

TYPE TEST CERTIFICATE OF COMPLETE TYPE TEST

OBJECT single-core power cable

TYPE 18/30 kV 1x240mm² Al/XLPE/PVC

Rated voltage, U ₀ /U (U _m)	18/30 (36) kV	Conductor material	AL
Conductor cross-section	1x240 mm ²	Insulation material	XLPE

MANUFACTURER Egytech Cables - El Sewedy
10th of Ramadan City, Egypt

CLIENT El Sewedy Cable Group
Cairo, Egypt

TESTED BY KEMA HIGH-VOLTAGE LABORATORY
Arnhem, the Netherlands

DATE OF TESTS 29 June 2009 until 31 August 2009

The object, constructed in accordance with the description, drawings and graphs incorporated in this Certificate, has been subjected to the series of proving tests in accordance with

IEC 60502-2

This Type Test Certificate has been issued by KEMA following exclusively the STL Guides.

The results are shown in the record of Proving Tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above Standard and to justify the ratings assigned by the manufacturer as listed on page 4.

The Certificate applies only to the object tested. The responsibility for conformity of any object having the same designations with that tested rests with the Manufacturer.

This Certificate consists of 39 pages in total.

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KEMA Nederland B.V.



P.G.A. Bus
KEMA T&D Testing Services
Managing Director

Arnhem, 3 December 2009

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1 IDENTIFICATION OF THE TEST OBJECT

1.1 Description of the test object

Manufacturer	EGYTECH CABLES - EL SEWEDY 10 th of Ramadan City, Egypt
Type	1x240 mm ² Al/XLPE/PVC 18/30 kV
Year of manufacture	2008
Sampling procedure	by the manufacturer
Quantity submitted	45 m
Rated voltage, U ₀ /U (U _m)	18/30 (36) kV
No. of cores	1
Marking on the cable	EL SEWEDY CABLES 1X240 MM2 18/30 KV AL/XLPE/PVC SECHE SOUS ATMOSPHERE D'AZOTE 2008

Conductor

- material	aluminium
- cross-section	240 mm ²
- nominal diameter	18,1 (± 0,3) after compaction mm
- type	stranded compacted
- maximum conductor temperature in normal operation	90 °C

Conductor screen

- material	semi conductive material (bonded)
- nominal thickness	0,5 mm
- material designation	LE 595
- manufacturer	Borealis

Insulation

- material	XLPE
- nominal thickness	8 mm
- material designation	LE 4201 R
- manufacturer	Borealis

Insulation screen

- material	semi conductive material
- strippable	yes
- nominal thickness	0,7 mm
- material designation	DYM 617
- manufacturer	DYM

Metallic screen

- material copper wires + open helix copper tape
- number and nominal diameter of wires 59 wires of $\varnothing 0,74 (\pm 0,03)$ mm
- nominal thickness and width of tape $0,1 \times 10 (\pm 0,01)$ mm
- nominal thickness/diameter tape thickness = 0,1 mm
wire diameter = 0,74 mm

Oversheath

- material PVC, type ST₂
- nominal thickness 2,3 mm
- nominal overall diameter of cable 44,4 mm
- manufacturer Egyplast (Egypt)
- colour black

Longitudinally watertightness

- along insulation screen yes
 - number of swelling tapes 2 - a semi conductive water blocking tape underneath the copper screen and a non conductive water blocking tape over the copper screen (overlap of 10%)
 - nominal thickness and width (semi conductive) $1 \times 40 \times 0,3$ mm
(non conductive) $1 \times 50 \times 0,5$ mm
 - manufacturer (semi conductive) Fukuokua (Japan)
(non conductive) Tianrong (China)
- along the conductor not claimed

Fire retardant (IEC 60332-1-2)

no

1.2 List of documents

The manufacturer has guaranteed that the object submitted for tests has been manufactured in accordance with the following documents.

KEMA has verified that these documents adequately represent the object tested.

The following documents are included in this Certificate:

drawing no./ document no.	revision	date	title
AX5-T101-U20-00-00	0	6 April 2008	EL-SEWEDY CABLES
data sheet	-	-	1X240- 18 / 30 kV cable AL/XLPE/PVC cable construction

2 GENERAL INFORMATION

2.1 The tests were witnessed by

The tests were not witnessed.

2.2 The tests were carried out by

Name	Company
Mr Th.H.P. Ariaans	KEMA Nederland B.V.,
Mr R.J.C. Kloppenburg	Arnhem, the Netherlands

2.3 Subcontracting

The following tests were subcontracted to KEMA Quality:

- measurement of resistivity of semi conducting screens in accordance with clause 18.1.9 of IEC 60502-2;
- non-electrical type tests in accordance with clause 19 of IEC 60502-2 with exception of water penetration test;
- verification of cable construction in accordance with clauses 5-14 of IEC 60502-2.

2.4 Purpose of the test

Purpose of the test was to verify whether the material complies with the specified requirements.

2.5 Measurement uncertainty

A table with measurement uncertainties is enclosed in appendix A. Unless otherwise indicated in the report, the measurement uncertainties of the results presented are as indicated in this table.

2.6 Applicable standards

When reference is made to a standard and the date of issue is not stated, this applies to the latest issue, including amendments, which have been officially published prior to the date of the tests.

3 ELECTRICAL TYPE TESTS

3.1 General

3.1.1 Tests at elevated conductor temperature

For the tests with the cable at elevated temperature, a reference loop for temperature control of the conductor was installed. The reference cable was cut from the total cable length submitted by the client intended for the type test. This reference loop was installed close to the main loop in order to create the same environmental conditions as for the test loop.

The heating currents in both the reference loop and the test loop were kept equal at all times, thus the conductor temperature of the reference loop is representative for the conductor temperature of the test loop. Annex A, method 1 of IEC 60840 was used as a guide.

3.2 Bending test followed by a partial discharge test

3.2.1 Bending test

Standard and date

Standard IEC 60502-2, clause 18.1.3

Test date 29 June 2009

Environmental conditions

Ambient temperature 15 °C

Temperature of test object 15 °C

Characteristic test data

Bending diameter:

Single-core cable ("others") $20(d + D) \pm 5\%$

measured outer diameter of cable D (mm)	measured diameter of cable conductor d (mm)	required bending diameter D_r (mm)	diameter of test cylinder D_t (mm)
46,9	18,3	$1239 \leq D_r \leq 1369$	1330

Procedure

The test sample shall be bent around a test cylinder at ambient temperature for at least one complete turn. It shall then be unwound and repeated, except that the sample shall be bent in the reverse direction without axial rotation. This cycle of operation shall be carried out three times.

Observation

The test was carried out successfully.

3.2.2 Partial discharge test

Standard and date

Standard IEC 60502-2, clause 18.1.4
 Test date 24 July 2009

Environmental conditions

Ambient temperature 20 °C
 Temperature of test object 20 °C

Characteristic test data

Circuit balanced
 Calibration 5 pC
 Noise < 2 pC
 Sensitivity < 4 pC
 Required sensitivity ≤ 5 pC
 Bandwidth 40-400 kHz
 Test frequency 50 Hz
 Coupling capacitor 2600 pF

core	voltage applied, 50 Hz		duration (s)	partial discharge level (pC)
	... x U ₀	(kV)		
1	2	36	10	-
1	1,73	31,1	-	not detectable

Requirement

There shall be no detectable discharge exceeding the declared sensitivity from the test object at 1,73U₀.

Result

The test was passed.

3.3 Tan δ measurement

Standard and date

Standard IEC 60502-2, clause 18.1.5

Test date 27 July 2009

Environmental conditions

Ambient temperature 20 °C

Temperature of test object 97 °C

Characteristic test data

Length of test object 14,34 m

Standard capacitor 100 pF

core	voltage applied, 50 Hz (kV)	core capacitance ¹⁾ (μ F/km)	tan δ
1, 2 and 3	5	0,196	$0,6 \times 10^{-4}$
1) for information only			

Requirement

The measured value shall not be higher than 40×10^{-4} .

Result

The test was passed.

3.4 Heating cycle test followed by a partial discharge test

3.4.1 Heating cycle test

Standard and date

Standard IEC 60502-2, clause 18.1.6
 Test period 28 July 2009 until 4 August 2009

Environmental conditions

Ambient temperature 20-21 °C

Characteristic test data

Stabilized temperature 97 °C

no. of heating-cycles	required stable conductor temperature (°C)	heating current during stable condition (A)	heating per cycle		cooling per cycle
			total duration (h)	duration of conductor at stable temperature (h)	total duration (h)
20	95-100	approx. 630	5	2	8

Procedure

The heating cycle shall be of at least 8 h duration. The conductor temperature shall be maintained within the stated temperature limits for at least 2 h of each heating period. This shall be followed by at least 3 h of natural cooling in air to a conductor temperature within 10 K of ambient temperature.

Observation

The test was carried out successfully.

3.4.2 Partial discharge test

Standard and date

Standard IEC 60502-2, clause 18.1.4
 Test date 4 August 2009

Environmental conditions

Ambient temperature 20 °C
 Temperature of test object 20 °C

Characteristic test data

Circuit balanced
 Calibration 5 pC
 Noise < 2 pC
 Sensitivity < 4 pC
 Required sensitivity ≤ 5 pC
 Bandwidth 40-400 kHz
 Test frequency 50 Hz
 Coupling capacitor 2600 pF

core	voltage applied, 50 Hz		duration (s)	partial discharge level (pC)
	... x U ₀	(kV)		
1	2	36	10	-
1	1,73	31,1	-	not detectable

Requirement

There shall be no detectable discharge exceeding the declared sensitivity from the test object at 1,73U₀.

Result

The test was passed.

3.5 Impulse test followed by a voltage test

3.5.1 Impulse test

Standard and date

Standard IEC 60502-2, clause 18.1.7

Test date 5 August 2009

Environmental conditions

Ambient temperature 20 °C

Temperature of test object 97 °C

Characteristic test data

Specified test voltage 170 kV

testing arrangement		polarity	voltage applied (% of test voltage)	no. of impulses	see figure
voltage applied to	earthed				
conductor	metallic screen	positive	50	1	1 (waveshape)
			65	1	2
			80	1	2
			100	10	3 and 4
conductor	metallic screen	negative	50	1	5 (waveshape)
			65	1	6
			80	1	6
			100	10	7 and 8

Requirement

Each core of the cable shall withstand without failure 10 positive and 10 negative voltage impulses.

Result

The test was passed.

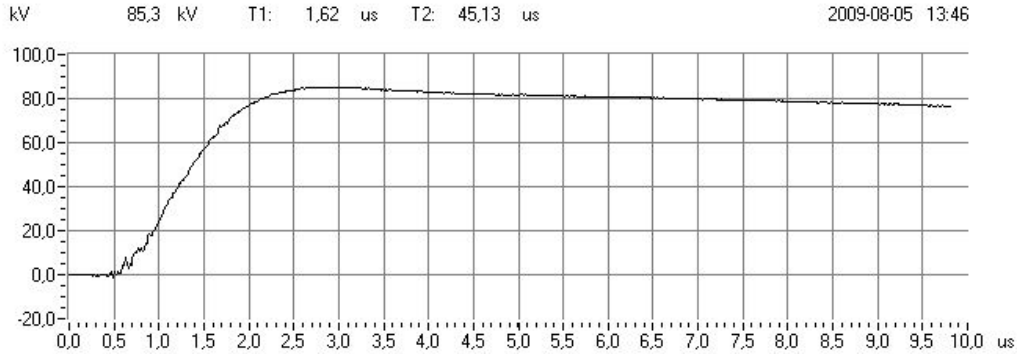


Fig. 1: Waveshape 50% of test voltage

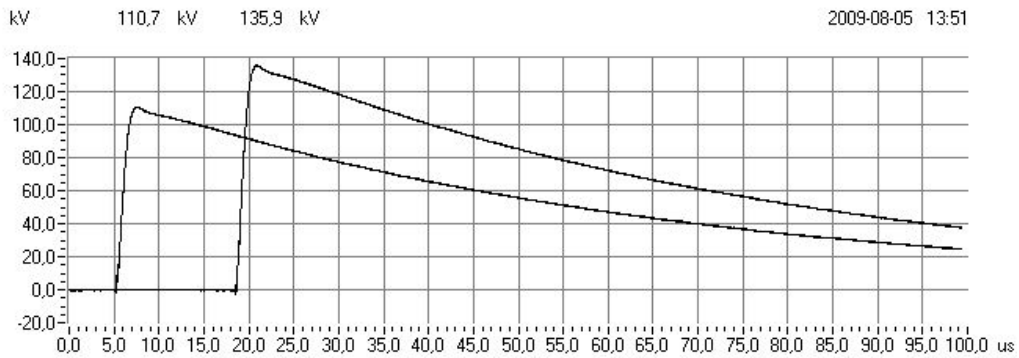


Fig. 2: 65% and 80% of test voltage

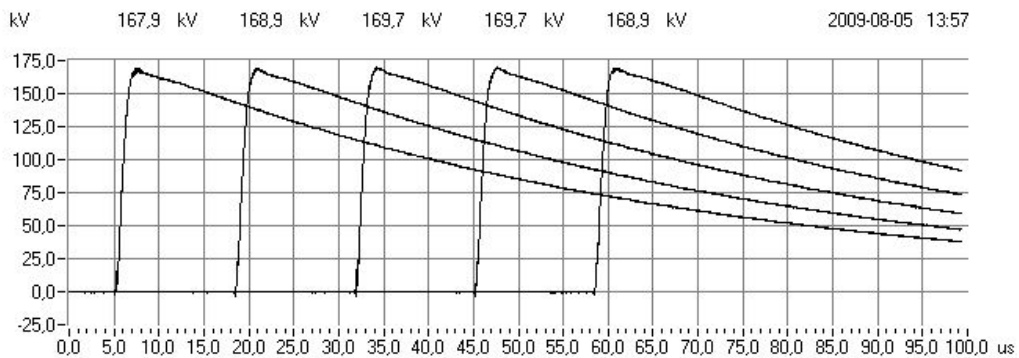


Fig. 3: 100% of test voltage

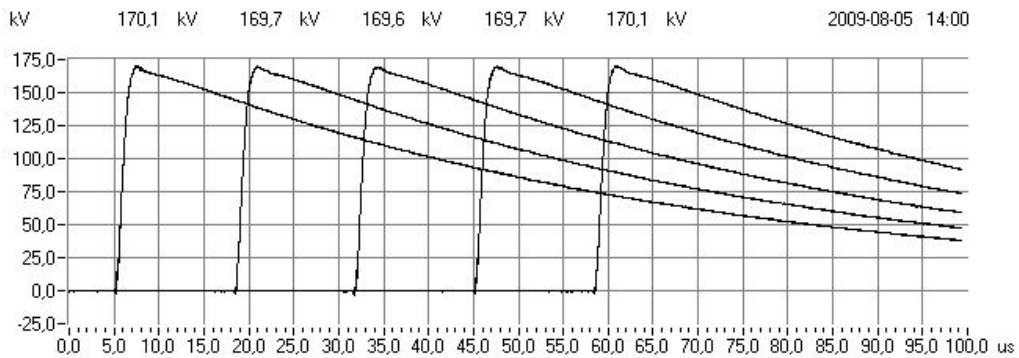


Fig. 4: 100% of test voltage

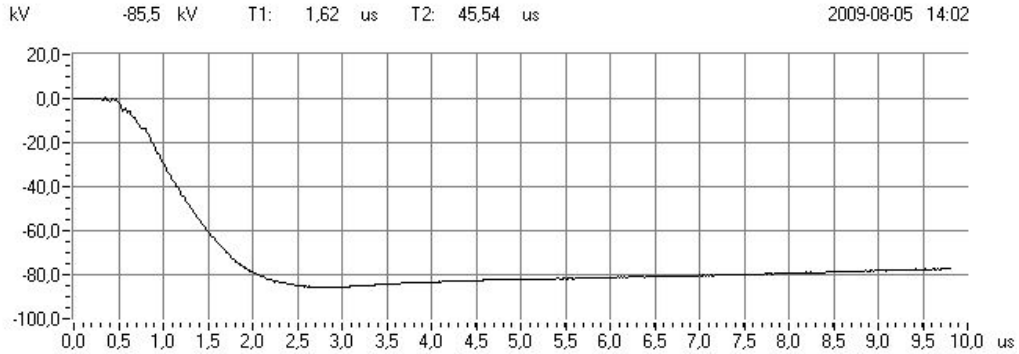


Fig. 5: Waveshape -50% of test voltage

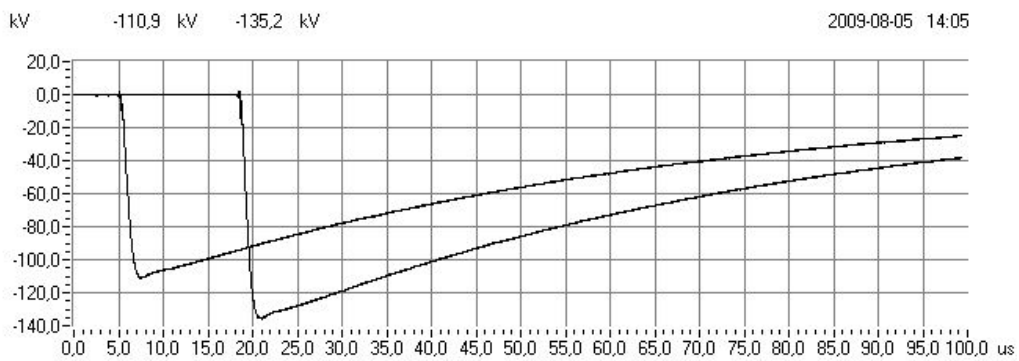


Fig. 6: -65% and -80% of test voltage

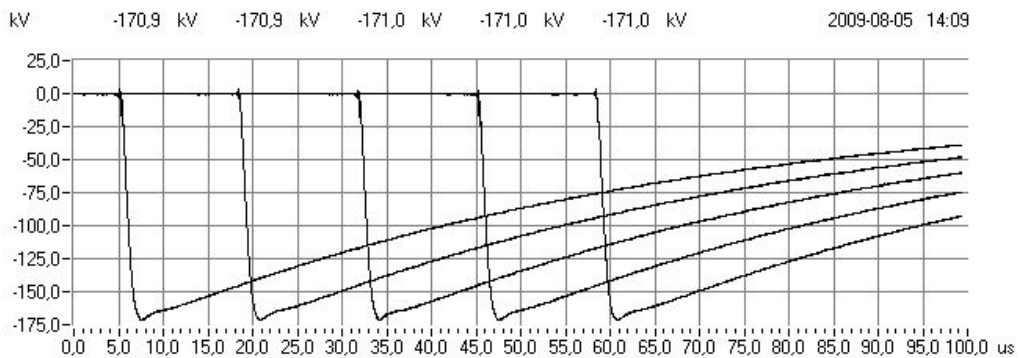


Fig. 7: -100% of test voltage

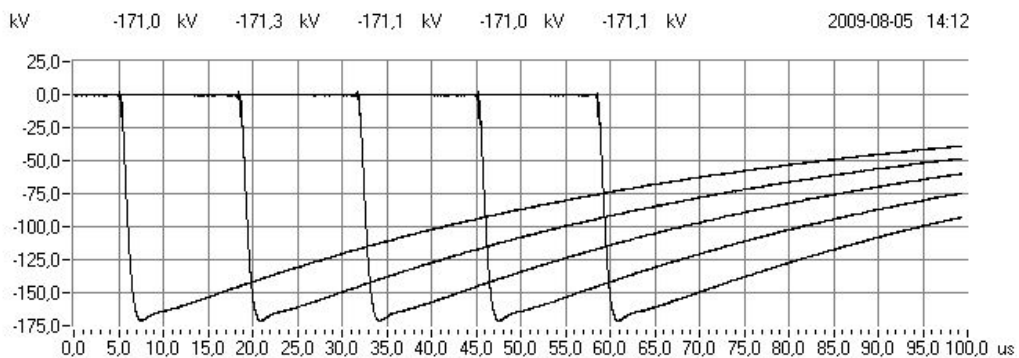


Fig. 8: -100% of test voltage

3.5.2 Voltage test

Standard and date

Standard IEC 60502-2, clause 18.1.7

Test date 6 August 2009

Environmental conditions

Ambient temperature 22 °C

Temperature of test object 22 °C

testing arrangement		voltage applied, 50 Hz		duration
voltage applied to	earth connected to	xU_0	(kV)	(min)
conductor	metallic screen	3,5	63	15

Requirement

No breakdown of the insulation shall occur.

Result

The test was passed.

3.6 Voltage test for 4 hours

Standard and date

Standard IEC 60502-2, clause 18.1.8

Test date 6 August 2009

Environmental conditions

Ambient temperature 22 °C

Temperature of test object 22 °C

testing arrangement		voltage applied, 50 Hz		duration
voltage applied to	earth connected to	xU_0	(kV)	(h)
conductor	metallic screen	4	72	4

Requirement

No breakdown of the insulation shall occur.

Result

The test was passed.

3.7 Resistivity of semi-conducting screens

Standard and date

Standard IEC 60502-2, clause 18.1.9
 Test period 22 July 2009 until 31 July 2009

Characteristic test data

Temperature during ageing 100 ± 2 °C
 Duration 7 days
 Resistivity measured at 90 °C

item	unit	requirement	measured/determined
conductor screen			
- without ageing	Ωm	≤ 1000	94
- after ageing	Ωm	≤ 1000	20
insulation screen			
- without ageing	Ωm	≤ 500	3
- after ageing	Ωm	≤ 500	20

Note

The measurement of resistivity shall be at a temperature within ± 2 °C of the maximum conductor temperature in normal operation.

Result

The test was passed.

4 NON-ELECTRICAL TYPE TESTS

4.1 Measurement of thickness of insulation

Standard and date

Standard IEC 60502-2, clause 19.1

Test date 22 July 2009

insulation thickness	unit	requirement	specified	measured/determined
- nominal	mm	-	8,0	-
- average	mm	-	-	8,3
- minimum (t_{\min})	mm	$\geq 7,10$	7,1	7,85
- maximum (t_{\max})	mm	-	-	8,53
- $(t_{\max} - t_{\min}) / t_{\max}$		$\leq 0,15$	-	0,08

Result

The test was passed.

4.2 Measurement of thickness of non-metallic sheaths

Standard and date

Standard IEC 60502-2, clause 19.2

Test date 22 July 2009

Oversheath

thickness	unit	requirement	specified	measured/determined
- nominal	mm	$\geq 1,4$	2,3	-
- average	mm	-	-	2,7
- minimum (t_{\min})	mm	$\geq 1,85$	1,9	2,36

Result

The test was passed.

4.3 Tests for determining the mechanical properties of the insulation before and after ageing

Standard and date

Standard IEC 60502-2, clause 19.3
 Test period 22 July 2009 until 30 July 2009

Characteristic test data

Temperature during ageing 135 ± 3 °C
 Duration 7 days

item	unit	requirement	measured/determined
without ageing			
- tensile strength	N/mm ²	≥ 12,5	22,7
- elongation	%	≥ 200	509
after ageing			
- tensile strength	N/mm ²	-	27,9
- variation with samples without ageing	%	± 25 max.	23
- elongation	%	-	565
- variation with samples without ageing	%	± 25 max.	10

Result

The test was passed.

4.4 Tests for determining the mechanical properties of non-metallic sheaths before and after ageing

Standard and date

Standard IEC 60502-2, clause 19.4
 Test period 22 July 2009 until 30 July 2009

Characteristic test data

Temperature during ageing 100 ± 2 °C
 Duration 7 days

Oversheath

item	unit	requirement	measured/determined
without ageing			
- tensile strength	N/mm ²	≥ 12,5	19,4
- elongation	%	≥ 150	233
after ageing			
- tensile strength	N/mm ²	≥ 12,5	20,0
- variation with samples without ageing	%	± 25 max.	3
- elongation	%	≥ 150	239
- variation with samples without ageing	%	± 25 max.	2

Result

The test was passed.

4.5 Additional ageing test on pieces of completed cable

Standard and date

Standard IEC 60502-2, clause 19.5
 Test period 22 July 2009 until 30 July 2009

Characteristic test data

Temperature during ageing 100 ± 2 °C
 Duration 7 days

Insulation

item	unit	requirement	measured/determined
- tensile strength	N/mm ²	-	25,2
- variation with samples without ageing	%	± 25 max.	11
- elongation	%	-	518
- variation with samples without ageing	%	± 25 max.	2

Oversheath

item	unit	requirement	measured/determined
- tensile strength	N/mm ²	-	18,4
- variation with samples without ageing	%	± 25 max.	-5
- elongation	%	-	249
- variation with samples without ageing	%	± 25 max.	7

Result

The test was passed.

4.6 Loss of mass test on PVC sheaths of type ST₂

Standard and date

Standard IEC 60502-2, clause 19.6

Test period 22 July 2009 until 30 July 2009

Characteristic test data

Temperature during ageing 100 ± 2 °C

Duration 7 days

Oversheath

item	unit	requirement	measured/determined
- loss of mass	mg/cm ²	≤ 1,5	0,5

Result

The test was passed.

4.7 Pressure test at high temperature on non-metallic sheaths

Standard and date

Standard IEC 60502-2, clause 19.7
Test date 23 July 2009

Characteristic test data (PVC insulation)

Temperature 90 ± 2 °C
Duration 6 h
Load 10,7 N

Oversheath

item	unit	requirement	measured/determined
- depth of indentation	%	≤ 50	20

Result

The test was passed.

4.8 Test on PVC insulation and sheaths at low temperatures

Standard and date

Standard IEC 60502-2, clause 19.8
Test period 23 July 2009 until 24 July 2009

Characteristic test data (oversheath)

Temperature -15 ± 2 °C
Cooling time ≥ 16 h
Mass of hammer 1250 g

Oversheath

item	unit	requirement	measured/determined
- elongation	%	≥ 20	270
- cold impact test	-	no cracks	no cracks

Result

The test was passed.

4.9 Test for resistance of PVC insulation and sheaths to cracking (heat shock test)

Standard and date

Standard IEC 60502-2, clause 19.9

Test date 31 July 2009

Characteristic test data (PVC insulation)

Temperature 150 ± 3 °C

Duration 1 h

Diameter of mandrel 6 mm

Number of turns 6

Oversheath

item	unit	requirement	measured/determined
- soundness	-	no cracks	no cracks

Result

The test was passed.

4.10 Hot set test for XLPE insulation

Standard and date

Standard IEC 60502-2, clause 19.11
Test date 23 July 2009

Characteristic test data

Air temperature 200 ± 3 °C
Time under load 15 min
Mechanical stress 20 N/cm²

item	unit	requirement	measured/determined
- elongation under load	%	≤ 175	70
- permanent elongation	%	≤ 15	0

Result

The test was passed.

4.11 Water absorption test on insulation

Standard and date

Standard IEC 60502-2, clause 19.13
Test period 22 July 2009 until 11 August 2009

Characteristic test data

Temperature 85 ± 2 °C
Duration 14 days

item	unit	requirement	measured/determined
- variation of mass	mg/cm ²	≤ 1	0,1

Result

The test was passed.

4.12 Shrinkage test for XLPE insulation

Standard and date

Standard IEC 60502-2, clause 19.16

Test date 23 July 2009

Characteristic test data

Temperature 130 ± 3 °C

Duration 1 h

item	unit	requirement	measured/determined
- shrinkage	%	≤ 4	1,5

Result

The test was passed.

4.13 Strippability test for insulation screen

Standard and date

Standard IEC 60502-2, clause 19.21

Test period 22 July 2009 until 31 July 2009

item	unit	requirement	measured/determined
- before ageing	N	$4 \leq F \leq 45$	19 / 24 / 30
- after ageing	N	$4 \leq F \leq 45$	12 / 14 / 10

Requirement (additional)

The insulation surface shall not be damaged and no trace of the insulation screen shall remain on the insulation.

Result

The test was passed.

4.14 Water penetration test

Standard and date

Standard IEC 60502-2, clause 19.22 and Annex F
 Test period 3 August 2009 until 7 August 2009

Atmospheric conditions

Ambient temperature 20-21 °C

Characteristic test data

Stabilized temperature 97 °C
 Length of cable sample 3 m
 Water height above cable centre 1 m

no. of heating-cycles	required stable conductor temperature (°C)	heating current during stable condition (A)	heating per cycle		cooling per cycle
			total duration (h)	duration of conductor at stable temperature (h)	total duration (h)
20	95-100	approx. 650	5	2	8

Note

The manufacturer has claimed that barriers have been included, which prevents longitudinal water penetration in the region of the metallic layers.

Procedure

The cable sample was prepared in accordance with the procedure as mentioned in clause F.1 of IEC 60502-2. Following this, the tube was filled within 5 minutes with water up to a height of the water in the tube of 1 m above the cable centre. After 24 hours the first heating cycle was started. For the procedure of the heating cycles reference is made to clause F.2 of IEC 60502-2.

Requirement

No water shall emerge from the ends of the cable sample.

Result

The test was passed.

5 VERIFICATION OF CABLE CONSTRUCTION

Verification of cable construction was carried out in accordance with clauses 5-14 of IEC 60502-2. The results are presented below.

item	unit	requirement	specified	measured/ determined
conductor				
- diameter of conductor	mm	$17,6 \leq d \leq 19,2$	18,1	18,3
- number of wires		≥ 30		34
- diameter of wires	mm	-		3,0
- resistance at 20°C	Ω/km	$\leq 0,125$		0,1232

	observed/determined
construction	<ul style="list-style-type: none"> - conductor of aluminium wires 34 x Ø 3,0 mm approx. - conductor construction 1-6-11-16 - semi-conducting insulation screen - XLPE insulation - semi-conducting insulation screen - waterblocking tape 48x0,3 mm approx. - screen of copper wires 59 x Ø 0,7 mm approx. - copper tape open helix 0,1 x 10 mm approx. - synthetic tape 50 x 0,3 mm approx - oversheath PVC ST₂
outer diameter of the cable, average (mm)	46,9
outer diameter of the core, average (mm)	38,0

Result

No significant deviations from the specified requirements were found.

APPENDIX A MEASUREMENT UNCERTAINTIES

The measurement uncertainties in the results presented are as specified below unless otherwise indicated.

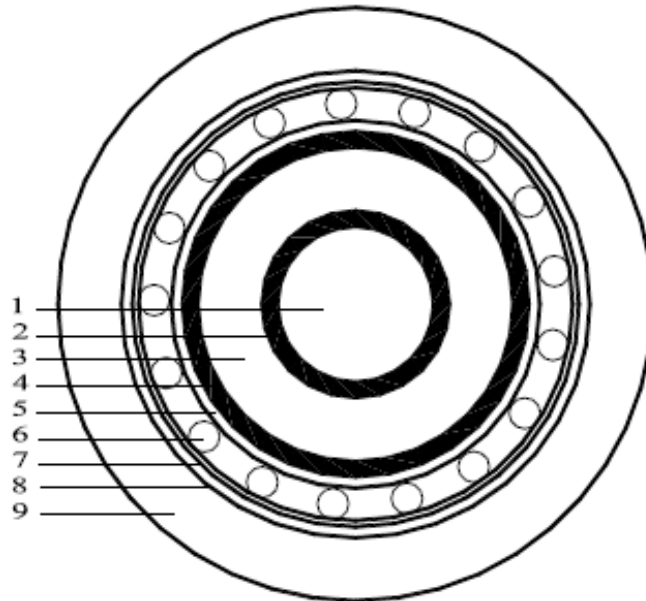
measurement	measurement uncertainty
dielectric tests and impulse current tests	peak value: $\leq 3\%$ time parameters: $\leq 10\%$
capacitance measurement	0,3%
$\tan \delta$ measurement	$\pm 0,5\% \pm 5 \times 10^{-5}$
partial discharge measurement	< 10 pC : 2 pC 10 - 100 pC : 5 pC > 100 pC : 20%
measurement of impedance ac-resistance measurement	$\leq 1\%$
measurement of losses	$\leq 1\%$
measurement of insulation resistance	$\leq 10\%$
measurement of dc resistance	1 $\mu\Omega$ - 5 $\mu\Omega$: 1% 5 $\mu\Omega$ - 10 $\mu\Omega$: 0,5% 10 $\mu\Omega$ - 200 $\mu\Omega$: 0,2%
radio interference test	2 dB
calibration of current transformers	$2,2 \times 10^{-4}$ li/lu and 290 μrad
calibration of voltage transformers	$1,6 \times 10^{-4}$ Ui/Uu en 510 μrad
measurement of conductivity	5%
measurement of temperature	-50 °C - -40 °C : 3 K -40 °C - 125 °C : 2 K 125 °C - 150 °C : 3 K
tensile test	1%
sound level measurement	type 1 meter as per IEC 651 and ANSI S1.4.1971
measurement of voltage ratio	0,1%

APPENDIX B MANUFACTURER'S DRAWING AND DATA SHEET

4 pages (including this page)

drawing no./ document no.	revision	date	title
AX5-T101-U20-00-00	0	6 April 2008	EL-SEWEDY CABLES
data sheet	-	-	1X240- 18 / 30 kV cable AL/XLPE/PVC cable construction

**ELSEWEDY
CABLES**



<i>Section</i> : 1 x 240 mm²		<i>Type</i> : Al/PRC/PVC
<i>Tension</i> : 18 / 30 kV		<i>Norme</i> : CEI 60502-2:2005
<i>Code</i> : AX5-T101-U20-00-00		EL-SEWEDY CABLES
<i>Sr.</i>	<i>Description</i>	
1.	<i>Conducteur en Aluminium</i>	
2.	<i>Couche semi-conductrice extrudée intérieure</i>	
3.	<i>Isolation en PRC</i>	
4.	<i>Couche semi-conductrice extrudée externe (type pelable)</i>	
5.	<i>Ruban Semi-conducteur d'étanchéité</i>	
6.	<i>Ecran fils de cuivre (25 mm²)</i>	
7.	<i>Ecran ruban en cuivre (Hélice ouverte)</i>	
8.	<i>Ruban Non-conducteur d'étanchéité</i>	
9.	<i>Gaine extérieure en PVC (noire)</i>	
<i>Hors de mesure</i>	<i>Dessiné par</i> M. Hossam Edeen Mustafa	<i>Approuvé par</i> Ing. Tamer Adel

Egytech Cables Co. El Sewedy

Technical Department

1X240- 18 / 30 kV Cable

AL/XLPE/PVC

Cable Construction

1. Conductor

Material		Aluminum
Size	mm ²	240
No. of wires		34
Conductor Diameter	mm	18.1 (Approx.)

2. Conductor Screen

Material		Extruded semi-conducting material
Thickness	mm	0.5 (nominal)
	mm	0.3 (minimum at any point)
Diameter	mm	19.1 (Approx.)

3. Insulation

Material		Cross Linked Poly Ethylene (XLPE)
Thickness	mm	8.0 (nominal)
	mm	7.1 (minimum at any point)
Diameter	mm	35.1 (Approx.)
Insulation electric stress	KV/mm	1.7

4. Insulation Screen

Material		Extruded semi-conducting material (Strippable Type)
Thickness	mm	0.7 (nominal)
	mm	0.5 (minimum at any point)
Diameter	mm	36.5 (Approx.)

5- Water blocking tape

Material		Semi conductive water blocking tape
Application		Helically

6. Metallic Screen

Material		Copper wires screen banded with copper tape open helix
wires (no. x Diameter)	mm	59 x 0.74
Tapes (no. x width x thickness)	mm	1 x 10 x 0.1
Total C.S.A	mm ²	25.4
Diameter	mm	38.8 (Approx.)

7- Water blocking tape

Material		Non conductive water blocking tape
Application		Helically

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8. Outer Sheath

Material		POLY VINYL CHLORIDE (PVC)
Color		Black
Thickness	mm	2.3 (nominal)
	mm	1.9 (minimum at any point)
Outer Diameter	mm	44.4 (Approx.)
Density	gm / m ³	1.507 (Approx.)

Applicable Standards:

- IEC 60502-2:2005