

KEMA TYPE TEST CERTIFICATE OF COMPLETE TYPE TESTS

Object A three-core power cable **1779-18**

Type 6,35/11 kV, AL/XLPE/SWA/PVC 3 x 300 mm²

Rated voltage, U ₀ /U (U _m)	6,35/11 (12) kV	Conductor material	AL
Conductor cross-section	3x300 mm ²	Insulation material	XLPE

Manufacturer Elsewedy Cables,
Industrial Zone A-3, 10th of Ramadan City, Egypt

Client Elsewedy Cables,
Industrial Zone A-3, 10th of Ramadan City, Egypt

Tested by KEMA B.V.,
Utrechtseweg 310, Arnhem, the Netherlands

Date of tests 29 November 2018 to 6 February 2019

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

IEC 60502-2:2014

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 Standards and to justify the ratings assigned by the manufacturer as listed on page 5.

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

*) as declared by the manufacturer

This Certificate consists of 39 pages in total.

KEMA B.V.



Bas Verhoeven
Director, High-Voltage
Laboratory



Laboratories

Arnhem, 11 June 2019

INFORMATION SHEET

1 KEMA Type Test Certificate

A KEMA Type Test Certificate contains a record of a series of (type) tests carried out in accordance with a recognized standard. The equipment tested has fulfilled the requirements of this standard and the relevant ratings assigned by the manufacturer are endorsed by DNV GL. In addition, the test object's technical drawings have been verified and the condition of the test object after the tests is assessed and recorded. The Certificate contains the essential drawings and a description of the equipment tested. A KEMA Type Test Certificate signifies that the object meets all the requirements of the named subclauses of the standard. It can be identified by gold-embossed lettering on the cover and a gold seal on its front sheet.

The Certificate is applicable to the equipment tested only. DNV GL is responsible for the validity and the contents of the Certificate. The responsibility for conformity of any object having the same type references as the one tested rests with the manufacturer.

Detailed rules on types of certification are given in DNV GL's Certification procedure applicable to KEMA Laboratories.

2 KEMA Report of Performance

A KEMA Report of Performance is issued when an object has successfully completed and passed a subset (but not all) of test programmes in accordance with a recognized standard. In addition, the test object's technical drawings have been verified and the condition of the test object after the tests is assessed and recorded. The report is applicable to the equipment tested only. A KEMA Report of Performance signifies that the object meets the requirements of the named subclauses of the standard. It can be identified by silver-embossed lettering on the cover and a silver seal on its front sheet.

The sentence on the front page of a KEMA Report of Performance will state that the tests have been carried out in accordance with The object has complied with the relevant requirements.

3 KEMA Test Report

A KEMA Test Report is issued in all other cases. Reasons for issuing a KEMA Test Report could be:

- Tests were performed according to the client's instructions.
- Tests were performed only partially according to the standard.
- No technical drawings were submitted for verification and/or no assessment of the condition of the test object after the tests was performed.
- The object failed one or more of the performed tests.

The KEMA Test Report can be identified by the grey-embossed lettering on the cover and grey seal on its front sheet.

In case the number of tests, the test procedure and the test parameters are based on a recognized standard and related to the ratings assigned by the manufacturer, the following sentence will appear on the front sheet. The tests have been carried out in accordance with the client's instructions. Test procedure and test parameters were based on If the object does not pass the tests such behaviour will be mentioned on the front sheet. Verification of the drawings (if submitted) and assessment of the condition after the tests is only done on client's request.

When the tests, test procedure and/or test parameters are not in accordance with a recognized standard, the front sheet will state the tests have been carried out in accordance with client's instructions.

4 Official and uncontrolled test documents

The official test documents of DNV GL are issued in bound form. Uncontrolled copies may be provided as loose sheets or as a digital file for convenience of reproduction by the client. The copyright has to be respected at all times.

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1 IDENTIFICATION OF THE OBJECT TESTED

1.1 Ratings/characteristics of the object tested

Rated voltage, U_0/U (U_m)	6,35/11 (12) kV
Rated maximum conductor temperature in normal operation	90 °C
Rated conductor cross-section	3x300 mm ²

1.2 Description of the object tested

Standard	IEC 60502-2, Clauses 5 to 14
Manufacturer	Elsewedy Cables - Egypt, Industrial Zone A-3, 10th of Ramadan City, Egypt
Type	6,35/11 kV 3x300 mm ² AL/XLPE/SWA/PVC Cable
Manufacturing year	2018
Quantity submitted	45 m
Rated voltage, U_0/U (U_m)	6,35/11 (12) kV
Nominal capacitance between conductor and metal screen	0,503 μ F/km
No. of cores	3
Core identification	core 1 = red core 2 = yellow core 3 = blue
Overall diameter	82,71 mm
Marking on the oversheath	11000 VOLTS 300 MM.SQ. THREE CORE AL/XLPE/SWA/PVC PROPERTY OF FEWA - UAE 2018 EL SEWEDY CABLES
Construction	see List of drawings

Conductor

• material	aluminium
• cross-section	300 mm ²
• nominal diameter	20,2 mm
• type	stranded circular compacted
• maximum conductor temperature in normal operation	90 °C
• presence and nature of measures to achieve longitudinal watertightness	no

Conductor screen

• material	semi-conducting extruded thermosetting compound
• nominal thickness	0,5 mm / 0,3 mm minimum
• material designation	known in KEMA Laboratories' files
• manufacturer of the material	known in KEMA Laboratories' files

Insulation

- material XLPE
- nominal thickness 3,4 mm / 2,96 mm minimum
- nominal inner diameter of the insulation 21,4 mm (Approx.)
- nominal outer diameter of the insulation 28,2 mm (Approx.)
- material designation known in KEMA Laboratories' files
- manufacturer of the material known in KEMA Laboratories' files

Insulation (core) screen

- material semi-conducting extruded polyethylene compound (Bonded)
- strippable no
- nominal thickness 0,5 mm / 0,3 minimum
- material designation known in KEMA Laboratories' files
- manufacturer of the material known in KEMA Laboratories' files

Longitudinal water tightness

no

Metal screen

- material overlapped copper tape
- number of wires/tapes 1
- nominal thickness and width of tape 0,1 x 40 mm (overlap: 39%)
- cross-sectional area 25 mm²

Fibre optic wires

no

Longitudinal water tightness

no

Fillers and binder tapes

- material polypropylene filler
- number of binder tapes two
- thickness and width of the tape 0,1 x 60mm (90% gap)

Separation sheath

- material PVC, type ST2
- nominal thickness 1,9 mm / 1,32 mm minimum
- manufacturer of the material known in KEMA Laboratories' files

Metal sheath

no

Metal armour

- material galv. steel wires
- number of wires 62
- nominal diameter of wires 3,15 ± 5%
- cross-sectional area 465 mm²
- manufacturer of the material known in KEMA Laboratories' files

Binder tape over the metal armour

- number of tapes five
- thickness and width 0,1 x 60mm (10% overlap)

Metal foil or tape, longitudinally applied, bonded to the oversheath no**Oversheath**

- material PVC type ST2
- nominal thickness 2,75 mm / 2,00 mm minimum
- nominal overall diameter of the cable (D) 80,7 mm
- material designation known in KEMA Laboratories' files
- manufacturer of the material known in KEMA Laboratories' files
- colour Black
- graphite coating applied no

Fire retardant (according to IEC 60332-1) yes**Manufacturing details insulation system**

- location of manufacturing 10th of Ramadan, Egypt
- type of extrusion line CCV
- type of extrusion triple common extrusion
- factory identification of extrusion line EPL30/255_MILLFER
- manufacturer of the extrusion line known in KEMA Laboratories' files
- identification of production batch 1054SW
- curing means dry
- cooling means water
- manufacturing length (where cable sample for testing has been taken from) 500 m
- length markings on cable sample sent to KEMA Laboratories begin: 0034 m, end: 0079m

1.3 List of drawings

The manufacturer has guaranteed that the object submitted for tests has been manufactured in accordance with the following drawings and/or documents. KEMA Laboratories has verified that these drawings and/or documents adequately represent the object tested. The manufacturer is responsible for the correctness of these drawings and/or documents and the technical data presented.

The following drawings and/or documents have been included in this Certificate:

Drawing no./document no.	Revision
AX2-TA03-W30-00-00	0

2 GENERAL INFORMATION

2.1 The tests were witnessed by

The tests were carried out without a representative of the client present.

2.2 The tests were carried out under responsibility of

Name	Company
Hristanov, N.	KEMA B.V., Arnhem, the Netherlands

2.3 Measurement uncertainty

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

3 ELECTRICAL TYPE TESTS

3.1 Test arrangement

3.1.1 Determination of the cable conductor temperature

Standard

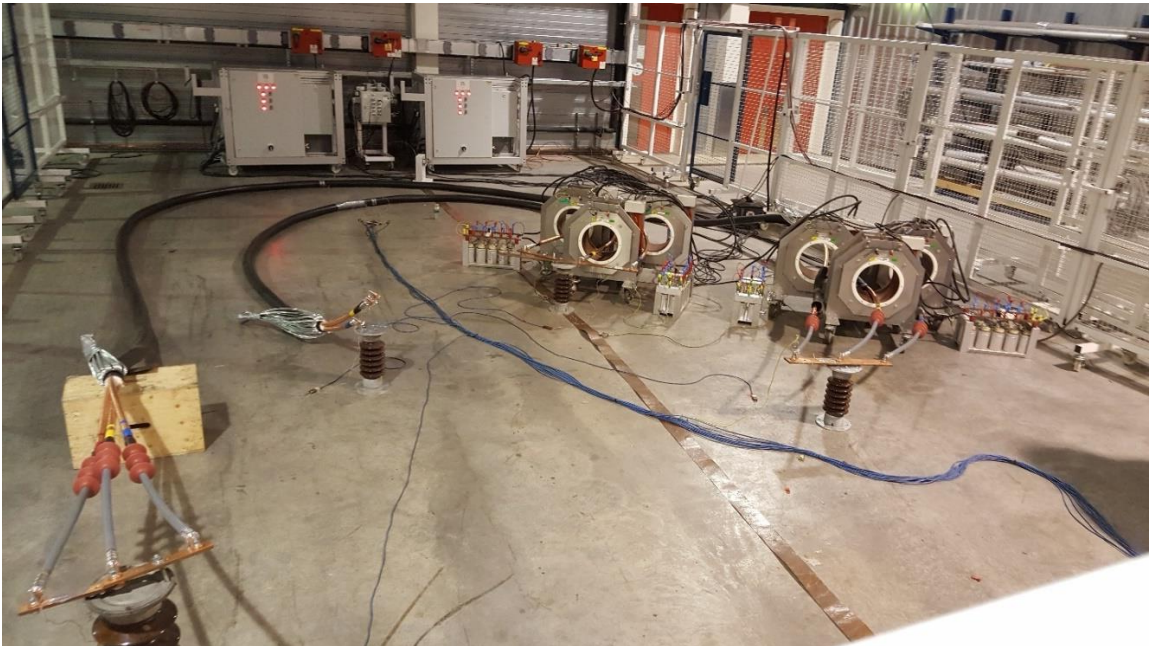
Standard IEC 60502-2, subclause 15.4

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

The heating currents in 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 G was used as a guide and Annex G, subclause G.3.1, method 1 was applied. The tests at elevated temperature are carried out after the conductor temperature has been within the stated limit for at least 2 hours.



3.1.2 Photograph of test set-up



3.2 Bending test

Standard and date

Standard IEC 60502-2, subclause 18.2.4

Test date 29 November 2018

Environmental conditions

Ambient temperature 8 °C

Characteristic test data

Temperature of test object 8 °C

Maximum bending diameter $< 15(d+D) + 5\%$

Length of cable bended 27 m

Length marking of cable bended 0034 - 0059

Actual external diameter of cable D	Actual diameter of cable conductor d	Maximum bending diameter D _r	Diameter of test cylinder D _t
mm	mm	mm	mm
81,5	20,2	1602	1100

Result

The test was carried out successfully.

3.3 Partial discharge test

Standard and date

Standard IEC 60502-2, subclause 18.2.5
 Test date 5 December 2018

Environmental conditions

Ambient temperature 20 °C

Characteristic test data

Temperature of test object 20 °C
 Circuit direct
 Calibration 10 pC
 Noise level at 1,73 U₀ 2,5 pC
 Declared sensitivity 4 pC
 Required sensitivity ≤ 5 pC
 Centre frequency 100 kHz
 Bandwidth (Δf) 135 kHz
 Test frequency 50 Hz
 Coupling capacitor 2,6 nF

Core	Voltage applied, 50 Hz		Duration s	Partial discharge level pC
	... x U ₀	kV		
1	2	12,7	10	-
	1,73	11	-	Not detectable
2	2	12,7	10	-
	1,73	11	-	Not detectable
3	2	12,7	10	-
	1,73	11	-	Not detectable

Requirement

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

Result

The object passed the test.

3.4 Tan δ measurement

Standard and date

Standard IEC 60502-2, subclause 18.2.6

Test date 5 December 2018

Environmental conditions

Ambient temperature 20 °C

Characteristic test data

Temperature of test object 97 °C

Length of each core 16,83 m

Standard capacitor 99,88 pF

Core	Voltage applied, 50 Hz kV	Capacitance of core ¹⁾ $\mu\text{F}/\text{km}$	Tan δ
Red, Yellow, Blue	5	0,426	$1,923 \times 10^{-4}$
¹⁾ for information only			

Requirement

The measured value shall not be higher than 40×10^{-4} at ≥ 2 kV.

Result

The object passed the test.

3.5 Heating cycle test

Standard and date

Standard IEC 60502-2, subclause 18.2.7

Test date 10 December 2018

Environmental conditions

Ambient temperature 20 °C

Characteristic test data

Heating method conductor current

No. of heating cycles	Steady conductor temperature °C	Heating current during steady condition A	Heating cycle		
			Heating		Cooling
			Total duration h	Duration of conductor at steady temperature h	Total duration h
20	97	515	5	2	5

Requirement

The test shall be carried out successfully.

Result

The object passed the test.

3.6 Partial discharge test

Standard and date

Standard IEC 60502-2, subclause 18.2.5
 Test date 19 December 2018

Environmental conditions

Ambient temperature 20 °C

Characteristic test data

Temperature of test object 20 °C
 Circuit direct
 Calibration 10 pC
 Noise level at 1,73 U₀ 3 pC
 Declared sensitivity 5 pC
 Required sensitivity ≤ 5 pC
 Centre frequency 223 kHz
 Bandwidth (Δf) 100 kHz
 Test frequency 50 Hz
 Coupling capacitor 2,6 nF

Core	Voltage applied, 50 Hz		Duration s	Partial discharge level pC
	... x U ₀	kV		
1	2	12,7	10	-
	1,73	11	-	Not detectable
2	2	12,7	10	-
	1,73	11	-	Not detectable
3	2	12,7	10	-
	1,73	11	-	Not detectable

Requirement

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

Result

The object passed the test.

3.7 Impulse test

Standard and date

Standard IEC 60502-2, subclause 18.2.8

Test date 19 December 2018

Environmental conditions

Ambient temperature 20 °C

Characteristic test data

Temperature of test object 97 °C

Specified test voltage 75 kV

Testing arrangement		Polarity	Voltage applied (% of test voltage)	No. of impulses	See figure on next pages
Voltage applied to	Earthed				
Conductors of all three cores	Metal screens	Positive	50	1	1 (waveshape)
			65	1	2
			80	1	2
			100	10	3 and 4
Conductors of all three cores	Metal screens	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 object passed the test.

Lightning impulse test with positive voltage

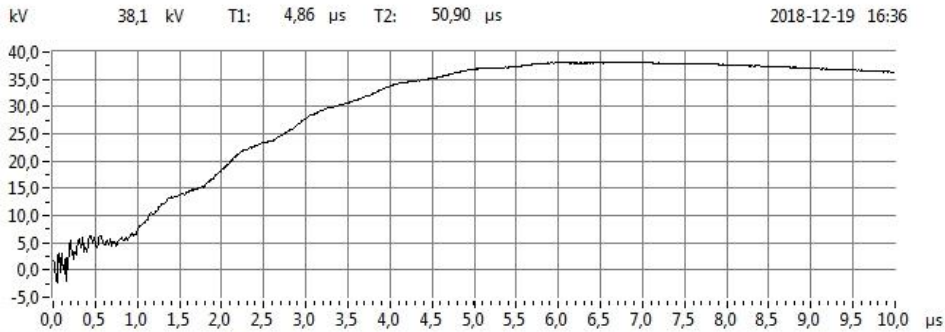


Fig. 1: Waveshape 72129097 11kV 3x300mm2 50% of the test voltage

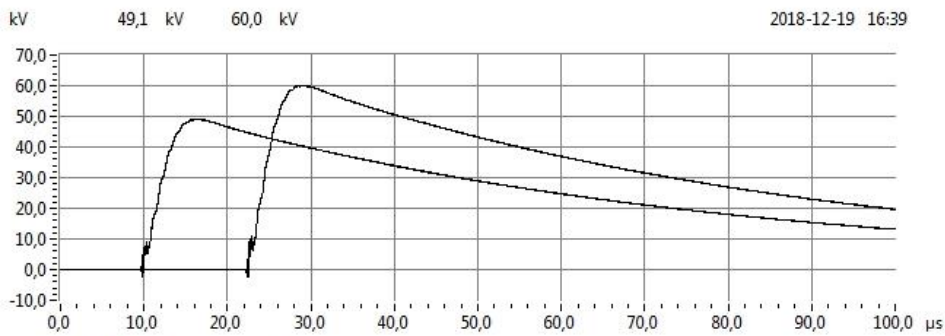


Fig. 2: 72129097 11kV 3x300mm2 65% and 80% of the test voltage

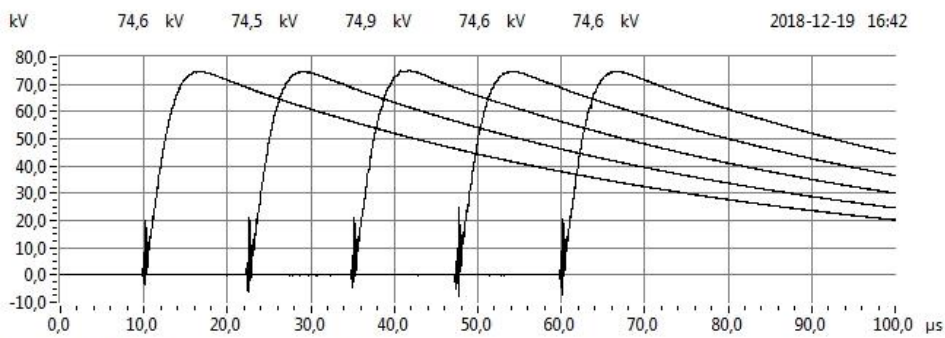


Fig. 3: 72129097 11kV 3x300mm2 100% of the test voltage

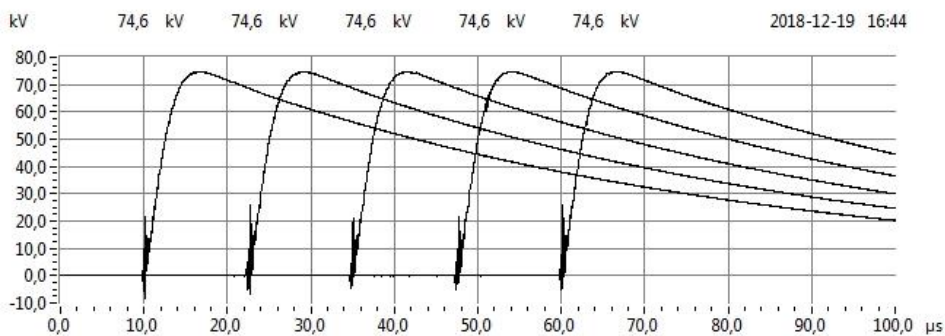


Fig. 4: 72129097 11kV 3x300mm2 100% of the test voltage

Lightning impulse test with negative voltage

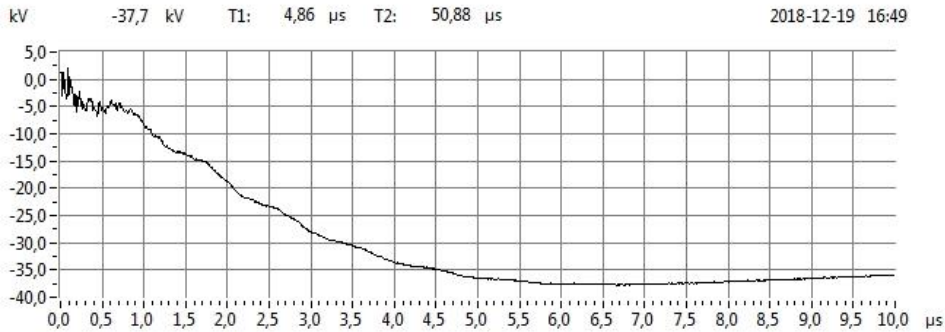


Fig. 5: Waveshape 72129097 11kV 3x300mm2 -50% of the test voltage

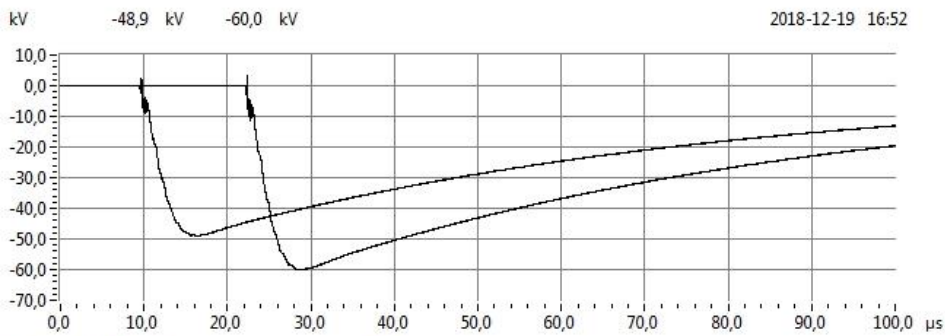


Fig. 6: 72129097 11kV 3x300mm2 -65% and -80% of the test voltage

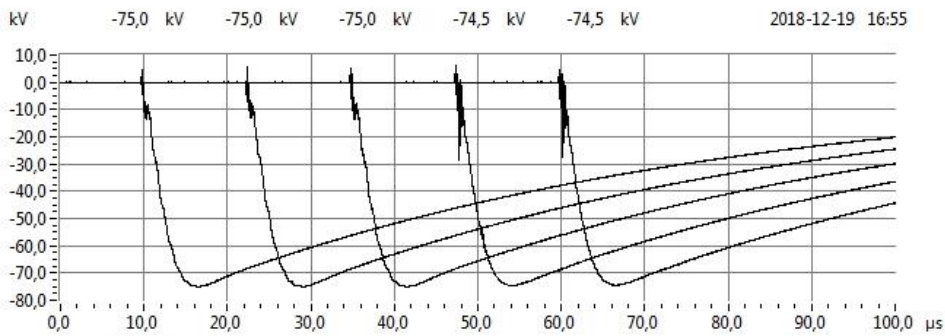


Fig. 7: 72129097 11kV 3x300mm2 -100% of the test voltage

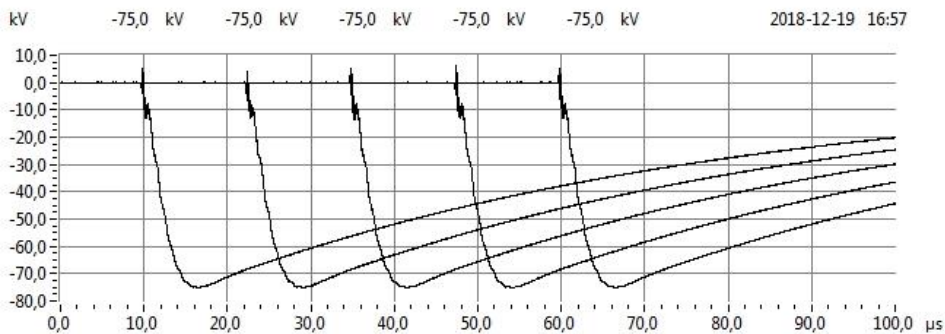


Fig. 8: 72129097 11kV 3x300mm2 -100% of the test voltage

3.8 Voltage test for 15 min

Standard and date

Standard IEC 60502-2, subclause 18.2.8

Test date 20 December 2018

Environmental conditions

Ambient temperature 20 °C

Characteristic test data

Temperature of test object 20 °C

Testing arrangement		Voltage applied, 50 Hz		Duration
Voltage applied to	Earth connected to	... x U ₀	kV	min
Conductors	Metal screens	3,5	22,2	15

Requirement

No breakdown of the insulation shall occur.

Result

The object passed the test.

3.9 Voltage test for 4 h

Standard and date

Standard IEC 60502-2, subclause 18.2.9

Test date 20 December 2018

Environmental conditions

Ambient temperature 20 °C

Characteristic test data

Temperature of test object 20 °C

Testing arrangement		Voltage applied, 50 Hz		Duration
Voltage applied to	Earth connected to	... x U ₀	kV	h
Conductors	Metal screens	4	25,4	4

Requirement

No breakdown of the insulation shall occur.

Result

The object passed the test.

3.10 Resistivity of semi-conducting screens

Standard and date

Standard IEC 60502-2, subclause 18.2.10

Test date 13 February 2019

Characteristic test data

Temperature during ageing 100 °C

Duration 7 x 24 h (3 to 10 January 2019)

Resistivity measured at 90 ± 2 °C

Item	Unit	Requirement	Measured/determined		
			Core red	Core yellow	Core blue
Conductor screen					
without ageing	Ωm	≤ 1000	228	236	271
after ageing	Ωm	≤ 1000	391	317	419
Insulation screen					
without ageing	Ωm	≤ 500	369	351	293
after ageing	Ωm	≤ 500	34	39	33

Result

The object passed the test.

4 NON-ELECTRICAL TYPE TESTS

4.1 Measurement of thickness of insulation

Standard and date

Standard IEC 60502-2, subclause 19.2

Test date 4 January 2019

Item	Unit	Requirement	Specified	Measured/determined		
				Core red	Core yellow	Core blue
Nominal	mm	3,4	3,4	-	-	-
Average	mm	-	-	3,48	3,47	3,51
Minimum [t_{\min}]	mm	$\geq 2,96$	2,96	3,35	3,25	3,40
Maximum [t_{\max}]	mm	-	-	3,61	3,61	3,63
$(t_{\max} - t_{\min}) / t_{\max}$	-	$\leq 0,15$	-	0,07	0,10	0,06

Result

The object passed the test.

4.2 Measurement of thickness of non-metal sheaths (including extruded separation sheaths, but excluding inner coverings)

Standard and date

Standard IEC 60502-2, subclause 19.3

Test date 17 January 2019

Separation sheath

Item	Unit	Requirement	Specified	Measured/determined
Nominal	mm	$\geq 1,2$	1,9	-
Average	mm	-	-	1,95
Minimum	mm	$\geq 1,32$	-	1,86

Oversheath

Item	Unit	Requirement	Specified	Measured/determined
Nominal	mm	$\geq 1,8$	2,75	-
Average	mm	-	-	3,19
Minimum	mm	$\geq 2,0$	-	2,32

Note

The nominal thickness of the separation sheath and oversheath is calculated according to subclause 13.3.3 and Annex A.

Result

The object passed the test.

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

Standard and date

Standard IEC 60502-2, subclause 19.5
 Test date 30 January 2019

Characteristic test data

Temperature during ageing $135 \pm 3 \text{ }^\circ\text{C}$
 Ageing duration 7 x 24 h (21 to 28 January 2019)

Item	Unit	Requirement	Measured/determined		
			Core red	Core yellow	Core blue
Without ageing					
Tensile strength	N/mm ²	$\geq 12,5$	27,9	28,9	30,8
Elongation at break	%	≥ 200	543	547	575
After ageing in air oven					
Tensile strength					
• value after ageing	N/mm ²	-	33,0	33,5	33,6
• variation	%	$\pm 25 \text{ max.}$	18	16	9
Elongation at break					
• value after ageing	%	-	591	611	607
• variation	%	$\pm 25 \text{ max.}$	9	12	5

Result

The object passed the test.

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

Standard and date

Standard IEC 60502-2, subclause 19.6
 Test date 6 February 2019

Characteristic test data

Temperature during ageing 100 ± 2 °C
 Ageing duration 7 x 24 h (21 to 28 January 2019)

Separation sheath

Item	Unit	Requirement	Measured/determined
Without ageing			
Tensile strength	N/mm ²	≥ 12,5	16,9
Elongation at break	%	≥ 150	196
After ageing in air oven			
Tensile strength			
• value after ageing	N/mm ²	≥ 12,5	16,2
• variation	%	± 25 max.	-4
Elongation at break			
• value after ageing	%	≥ 150	189
• variation	%	± 25 max.	-3

Oversheath

Item	Unit	Requirement	Measured/determined
Without ageing			
Tensile strength	N/mm ²	≥ 12,5	18,2
Elongation at break	%	≥ 150	236
After ageing in air oven			
Tensile strength			
• value after ageing	N/mm ²	≥ 12,5	18,0
• variation	%	± 25 max.	-1
Elongation at break			
• value after ageing	%	≥ 150	231
• variation	%	± 25 max.	-2

Result

The object passed the test.

4.5 Additional ageing test on pieces of completed cable

Standard and date

Standard IEC 60502-2, subclause 19.7

Test date 30 January 2019

Characteristic test data

Temperature during ageing 100 ± 2 °C

Ageing duration 7 x 24 h (03 Jan to 10 Jan 2019)

Insulation

Item	Unit	Requirement	Measured/determined		
			Core red	Core yellow	Core blue
Without ageing					
Tensile strength	N/mm ²	≥ 12,5	27,9	28,9	30,8
Elongation at break	%	≥ 200	543	547	575
After ageing in air oven					
Tensile strength					
• value after ageing	N/mm ²	-	28,1	28,4	29,0
• variation	%	± 25 max.	1	-2	-6
Elongation at break					
• value after ageing	%	-	553	570	559
• variation	%	± 25 max.	2	4	-3

Separation sheath

Item	Unit	Requirement	Measured/determined
Without ageing			
Tensile strength	N/mm ²	≥ 12,5	16,9
Elongation at break	%	≥ 150	196
After ageing in air oven			
Tensile strength			
• value after ageing	N/mm ²	≥ 12,5	18,0
• variation	%	± 25 max.	7
Elongation at break			
• value after ageing	%	≥ 150	205
• variation	%	± 25 max.	4

Oversheath

Item	Unit	Requirement	Measured/determined
Without ageing			
Tensile strength	N/mm ²	≥ 12,5	18,2
Elongation at break	%	≥ 150	236
After ageing in air oven			
Tensile strength			
• value after ageing	N/mm ²	≥ 12,5	17,5
• variation	%	± 25 max.	-4
Elongation at break			
• value after ageing	%	≥ 150	220
• variation	%	± 25 max.	-7

Result

The object passed the test.

4.6 Loss of mass test on PVC sheaths of type ST₂

Standard and date

Standard IEC 60502-2, subclause 19.8

Test date 29 January 2019

Characteristic test data

Temperature treatment 100 ± 2 °C

Duration 7 x 24 h (21 to 28 January 2019)

Separation sheath

Item	Unit	Requirement	Measured/determined
Loss of mass	mg/cm ²	≤ 1,5	0,32

Oversheath

Item	Unit	Requirement	Measured/determined
Loss of mass	mg/cm ²	≤ 1,5	0,47

Result

The object passed the test.

4.7 Pressure test at high temperature on insulation and non-metal sheaths

Standard and date

Standard IEC 60502-2, subclause 19.9
Test date 29 January 2019

Characteristic test data

Temperature 90 ± 2 °C
Heating time 6 h
Mandrel diameter 63 mm
Load 11 N

Separation sheath

Item	Unit	Requirement	Measured/determined
Depth of indentation	%	≤ 50	29

Characteristic test data

Temperature 90 ± 2 °C
Heating time 6 h
Mandrel diameter 75 mm
Load 16 N

Oversheath

Item	Unit	Requirement	Measured/determined
Depth of indentation	%	≤ 50	27

Result

The object passed the test.

4.8 Test on PVC insulation and sheaths at low temperature

Standard and date

Standard IEC 60502-2, subclause 19.10
Test date 25 and 31 January 2019

Characteristic test data

Temperature $-15 \pm 2 \text{ }^\circ\text{C}$
Cooling time $\geq 16 \text{ h}$
Mass of hammer 1250 g

Separation sheath

Item	Unit	Requirement	Measured/determined
Cold elongation test	%	≥ 20	77
Cold impact test	-	No cracks	No cracks

Characteristic test data

Temperature $-15 \pm 2 \text{ }^\circ\text{C}$
Cooling time $\geq 16 \text{ h}$
Mass of hammer 1250 g

Oversheath

Item	Unit	Requirement	Measured/determined
Cold elongation test	%	≥ 20	107
Cold impact test	-	No cracks	No cracks

Result

The object passed the test.

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

Standard and date

Standard IEC 60502-2, subclause 19.11
 Test date 5 February 2019

Characteristic test data

Temperature 150 ± 3 °C
 Duration 1 h
 Diameter of mandrel 4 mm
 Number of turns 6

Separation sheath

Item	Unit	Requirement	Measured/determined
Visual examination	-	No cracks	No cracks

Characteristic test data

Temperature 150 ± 3 °C
 Duration 1 h
 Diameter of mandrel 8 mm
 Number of turns 4

Oversheath

Item	Unit	Requirement	Measured/determined
Visual examination	-	No cracks	No cracks

Result

The object passed the test.

4.10 Hot set test for XLPE insulation

Standard and date

Standard IEC 60502-2, subclause 19.13
Test date 22 January 2019

Characteristic test data

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

Insulation

Item	Unit	Requirement	Measured/determined		
			Core red	Core yellow	Core blue
Elongation under load	%	≤ 175	52	57	57
Permanent elongation after cooling	%	≤ 15	-4	-2	-1

Result

The object passed the test.

4.11 Water absorption test on insulation

Standard and date

Standard IEC 60502-2, subclause 19.15
Test date 28 January 2019

Characteristic test data

Temperature of water 85 ± 2 °C
Duration 14 x 24 h (11 to 25 January 2019)
Test method Gravimetric

Insulation

Item	Unit	Requirement	Measured/determined		
			Core red	Core yellow	Core blue
Increase of mass	mg/cm ²	$\leq 1,00$	0,04	0,02	0,07

Result

The object passed the test.

4.12 Flame spread on single cables

Standard and date

Standard IEC 60502-2, subclause 19.16

Test date 13 February 2019

Characteristic test data

Overall diameter of test piece 80,8 mm

Time for flame application 480 s

Flame type 1 kW pre-mixed flame

Complete cable	Unit	Requirement	Measured/determined
The distance between the lower edge of the top support and the onset of charring	mm	≥ 50	365
The distance between the lower edge of the top support and charring extends downwards to a point	mm	≤ 540	504

Result

The object passed the test.

4.13 Shrinkage test for XLPE insulation

Standard and date

Standard IEC 60502-2, subclause 19.18

Test date 11 January 2019

Characteristic test data

Distance L between marks 200 mm

Temperature 130 ± 3 °C

Duration 1 h

Item	Unit	Requirement	Measured/determined		
			Core red	Core yellow	Core blue
Shrinkage	%	≤ 4	1,6	1,4	1,6

Result

The object passed the test.

5 CHECK OF CABLE CONSTRUCTION

Standard and date

Standard IEC 60502-2, subclauses 5 to 14

Test date 3 December 2018 and 17 January 2019

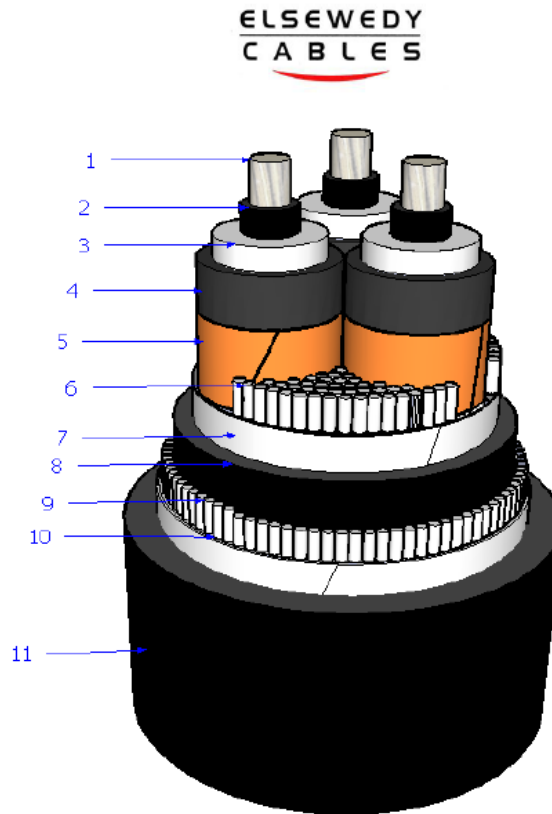
Item	Unit	Requirement	Specified	Measured/determined		
				Core 1	Core 2	Core 3
Conductor						
Diameter of conductor (d)	mm	$19,7 \leq d \leq 21,6^{1)}$	20,2	20,10	20,10	20,10
Number of wires	-	≥ 30	-	34	34	34
Diameter of wires	mm	-	-	3,27	3,27	3,27
Resistance at 20 °C	Ω/km	$\leq 0,1000$	$\leq 0,1000$	0,0993	0,0976	0,0996
Water blocking yarns between conductor layers		-	-	no	no	no
Conductor screen						
Diameter over conductor screen	mm	-	-	21,63	21,48	21,60
Thickness	mm	-	0,5 (nominal)	0,74	0,61	0,76
Insulation						
Diameter over insulation	mm	-	28,2	28,65	28,51	28,72
Thickness	mm	$\geq 2,96$	3,4 (nominal)	3,48	3,47	3,51
Insulation screen						
Diameter over insulation screen	mm	-	-	30,08	29,88	30,21
Thickness	mm	-	0,5 (nominal)	0,69	0,66	0,72
Metal screen						
Number of Cu tapes	-	-	1	1	1	1
Thickness x width of tape	mm	-	0,1 x 40	0,102 x 39,82	0,102 x 39,82	0,102 x 39,82
Overlap	%		39	43	43	43

Item	Unit	Requirement	Specified	Measured/determined
Fillers				
Filler material	-	-	Polypropylene present	present
Binder tape				
Number of tapes	-	-	2	2
Thickness x width of tape	mm	-	0,1 x 60mm (90% gap)	0,103 x 60,15 gap 22mm (36%) 0,096 x 58,61 gap 20mm (34%)
Separation sheath				
Diameter over separation sheath	mm	-	-	67,16
Thickness	mm	-	1,9 (nominal)	1,95
Metal armour				
Number of wires	-	-	62	62
Diameter of wires	mm	-	3,15 ± 5%	3,08
Binder tape				
Number of tapes	-	-	5	5
Thickness x width of tape	mm	-	0,1 x 60 (10%)	0,096 x 58,86 gap 3,5mm (6%) 0,096 x 58,10 overlap 8% 0,098 x 60,49 overlap 16% 0,109 x 57,91 overlap 11% 0,101 x 58,12 overlap 0%
Oversheath				
Diameter over oversheath	mm	-	80,7 (nominal)	80,81
Thickness	mm	-	2,0 (minimum)	3,19 (average) 2,32 (minimum)
Colour	-	-	black	black
Marking on the cable	11000 VOLTS 300 MM.SQ. THREE CORES AL/XLPE/SWA/PVC PROPERTY OF FEWA - UAE 2018 EL SEWEDY CABLES			
1) Dimensional limits do not have the status of a requirement but as a guideline only				

Result

The object passed the test.

6 DRAWING



<i>Size</i> : 3 x 300 mm ²		<i>Type</i> : AL/XLPE/SWA/PVC	
<i>Voltage:</i> 6.35/11 kV		<i>Standard:</i> IEC 60502-2:2005	
<i>Code</i> : AX2-TA03-W30-00-00		EL-SEWEDY CABLES	
Sr.	Description		
1.	<i>Aluminum Conductor (Compacted)</i>		
2.	Inner Semi-conductor (Bonded)		
3.	<i>XLPE Insulation</i>		
4.	Outer Semi-conductor (Bonded)		
5.	Copper Tape Screen		
6.	Polypropylene Filler		
7.	Binder Tape		
8.	PVC Bedding		
9.	Steel Wire Armoured		
10.	Binder Tape		
11.	PVC Sheath		
<i>Not to Scale</i>		<i>Drawn by Mr. Husainy</i>	<i>Approved by Eng. Ahmed Farag</i>

7 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	≤ 3%
time parameters	≤ 10%
Capacitance measurement	0,3%
Tan δ measurement	± 0,5% ± 5 x 10 ⁻⁵
Partial discharge measurement:	
< 10 pC	2 pC
10 to 100 pC	5 pC
> 100 pC	20%
Measurement of impedance AC-resistance measurement	≤ 1%
Measurement of losses	≤ 1%
Measurement of insulation resistance	≤ 10%
Measurement of DC resistance:	
1 to 5 μΩ	1%
5 to 10 μΩ	0,5%
10 to 200 μΩ	0,2%
Radio interference test	2 dB
Calibration of current transformers	2,2 x 10 ⁻⁴ I _i /I _u and 290 μrad
Calibration of voltage transformers	1,6 x 10 ⁻⁴ U _i /U _u and 510 μrad
Measurement of conductivity	5%
Measurement of temperature:	
-50 to -40 °C	3 K
-40 to 125 °C	2 K
125 to 150 °C	3 K
Tensile test	1%
Sound level measurement	type 1 meter as per IEC 60651 and ANSI S1,4,1971
Measurement of voltage ratio	0,1%