REPORT OF PERFORMANCE

TIC 1616-11

OBJECT	4-core power cable
TYPE	0,6/1 kV, 4x120 mm^2 CU/XLPE/SWA/PVC
MANUFACTURER	National Cable Industry-Sharjah, U.A.E., Sharjah, U.A.E.
CLIENT	National Cable Industry-Sharjah, U.A.E., Sharjah, U.A.E.
TESTED BY	KEMA HIGH-VOLTAGE LABORATORY Arnhem, The Netherlands
DATES OF TESTS	29 September 2011 until 21 October 2011
TEST PROGRAMME	Type tests are in accordance with IEC 60502-1 (2004) including Amendment 1 (2009).
SUMMARY AND CONCLUSION	The object passed the tests.

This Report of Performance 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 report consists of 28 pages in total.

KEMA Nederland B.V.

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

Arnhem, 20 December 2011

TABLE OF CONTENTS

1 IDENTIFICATION OF THE TEST OBJECT

1.1 Description of the test object

Manufacturer	NATIONAL CABLE INDUSTRY-SHARJAH, U.A.E.
Type	0,6/1 kV, 4x120 mm^2 CU/XLPE/SWA/PVC
Year of manufacture	2011
Test according to standard(s)	IEC 60502-1
Rated voltage, U_0/U (U_m)	0,6/1 (1,2) kV
No. of cores	4
Marking on the cable	KAHRAMAA QATAR, 600/1000 VOLTS, 4X120MM2 CU/XLPE/SWA/PVC, IEC 60502, NATIONAL CABLES INDUSTRY, UAE, “year”

Conductor

- material	Copper
- cross-section	120 mm^2
- approx. dimensions	12,2 x 17,0 mm
- type/shape of conductor	sector shaped
- maximum conductor temperature in normal operation	90 °C

Insulation

- material	XLPE
- nominal thickness	1,2 mm
- material designation	known in KEMA's file
- material supplier	known in KEMA's file
- core identification	red, yellow, blue, black

Inner covering

- type	extruded
- material	PVC
- nominal thickness	1,4 mm
- material supplier	known in KEMA's file

Binder tape

- approx. dimensions	0,1 mm Thickness (Approx.)

Metallic armour

- material	Galvanised Steel Wires + Tinned Copper Wires
- number and nominal diameter of wires (in case of wires)	Galvanised Steel Wires = 30x 2,5 mm Tinned Copper Wires = 13 x 2.5 mm
- cross-sectional area	Galvanised Steel Wires = 147,3 mm² Tinned Copper Wires = 63,8 mm²
- material supplier	known in KEMA's file

Oversheath

- material	PVC, type ST_2
- nominal thickness	2,5 mm
- outer diameter of cable	approx. 49 mm
- material designation	known in KEMA's file
- material supplier	known in KEMA's file
- colour	black

Fire retardant: Yes, as per IEC 60332-1

Manufacturing details (of cable sent to KEMA for testing)

- location of manufacturing	Sharjah, U.A.E.
- factory identification of extrusion line	NEXTROM
- manufacturing of the extrusion line	NEXTROM
- identification of the production batch	# 319085; identification no. 50753498
- manufacturing length (where cable sample for testing has been taken from)	1000 m

1.2 List of documents

The manufacturer has guaranteed that the object submitted for tests has been manufactured in accordance with the following document.
KEMA has verified that this document adequately represents the object tested.

The following document is included in this report:

drawing no./ document no.	revision	date	title
0102Q42415R1	0	01.08.2011	cable drawing 4x120 mm^2 CU/XLPE/SWA/PVC

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 B. Vos	DEKRA Certification B.V., Arnhem, the Netherlands

2.3 Subcontracting

All tests were subcontracted to DEKRA Certification B.V.

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 CONDUCTOR

Standard and date

Standard IEC 60502-1 (2004) +A1 (2009), clause 5

Test date 29 September 2011

3.1 Measurement of the resistance of the conductors

item	unit	requirement	measured/determined			
			red	yellow	blue	black
- resistance	Ω/km	≤ 0,153	0,150	0,152	0,149	0,137

Result

The object passed the test.

3.2 Measurement of the number of wires of the conductors

item	unit	requirement	measured/determined			
			red	yellow	blue	black
- number of wires	-	≥ 18	37	37	37	37

Result

The object passed the test.

.

4 ELECTRICAL TYPE TESTS

4.1 Measurement of insulation resistance at ambient temperature

Standard and date

Standard IEC 60502-1 (2004) +A1 (2009), clause 17.1
Test date 5 October 2011

item	unit	requirement	measured/determined			
			red	yellow	blue	black
volume resistivity, ρ at 20 °C	Ω.cm	–	1,5 x10^{16}	6,5 x10^{15}	6,5 x10^{15}	6,6 x10^{15}
insulation resistance constant, K_i at 20 °C	MΩ.km	–	55521	23690	236903	241631

Result

The test results are for information only.

4.2 Measurement of insulation resistance at max. conductor temperature in normal operation

Standard and date

Standard IEC 60502-1 (2004) +A1 (2009), clause 17.2

Test date 6 October 2011

item	unit	requirement	measured/determined			
			red	yellow	blue	black
volume resistivity, ρ at 90 °C	Ω.cm	≥ 10^{12}	1,5 x10^{16}	1,0 x10^{16}	1,2 x10^{16}	7,3 x10^{15}
insulation resistance constant, K_i at 90 °C	MΩ.km	≥ 3,67	55521	36641	43748	26740

Result

The object passed the test.

4.3 Voltage test for 4 h

Standard and date

Standard IEC 60502-1 (2004) +A1 (2009), clause 17.3
Test date 29 September 2011

Environmental conditions

Temperature 20 ± 2 °C

applied voltage (kV)	frequency (Hz)	duration (h)	measured/determined
2,4	50	4	no breakdown

Requirement

No breakdown of the insulation shall occur.

Result

The object passed the test.

5 NON-ELECTRICAL TYPE TESTS

5.1 Measurement of thickness of insulation

Standard and date

Standard IEC 60502-1 (2004) +A1 (2009), clause 18.1
Test date 5 October 2011

insulation thickness	unit	requirement	specified	measured/determined			
				red	yellow	blue	black
- nominal	mm	≥ 1,2	1,2	-	-	-	-
- average	mm	-	-	1,9	1,7	1,8	1,8
- minimum (t_m)	mm	≥ 0,98	-	1,51	1,53	1,53	1,50

Result

The object passed the test.

5.2 Measurement of thickness of non-metallic sheaths

Standard and date

Standard IEC 60502-1 (2004) +A1 (2009), clause 18.2
Test date 5 October 2011

Oversheath

thickness	unit	requirement	specified	measured/determined
- nominal	mm	≥ 1,8	2,5	-
- average	mm	-	-	3,1
- minimum (t_{min})	mm	≥ 1,8	1,8	2,86

Inner sheath

thickness	unit	requirement	specified	measured/determined
- nominal	mm	-	1,4	-
- average	mm	-	-	1,7
- minimum (t_{min})	mm	-	0,92	1,50

Result

The object passed the test.

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

Standard and date

Standard IEC 60502-1 (2004) +A1 (2009), clause 18.3
Test period 6 October 2011 until 14 October 2011

Characteristic test data

Temperature during ageing 135 ±3 °C
Duration 7 days

item	unit	requirement	measured/determined			
			red	yellow	blue	black
without ageing						
- tensile strength	N/mm²	≥ 12,5	26,3	24,4	28,2	25,7
- elongation	%	≥ 200	608	572	561	608
after ageing						
- tensile strength	N/mm²	-	26,0	26,7	28,1	28,1
- variation with samples without ageing	%	± 25 max.	-1	9	1	9
- elongation	%	-	588	568	577	600
- variation with samples without ageing	%	± 25 max.	-3	-1	3	-1

Result

The object passed the test.

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

Standard and date

Standard	IEC 60502-1 (2004) +A1 (2009), clause 18.4
Test period	6 October 2011 until 14 October 2011

Characteristic test data (oversheath)

Temperature during ageing	100 ± 2	°C
Duration	7	days

Oversheath

item	unit	requirement	measured/determined
without ageing			
- tensile strength	N/mm²	≥ 12,5	18,8
- elongation	%	≥ 125	213
after ageing			
- tensile strength	N/mm²	≥ 12,5	19,0
- variation with samples without ageing	%	± 25 max.	1
- elongation	%	≥ 150	207
- variation with samples without ageing	%	± 25 max.	-3

Result

The object passed the test.

5.5 Additional ageing test on pieces of completed cables

Standard and date

Standard	IEC 60502-1 (2004) +A1 (2009), clause 18.5
Test period	6 October 2011 until 14 October 2011

Characteristic test data

Temperature during ageing	100 ± 2	°C
Duration	7	days

Insulation

item	unit	requirement	measured/determined			
			red	yellow	blue	black
- tensile strength	N/mm²	-	23,9	20,9	25,0	23,2
- variation with samples without ageing	%	± 25 max.	-9	-14	-11	-10
- elongation	%	-	594	514	596	599
- variation with samples without ageing	%	± 25 max.	-2	-10	6	-1

Oversheath

item	unit	requirement	measured/determined
- tensile strength	N/mm²	-	18,8
- variation with samples without ageing	%	± 25 max.	0
- elongation	%	-	206
- variation with samples without ageing	%	± 25 max.	-3

Result

The object passed the test.

5.6 Loss of mass test on PVC sheaths of type ST_2

Standard and date

Standard	IEC 60502-1 (2004) +A1 (2009), clause 18.6
Test period	5 October 2011 until 14 October 2011

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	< 0,1

Result

The object passed the test.

5.7 Pressure test at high temperature on PVC non-metallic sheath

Standard and date

Standard	IEC 60502-1 (2004) +A1 (2009), clause 18.7
Test date	10 October 2011

Characteristic test data

Temperature during ageing	90 ± 2	°C
Duration	6	h
Load	17,8	N

Oversheath

item	unit	requirement	measured/determined
- depth of indentation	%	≤ 50	27

Result

The object passed the test.

5.8 Test on PVC sheath and halogen free sheaths at low temperatures

Standard and date

Standard	IEC 60502-1 (2004) +A1 (2009), clause 18.8
Test date	27 September 2011

Characteristic test data

Temperature	-15 ± 2	°C
Mass of hammer	1250	g

Oversheath

item	unit	requirement	measured/determined
- cold elongation	%	≥ 20	250
- cold impact test	-	no cracks	no cracks

Result

The object passed the test.

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

Standard and date

Standard	IEC 60502-1 (2004) +A1 (2009), clause 18.9
Test date	7 October 2011

Characteristic test data (oversheath)

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

Oversheath

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

Result

The object passed the test.

5.10 Hot set test for XLPE insulation

Standard and date

Standard IEC 60502-1 (2004) +A1 (2009), clause 18.11
Test date 7 October 2011

Characteristic test data

Temperature	200 ± 3	°C
Time under load	15	min
Mechanical stress	20	N/cm^2

item	unit	requirement	measured/determined			
			red	yellow	blue	black
- elongation under load	%	≤ 175	70	65	65	60
- permanent elongation	%	≤ 15	5	5	0	0

Result

The object passed the test.

5.11 Water absorption test on XLPE insulation

Standard and date

Standard	IEC 60502-1 (2004) +A1 (2009), clause 18.13
Test period	22 September 2011 until 11 October 2011

Characteristic test data

Temperature	85 ± 2	°C
Duration	14	days

item	unit	requirement	measured/determined			
			red	yellow	blue	black
- variation of mass	mg/cm^2	≤ 1	0,2	0,1	0,2	0,2

Result

The object passed the test.

5.12 Fire tests

5.12.1 Flame spread test on single cables

Standard and date

Standard	IEC 60502-1 (2004) +A1 (2009), clause 18.14.1 and IEC 60332-1
Test date	20 October 2011

Characteristic test data

Duration 240 s

item	unit	requirement	measured/determined
- length free of charring	mm	> 50	365
- downward limit charred surface	mm	< 540	505

Result

The object passed the test.

5.13 Shrinkage test for XLPE insulation

Standard and date

Standard	IEC 60502-1 (2004) +A1 (2009), clause 18.16
Test date	26 September 2011

Characteristic test data

Temperature	130 ±3	°C
Duration	1	h

item	unit	requirement	measured/determined			
			red	yellow	blue	black
- shrinkage	%	≤ 4	1	0	1	1

Result

The object passed the test.

6 VERIFICATION OF CABLE CONSTRUCTION

Verification of cable construction was carried out in accordance with clauses 5-13 of IEC 60502-1.
The results are presented below.

	observed/determined
Construction	- 4 copper conductors, sector shaped - construction: 1-6-12-18; wires ø 1,9 mm (approx.) - XLPE insulation - filling material (polypropylene yarns) - binder tape (polypropylene tape) - inner sheath (extruded PVC) - water blocking tape - metallic armour ; galvanised steel wires, 33 wires ø 2,5mm tinned copper wires, 12 wires ø 2,5mm - Steel galvanised tape (30 x 0,5 mm) - water blocking tape - PVC oversheath
outer diameter of the cable, average	53 mm (approx.)

Result

No deviations from the specified requirements are found.

APPENDIX A MEASUREMENT UNCERTAINTIES

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

measurement	measurement uncertainty
tensile strenght test	1%
measurement of dimensions	5 μm
measurement loss of mass	0,11 mg : 8,0 gr
measurement of conductor resistance	0,03% of measured value
measurement at low temperature	0,1 °C
measurment in heatingcabinets	0,1 °C
voltage test	2.10^{-3}.U + 20V 2.10^{-3}.I + 0,2%

APPENDIX B MANUFACTURER'S DRAWING(S)/DATA SHEET

2 pages (including this page)

drawing no./ document no.	revision	date	title
0102Q42415R1	0	01.08.2011	cable drawing 4x120 mm^2 CU/XLPE/SWA/PVC

Drawing No.: 0102Q42415R1 Rev. 0
Dated: 01.08.2011

TECHNICAL & QC DEPARTMENT

الوطنية لصناعة الكابلات
NATIONAL CABLES INDUSTRY

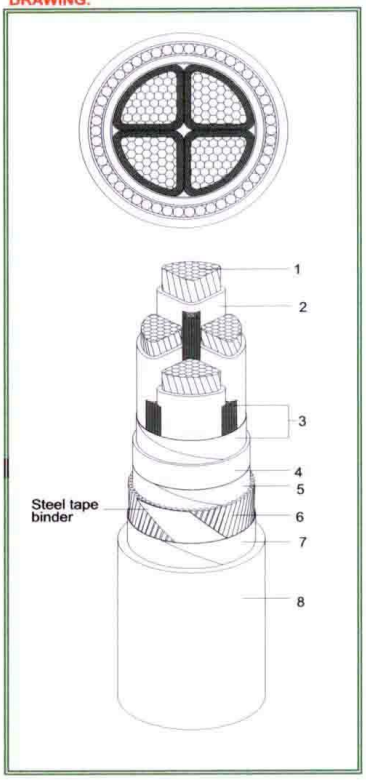
CABLE DRAWING

Cable size	: 4x120 MM²	Rated Voltage	: 0.6/1 (1.2) kV	Cable code:	0102Q42415R1
Cable Type	: CU/XLPE/SWA+TCW/PVC	Ref. Standards	: IEC 60502-1& KAHRAMAA : Version#5 Rev-0/2010	Spec no:	ED-03-040

DIMENSION DATA:

S.NO	DESCRIPTION	UNIT	OFFER DETAILS
1	**CONDUCTOR:**		
	Material		Copper
	Form of stranding		Sectoral shaped
	Approximate dimension	mm	12.2 x 17.0
	D.C. Resistance at 20°C	Ω/km	0.153
2	**INSULATION:**		
	Material		Extruded XLPE
	Nominal thickness	mm	1.2
	Approximate dimension	mm	14.6 x 19.4
	Colors		Red, Yellow, Blue, Black
3	**ASSEMBLY:**		
	Approximate diameter	mm	34.70
	Fillers		Polypropylene yarns
	Binding tape		Polypropylene tape
4	**INNER SHEATH:**		
	Material		Extruded PVC
	Nominal thickness	mm	1.4
	Approximate diameter	mm	37.50
5	**WATER BARRIER TAPES**		Non conductive water swellable tape
	Material		
	Nominal thickness	mm	0.15
	Approximate diameter	mm	38
6	**ARMOUR:**		Galvanized round steel wires + Tinned copper wires
	Material		
	Wire diameter	mm	2.5
	Approximate diameter	mm	43.00
	Steel tape binder nominal thickness	mm	0.3 (minimum)
7	**WATER BARRIER TAPES**		Non conductive water swellable tape
	Material		
	Nominal thickness	mm	0.15
	Approximate diameter	mm	43.3
8	**OUTER SHEATH:**		
	Material		Extruded PVC
	Nominal thickness	mm	2.5
	Approximate overall diameter	mm	49.0
	Color		Black

DRAWING:



***Note** : Water barrier tapes shall be applied under and over armour to prevent movement of water in transverse and longitudinal direction*

CABLE MARKING:

Embossing on the outer sheath in max 50 cm spacing in one line:

KAHRAMAA QATAR, 600/1000 VOLTS, 4x120MM², CU/XLPE/SWA/PVC, IEC 60502 NATIONAL CABLES INDUSTRY, U.A.E., 2011

PACKAGING:

Approximate weight of complete cable	: 7150 kg/km
Nominal cutting length	: 500 M ± 5%
Drum type	: Steel or Wooden
Drum dimensions (Approx.):	
• Outer diameter	: 2050 mm
• Outer width	: 1200 mm

All diameters and weights are approximate.

TECHNICAL & QC DEPT. NCI

Prepared by: *Checked by:* *Approved by:*

P.O.Box: 27472, Sharjah, U.A.E. ☎ Tel: 06-5311888 (8 Lines) 🖷 Fax: 06-5311577- CR: 35305 / IR: 506877
e-mail: n_c_i@emirates.net.ae website: www.nci.ae

SHARJAH ECONOMIC EXCELLENCE AWARD 2008
MOHAMMED BIN RASHID AL MAKTOUM BUSINESS AWARD
Gulf Excellance Award 2006

FORM # TE01/F06 Rev. 02