESG72-H



Technical data		
Max. operating voltage	U_m (kV)	72.5
Standards		IEC60840 IEC60859 IEC62271
Rated voltage	U (kV)	60 - 69
Rated lightning impulse withstand voltage (BIL)	(kV)	325
Cross-sectional range	(mm^2)	95 - 2000
Diameter over cable insulation (prepared)	(mm)	37 - 89
max. diameter over outer cable sheath	(mm)	120
Net Weight approx.	(kg)	55
Ausrichtung		horizontal

Measurements		
Dimension A	A (mm)	270
Dimension B	B (mm)	80 ± 0,3
Dimension C	C (mm)	295
Dimension D	D (mm)	8 x Ø11
Dimension E	E (mm)	255
Dimension F	F (mm)	245 ± 0,3
Dimension G	G (mm)	184
Dimension H	H (mm)	583 ± 1
Dimension I	I (mm)	100
Dimension J	J (mm)	4 x M10
Dimension K	K (mm)	24
Dimension L	L (mm)	7



Technical data

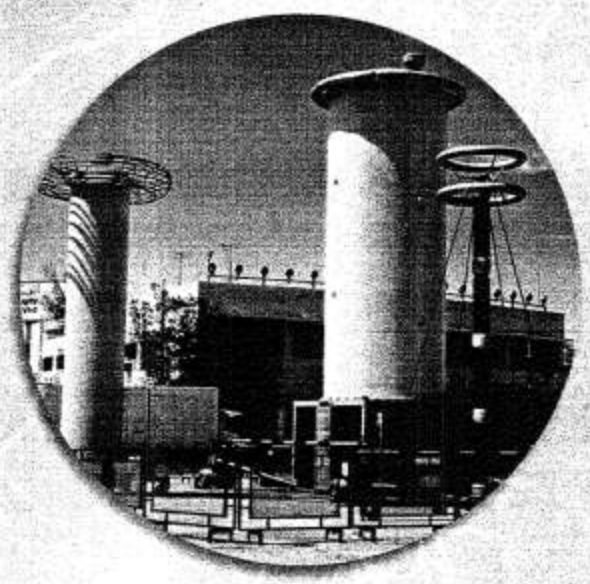
Max. operating voltage	U_m (kV)	72.5
Standards		IEC60840 IEC60815
Rated voltage	U (kV)	60 - 69
Rated lightning impulse withstand voltage (BIL)	(kV)	325
Cross-sectional range	(mm^2)	95 - 2000
Diameter over cable insulation (prepared)	(mm)	37 - 84
max. diameter over outer cable sheath	(mm)	120
Net Weight approx.	(kg)	132
minimal creepage distance	(mm)	2,270
Pollution class		4
Pollution class	(mm/kV)	31

Measurements

Dimension A	A (mm)	320 (420)
Dimension B	B (mm)	270 (345)
Dimension C	C (mm)	19

Arab Republic of Egypt
Ministry of Electricity & Energy
Egyptian Electricity Holding Co.

Extra High Voltage Research Centre



TÜV CERT

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