

REPORT OF PERFORMANCE

TIC 1580-13

OBJECT	Three-core power cable			
TYPE	18/30(36) kV, 3x500 mm ² , 2XWY(P)-FR XLPE			
	Rated voltage, U₀/U (U_m)	18/30 (36) kV	Conductor material	Cu
	Conductor cross-section	3x500 mm²	Insulation material	XLPE
CLIENT	KEC INTERNATIONAL LIMITED, Vadodara, Gujarat, India			
MANUFACTURER	KEC INTERNATIONAL LIMITED, Vadodara, Gujarat, India			
TESTED BY	KEMA Nederland B.V., Arnhem, The Netherlands			
DATE(S) OF TESTS	10 October to 22 November 2013			
TEST SPECIFICATION	The programme was specified by the client and was based on IEC 60502-2 (2005).			
SUMMARY AND CONCLUSION	The cable passed the tests.			

This report 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.

This report consists of 38 pages in total.

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KEMA Nederland B.V.



S.A.M. Verhoeven
Director Testing, Inspections &
Certification The Netherlands

Arnhem, 14 January 2014

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1 IDENTIFICATION OF THE OBJECT TESTED

1.1 Ratings/characteristics of the object tested and proved by tests

Rated voltage, U_0/U (U_m)	18/30 (36) kV
Rated maximum conductor temperature in normal operation	90 °C
Rated conductor cross-section	3x500 mm ²

The test voltages were based on U_0 test = 18 kV.

1.2 Description of the object tested

Standard	IEC 60502-2, Clause 5-14
Manufacturer (as stated by the client)	KEC INTERNATIONAL LIMITED, Vadodara, Gujarat, India
Type	$U_0 = 18$ kV 3x500 mm ² XLPE CABLE
Manufacturing date	2013
Sampling procedure	By the manufacturer
Quantity submitted	60 m
Rated voltage, U_0/U (U_m)	18/30 (36) kV
Nominal capacitance between conductor and metal screen	0,303 μ F/km
No. of cores (core identification)	1
Overall diameter	121,4 mm
Embossing on the oversheath	KEC INTL.LTD. RPG CABLES 18/30(36)kV ELECTRIC CABLE 3x500mm ² XLPE 2XWY(P) FR 2013
Construction	See List of drawings

Conductor

– material	Copper
– cross-section	500 mm ²
– nominal diameter	26,8 mm
– type	Stranded compacted
– maximum conductor temperature in normal operation	90 °C
– presence and nature of measures to achieve longitudinal watertightness	no

Conductor screen

– material	Semi-conducting compound 33 kV
– nominal thickness	0,3 mm
– material designation	DYM 515
– manufacturer of the material	DYM, South Korea

Insulation

- material Cross linkable compound 66 kV
- nominal thickness 8,0 mm
- material designation Dow HFDB 4201 EC
- manufacturer of the material DOW CHEMICALS

Insulation (core) screen

- material Semi conducting compound 33 kV
- strippable yes
- nominal thickness 0,6 mm
- material designation Pramkor 3005 ES
- manufacturer of the material Pramkor

Metallic screen

- material Copper tape, 1 layer
- nominal thickness and width of tape 65 x 0,04 mm
- Diameter over copper tape screen 45,25 mm

Longitudinally watertightness

- presence and nature of measures to achieve longitudinal watertightness along insulation screen no

Inner coverings and fillers

- material Polypropylene fillers & Polyester tape binder

Separation sheath

- material PVC, type ST₂
- nominal thickness 2,5 mm
- manufacturer of the material YASH POLYMERS

Metallic armour

- material GS round wires
- number of wires 73
- nominal diameter of wires 4 mm
- cross-sectional area 917 mm²
- manufacturer of the material BEDMUTHA

Oversheath

- material PVC, type ST₂
- nominal thickness 4,8 mm
- nominal overall diameter of the cable (D) 121,42 mm
- manufacturer of the material YASH POLYMERS
- colour black
- graphite coating applied no

Fire retardant (according to IEC 60332-1) no

Manufacturing details insulation system

- location of manufacturing Vadodara, Gujarat, India
- type of extrusion line CCV
- type of extrusion Triple extrusion
- factory identification of extrusion line EPL-50 Maillefer
- manufacturer of the extrusion line Maillefer, Finland
- identification of production batch Cable UID no.2946
- curing means Dry curing
- cooling means Dry cured water cooled
- manufacturing length (where cable sample for testing has been taken from) 200 m
- length markings on cable sample sent to KEMA begin: 0002 m, end: 0062m

1.3 List of drawings

The manufacturer has guaranteed that the object submitted for tests has been manufactured in accordance with the following drawing and/or document. KEMA has verified that this drawing and/or document adequately represents the object tested. The manufacturer is responsible for the correctness of this drawing and/or document and the technical data presented.

The following drawing and/or document have been included in this report:

Drawing no./document no.
XLPE/3 /W / KEMA

Revision
Rev 0

2 GENERAL INFORMATION

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

2.1 The tests were carried out by

Name	Company
Mr A. Sengers	KEMA Nederland B.V.,
Mr E. Pultrum	Arnhem, The Netherlands

2.2 Subcontracting

The following tests were subcontracted to DNV KEMA New Energy Technology (NET):

- measurement of resistivity of semi-conducting screens in accordance with Sub clause 18.1.9.
- non-electrical type tests in accordance with Clause 19.
- check of cable constructions in accordance with clauses 5-14 of IEC 60502-2.

2.3 Purpose of the tests

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

2.4 Measurement uncertainty

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

3 ELECTRICAL TYPE TESTS

3.1 Test arrangement

3.1.1 Determination of the cable conductor temperature

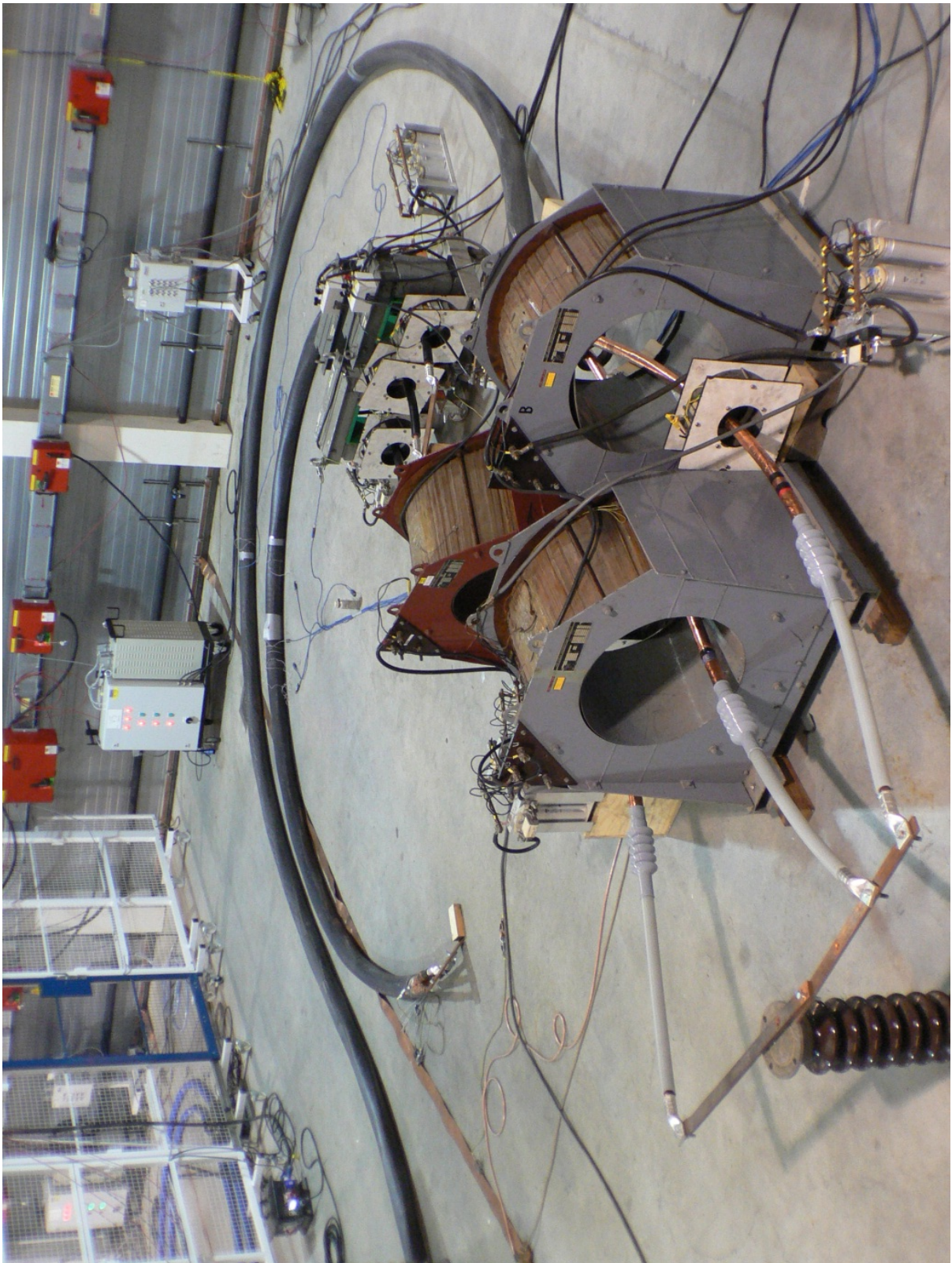
Standard

Standard IEC 60840, Annex A, Subclause A.3.1 was used as a guide

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 loop was installed close to the test loop in order to create the same environmental conditions, thus the conductor temperature of the reference loop is representative for the conductor temperature of the test loop. IEC 60840, Annex A was used as a guide and IEC 60840, Subclause A.3.1, method 1 was applied.

The tests at elevated temperature are carried out two hours after thermal equilibrium has been established.

3.1.2 Photograph of test set-up



3.2 Bending test

Standard and date

Standard IEC 60502-2, Subclause 18.1.3

Test date 10 October 2013

Environmental conditions

Ambient temperature 12 °C

Characteristic test data

Temperature of test object 12 °C

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

Length of cable bended 21 m

Actual external diameter of cable D (mm)	Actual diameter of conductor d (mm)	Required bending diameter D _r (mm)	Diameter of test cylinder D _t (mm)
125,5	26,8	$2056 \leq D_r \leq 2399$	2200

Result

The test was carried out successfully.

3.3 Partial discharge test

Standard and date

Standard IEC 60502-2, Subclause 18.1.4

Test date 23 October 2013

Environmental conditions

Ambient temperature 21 °C

Characteristic test data

Temperature of test object 21 °C

Circuit direct

Calibration 5 pC

Noise level at 1,73 U_0 < 2 pC

Sensitivity 4 pC

Required sensitivity ≤ 5 pC

Centre frequency 140 kHz

Bandwidth 100 kHz

Test frequency 50 Hz

Coupling capacitor 2600 pF

Core	Voltage applied, 50 Hz		Duration (s)	Partial discharge level (pC)
	... x U_0	(kV)		
red	2	36	10	-
	1,73	31,1	-	Not detectable
yellow	2	36	10	-
	1,73	31,1	-	Not detectable
blue	2	36	10	-
	1,73	31,1	-	Not detectable

Requirement

There shall be no detectable discharge exceeding the declared sensitivity from the test object at 1,73 U_0 .

Result

The object passed the test.

3.4 Tan δ measurement

Standard and date

Standard IEC 60502-2, Subclause 18.1.5

Test date 29 October 2013

Environmental conditions

Ambient temperature 21 °C

Characteristic test data

Temperature of test object 97 °C

Length of test object 18,93 m

Standard capacitor 100 pF

Core	Voltage applied, 50 Hz (kV)	Capacitance of core ¹⁾ (μ F/km)	Tan δ
1, 2 and 3	5	0,399	$7,6 \times 10^{-4}$
¹⁾ for information only			

RequirementThe measured value shall not be higher than $40 \times 10^{-4} \geq 2$ kV.**Result**

The object passed the test.

3.5 Heating cycle test

Standard and date

Standard IEC 60502-2, Subclause 18.1.6
 Test dates 30 October to 10 November 2013

Environmental conditions

Ambient temperature 20 °C

Characteristic test data

Heating method conductor current
 Stabilized temperature 97 °C

No. of heating cycles	Required steady conductor temperature (°C)	Heating current during steady condition (A)	Heating cycle		Cooling cycle
			Total duration (h)	Duration of conductor at steady temperature (h)	Total duration (h)
20	95-100	approx.877	5	2	6

Result

The object passed the test.

3.6 Partial discharge test

Standard and date

Standard IEC 60502-2, Subclause 18.1.4

Test date 11 November 2013

Environmental conditions

Ambient temperature 20 °C

Characteristic test data

Temperature of test object 22 °C

Circuit direct

Calibration 5 pC

Noise level at 1,73 U_0 < 2,5 pC

Sensitivity 5 pC

Required sensitivity ≤ 5 pC

Centre frequency 123 kHz

Bandwidth 100 kHz

Test frequency 50 Hz

Coupling capacitor 2600 pF

Core	Voltage applied, 50 Hz		Duration (s)	Partial discharge level (pC)
	... x U_0	(kV)		
red	2	36	10	-
	1,73	31,1	-	Not detectable
yellow	2	36	10	-
	1,73	31,1	-	Not detectable
blue	2	36	10	-
	1,73	31,1	-	Not detectable

Requirement

There shall be no detectable discharge exceeding the declared sensitivity from the test object at 1,73 U_0 .

Result

The object passed the test.

3.7 Impulse test

Standard and date

Standard IEC 60502-2, Subclause 18.1.7

Test date 14 November 2013

Environmental conditions

Ambient temperature 20 °C

Characteristic test data

Temperature of test object 97 °C

Specified test voltage 170 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

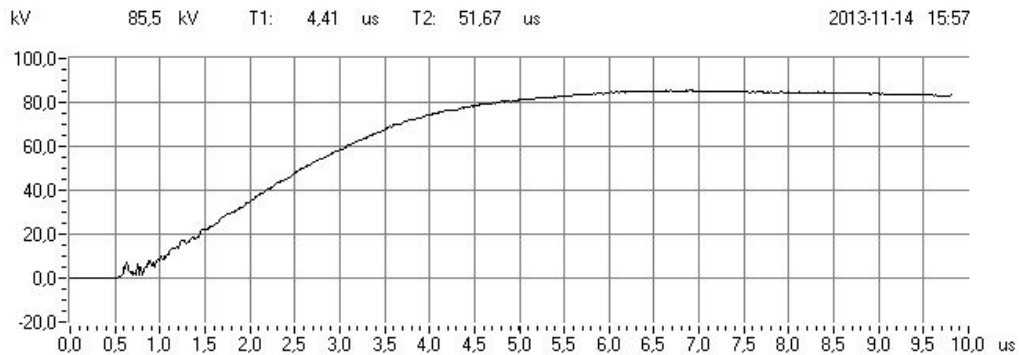


Fig. 1: Waveshape 72121658, KEC, +50%

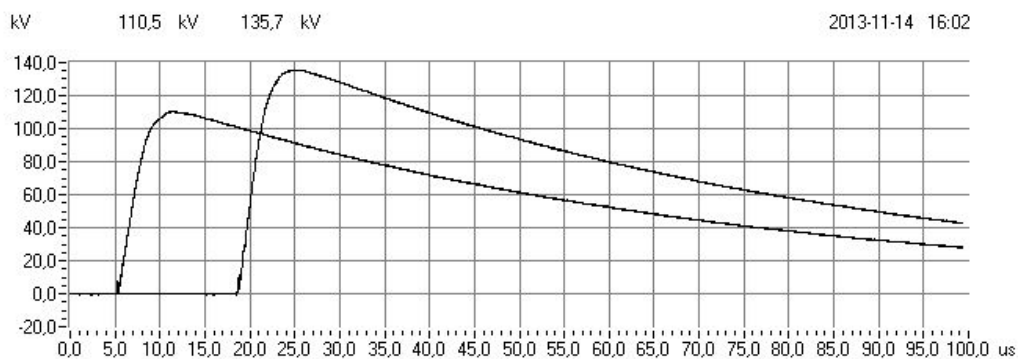


Fig. 2: 72121658, KEC, +65% and +80%

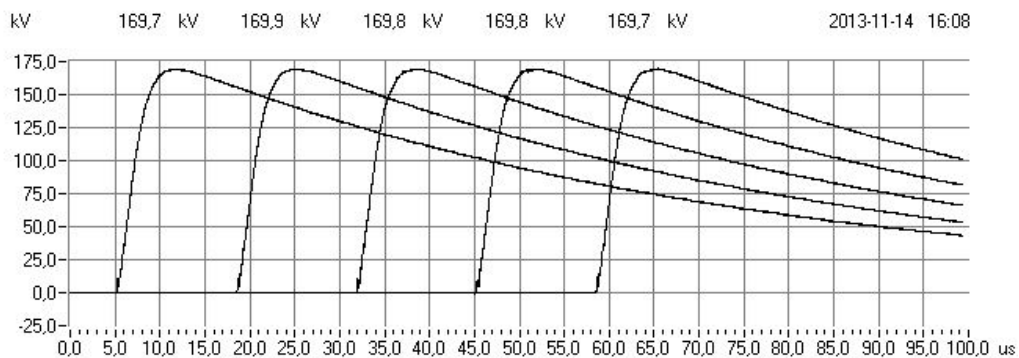


Fig. 3: 72121658, KEC, +100%

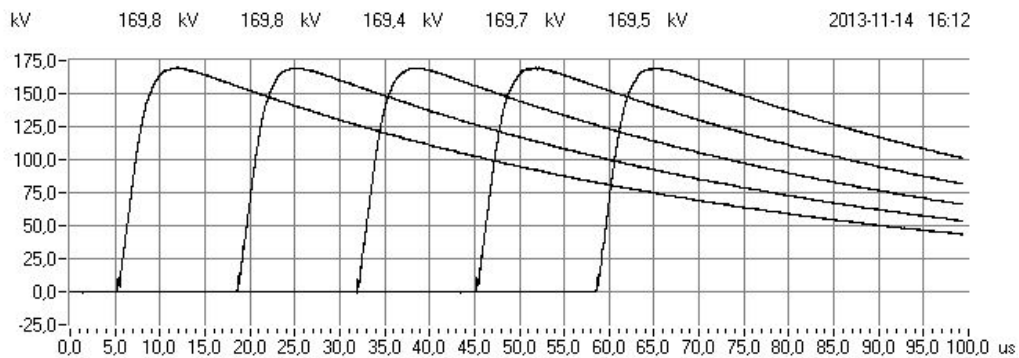


Fig. 4: 72121658, KEC, +100%

Lightning impulse test with negative voltage

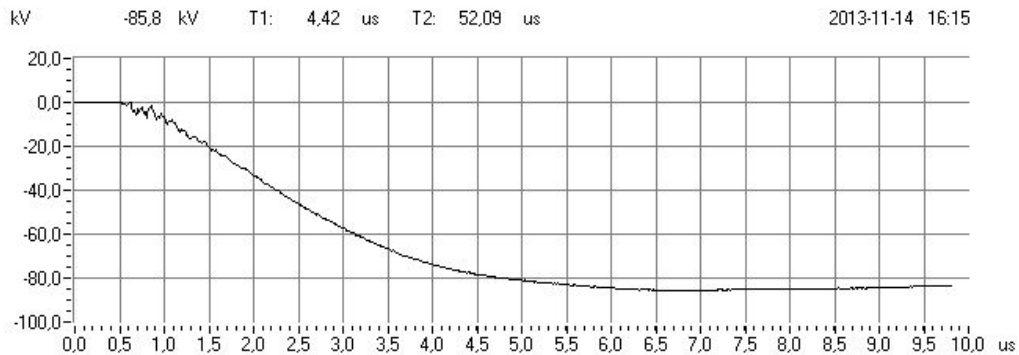


Fig. 5: Waveshape 72121658, KEC, -50%

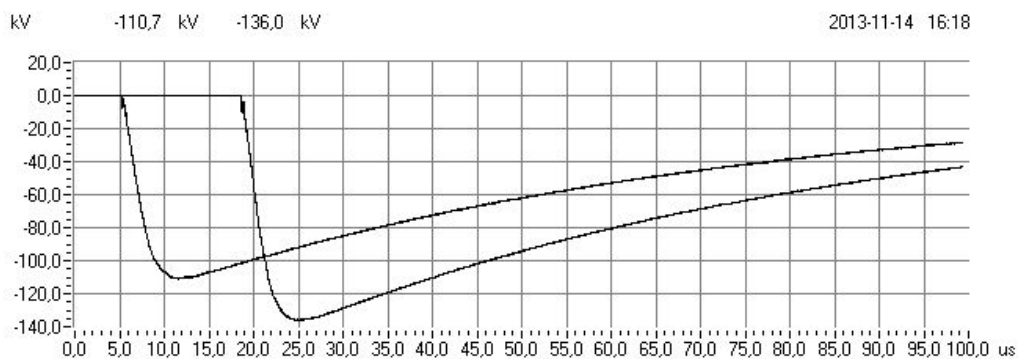


Fig. 6: 72121658, KEC, -65% and -80%

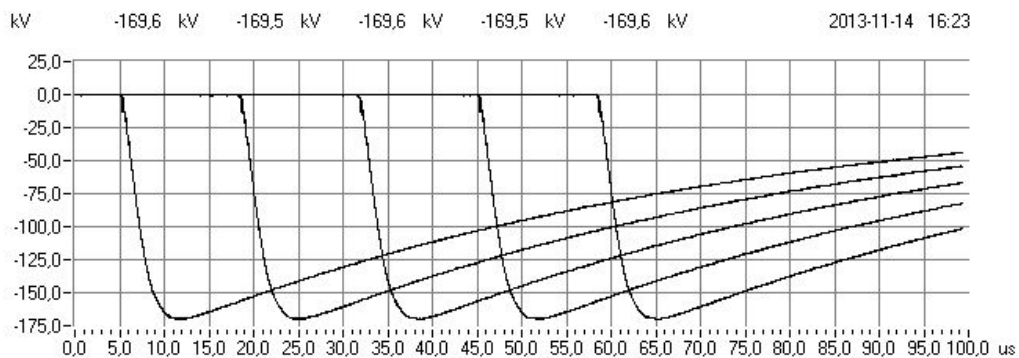


Fig. 7: 72121658, KEC, -100%

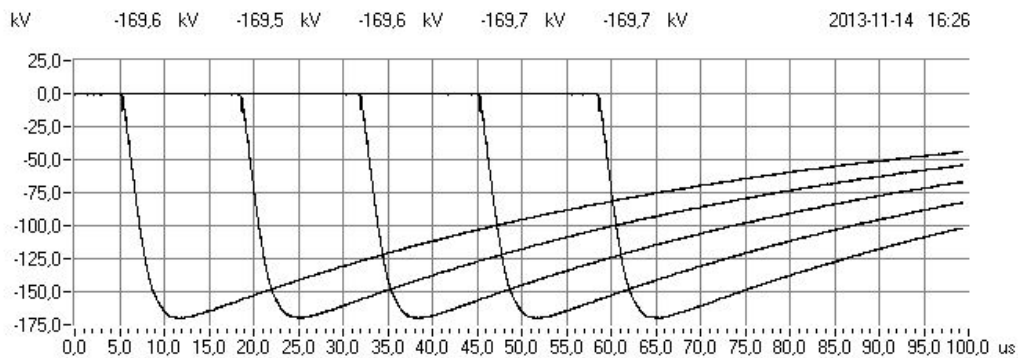


Fig. 8: 72121658, KEC, -100%

3.8 Voltage test for 15 min

Standard and date

Standard IEC 60502-2, Subclause 18.1.7

Test date 15 November 2013

Environmental conditions

Ambient temperature 20 °C

Characteristic test data

Temperature of test object 20 °C

Testing arrangement		Voltage applied, 50 Hz		Duration (min)
Voltage applied to	Earth connected to	... x U_0	(kV)	
Conductors	Metal screens	3,5	63	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 18.1.8

Test date 15 November 2013

Environmental conditions

Ambient temperature 20 °C

Characteristic test data

Temperature of test object 20 °C

Testing arrangement		Voltage applied, 50 Hz		Duration (h)
Voltage applied to	Earth connected to	... x U_0	(kV)	
Conductors	Metal screens	4	72	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 18.1.9

Test date 21 November 2013

Characteristic test data

Temperature during ageing 100 °C

Duration 7 days

Resistivity measured at 90 ± 2 °C

Item	Unit	Requirement	Measured/determined		
			Red	Yellow	Blue
Conductor screen					
– without ageing	Ωm	≤ 1000	0,44	0,32	0,49
– after ageing	Ωm	≤ 1000	1,07	0,88	0,68
Insulation screen					
– without ageing	Ωm	≤ 500	14,20	13,79	11,95
– after ageing	Ωm	≤ 500	38,64	28,37	40,08

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 19.1

Test date 19 November

Item	Unit	Requirement	Specified	Measured/determined		
				Red	Yellow	Blue
Nominal	mm	-	8,00	-	-	-
Average	mm	-	-	8,09	8,09	8,18
Minimum [t_{min}]	mm	$\geq 7,10$	7,10	7,85	7,85	8,06
Maximum [t_{max}]	mm	-	-	8,48	8,38	8,34
$(t_{max} - t_{min}) / t_{max}$	-	$\leq 0,15$	-	0,07	0,06	0,03

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 19.2

Test date 8 November 2013

Separation sheath thickness

Thickness	Unit	Requirement	Specified	Measured/determined
Nominal	mm	$\geq 1,2$	2,50	-
Average	mm	-	-	3,28
Minimum	mm	$\geq 1,80$	-	2,76

Oversheath thickness

Thickness	Unit	Requirement	Specified	Measured/determined
Nominal	mm	$\geq 1,80$	4,80	-
Average	mm	-	-	6,74
Minimum	mm	$\geq 3,64$	$\geq 3,64$	6,02

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 19.3

Test dates 8 to 15 November 2013

Characteristic test data

Temperature during aging $135 \pm 3 \text{ }^{\circ}\text{C}$

Ageing duration 7 days

Item	Unit	Requirement	Measured/determined		
			Red	Yellow	Blue
Without ageing					
Tensile strength	N/mm ²	$\geq 12,5$	33,9	34,1	33,6
Elongation at break	%	≥ 200	652	716	609
After ageing in air oven					
Tensile strength					
– value after ageing	N/mm ²	-	32,9	30,5	31,9
– variation	%	$\pm 25 \text{ max.}$	-3	-11	-5
Elongation at break					
– value after ageing	%	-	610	599	631
– variation	%	$\pm 25 \text{ max.}$	-6	-16	4

Result

The object passed the test.

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

Standard and date

Standard IEC 60502-2, Subclause 19.4

Test dates 8 to 15 November 2013

Characteristic test data

Temperature during aging $100 \pm 2 \text{ }^{\circ}\text{C}$

Ageing duration 7 days

Separation sheath

Item	Unit	Requirement	Measured/determined
Without ageing			
Tensile strength	N/mm ²	$\geq 12,5$	17,0
Elongation at break	%	≥ 150	172
After ageing in air oven			
Tensile strength			
– value after ageing	N/mm ²	$\geq 12,5$	18,4
– variation	%	$\pm 25 \text{ max.}$	9
Elongation at break			
– value after ageing	%	≥ 150	180
– variation	%	$\pm 25 \text{ max.}$	5

Oversheath

Item	Unit	Requirement	Measured/determined
Without ageing			
Tensile strength	N/mm ²	$\geq 12,5$	18,0
Elongation at break	%	≥ 150	157
After ageing in air oven			
Tensile strength			
– value after ageing	N/mm ²	$\geq 12,5$	17,9
– variation	%	$\pm 25 \text{ max.}$	-0
Elongation at break			
– value after ageing	%	≥ 150	155
– variation	%	$\pm 25 \text{ max.}$	-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 19.5

Test dates 8 to 15 November 2013

Characteristic test data

Temperature during aging $100 \pm 2 \text{ }^{\circ}\text{C}$

Ageing duration 7 days

Insulation

Item	Unit	Requirement	Measured/determined		
			Red	Yellow	Blue
Tensile strength					
– value after ageing	N/mm ²	-	31,9	31,9	32,4
– variation	%	$\pm 25 \text{ max.}$	-6	-7	-4
Elongation at break					
– value after ageing	%	-	655	611	651
– variation	%	$\pm 25 \text{ max.}$	1	-15	7

Separation sheath

Item	Unit	Requirement	Measured/determined
Tensile strength			
– value after ageing	N/mm ²	$\geq 12,5$	16,9
– variation	%	$\pm 25 \text{ max.}$	0
Elongation at break			
– value after ageing	%	≥ 150	209
– variation	%	$\pm 25 \text{ max.}$	22

Oversheath

Item	Unit	Requirement	Measured/determined
Tensile strength			
– value after ageing	N/mm ²	$\geq 12,5$	18,9
– variation	%	$\pm 25 \text{ max.}$	5
Elongation at break			
– value after ageing	%	≥ 150	167
– variation	%	$\pm 25 \text{ max.}$	6

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 19.6

Test dates 1 to 8 November 2013

Characteristic test data

Temperature treatment 100 ± 2 °C

Duration 7 days

Separation sheath

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

Oversheath

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

Result

The object passed the test.

4.7 Pressure test at high temperature non-metallic sheaths

Standard and date

Standard IEC 60502-2, Subclause 19.7

Test dates 11 and 12 November 2013

Characteristic test data sheaths PVC ST₂

Temperature 90 ± 2 °C

Heating time 6 hours

Load 17,6 N

Separation sheath

Item	Unit	Requirement	Measured/determined
Depth of Indentation	%	≤ 50	24,8

Characteristic test data sheaths PE ST₂

Temperature 90 ± 2 °C

Heating time 6 hours

Load 28,2 N

Oversheath

Item	Unit	Requirement	Measured/determined
Depth of indentation	%	≤ 50	16,7

Result

The object passed the test.

4.8 Test on PVC separation sheaths at low temperature

Standard and date

Standard IEC 60502-2, Subclause 19.8

Test dates 11 to 19 November 2013

Characteristic test data PVC ST₂

Temperature $-15 \pm 2 \text{ }^{\circ}\text{C}$

Cooling time $\geq 16 \text{ h}$

Mass of hammer 1500 g

Inner sheath/ separation sheath

Item	Unit	Requirement	Measured/determined
Cold elongation test	%	≥ 20	90
Cold impact test	-	No cracks	No cracks

Result

The object passed the test.

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

Standard and date

Standard IEC 60502-2, Subclause 19.9

Test date 7 November 2013

Characteristic test data

Temperature $150 \pm 3 \text{ }^{\circ}\text{C}$
Duration 1 h
Diameter of mandrel 8 mm
Number of turns 4

Inner sheath/separation sheath

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

Characteristic test data

Temperature $150 \pm 3 \text{ }^{\circ}\text{C}$
Duration 1 h
Diameter of mandrel 10 mm
Number of turns 2

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 19.11

Test date 5 November 2013

Characteristic test data

Air temperature 200 ± 3 °C

Time under load 15 min

Mechanical stress 20 N/cm²

Insulation

Item	Unit	Requirement	Measured/determined		
			Red	Yellow	Blue
Elongation under load	%	≤ 175	49	58	54
Permanent elongation after cooling	%	≤ 15	-1	-3	-3

Result

The object passed the test.

4.11 Water absorption test on insulation

Standard and date

Standard IEC 60502-2, Subclause 19.13

Test dates 4 to 22 November 2013

Characteristic test data XLPE

Temperature of water $85 \pm 2 \text{ }^{\circ}\text{C}$

Duration 336 h

Test method Gravimetric

Insulation

Item	Unit	Requirement	Measured/determined		
			Core red	Core yellow	Core blue
Increase of mass	mg/cm ²	≤ 1	0,01	0,03	0,01

Result

The object passed the test

4.12 Flame spread on single cables

Standard and date

Standard IEC 60502-2, Subclause 19.14

Test date 11 November 2013

Characteristic test data

Overall diameter of test piece 124,84 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	352
The distance between the lower edge of the top support and charring extends downwards to a point	mm	≤ 540	503

Result

The object passed the test.

4.14 Shrinkage test for XLPE insulation

Standard and date

Standard IEC 60502-2, Subclause 19.16

Test date 5 November 2013

Characteristic test data

Temperature 130 ± 3 °C

Duration 1 h

Distance between marks 200 mm

Insulation

Item	Unit	Requirement	Measured/determined		
			Red	Yellow	Blue
Shrinkage	%	≤ 4	1,8	1,6	1,6

Result

The object passed the test.

4.15 Strippability test for insulation screen

Standard and date

Standard IEC 60502-2, Subclause 19.21

Test date 18 November 2013

Item	Unit	Requirement	Measured		
			Red	Yellow	Blue
Before ageing	N	$4 \leq F \leq 45$	32 – 25 – 28	22 – 27 – 29	22 – 23 – 24
After ageing	N	$4 \leq F \leq 45$	15 – 13 – 11	12 – 11 – 10	10 – 11 – 9

Result

The object passed the test

5 CHECK OF CABLE CONSTRUCTION

Standard and date

Standard IEC 60502-2, Subclause 5-14

Test dates 1 to 8 November 2013

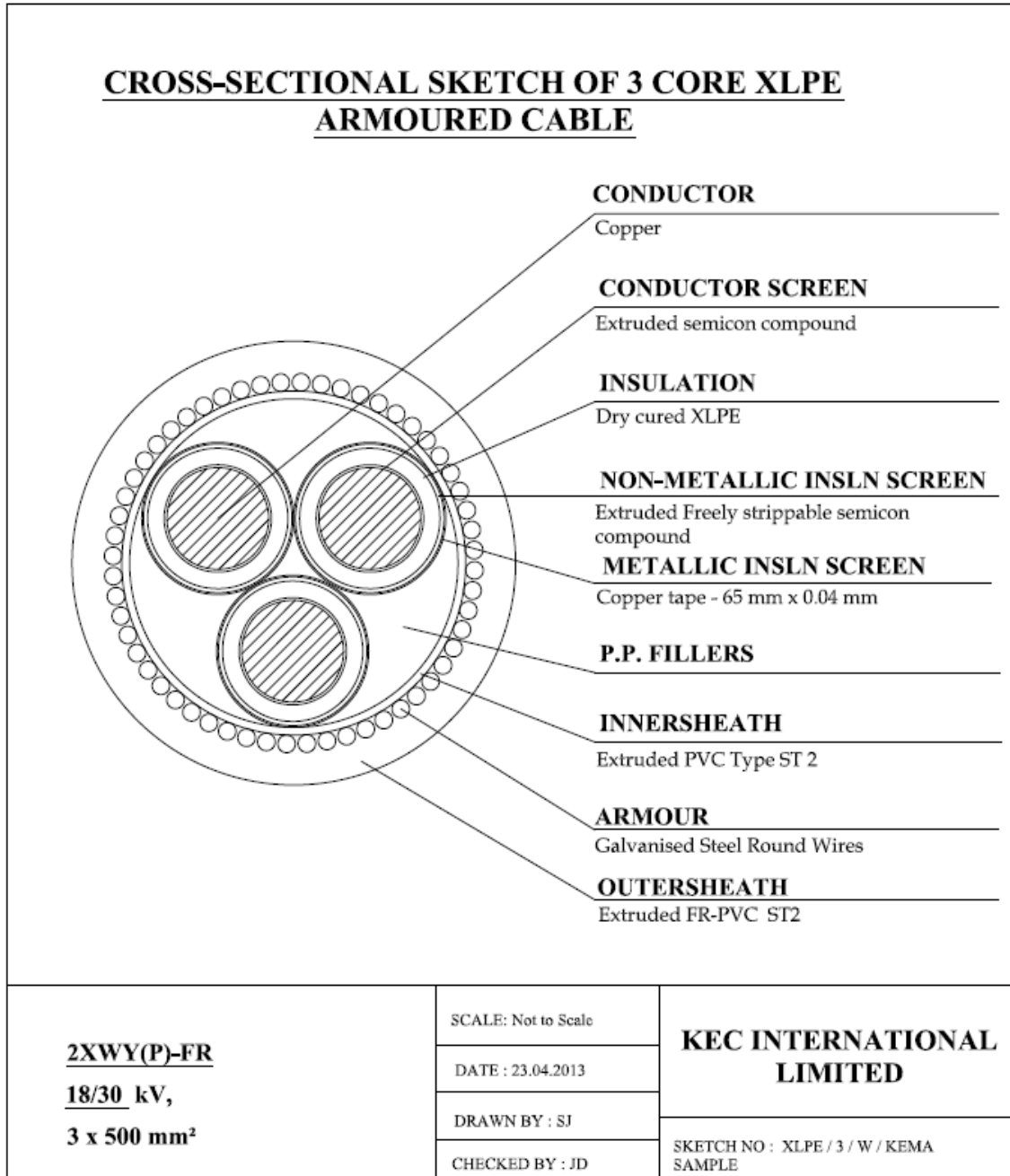
Item	Unit	Requirement	Specified	Measured/determined		
				Core red	Core yellow	Core blue
Conductor						
Diameter of conductor (d)	mm	$25,3 \leq d \leq 27,6$	26,80	26,50	26,50	26,48
Number of wires	-	≥ 53	-	55	55	55
Diameter of wires	mm	-	-	3,23	3,19	3,22
Resistance at 20 °C	Ω/km	$\leq 0,0366$	-	0,03648	0,03659	0,03650
Conductor screen						
Diameter over conductor screen	mm	-	-	27,58	27,45	27,46
Thickness	mm	$\geq 0,3$	-	0,53	0,45	0,42
Insulation						
Diameter over insulation	mm	-	-	43,94	43,77	43,92
Thickness	mm	$\geq 7,10$	8,0	8,09	8,09	8,18
Insulation screen						
Diameter over insulation screen	mm	-	-	45,84	45,84	45,84
Thickness	mm	$\geq 0,6$	-	0,65	0,63	0,72
Metallic screen						
Overlap	%	-	10	17	15	19
Thickness x width of tape	mm	-	65 x 0,04	64,43 x 0,05	64,30 x 0,04	64,01 x 0,04
Fillers			Polypropylene fillers & polyester tape binder			
Inner/separation sheath						
Diameter over innersheath	mm	-	-	97,77		
Thickness	mm	-	2,50	3,275		
Metallic armour						
Number of wires	-	-	73	73		
Diameter	mm	-	4,00	3,91		
Tape						
Thickness x width of tape	mm		-	61,90 x 0,10		
overlap	%		-	40		
Number of layers			-	3		

Item	Unit	Requirement	Specified	Measured/determined
Oversheath				
Diameter over oversheath	mm	-	121,42	124,84
Thickness	mm	-	4,80	6,74
Colour	-	-	black	black
Embossing on the cable	KEC INTL LTD RPG CABLES 18/30(36)kV ELECTRIC CABLE 3x500mm ² XLPE 2XWY(P) FR 2013			

Result

The object passed the test.

6 DRAWING



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	$\leq 3\%$
– 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 to 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 to 5 $\mu\Omega$	1%
– 5 to 10 $\mu\Omega$	0,5%
– 10 to 200 $\mu\Omega$	0,2%
Radio interference test	2 dB
Calibration of current transformers	$2,2 \times 10^{-4} I_i/I_u$ and 290 μrad
Calibration of voltage transformers	$1,6 \times 10^{-4} U_i/U_u$ 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%