

TYPE TEST CERTIFICATE OF COMPLETE TYPE TEST

OBJECT three-core power cable

DESIGNATION 19/33 (36) kV, 3x240 mm² Cu, XLPE cable

MANUFACTURER EGYTECH CABLES COMPANY EL SEWEDY
27A Baghdad St. Elkorba – 8th floor – Heliopolis – Cairo

DATE OF TESTS 4 November 2004 up to and including 21 December 2004

TESTED BY KEMA HIGH-VOLTAGE LABORATORY,
Utrechtseweg 310 - 6812 AR Arnhem - the Netherlands

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

IEC 60502-2

This Type Test Certification 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 1. 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 comprises 36 sheets in total.

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KEMA Nederland B.V.



S.A.M. Verhoeven

Arnhem, 27 January 2005



GENERAL

MATERIAL DATA

Object	three core power cable
Manufacturer	Egytech Cables Company El Sewedy
Type	19/33 (36) kV, 3x240 mm ² Cu, XLPE
Data sheet ref. no.	CX5-TA03-W20-01-01
Year of manufacture	2004
Quantity submitted:	70 m
- quantity used for electrical type test	17 m
- quantity used for non-electrical type test	4 x 1 m
- quantity used for flame retardant test	4 x 3,6 m
Rated voltage	19/33 (36) kV
Rated frequency	50 Hz
No. of cores	3
Insulation material	XLPE
Conductor material	copper
Conductor cross-section	240 mm ²
Maximum rated conductor temperature	90 °C
Screening material	copper tape
Armouring	yes, steel wire
Sheath material (outer sheath)	PVC ST ₂
Sheath material (bedding)	PVC ST ₂
Outer sheath colour	red
Longitudinally water tightness	not tested
Flame retardant	bedding and outer sheath
Standard	IEC 60502-2 (1997) and Amendment 1 (1998)
Sampling procedure	by the manufacturer

DRAWING AND DRAWING VERIFICATION

The manufacturer has guaranteed that the object submitted for tests has been manufactured in accordance with the data sheet as presented in appendix A. KEMA has verified that this data sheet adequately represent the equipment tested.

SUBCONTRACTING AND CONTENTS

The following tests, as mentioned in the Test Programme, were subcontracted to KEMA Quality B.V.:

- 1.7 measurement of resistivity of semi-conducting screens
- 2 non-electrical type tests in accordance with IEC 60502-2 clause 19
- 3 verification of cable construction in accordance with IEC 60502-2 clauses 5-14.
- Appendix B test for vertically flame spread of vertically-mounted bunched wires or cables – Category A in accordance with IEC 60332-3-22 (2000)

THE TEST WAS CARRIED OUT BY

Mr P.J. Hülkenberg

KEMA Nederland B.V.

Mr Th.R. Hiddink

KEMA Nederland B.V.

PURPOSE OF THE TEST

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

VERIFICATION OF CABLE CONSTRUCTION

MEASUREMENT UNCERTAINTY

APPENDIX A DATA SHEET OF EGYTECH CABLES COMPANY

APPENDIX B TESTS ON ELECTRIC CABLES UNDER FIRE CONDITIONS

TEST PROGRAMME AND CONTENTS OF THE ELECTRICAL TYPE TESTS

The tests as mentioned below have been carried out in accordance with IEC 60502-2 (1997) and Amendment 1 (1998).

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1 DESCRIPTION AND RESULTS OF THE ELECTRICAL TYPE TESTS

1.1 Bending test followed by a partial discharge test

1.1.1 BENDING TEST

The bending test was carried out in accordance with clause 18.1.4 of IEC 60502-2. The results are presented below.

Atmospheric conditions

Ambient temperature (t) 10 °C
 Temperature of test object (t) 10 °C

Date of test: 04 November 2004

outer diameter of cable D (mm)	diameter of cable conductor d (mm)	required bending diameter D_r (mm)	actual bending diameter D_a (mm)	observations
101,8	18,2	$1710 \leq D_r \leq 1890$	1890	3 cycles (wind/unwind and wind/unwind in opposite direction)

1.1.2 PARTIAL DISCHARGE TEST

The partial discharge test was carried out in accordance with clause 18.1.3 of IEC 60502-2. The results are presented below.

Atmospheric conditions

Ambient temperature	(t)	20 °C
Temperature of test object	(t)	20 °C

Characteristic test data

Circuit	balanced
Calibration	5 pC
Noise	1 pC
Bandwidth	40-400 kHz
Power frequency	50 Hz
Coupling capacitor	2600 pF

Date of test: 01 December 2004

core	voltage applied, 50 Hz		duration (s)	partial discharge level (pC)
	... x U ₀	(kV)		
R, Y, B	1,98	37,6	60	-
	1,73	32,9	20	≤ 1

Requirement

The measured value at 1,73xU₀ shall not be higher than 5 pC.

Evaluation

The test was passed.

1.2 Tan δ measurement

The capacitance and tan δ measurement was carried out in accordance with clause 18.1.5 of IEC 60502-2 and extra tan δ measurements at client's instructions. The results are presented below.

Atmospheric conditions

Ambient temperature	(t)	19 °C
Temperature of test object	(t)	95 °C

Characteristic test data

Length of test object	15,43 m
Standard capacitor	99,94 pF

Date of test: 03 December 2004

core	voltage applied, 50 Hz		core capacitance *	tan δ
	... x U ₀	(kV)		
R,Y,B	-	5	0,625	4,31

* for information only

Requirement

The measured value shall not be higher than 80×10^{-4} .

Evaluation

The test was passed.

1.3 Heating cycle test

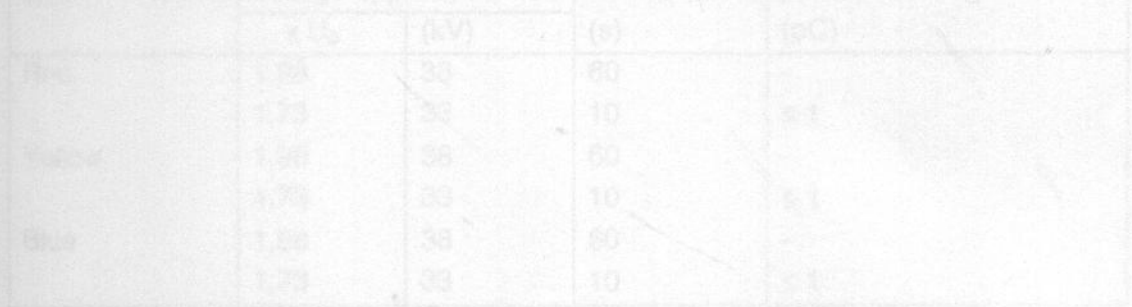
The heating cycle test was carried out in accordance with clause 18.1.6 of IEC 60502-2. The results are presented below.

Atmospheric conditions

Ambient temperature	(t)	18-23 °C
Temperature of test object	(t)	18-97 °C

Date of test: 6 December 2004 up to and including 15 December 2004

no. of heating-cycles	required conductor temperature (°C)	heating current (A)	heating per cycle		cooling per cycle (hours)
			total duration (hours)	duration of conductor at 97 °C (hours)	
20	95-100	720	3	2	3



Requirement: The measured value at 1,73 kV, shall not be higher than 5 µC.

Evaluation: The test was passed.

1.4 Partial discharge test by a voltage test

The partial discharge test was carried out in accordance with clause 18.1.3 of IEC 60502-2. The results are presented below.

Atmospheric conditions

Ambient temperature (t) 20 °C
 Temperature of test object (t) 20 °C

Characteristic test data

Circuit balanced
 Calibration 5 pC
 Noise 1 pC
 Bandwidth 40-400 kHz
 Power frequency 50 Hz
 Coupling capacitor 2600 pF

Date of test: 15 December 2004

core	voltage applied, 50 Hz		duration (s)	partial discharge level (pC)
	... x U ₀	(kV)		
Red	1,98	38	60	-
	1,73	33	10	≤ 1
Yellow	1,98	38	60	-
	1,73	33	10	≤ 1
Blue	1,98	38	60	-
	1,73	33	10	≤ 1

Requirement

The measured value at 1,73xU₀ shall not be higher than 5 pC.

Evaluation

The test was passed.

1.5 Impulse test followed by a voltage test

1.5.1 IMPULSE TEST

The impulse test was carried out in accordance with clause 18.1.7 of IEC 60502-2. In order to achieve the elevated temperature of the test object, current was induced in the cable. The impulse test was performed two hours after thermal equilibrium was established. The waveshape of the impulse voltage was determined at approximately 50 percent of the specified test value (see oscillograms).

The results are presented below.

Atmospheric conditions

Ambient temperature	(t)	20 °C
Temperature of test object	(t)	97 °C

Date of test: 17 December 2004

Specified test voltage: 170 kV

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

Requirement

No breakdown of the insulation shall occur.

Evaluation

The test was passed.

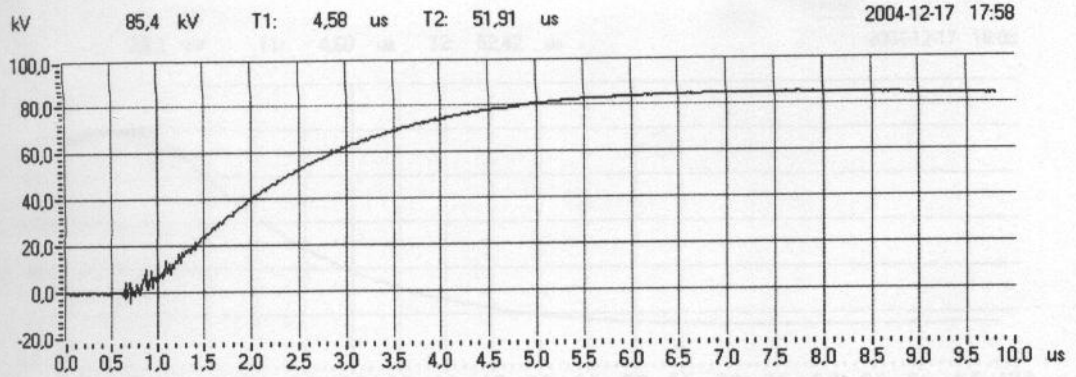


Fig. 1: Waveshape 70470221, Egytech 33kV cable, +50%

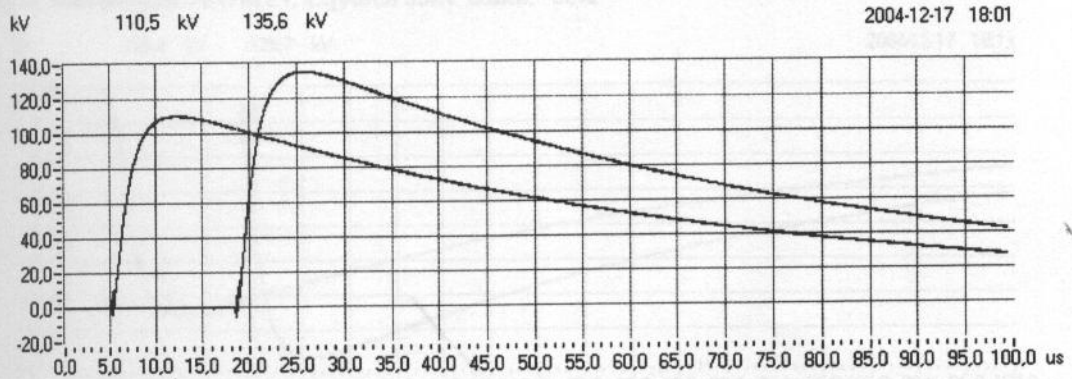


Fig. 2: 70470221, Egytech 33kV cable, +65% and +80%

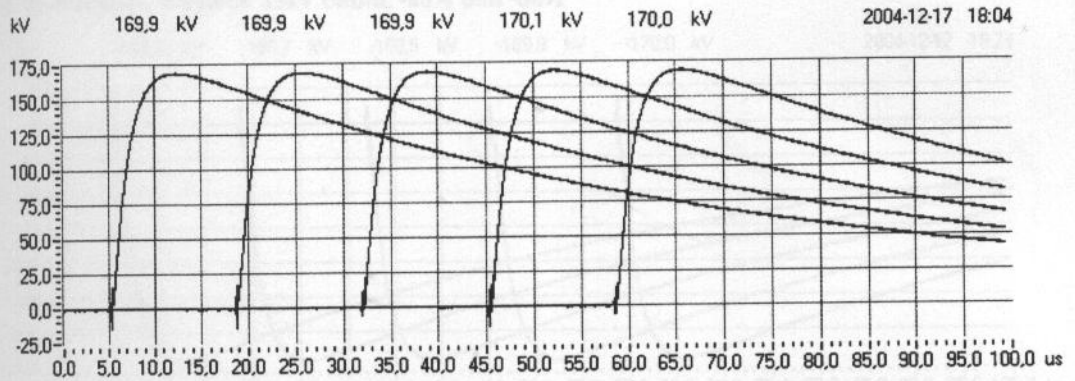


Fig. 3: 70470221, Egytech 33kV cable, +100%

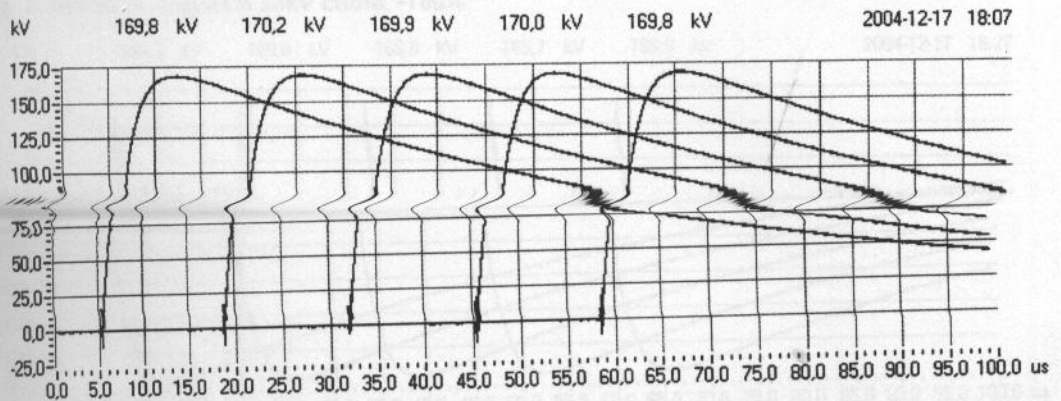


Fig. 4: 70470221, Egytech 33kV cable, +100%

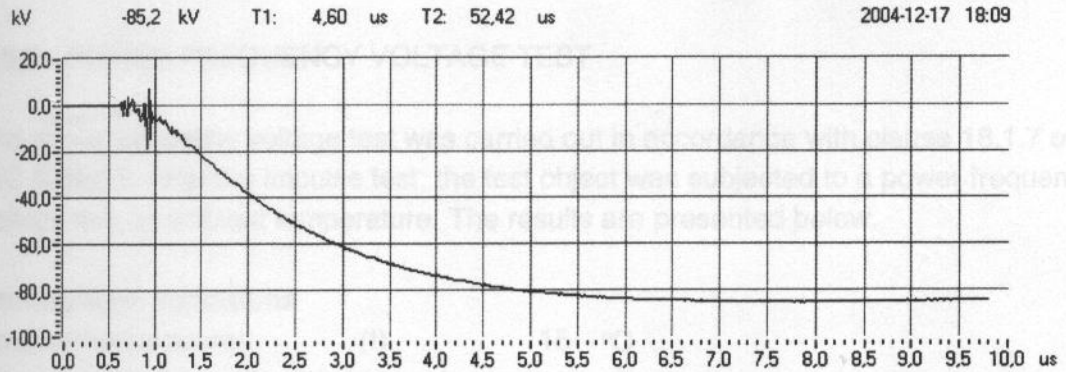


Fig. 5: Waveshape 70470221, Egytech 33kV cable, -50%

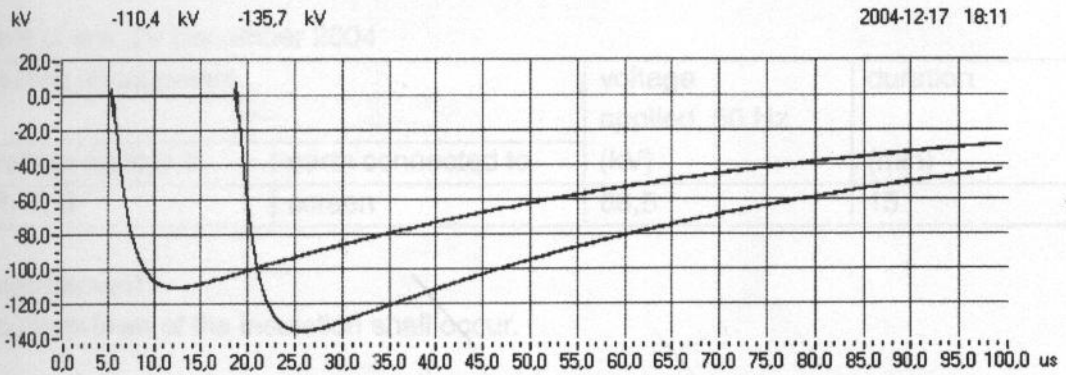


Fig. 6: 70470221, Egytech 33kV cable, -65% and -80%

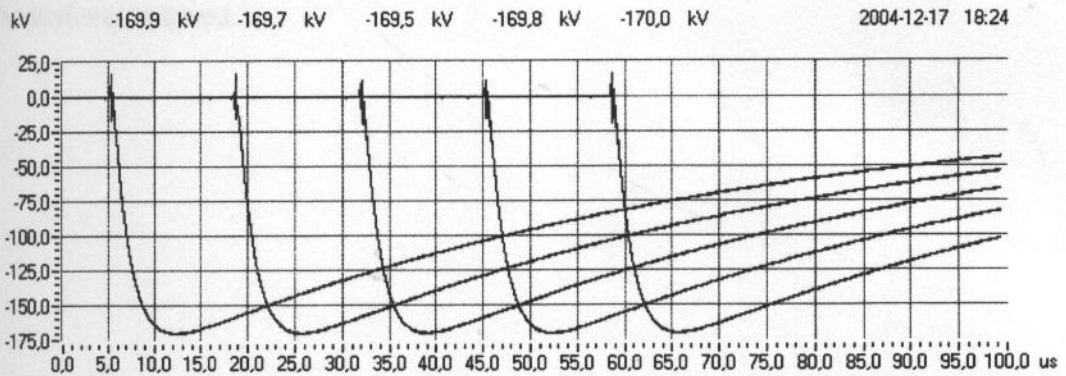


Fig. 7: 70470221, Egytech 33kV cable, -100%

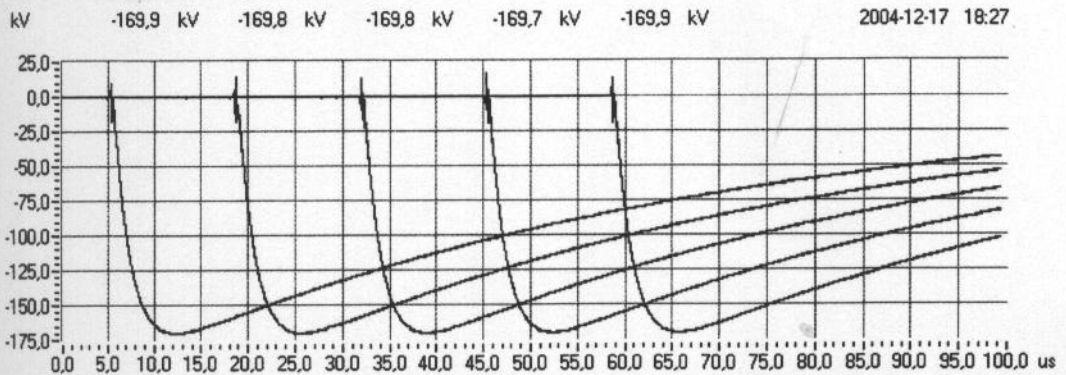


Fig. 8: 70470221, Egytech 33kV cable, -100%

1.5.2 POWER FREQUENCY VOLTAGE TEST

The power frequency voltage test was carried out in accordance with clause 18.1.7 of IEC 60502-2. After the impulse test, the test object was subjected to a power frequency voltage test, at ambient temperature. The results are presented below.

Atmospheric conditions

Ambient temperature	(t)	15 °C
Temperature of test object	(t)	15 °C

Date of test: 20 December 2004

testing arrangement		voltage applied, 50 Hz	duration
voltage applied to	earth connected to	(kV)	(min)
R, Y, B	screen	66,5	15

Requirement

No breakdown of the insulation shall occur.

Evaluation

The test was passed.

1.6 Voltage test for 4 h

The voltage test for four hours was carried out in accordance with clause 18.1.8 of IEC 60502-2. The results are presented below.

Atmospheric conditions

Ambient temperature	(t)	15 °C
Temperature of test object	(t)	15 °C

Date of test: 20 December 2004

testing arrangement		voltage applied, 50 Hz (kV)	duration (hours)
voltage applied to	earth connected to		
R, Y, B	screen	76	4

Requirement

No breakdown of the insulation shall occur.

Evaluation

The test was passed.

1.7 Measurement of the resistivity of semi-conducting screens

The voltage test for four hours was carried out in accordance with clause 18.1.9 of IEC 60502-2. The results are presented below.

Date: between 28 June and 22 July 2004

item	unit	requirement	measured/determined		
			R	Y	B
conductor screen					
- without	Ωm	≤ 1000	40	29	43
after ageing	Ωm	≤ 1000	41	42	38
insulation screen					
- without	Ωm	≤ 500	15	25	13
after ageing	Ωm	≤ 500	23	36	17

Evaluation

The test was passed.

2 DESCRIPTION AND RESULTS OF THE NON-ELECTRICAL TYPE TESTS

The non-electrical type tests were carried out from 28 June 2004 up to and including 22 July 2004.

2.1 Measurement of thickness of insulation

The impulse test was carried out in accordance with clauses 19.1 of IEC 60502-2. The results are presented below.

Item	unit	requirement	measured/determined		
			R	Y	B
- average	mm	≥ 8,0	8,0	8,2	8,4
- minimum	mm	≥ 7,10	8,3	7,9	8,2

Evaluation

The test was passed.

2.2 Measurement of thickness of sheath

The measurement of thickness of inner sheath was carried out in accordance with clause 19.2 of IEC 60502-2. The results are presented below.

Bedding

item	unit	requirement	measured/determined
- average	mm		2,8
- minimum	mm	≥ 1,6	2,5

Outer sheath

item	unit	requirement	measured/determined
- average	mm		3,8
- minimum	mm	≥ 3,2	3,2

Evaluation

The test was passed.

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

The test for determining of the mechanical properties of insulation before and after ageing was carried out in accordance with clause 19.3 of IEC 60502-2.

The results are presented below.

item	unit	requirement	measured/determined		
			R	Y	B
without ageing					
- tensile strength	N/mm ²	≥ 12,5	24,9	28,2	26,0
- elongation	%	≥ 200	535	550	553
after ageing					
- tensile strength	N/mm ²	-	28,3	27,6	29,0
variation with samples without ageing	%	± 25 max.	14	-2	12
- elongation	%	-	593	594	617
variation with samples without ageing	%	± 25 max.	11	8	12

Evaluation

The test was passed.

item	unit	requirement	measured/determined
- tensile strength	N/mm ²	≥ 12,5	24,9
- elongation	%	≥ 200	535
- tensile strength	N/mm ²	-	28,3
variation with samples without ageing	%	± 25 max.	14
- elongation	%	-	593
variation with samples without ageing	%	± 25 max.	11

Evaluation

The test was passed.

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

The test for determining of the mechanical properties of non-metallic sheaths before and after ageing was carried out in accordance with clause 19.4 of IEC 60502-2.

The results are presented below.

Bedding

item	unit	requirement	measured/determined
without ageing			
- tensile strength	N/mm ²	≥ 12,5	18,6
- elongation	%	≥ 150	248
after ageing			
- tensile strength	N/mm ²	≥ 12,5	17,2
variation with samples without ageing	%	± 25 max	-8
- elongation	%	≥ 150	222
variation with samples without ageing	%	± 25 max	-10

Outer sheath

item	unit	requirement	measured/determined
without ageing			
- tensile strength	N/mm ²	≥ 12,5	18,8
- elongation	%	≥ 150	300
after ageing			
- tensile strength	N/mm ²	≥ 12,5	18,3
variation with samples without ageing	%	± 25 max	-3
- elongation	%	≥ 150	284
variation with samples without ageing	%	± 25 max	-5

Evaluation

The test was passed.

2.5 Additional ageing tests on pieces of completed cables

The additional ageing tests on pieces of completed cables were carried out in accordance with clause 19.5 of IEC 60502-2. The results are presented below.

item	unit	requirement	measured/determined		
			R	Y	B
insulation					
- tensile strength	N/mm ²	-	27,6	26,8	27,9
variation with samples without ageing	%	± 25 max.	11	-5	7
- elongation	%	-	570	547	557
variation with samples without ageing	%	± 25 max.	7	-1	1
bedding					
- tensile strength	N/mm ²	-	18,1		
variation with samples without ageing	%	± 25 max.	-3		
- elongation	%	-	234		
variation with samples without ageing	%	± 25 max.	-6		
outer sheath					
- tensile strength	N/mm ²	-	18,3		
variation with samples without ageing	%	± 25 max.	-3		
- elongation	%	-	301		
variation with samples without ageing	%	± 25 max.	1		

Evaluation

The test was passed.

2.6 Loss of mass test on PVC sheaths of type ST2

The loss of mass test was carried out in accordance with clause 19.6 of IEC 60502-2. The results are presented below.

Bedding

item	unit	requirement	measured
loss of mass	mg/cm ²	≤ 1,5	0,9

Outer sheath

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

Evaluation

The test was passed.

2.7 Pressure test at high temperature on sheaths PVC ST2

The pressure test was carried out in accordance with clause 19.7 of IEC 60502-2. The results are presented below.

Bedding

item	unit	requirement	measured
depth of indentation	%	≤ 50	19

Outer sheath

item	unit	requirement	measured
depth of indentation	%	≤ 50	16

Evaluation

The test was passed.

2.8 Pressure test at low temperature on sheaths PVC ST2

The pressure test was carried out in accordance with clause 19.8 of IEC 60502-2.
The results are presented below.

Bedding

item	unit	requirement	measured
elongation	%	≥ 20	> 220
cold impact test		no cracks	no cracks

Outer sheath

item	unit	requirement	measured
elongation	%	≥ 20	> 220
cold impact test		no cracks	no cracks

Evaluation

The test was passed.

2.9 Test for resistance of PVC outer sheath to cracking (heat shock test)

The heat shock test was carried out in accordance with clause 19.9 of IEC 60502-2. The results are presented below.

Bedding

item	unit	requirement	measured
temperature	°C	150	
duration	h	1	
soundness		no cracks	no cracks

Outer sheath

item	unit	requirement	measured
temperature	°C	150	
duration	h	1	
soundness		no cracks	no cracks

Evaluation

The test was passed.

2.10 Hot set test for XLPE insulation

The hot set test was carried out in accordance with clause 19.11 of IEC 60502-2.
The results are presented below.

item	unit	requirement	measured		
			R	Y	B
- elongation under load	%	≤ 175	70	75	65
- permanent elongation	%	≤ 15	5	10	5

Evaluation

The test was passed.

2.11 Water absorption test on insulation

The water absorption test was carried out in accordance with clause 19.13 of IEC 60502-2. The results are presented below.

item	unit	requirement	measured		
			R	Y	B
variation of mass	mg/cm ²	≤ 1	0,12	0,03	-0,34

Note

The measured value was smaller than the sensitivity of the measurement system.

Evaluation

The test was passed.

2.12 Flame retardance test

The shrinkage test was carried out in accordance with clause 19.14 of IEC 60502-2. The results are presented below.

item	unit	requirement	measured
- time flame application	sec.	480	
- length free of charring	mm	> 50	410
- downward extend charred surface from lower edge of top support	mm	< 540	490

Evaluation

The test was passed.

2.13 Shrinkage test for XLPE insulation

The shrinkage test was carried out in accordance with clause 19.16 of IEC 60502-2. The results are presented below.

item	unit	requirement	measured		
			R	Y	B
shrinkage	%	≤ 4	1	1	1

Evaluation

The test was passed.

2.14 Strippability test

The strippability test was carried out in accordance with clause 19.21 of IEC 60502-2. The results are presented below.

item	unit	requirement	measured		
			R	Y	B
- before ageing	N	$\geq 4 \leq 45$	22,22,21	24,24,21	23,20,21
- after ageing	N	$\geq 4 \leq 45$	14,17,18	21,18,15	15,14,17
		The insulation surface shall not be damaged and no trace of the insulation screen shall remain on the insulation.	ok	ok	ok

Evaluation

The test was passed.

3 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	required/specified	measured/determined		
		R	Y	B
conductor (IEC 60228 Class 2) material: stranded aluminium wires (circular compacted) - resistance at 20 °C (Ω/km) - no. of wires - construction	see results of non-electrical type tests $\leq 0,0754/-$ $\geq 34/-$ -/-	see results of non-electrical type tests 0,0752 0,0752 0,0752 34 1-6-11-16		
screening <u>conductor screening</u>	yes/yes	present, semi-conducting		
<u>core screening</u> non-metallic part	yes/yes	present, semi-conducting		
metallic part - thickness - width	-/yes -/ 0,1 mm -/ 37,6 mm	copper tape screen - -		
insulation material: extruded XLPE	see result of non-electrical type tests	see results of non-electrical type tests		
filler material: synthetic	-/yes	polypropylene		
binder tape material: synthetic	-/yes	polypropylene		

item	required/specified	measured/determined
bedding material: PVC ST ₂ (flame retardant)	see results of non-electrical type tests	see results of non-electrical type tests
armouring material: steel	-/yes	80 steel galvanized wires ± Ø 3,1 mm
outer sheath material: PVC ST ₂ (flame retardant)	see results of non-electrical type tests	see results of non-electrical type tests
marking of the cable	-/-	ELSEWEDY CABLES (EGC) 3x240 mm ² 19/33KV CU/XLPE/SWA/PVC
colour of the core	-/-	red, yellow, blue
outer diameter of the core average (mm)	-/-	R Y B 38,6 38,4 38,8
colour of the outer sheath	-/yes	red
outer diameter of the cable average (mm)	-/yes	104,6
outer diameter of the conductors average (mm)	≤ 20,6	R Y B 18,7 18,9 18,7

Evaluation

The test was passed.

MEASUREMENT UNCERTAINTY

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 δ 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 a.c. resistance measurement	$\leq 1\%$
measurement of losses	$\leq 1\%$
measurement of insulation resistance	$\leq 10\%$
measurement of d.c. 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/Iu and 290 μ rad
calibration of voltage transformers	$1,6 \times 10^{-4}$ Ui/Uu en 510 μ rad
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 A DATA SHEET OF EGYTECH CABLES COMPANY

WITH NO: CX5-TA03-W20-01-01

Egytech Cables Co. El Sewedy

Technical Department

19 / 33 KV Power Cable [3 X 240 mm²]

Cable Construction

1. Conductor

Material		Copper
Size	mm ²	240
No. of wires		34
Conductor Diameter	mm	18.2

2. Conductor Screen

Material		Extruded semi-conducting material
Thickness	mm	0.7 [Nominal]
	mm	0.5 [Minimum]
Diameter	mm	19.6 [Approx.]

3. Insulation

Material		Cross Linked Poly Ethylene (XLPE)
Thickness	mm	8.0 [Nominal]
	mm	7.1 [Minimum]
Diameter	mm	35.6 [Approx.]

4. Insulation Screen

Material		Extruded semi-conducting material [Strippable Type]
Thickness	mm	0.8 [Nominal]
	mm	0.5 [Minimum]
Diameter	mm	37.2 [Approx.]

5. Metallic Screen

Material		Copper Tape Screen
Thickness of copper tapes	mm	0.1
Overlap percentage	%	10
No. of Tapes	No.	One per each phase
Total C.S.A	mm ²	26.3
Diameter	mm	37.6 [Approx.]

6. Assembly

Material		Polypropylene filler + tape
Diameter		81.7 [Approx.]

7. Bedding

Material		Polyvinyl Chloride (PVC) - [Flame retardant]
Thickness	mm	2.2 [Nominal]
	mm	1.6 [Minimum]
Diameter	mm	86.1 [Approx.]

**19 / 33 KV Power Cable
[3 X 240 mm²]****Cable Construction****8. Armour**

Material		Galvanized Steel Wire Armour
Diameter of steel wire	mm	3.15
No. of steel wire	No.	80
Binder tape thick. / Width	mm	0.5 / 60
Diameter over armour	mm	93.4 [Approx.]

8. Sheath

Material		Polyvinyl Chloride (PVC) - (Red) - [Flame Retardant]
Thickness	mm	4.2 [Nominal] 3.2 [Minimum]
Outer Diameter	mm	101.8 [Approx.]

Applicable Standards :

- IEC 60502-2 : 1997
- IEC 60332-3 CAT. [A] : 2000

APPENDIX B TESTS ON ELECTRIC CABLES UNDER FIRE CONDITIONS

Tests for vertical flame spread of vertically-mounted bunched wires or cables - Cat. A



page 1 of 2

TEST REPORT

No. 2078726.01

INTERNATIONAL ELECTROTECHNICAL COMMISSION

IEC Publication 60332-3-22 First edition 2000-10	TESTS ON ELECTRIC CABLES UNDER FIRE CONDITIONS Part 3-22: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category A
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Category A: Combustible material of 7 l/m.

- Test applied for: Egytech Cables (EI Sewedy)
- Manufacturer: Egytech Cables (EI Sewedy)
- Type of cable: CU/XLPE/SWA/PVC 3x240 mm², 19/33 kV
- Sampling: not carried out by the Laboratory.
- Procedure: see par. 5 of IEC 332-3-22 (2000) standard.
- Date of the test: November 25, 2004.
- Performance requirements:
* After burning has ceased, the charred or affected portion of the cables should not reached a height of 2.5 m above the bottom edge of the burner, measured at the front and rear of the cable assembly.
Remark: In the case of doubt, two further tests shall be undertaken. The test shall be deemed as satisfactory if both tests meet the requirements.
- Classification: Cable described in 3 meets the requirements and does not propagate the flame.
**It belongs to category A according to IEC 332-3-22
(first edition, 2000)**

Tested by: A.A. Mackenbach

Checked by: R. van Daalen

KEMA Quality B.V.
November 29, 2004

Remarks: - Test results are valid for materials up to tested samples.
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KEMA Quality B.V.

Utrechtseweg 310, 6812 AR Arnhem, The Netherlands
P.O. Box 5185, 6802 ED Arnhem, The Netherlands
Telephone +31 26 3 56 28 50, Telefax +31 26 3 52 58 00

No. 2078726.01

Test conditions:

- Cable length: approx. 3,6 m
 - Volume of combustible material: 6,0792 l/m
 - Cable diameter: approx. 103 mm
 - Method of mounting: space between each test piece of 20 mm
 - Number of lengths: 2
 - Flame application time: 40 min.
 - Number of burners: 1
 - Width of the mounted cables: approx. 226 mm.
-
- Burner characteristics: American Gas Furnace Co, 254 mm in wide, 11-55 drilling, ribbon-type burner (cat. n° IOL 11-55) with air-gas venturi mixer (cat n° 14-18)
 - Burner position: 600 mm above the floor of the test chamber, 75 mm behind the closest of the samples.

Complementary observations:

- Length of time of afterburn: 11 min.
- Overall distance of damage to the jacket above the level of the burner: 91 cm.

Remarks: - Test results are valid for materials up to tested samples.
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Telephone +31 26 3 56 28 50, Telefax +31 26 3 52 58 00