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TYPE TEST REPORT

NO. 3440.2100589.0742

National Cables Industry PO box 27472 Sharjah UNITED ARAB EMIRATES	**CLIENT**
National Cables Industry	**MANUFACTURER**
33 kV, 1 core, XLPE insulated, Cu wires + Cu tapes screened, laminated aluminium tape and PE sheathed (Cu/XLPE/LAT/PE) cable	**TEST OBJECT**
Cu/XLPE/LAT/PE, 1 x 500/35 mm², 33 kV	**TYPE**
Cable sample	**SERIAL NO.**
Rated voltage U_0/U 19/33 kV Highest system voltage U_m 36 kV	**RATED CHARACTERISTICS GIVEN BY THE CLIENT**
IEC 60502-2: 2005-03	**NORMATIVE DOCUMENT**
– Electrical type tests on cable – Non-electrical type tests on cable components and on complete cable	**RANGE OF TESTS PERFORMED**
August 2010 to October 2010	**DATE OF TEST**
The tests have been PASSED.	**TEST RESULT**

H. ZINNBAUER
Head of Centre of Competence
High-Power/High-Voltage

D. JEGUST
Test engineer in charge

Berlin, 16 November 2010

Contents **Sheet**

This test document comprises 32 sheets.

Distribution Copy No. 1

Copy No. 1 in English: National Cables Industry

1. Present at the test

Mr.	Jegust	IPH test engineer in charge
Mr.	Brose	IPH test engineer

2. Test performed

Electrical type tests on cable

Sequence of tests	Test	Step	Type of test
18.1	3		Bending test
	4		Partial discharge test at ambient temperature
	5		Tan δ measurement 5 °C to 10 °C above the maximum conductor temperature
	6	a	Heating cycle test
		b	Partial discharge test at ambient temperature
	7	a	Lightning impulse voltage test at elevated temperature
		b	Power frequency voltage test for 15 min
	8		Power-frequency voltage test for 4 h
	9		Resistivity of semi-conducting screens

Non-electrical type tests on cable components and on complete cable

Sequence of tests	Test	Step	Type of test
19	1		• Measurement of thicknesses of insulation
	3		• Tests for determining the mechanical properties of insulation before and after ageing
	4		• Tests for determining the mechanical properties of non-metallic sheaths before and after ageing
	5		• Additional ageing tests on pieces of complete cables
	7		• Pressure test at high temperature on insulations and non-metallic sheaths
	11		• Hot set test for XLPE insulations
	13		• Water absorption test on insulation
	15		• Measurement of carbon black content of black PE oversheaths
	16		• Shrinkage test for XLPE insulation
	20		• Shrinkage test for PE oversheaths
	22		• Water penetration test

3. Identity of test object

3.1 Technical data and charakteristics

The technical data and characteristics of the test object are defined by the following parameters and specified by the client.

Test object:	33 kV, 1 core, XLPE insulated, Cu wires + Cu tapes screened, laminated aluminium tape and PE sheathed (Cu/XLPE/Lat/PE) -cable		
Type:	1Cx500/35 MM², Cu/XLPE/LAT/PE, 33 kV		
Manufacturer:	National Cables Industry U.A.E		
Serial No.:	10502 m		
Year of manufacture:	2010		
Rated characteristics:	Rated voltage	U_0/U	19/33 kV
	Maximum value between two phase conductors	U_m	36 kV
	Cable		Single-core cable with extruded insulation, screened
	Cable marking		33000 VOLTS 1x500/35mm² CU/XLPE/LAT/PE PROPERTY of FEWA UAE NATIONAL CABLES INDUSTRY U.A.E. 2010
	Designation of manufacturer		NATIONAL CABLES INDUSTRY U.A.E. 2010
	Material of conductor		Cu
	Material of screen		Cu

3.2 Identity documents

The tests were carried out on a cable sample with markings type of cable, of manufacturer and as follows in two lines, turned 180°:

1. 33000 VOLTS 1x500/35mm² CU/XLPE/LAT/PE PROPERTY of FEWA UAE NATIONAL CABLES INDUSTRY U.A.E. 2010
2. Turned 45°: 10502 m
3. 33000 VOLTS 1x500/35mm² CU/XLPE/LAT/PE PROPERTY of FEWA UAE NATIONAL CABLES INDUSTRY U.A.E. 2010

The manufacturer confirms that the test object has been manufactured in compliance with the drawings given in this document. IPH did not verify this compliance in detail.
The identity of the test object is fixed by the following drawings and data submitted by the client:

Name of drawing	Drawing No.	Date of drawing	Author	Notes
33 kV, 1 core, XLPE insulated, Cu wires + Cu tapes screened, laminated aluminium tape and PE sheathed (Cu/XLPE/LAT/PE) cable	-	-	National Cables Industry	Sheet 32

Entry of test objects at IPH: 25 June 2010

4. Electrical type tests on cable

4.1 Bending test

4.1.1 Test laboratory

High-voltage test laboratory, high voltage hall 1

4.1.2 Normative document

IEC 60502-2: 2005-04, Sub-clause 18.1.3

4.1.3 Required test parameters

The bending diameter calculated acc. normative document $D \leq 25\ (d + D) \pm 5\ \%$.

4.1.4 Test arrangement

The test was carried out in IPH. The cable sample with a length of more than 10 m was three times bended around a test cylinder and unwound in each direction around the required test diameter at ambient temperature. For this, each sample part was bended and afterwards unwound and again bended and unwound in the opposite direction.

This test was witnessed by the IPH test engineer.

4.1.5 Test results

D = cable diameter in mm	d = conductor diameter in mm	Bending diameter in mm	Max. diameter in mm	Chosen diameter in mm
55,3	26,7	2050	2153	1750

4.1.6 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED.

4.2 Partial discharge test at ambient temperature

4.2.1 Test laboratory

High-voltage test laboratory, high voltage hall 2

4.2.2 Normative document

IEC 60502-2: 2005-04, Sub-clause 18.1.4

4.2.3 Test and measuring circuit

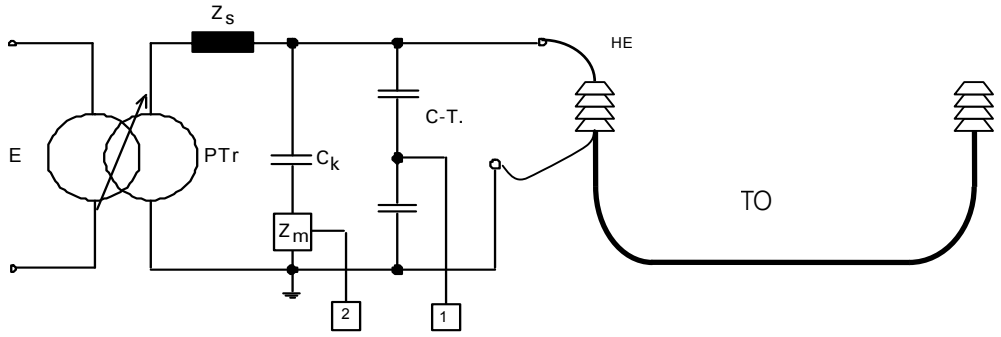
Technical data of test circuit

Test transformer:	Rated voltage	125	kV
	Rated power	100	kVA
	Rated frequency	50	Hz
	Damping resistance	0.67	kOhm

Technical data of measuring circuit

Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
1	Test voltage	Capacitive divider with MU11 peak voltmeter (made by TuRD)	Ratio 864
2	Partial discharges	- Coupling capacitor WMCF (made by TuRD) - Coupling quadripole COPL542A - MPD540 measuring station - 502 USB interface - CAL542 PD calibrator (made by mtronix)	C_k = 1 nF Band width = 300 MHz Centre frequency = 400 kHz Output 10 pC

Measuring circuit for partial discharge test



E Supply
PTr Test transformer with variable transformer connected in series
Z_s Blocking impedance
C_k Coupling capacitor
Z_m Coupling quadripole (measuring impedance)
C-T. Capacitive divider
HE Auxiliary sealing end
1, 2 Measuring points
TO Test object

4.2.4 Test results

calibration level at 5 pC.

Test voltage in kV	Noise level in pC	PD initiation in kV	PD at test voltage in pC	PD interruption in kV	Required sensitivity in pC
2 x U_0 =38*[1)] 1.73 x U_0 = 33	≤ 1,5	-	≤ 1,5	-	≤ 5

*1) Measured value during $2U_0$ = 38 kV for 10 sec
No internal partial discharge was detected

4.2.5 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED.

4.3 Tan δ measurement 5 °C to 10 °C above the maximum conductor temperature

4.3.1 Test laboratory

High-voltage test laboratory, high voltage hall 1

4.3.2 Normative document

IEC 60502-2: 2005-03, Sub-clauses 18.1.5

4.3.3 Test and measuring circuits

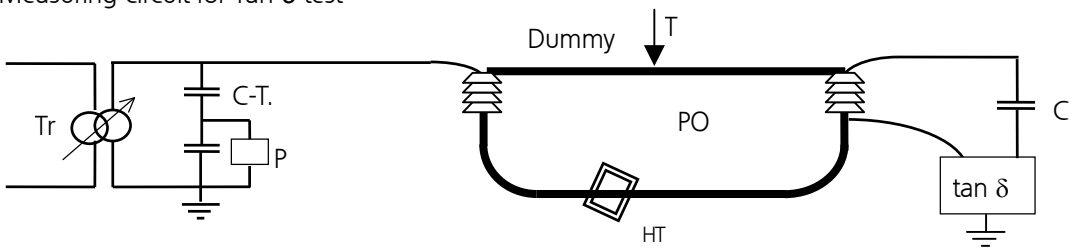
Technical data of test circuit

Test transformer:	Rated voltage	100	kV
	Rated power	100	kVA
	Rated frequency	50	Hz

Technical data of measuring circuit

Measured quantity	Measuring sensor/device	Technical parameters
Test voltage	HV divider (Haefely) Inv. No. 11228/6, Cal. No. 12315 MU11 peak voltmeter (TUR Dresden)	-
Tan δ	MWB measuring bridge Cal. No. 7524	-
Standard capacitor	Compressed gas capacitor Cal. No. 12314	C = 57.02 pF

Measuring circuit for Tan δ test



Tr	High-voltage test transformer with variable transformer		
C-T.	Capacitive divider		
P	Peak voltmeter	PO	Test object/cable, accessories
C	Standard capacitor	tan	Tan-δ measuring bridge
HT	Heating transformer	T	Temperature measurement

4.3.4 Test results

Test temperature: 97 °C

Test voltage	Measured tan δ	Tan δ required
6 kV	2×10^{-4}	$\leq 40 \times 10^{-4}$

4.3.5 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED.

4.4 Heating cycle test

4.4.1 Test laboratory

High-voltage test laboratory, high voltage hall 1

4.4.2 Normative document

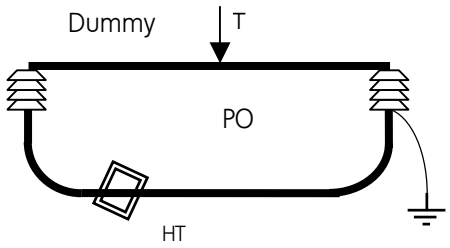
IEC 60502-2: 2005-03, Sub-clauses 18.1.6

4.4.3 Required test parameters

Heating cycle	at least 5 hours of conductor heating	
	Temperature maintained at least for 2 hours	95 °C – 100 °C
	At least 3 hours of cooling	
	Number of cycles	20

4.4.4 Test arrangement

Measuring circuit for heating cycle test



PO	Test circuit/cable	S	Copper screen
H T	Heating transformers	T	Temperature measurement

4.4.5 Test results

The test set-up was subjected to 20 heating cycles. The heating current was 1400 A.
During the cyclic load, the cable was heated to a minimum conductor temperature ranging from 95 °C to maximum 100 °C. The temperature was maintained constant for 2 hours. Subsequently, the cable was naturally cooled during 3 hours.
The conductor temperature was continuously checked at the dummy.

No breakdown on the insulation occurred during the heating cycle test.

4.4.6 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED.

4.5 Partial discharge test at ambient temperature

4.5.1 Test laboratory

High-voltage test laboratory, high voltage hall 1

4.5.2 Normative document

IEC 60502-2: 2005-03, Sub-clauses 18.1.6

4.5.3 Test and measuring circuit

See subclause 4.2.3

4.5.4 Test results

calibration level at 2 pC.

Test voltage in kV	Noise level in pC	PD initiation in kV	PD at test voltage in pC	PD interruption in kV	Required sensitivity in pC
2 x U_0 = 38*[1)] 1.73 x U_0 = 33	≤ 1	-	≤ 1	-	≤ 5

*1) Measured value during 2Uo 38 kV for 10 sec.
No internal partial discharge was detected

4.5.5 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED.

4.6 Lightning impulse voltage test at a elevated temperature

4.6.1 Test laboratory

High-voltage test laboratory, high voltage hall 1

4.6.2 Normative document

IEC 60502-2: 2005-03, Sub-clauses 18.1.7

4.6.3 Test and measuring circuit

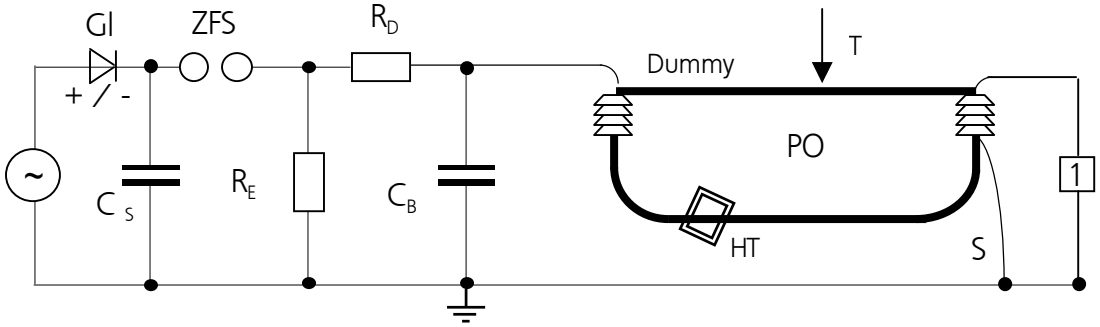
Technical data of test circuit

Impulse circuit:	Number of stages	n	=	1		
	Impulse capacitance	C_S	=	1000	nF	per range
	Loading capacitance	C_B	=	0	nF	
	Damping resistance	R_D	=	91	Ω	per range
	Discharge resistance	R_E	=	220	Ω	per range

Technical data of measuring circuit

Measured quantity	Measuring sensor/device	Technical parameters
Impulse voltage	Divider of CZ 2400 type HIAS 742	2400 kV Ratio 1774.4

Measuring circuit for lightning impulse voltage test



Gl	Rectifier
C_S	Impulse capacitance
ZFS	Spark gap
R_E	Discharge resistance
R_D	Damping resistance
C_B	Loading capacitance
PO	Test object
S	Copper screen
1	Measuring point/measurement

4.6.4 Test results

In the lightning impulse voltage test the conductor temperature was also measured using a thermal image (dummy)

Ten impulses of each polarity and of 1,2/50 µs (lightning impulse) waveform were applied. It was assured that temperature fell not below the minimum permissible conductor temperature of 95°C during the lightning impulse voltage test.

Full wave Front time 3.2 µs

Virtual time to half value 59 µs

Test voltage U_p	Lightning impulse voltage, positive polarity	Lightning impulse voltage, negative polarity	Number of impulses	Result
170 kV	x		10*1)	No disruptive, no discharge
		x	10*1)	

*1) See also attached diagrams of first und tenth impulse.

Non disruptive discharge occurred on the insulation during the impulse voltage test.

4.6.5 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED.

4.7 Power-frequency voltage test for 15 min

4.7.1 Test laboratory

High-voltage test laboratory, high voltage hall 2

4.7.2 Normative document

IEC 60502-2: 2005-03, Sub-clauses 18.1.7

4.7.3 Test and measuring circuit

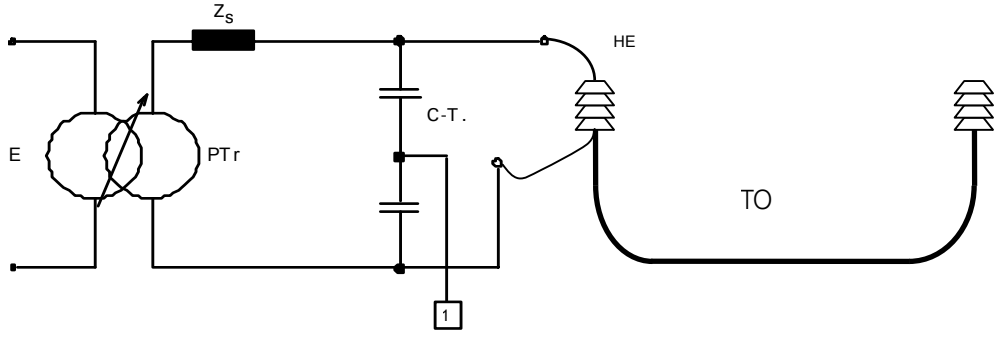
Technical data of test circuit

Test transformer:	Rated voltage	125	kV
	Rated power	100	kVA
	Rated frequency	50	Hz
	Damping resistance	0.67	kOhm

Technical data of measuring circuit

Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
1	Test voltage	Capacitive divider with MU11 peak voltmeter (made by TuRD)	Ratio 864

Measuring circuit for power frequency voltage test



E Supply
PTr Test transformer with variable transformer connected in series
Z_S Blocking impedance
C-T. Capacitive divider
HE Auxiliary sealing end
1 Measuring points
TO Test object

4.7.4 Test results

Test voltage was applied AC 63 kV for 15 min. No breakdown was occurred.

4.7.5 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED.

4.8 Power-frequency voltage test for 4 h

4.8.1 Test laboratory

High-voltage test laboratory, high voltage hall 2

4.8.2 Normative document

IEC 60502-2: 2005-03, Sub-clauses 18.1.8

4.8.3 Test and measuring circuit

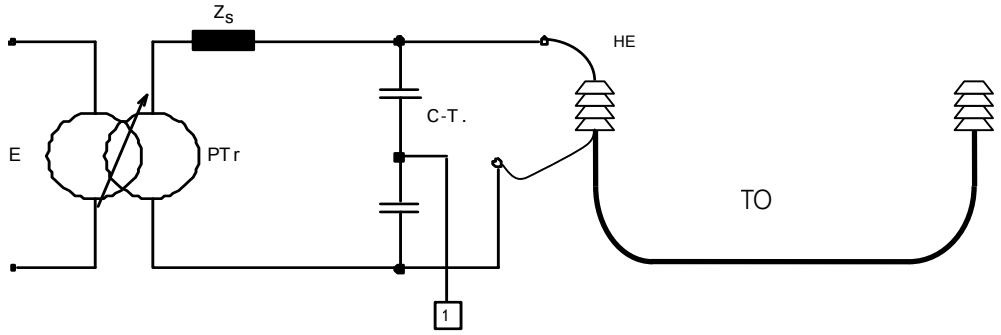
Technical data of test circuit

Test transformer:	Rated voltage	125	kV
	Rated power	100	kVA
	Rated frequency	50	Hz
	Damping resistance	0.67	kOhm

Technical data of measuring circuit

Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
1	Test voltage	Capacitive divider with MU11 peak voltmeter (made by TuRD)	Ratio 864

Measuring circuit for power frequency voltage test



E Supply
PTr Test transformer with variable transformer connected in series
Z_s Blocking impedance
C-T. Capacitive divider
HE Auxiliary sealing end
1 Measuring points
TO Test object

4.8.4 Test results

Test voltage was applied AC 72 kV for 4 h. No breakdown was occurred.

4.8.5 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED.

4.9 Resistivity of semi-conducting screens

4.9.1 Test laboratory

High-voltage test laboratory, high voltage hall 1

4.9.2 Normative document

IEC 60502-2: 2005-03, Sub-clause 18.1.9

4.9.3 Test arrangement

As described in IEC 60502-2, Annex C

Test equipment and measuring instruments:
Heating cabinet No. 18 for ageing treatment, calibration No. 9977
Heating cabinet No. 21 for measurement, calibration No. 10060
DC voltage supply HP E 3610A, Inv. No. 10642/01
Multimeter Fluke 8050A Inv. No. 10866/02, calibration No. 9762

4.9.4 Test results

	Resistance in Ohm m		
Semi-conducting screen	Before ageing	After ageing at 100°C	Requirement
Inner	6,53	4,83	< 1000
Outer	0,4	0,4	< 500

4.9.5 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED.

5. Non-electrical type tests on cable components and on complete cable

5.1 Measurement of thicknesses of insulation

5.1.1 Normative document

IEC 60502-2: 2005-03, Sub-clause 19.1, 19.2
IEC 60228

5.1.2 Measuring instruments

Profile projector inventory No. 10609/01, measuring microscope with video measuring system, calibration scale, inv. No. 10614/01, calliper Inv. No. 10929/03, steel tape inv. No.: 11380/07
Micrometer gauge, inv. No. 10629, Micro Ohmmeter, inv. No.: 10612/0

5.1.3 Test results

5.1.3.1 PE oversheath

Marking	Embossing on sheath in two lines, turned 180°: 33000 VOLTS 1x500/35MM² CU/XLPE/LAT/PE PROPERTY of FEWA UAE NATIONAL CABLES INDUSTRY U.A.E. 2010	
Colour	black	
Material	PE	
	Diameter mm	Thickness mm
Measured values	56.03 55.32 54.61	2.25 2.62 2.80 2.89 2.77 2.38
Required nominal value by IEC 60502-2	--	2.6
Measured average value	55.3	2.62
Measured minimum value	--	2.25
Required minimum value by IEC 60502-2	--	1.8

Aluminium foil, longitudinal applied

		Measured values in mm
Number of tapes		1
Width x thickness	mm	approx. 172 x 0.2
Overlap	mm	15

Water blocking fleece

		Measured values
Diameter	mm	49

Copper screen

	Measured values
Diameter over screen mm	48.6
Number of tapes	1
Width x thickness mm	15 x 0.15
Number of wires	70
Diameter of wires mm	0.79
Cross section mm² including copper helix	35.7

Conductive water blocking fleece, taped with a gap

	Measured values mm
Number of tapes	2
Width x thickness mm	60 x 0.3

Outer semi-conducting screen

	Diameter mm			Thickness mm		
Measured values	46.12	46.31	46.24	0.73 0.83	0.81 0.75	0.85 0.73
Minimum measured value	46.12			0.73		
Average	46.2			0.78		
Maximum measured value	46.31			0.85		

XLPE insulation

	Diameter mm			Thickness mm		
Measured values	44.56	44.75	44.67	7.90 8.10	7.88 8.24	7.93 8.14
Required minimum value by IEC 60502-2	--			7.10		
Minimum measured value	44.56			7.88		
Average measured value	44.7			8.14		
Centricity	--			0.04		
Requirement				≤ 0.15		

5.1.3.2 Inner semi-conducting screen

	Diameter mm	Thickness mm
Measured values	28.57 28.63 28.6	0.77 0.80 1.05 0.93 0.89 0.73
Average measured value	28.6	0,86

5.1.3.3 Stranded copper conductor

	Measured values	Required values by IEC 60228
Diameter measured value mm	26.7 26.6 26.7	--
Diameter average value mm	26.7	min. 25.3 max. 27.6
Number of wires	61	Min. 53
Value Ω /km at 20 °C	0,0361	≤ 0.0366

5.1.4 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED.

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

5.2.1 Normative documents

IEC 60502-2: 2005-03, Sub-clause 19.3

5.2.2 Testing device

Tensile test machine Zwick Z 1435, heating cabinet No. 4

5.2.3 Test results

Type of compound: XLPE

5.2.3.1 Measured values before ageing

Sample No.	Tensile strength in N/mm²	Elongation at break in %
1	22.24	521
2	17.65	468
3	19.90	506
4	20.93	513
5	18,66	478
6	17.76	446
Median	**19.28**	**492**
Requirements	Min. 12.5	Min. 200

5.2.3.2 Measured values after ageing treatment

Treatment: 135°C, 168 h

Sample No.	Tensile strength in N/mm²	Elongation at break in %
1	21.24	531
2	20.12	508
3	21.51	545
4	18.17	512
5	19.98	527
6	16.96	499
Median	**20.05**	**519.5**
Measured variation	4.0 %	5.6 %
Requirements	Max. ± 25 %	Max. ± 25 %

5.2.4 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED.

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

5.3.1 Normative documents

IEC 60502-2: 2005-03, Sub-clause 19.4

5.3.2 Testing device

Tensile test machine Zwick Z 1435, heating cabinet No. 8

5.3.3 Test results

Type of compound: ST_7

5.3.3.1 Measured values before ageing

Sample No.	Tensile strength in N/mm²	Elongation at break in %
1	27.97	694
2	25.04	651
3	24.48	657
4	25.77	645
5	29.13	701
6	26.91	665
Median	**26.34**	**661**
Requirements	Min. 12.5 %	Min. 300 %

5.3.3.2 Measured values after ageing treatment

Treatment: 110°C, 240 h

Sample No.	Tensile strength in N/mm²	Elongation at break in %
1	27,05	687
2	27,45	695
3	29,62	723
4	24,07	632
5	24,29	616
6	25,59	667
Median	**26,32**	**677**
Requirements	--	Min. 300

5.3.4 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED.

5.4 Additional ageing tests on pieces of complete cables

5.4.1 Normative document

IEC 60502-2: 2005-03, Sub-clause 19.5

5.4.2 Testing device

Tensile test machine Zwick Z 1435, heating cabinet No. 15

5.4.3 Test results

5.4.3.1 XLPE insulation

Treatment: 100°C, 7x24 h

Sample No.	Tensile strength in N/mm²	Elongation at break in %
1	22.17	530
2	23.58	566
3	23.39	535
4	20.44	503
5	22.34	528
6	21.21	530
Median	**22.26**	**530**
Variation	15.4 %	7.7 %
Requirements	Max. ± 25 %	Max. ± 25 %

5.4.3.2 PE oversheath

Treatment: 100°C, 7x24 h

Sample No.	Tensile strength in N/mm²	Elongation at break in %
1	30,65	718
2	30,21	705
3	27,33	659
4	25,34	639
5	26,64	666
6	29,94	702
Median	**28,64**	**684**
Requirements	--	Min 300%

5.4.4 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED.

5.5 Pressure test at high temperature on insulations and non-metallic sheaths

5.5.1 Normative documents

IEC 60502-2: 2005-03, Sub-clause 19.7

5.5.2 Testing device

Heating cabinet. No. 21, measuring projector

5.5.3 Test results

Type of compound: ST_7

Treatment: 90 °C, 6 h

Sample No.	Thickness of sheath	Engaged depth	
	mm	mm	%
1	2.95	0,18	6
2	2.34	0,15	6
3	2.55	0,15	6
Requirements	None	--	Max. 50

5.5.4 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED

5.6 Hot set test for XLPE insulations

5.6.1 Normative documents

IEC 60502-2: 2005-03, Sub-clause 19.11

5.6.2 Testing device

Heating cabinet No. 21, length measurement system (for example a steel measuring tape)

5.6.3 Test results

Treatment: 200 °C, 15 minutes under load, 5 minutes relaxing

Sample No.	Elongation under load in %	Permanent elongation after cooling in %
1	71	-2
2	67	-5
3	71	-2
4	75	0
5	76	-2
6	81	-2
Requirements	Max. 175 %	Max. 15 %

5.6.4 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED

5.7 Water absorption test on insulation

5.7.1 Normative document

IEC 60502-2: 2005-03, Sub-clause 19.13

5.7.2 Testing device

Low-pressure oven No. 30, laboratory balance, inventory No. 1132/05

5.7.3 Test results

Type of compound: XLPE

Treatment: 85 °C, 336 h

Sample No.	Weight M1 of dry pieces g	Weight M2 of wet pieces g	Weight M3 of dry pieces g	Area cm²	Result mg/cm²	Requirement mg/cm²
1	0.3901	0.3902	0,3902	9.080	0.01	< 1
2	0.3665	0.3673	0.3665	9.872	0.08	

5.7.4 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED

5.8 Measurement of carbon black content of the PE oversheaths

5.8.1 Normative document

IEC 60502-2 2005-03 , Sub-clause 19.15

5.8.2 Test equipment

Muffle furnace, laboratory balance, inventory No. 1132/05, calibration No. C9645 09/07

5.8.3 Test results

Type of mixture: ST_7

Sample No.	Carbon black content in %	Requirements in %
1	2.17	2.5 ± 0.5
2	2.14	

5.8.4 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED

5.9 Shrinkage test for XLPE insulation

5.9.1 Normative document

IEC 60502-2: 2005-03, Sub-clause 19.16

5.9.2 Testing device

Oven No. 21, steel tape measure

5.9.3 Test results

Treatment: 130°C, 1 h

Sample No.	Distance before ageing mm	Distance after cooling mm	Result %	Requirement %
1	198	195	1,5	Max. 4

5.9.4 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED

5.10 Shrinkage test for PE oversheaths

5.10.1 Normative document

IEC 60502-2: 2005-03, Sub-clause 19.20

5.10.2 Testing device

Oven No. 12, steel tape measure

5.10.3 Test results

Treatment: 80°C, 5 Cycle 5 h heating, 3 h cooling

Measured line In the bow	Distance before ageing mm	Distance after cooling mm	Result %	Average value %	Requirement %
1	504	502	0,4	0,2	Max. 3
2	495	495	0		

5.10.4 Assessment of test

The cable meets the requirements defined in normative document specified above
The test has been PASSED

5.11 Water penetation test

5.11.1 Normative document

IEC 60502-2: 2005-03, Sub-clause 19.22

5.11.2 Testing device

Test equipment in accordance to IEC 60502-2, Annex F

5.11.3 Test results

Treatment: 97°C, 10 Cycle 5 h heating, 3 h cooling

No water emerge from the ends of the test piece
The depth of penetration was 35 cm

5.11.4 Assessment of test

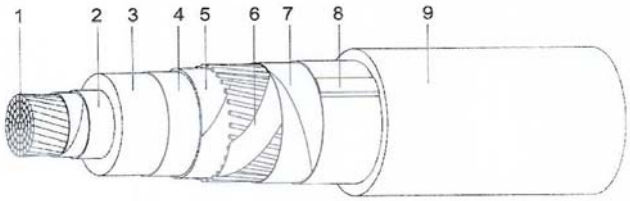
The cable meets the requirements defined in normative document specified above
The test has been PASSED

6. Drawing

NCI

33 kV, 1 CORE, XLPE INSULATED, CU WIRES + CU TAPES SCREENED, LAMINATED ALUMINIUM TAPE AND PE SHEATHED (CU/XLPE/LAT/PE) CABLE

Applicable Standard : IEC 60502-2 & FEWA Specification No.: CBL - 3.3



TECHNICAL & QC NCI DEPT

1Cx500/35 MM², CU/XLPE/LAT/PE, 33 kV

1.	Conductor	: Plain Annealed Copper, Round Stranded Compacted (Water-tight conductor)
2.	Conductor Shield	: Extruded semi-conductive compound, Bonded
3.	Insulation	: Extruded Cross linked Polyethylene (XLPE)
4.	Insulation Shield	: Extruded semi-conductive compound, Bonded
5.	Water barrier	: Semiconductive water swellable tapes
6.	Metallic screen	: Copper Wires and Copper Tape Open Helix
7.	Water barrier	: Non-conductive water swellable tapes
8.	Radial Water Barrier	: PE Laminated Aluminium Tape (LAT)
9.	Outer Sheath	: Extruded Polyethylene (PE - ST7) + Graphite coating Color: Black

Identification of Cable by Emboss on the Outer Sheath in Two lines:

33000 VOLTS, 1x500/35 MM², CU/XLPE/LAT/PE, PROPERTY OF FEWA U.A.E., NATIONAL CABLES INDUSTRY U.A.E., "YEAR"