KEMA

1038-15

TYPE TEST CERTIFICATE OF COMPLETE TYPE TESTS

OBJECT	A three-core heat-shrinkable straight-through joint
TYPE	GSJ/ XAS/1233 A

Rated voltage, U_0/U (U_m)	**6,35/11 (12) kV**	**Conductor material**	**AL**
Conductor cross-section	**3 x 185 mm²**	**Insulation material**	**XLPE**

MANUFACTURER	Gala Shrink Fit, Mumbai, India
CLIENT	Gala Shrink Fit, Mumbai, India
TESTED BY	KEMA Nederland B.V., Arnhem, The Netherlands
DATE OF TESTS	12 August 2014 to 5 February 2015

The 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 60502-4 (2010)

This Type Test Certificate has been issued by KEMA following exclusively the STL Guides.

The results are shown in this document. The values obtained and the general performance are considered to comply with the above Standard and to justify the ratings assigned by the manufacturer as listed on page 4.

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.

This Certificate consists of 65 pages in total.

KEMA Nederland B.V.

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

Arnhem, 30 April 2015

Version: 1

CONTENTS

page

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)	6,35/11 (12) kV
Rated maximum conductor temperature in normal operation	90 °C
Rated conductor cross-section	3 x 185 mm^2
Thermal short-circuit current	22,5 kA

1.2 Characteristics of the joint for cables with extruded insulation

Manufacturer	Gala Shrink Fit, Mumbai, India
Type	heat-shrinkable straight-through joint
Year of manufacture	2014
Rated voltage, U_0/U (U_m)	6,35/11 (12) kV
No. of cores	3
Dynamic short-circuit current	not applicable
Type connector	inline connector
Length connector	100 mm
Internal diameter connector	16 mm
External diameter connector	27 mm
Type of stress control	stress grading mastic

1.3 Characteristics of the test cable

Note: the cable is not part of the type test.

Manufacturer (as stated by the client)	Apar Industries Limited, India
Type	U_0 = 6 kV 3x185 mm^2 Al/XLPE/CTS/PVC/SWA/PVC (A2XCEWY) CABLE
Manufacturing year	2014
Rated voltage, U_0/U (U_m)	6/10 (12) kV
No. of cores	3
Core identification	core 1 = red core 2 = yellow core 3 = blue
Marking on the oversheath	AIL/UNIT: UNIFLEX CABLES- INDIA 'UNICAB' 6/10 (12) KV XLPE CABLE '3X185 Sq.mm 2014
Construction	see List of drawings

Conductor

– material	aluminium
– cross-section	185 mm^2
– nominal diameter	16,2 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	extruded semi-conducting compound
– nominal thickness	0,6 mm
– material designation	extruded semi-conducting compound
– manufacturer of the material	Hanwha and Sakun Polymer

Insulation

– material	XLPE
– nominal thickness	3,4 mm

Insulation (core) screen

– material	extruded semi-conducting compound
– strippable	yes
– nominal thickness	0,5 mm

Metal screen

– material	two annealed plain copper tape
– type	helical
– nominal thickness and width of tape	0,03 x 40 mm (overlap 10%)
– nominal thickness and width of tape	2 x 40 mm (overlap 10%)
– cross-sectional area	27,6 mm^2 three cores together

Inner coverings and fillers

– material	yes

Separation sheath

– material	PVC, type ST_2
– nominal thickness	1,6 mm
– manufacturer of the material	Gala Shrink Fit, Mumbai, India

Metal armour

– material	galvanised steel round wires
– number of wires	68
– nominal diameter of wires	2,5 mm
– cross-sectional area	333,8 mm^2

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

Oversheath

– material	PVC, type ST_2
– nominal thickness	3,3 mm
– nominal overall diameter of the cable (D)	72,0 mm
– material designation	PVC, type ST2
– manufacturer of the material	Gala Shrink Fit, Mumbai, India
– colour	black

Manufacturing details insulation system

– location of manufacturing	Umbergaon, India
– type of extrusion line	CCV
– type of extrusion	triple common extrusion
– curing means	dry
– cooling means	dry
– manufacturing length (where cable sample for testing has been taken from)	100 m

1.4 List of drawings

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

The following drawing and documents have been included in this Certificate:

Drawing No./document No.	Revision
GTSPL/K3/06/14	00

The following document is only listed for reference and is kept in KEMA's files:

Document no.	Revision/date
Components list GSJ/XAS/1233A	-
Jointing instruction GSJ/XAS/1233A	-

2 GENERAL INFORMATION

2.1 The tests were witnessed by

Name	Company
Mr Gurubax Singh 12 August to 15 August 2014	Gala Shrink Fit, Mumbai, India

2.2 The tests were carried out by

Name	Company
Mr A. Sengers Ms H. He Mr T. Ariaans Mr E. Pultrum Mr D. Bouchier Mr N. Dobbe Mr K. van der Linden	KEMA Nederland 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 TEST SEQUENCE 2.1 FOR JOINT (TWO JOINTS)

3.1 Test arrangement

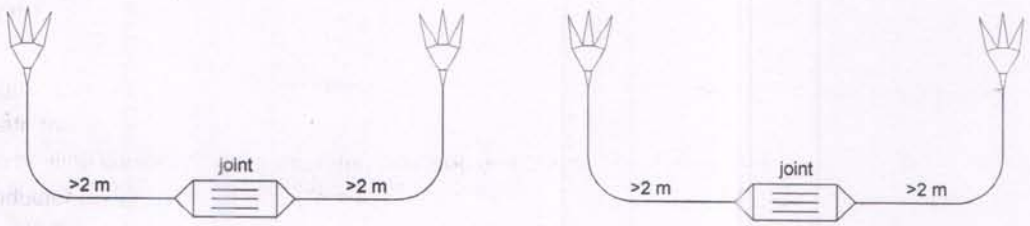
3.1.1 Determination of the cable conductor temperature

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 cable was cut from the total cable length intended for the type test. This reference loop was installed close to the main loop in order to create the same environmental conditions as for the test loop.
The heating currents in both 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. 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 after the conductor temperature has been within the stated temperature limits for at least 2 hours. The test set-up was consisting of a joint as part of a cable system, also incorporating two outdoor terminations which are not part of the type test objects. The test set-up of two separate main test loops connected in series.



Sample 1 and 2 for test sequence 2.1

4 TEST SEQUENCE 2.1

4.1 DC voltage dry

Standard and date

Standard IEC 60502-4, Table 6, test number 1
Test date 12 August 2014

Environmental conditions

Ambient temperature 21 °C
Temperature of test object 21 °C

Testing arrangement		Voltage applied, DC		Duration
Voltage applied to	Earth connected to	... x U_0	(kV)	(min)
Conductor 1, 2 and 3 of test loop 1	Metal screens	6	38	15
Conductor 1, 2 and 3 of test loop 2	Metal screens	6	38	15

Note

On request of the client the test has been performed more severely at 6 x U_0 instead of 4 x U_0.

Requirement

No breakdown or flashover shall occur.

Result

The object passed the test.

4.2. AC voltage dry

Standard and date

Standard	IEC 60502-4, Table 6, test number 1
Test date	12 August 2014

Environmental conditions

Ambient temperature	21	°C
Temperature of test object	22	°C

Testing arrangement		Voltage applied, 50 Hz		Duration (min)
Voltage applied to	Earth connected to	... x U_0	(kV)	
Conductor 1, 2 and 3 of test loop 1	Metal screens	4,5	28,5	5
Conductor 1, 2 and 3 of test loop 2	Metal screens	4,5	28,5	5

Requirement

No breakdown or flashover shall occur.

Result

The object passed the test.

4.3 Partial discharge at ambient temperature

Standard and date

Standard	IEC 60502-4, Table 6, test number 2
Test date	13 August 2014

Environmental conditions

Ambient temperature	22 °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
Declared sensitivity	5 pC
Required sensitivity	≤ 5 pC
Centre frequency	117,5 kHz
Bandwidth (Δf)	100 kHz
Test frequency	50 Hz
Coupling capacitor	2600 pF

Core	Voltage applied, 50 Hz		Duration	Partial discharge level
	... x U_0	(kV)	(s)	(pC)
1 of test loop 1	2	12,5	10	-
	1,73	11	-	Not detectable
2 of test loop 1	2	12,5	10	-
	1,73	11	-	Not detectable
3 of test loop 1	2	12,5	10	-
	1,73	11	-	Not detectable
1 of test loop 2	2	12,5	10	-
	1,73	11	-	Not detectable
2 of test loop 2	2	12,5	10	-
	1,73	11	-	Not detectable
3 of test loop 2	2	12,5	10	-
	1,73	11	-	Not detectable

Requirement

The maximum partial discharge level from the test object at 1,73 U_0 shall not exceed 10 pC.

Result

The object passed the test.

4.4 Impulse voltage at elevated temperature

Standard and date

Standard IEC 60502-4, Table 6, test number 3
Test date 26 August 2015

Environmental conditions

Ambient temperature 21 °C

Characteristic test data

Temperature of test object 97 °C
Specified test voltage 95 kV

Testing arrangement		Polarity	Voltage applied	No. of impulses	See figure on next pages
Voltage applied to	Earthed		(% of test voltage)		
Conductor 1 test loop 1 and 2	Metal screens and conductor 2 and 3	Positive	50	1	1 (waveshape)
			65	1	2
			80	1	2
			100	10	3 and 4
Conductor 1 test loop 1 and 2	Metal screens and conductor 2 and 3	Negative	50	1	5 (waveshape)
			65	1	6
			80	1	6
			100	10	7 and 8
Conductor 2 test loop 1 and 2	Metal screens and conductor 1 and 3	Positive	50	1	9 (waveshape)
			65	1	10
			80	1	10
			100	10	11 and 12
Conductor 2 test loop 1 and 2	Metal screens and conductor 1 and 3	Negative	50	1	13(waveshape)
			65	1	14
			80	1	14
			100	10	15 and 16
Conductor 3 test loop 1 and 2	Metal screens and conductor 1 and 2	Positive	50	1	17 (waveshape)
			65	1	18
			80	1	18
			100	10	19 and 20
Conductor 3 I test loop 1 and 2	Metal screens and conductor 1 and 2	Negative	50	1	21 (waveshape)
			65	1	22
			80	1	22
			100	10	23 and 24

Note

On request of the client the applied LI voltage was 95 kV instead of 75 kV.

Requirement

Each core of the cable and accessory shall withstand without failure 10 positive and 10 negative voltage impulses.

Result

The object passed the test.

4.5 Heating cycle voltage in air

.Standard and date

Standard IEC 60502-4, Table 6, test number 4
Test dates 28 August to 9 October 2014

.Environmental conditions

Ambient temperature 20-22 °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			Voltage	
			Heating		Cooling		
			Total duration (h)	Duration of conductor at steady temperature (h)	Total duration (h)	Total duration (h)	Voltage applied 2,5 U_0 (kV)
63	95-100	approx. 409	5	2	4	9	16

Note

On request of the client the applied number of heating cycles was 63 instead of 30.

Requirement

No breakdown shall occur.

Result

The object passed the test.

4.6 Heating cycle voltage under water

Standard and date

Standard	IEC 60502-4, Table 6, test number 5
Test dates	10 October to 3 November 2014

Environmental conditions

Ambient temperature	20-22 °C

Characteristic test data

Heating method	conductor current
Stabilized temperature	97 °C
Height above water	1 m

No. of heating cycles	Required steady conductor temperature (°C)	Heating current during steady condition (A)	Heating cycle			Voltage	
			Heating		Cooling		
			Total duration (h)	Duration of conductor at steady temperature (h)	Total duration (h)	Total duration (h)	Voltage applied 2,5 U_0 (kV)
63	95-100	approx. 416	5	2	4	9	16

Note 1

For accessories used with non-longitudinal water blocked cable designs, the heating cycles voltage test under water shall be performed with oversheath damage. The oversheath of the cable is opened up to the core.
The joints were placed inside vessels, filled with water with a height of 1 meter above the top surface of the accessory.

On request of the client the applied number of heating cycles was 63 instead of 30.

Requirement

No breakdown shall occur.

Result

The object passed the test.

4.7 Partial discharge at elevated and ambient temperature

4.7.1 Partial discharge at elevated temperature

Standard and date

Standard	IEC 60502-4, Table 6, test number 6
Test date	11 November 2014

Environmental conditions

Ambient temperature	20 °C

Characteristic test data

Temperature of test object	97 °C
Circuit	direct
Calibration	5 pC
Noise level at 1,73 U_0	2 pC
Declared sensitivity	4 pC
Required sensitivity	≤ 5 pC
Centre frequency	98 kHz
Bandwidth (Δf)	100 kHz
Test frequency	50 Hz
Coupling capacitor	2600 pF

Core	Voltage applied, 50 Hz		Duration	Partial discharge level
	... x U_0	(kV)	(s)	(pC)
1 of test loop 1 and 2	2	12,5	10	-
	1,73	11	-	Not detectable
2 of test loop 1 and 2	2	12,5	10	-
	1,73	11	-	Not detectable
3 of test loop 1 and 2	2	12,5	10	-
	1,73	11	-	Not detectable

Requirement

The maximum partial discharge level from the test object at 1,73 U_0 shall not exceed 10 pC.

Result

The object passed the test.

4.7.2 Partial discharge at ambient temperature

Standard and date

Standard	IEC 60502-4, Table 6, test number 6
Test date	13 November 2014

Environmental conditions

Ambient temperature	20 °C

Characteristic test data

Temperature of test object	20 °C
Circuit	direct
Calibration	5 pC
Noise level at 1,73 U_0	2,5 pC
Declared sensitivity	5 pC
Required sensitivity	≤ 5 pC
Centre frequency	124,5 kHz
Bandwidth (Δf)	100 kHz
Test frequency	50 Hz
Coupling capacitor	2600 pF

Core	Voltage applied, 50 Hz		Duration	Partial discharge level
	... x U_0	(kV)	(s)	(pC)
1 of test loop 1 and 2	2	12,5	10	-
	1,73	11	-	Not detectable
2 of test loop 1 and 2	2	12,5	10	-
	1,73	11	-	Not detectable
3 of test loop 1 and 2	2	12,5	10	-
	1,73	11	-	Not detectable

Requirement

The maximum partial discharge level from the test object at 1,73 U_0 shall not exceed 10 pC.

Result

The object passed the test.

4.8 Impulse voltage at ambient temperature

.Standard and date

Standard IEC 60502-4, Table 6, test number 10
Test date 14 November 2014

.Environmental conditions

Ambient temperature 20 °C

.Characteristic test data

Temperature of test object 20 °C
Specified test voltage 95 kV

Testing arrangement		Polarity	Voltage applied	No. of impulses	See figure on next pages
Voltage applied to	Earthed		(% of test voltage)		
Conductor 1 of test loop 1 and 2	Metal screens and conductor 2 and 3	Positive	50	1	1 (waveshape)
			65	1	2
			80	1	2
			100	10	3 and 4
Conductor 1 of test loop 1 and 2	Metal screens and conductor 2 and 3	Negative	50	1	5 (waveshape)
			65	1	6
			80	1	6
			100	10	7 and 8
Conductor 2 of test loop 1 and 2	Metal screens and conductor 1 and 3	Positive	50	1	9 (waveshape)
			65	1	10
			80	1	10
			100	10	11 and 12
Conductor 2 of test loop 1 and 2	Metal screens and conductor 1 and 3	Negative	50	1	13 (waveshape)
			65	1	14
			80	1	14
			100	10	15 and 16
Conductor 3 of test loop 1 and 2	Metal screens and conductor 1 and 2	Positive	50	1	17(waveshape)
			65	1	18
			80	1	18
			100	10	19 and 20
Conductor 3 of test loop 1 and 2	Metal screens and conductor 1 and 2	Negative	50	1	21 (waveshape)
			65	1	22
			80	1	22
			100	10	23 and 24

Note

On request of the client the applied LI voltage was 95 kV instead of 75 kV.

Requirement

Each core of the cable and accessory shall withstand without failure 10 positive and 10 negative voltage impulses.

Result

The object passed the test.

4.9 AC voltage dry

Standard and date

Standard IEC 60502-4, Table 6, test number 11
Test date 17 November 2014

Environmental conditions

Ambient temperature 20 °C
Temperature of test object 20 °C

Testing arrangement		Voltage applied, 50 Hz		Duration
Voltage applied to	Earth connected to	... x U_0	(kV)	(min)
Conductor 1,2 and 3 of test loop 1 and 2	Metal screens	2,5	16	15

Requirement

No breakdown or flashover shall occur.

Result

The object passed the test.

4.10 Examination

Standard and date

Standard	IEC 60502-4, Table 6, test number 12
Test date	1 December 2014

Environmental conditions

Ambient temperature	21	°C
Temperature of test object	21	°C

Test loop	Observations[1)]
1 and 2	None of the following has been detected: - cracking in the filling material and/or tape or tubing components - a moisture path bridging a primary seal - corrosion and/or tracking and/or erosion which would, in time, lead to a failure of the accessory - leakage of any insulating material
1) Photographs of the examination are presented on the next page	

Result

The results are for information only.

5 TEST SEQUENCE 2.2 FOR JOINT (ONE JOINT)

5.1 Test arrangement

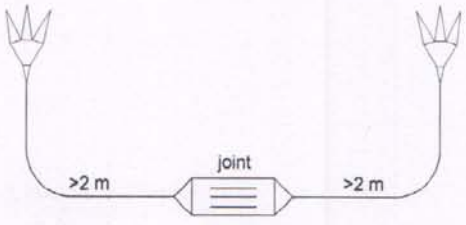
5.1.1 Determination of the cable conductor temperature

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 cable was cut from the total cable length intended for the type test. This reference loop was installed close to the main loop in order to create the same environmental conditions as for the test loop.
The heating currents in both 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. 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 after the conductor temperature has been within the stated temperature limits for at least 2 hours. The test set-up was consisting of a joint as part of a cable system, also incorporating a heat-shrinkable outdoor termination and a heat-shrinkable indoor termination.



Sample 3 for test sequence 2.2

5.2 DC voltage dry

Standard and date

Standard	IEC 60502-4, Table 6, test number 1
Test date	12 August 2014

Environmental conditions

Ambient temperature	21	°C
Temperature of test object	22	°C

Testing arrangement		Voltage applied, DC		Duration
Voltage applied to	Earth connected to	... x U_0	(kV)	(min)
Conductor 1,2 and 3 of test loop 3	Metal screens	6	38	15

Note

On request of the client the test has been performed more severely at 6 x U_0 instead of 4 x U_0.

Requirement

No breakdown or flashover shall occur.

Result

The object passed the test.

5.3 AC voltage dry

Standard and date

Standard	IEC 60502-4, Table 6, test number 1
Test date	12 August 2014

Environmental conditions

Ambient temperature	21	°C
Temperature of test object	22	°C

Testing arrangement		Voltage applied, 50 Hz		Duration
Voltage applied to	Earth connected to	... x U_0	(kV)	(min)
Conductor 1,2 and 3 of test loop 3	Metal screens and conductor 2 and 3	4,5	28,5	5

Requirement

No breakdown or flashover shall occur.

Result

The object passed the test.

5.4 Thermal short circuit (screen)

Standard and date

Standard IEC 60502-4, Table 6, test number 7
Test date 9 January 2015

Environmental conditions

Ambient temperature 22 °C

Characteristic test data

Stabilized conductor temperature 97 °C

Conductor heating		
Required conductor temperature θ (°C)	Applied 3-phase heating current (A)	Conductor stable at 97 °C before short-circuit application (h)
$95 \leq \theta \leq 100$	530	2

Short-circuit application on screen (see figures on the next pages)			
Specified short-circuit current (kA)	Frequency (Hz)	Duration (s)	Number of short-circuit applications
2,5	50	1	2

Procedure

The conductor temperature shall be maintained within the stated temperature limits for at least 2 h before carrying out the short-circuit test. Between the two short-circuit applications, the cable screen shall be allowed to cool down to a temperature less than 10 K above its temperature prior to the first short-circuit application.

Requirement

No visible deterioration may occur.

Result

The object passed the test.

5.5 Thermal short circuit test

Standard and date

Standard	IEC 60502-4, Table 6, test number 8
Test date	28 January 2015

Environmental conditions

Ambient temperature	11	°C

Characteristic test data

Conductor material		Aluminum
Cross section conductor	185	mm^2
Maximum short circuit conductor temperature	250	°C

First short circuit application

Start temperature of test object (measured value)	13,5	°C
Selected duration of short circuit current	1	s
Calculated short circuit current	22,5	kA
Thermal current, three phase	22,7	kA
Duration	1,06	s

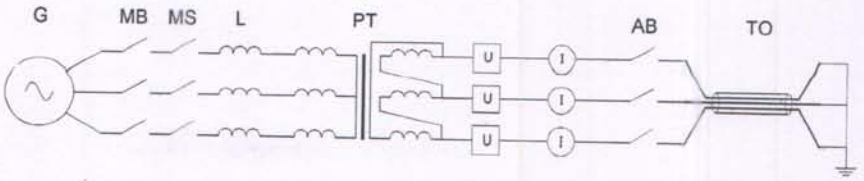
Second short circuit application

Start temperature of test object (measured value)	13,5	°C
Selected duration of short circuit current	1	s
Calculated short circuit current	22,5	kA
Thermal current, three phase	22,7	kA
Duration	1,05	s

Procedure

Two short-circuits shall be applied to raise the conductor temperature to the maximum permissible short-circuit temperature of the cable within 5 s. Between the two short-circuits, the test loop shall be allowed to cool to a temperature less than 10 K above its temperature prior to the first short-circuit.

Test circuit S01



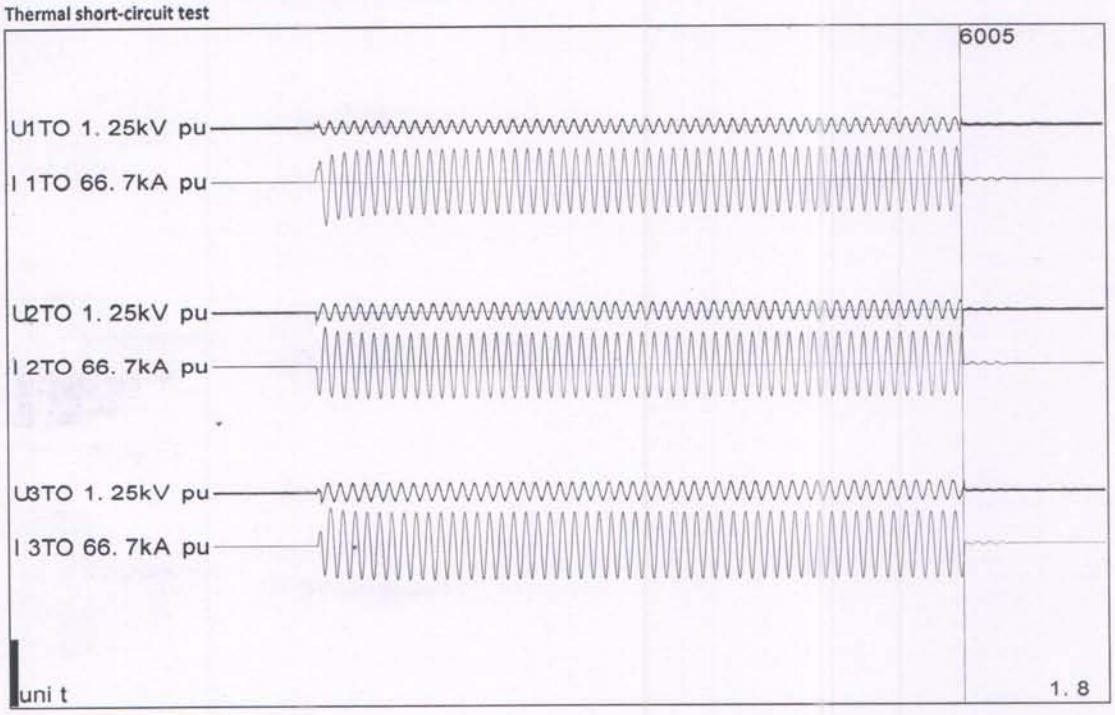
G	= Generator	TO	= Test Object	U	= Voltage Measurement to earth
MB	= Master Breaker	L	= Reactor	I	= Current Measurement
MS	= Make Switch				
PT	= Power Transformer				

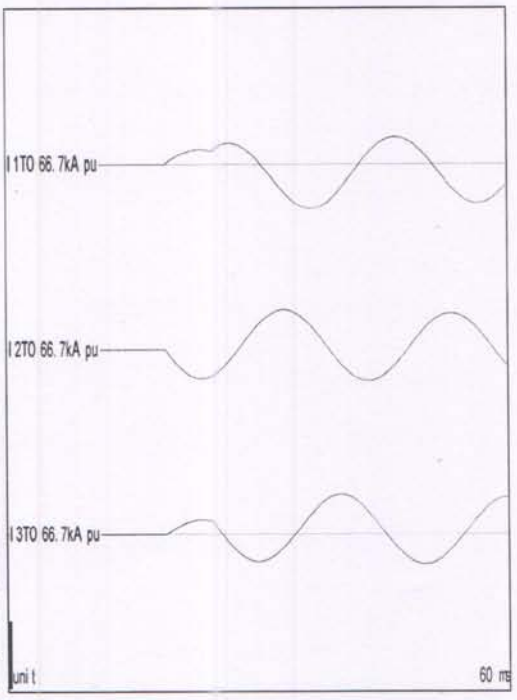
Supply		
Power	MVA	47,2
Frequency	Hz	50
Phase(s)		3
Voltage	kV	2,2
Current	kA	22
Impedance	Ω	0,033
Power factor		< 0,1
Neutral		Not earthed

Load	
Short-circuit point	earthed

5.6 Test results and oscillograms

Thermal short-circuit test





Test number: 150128-6005

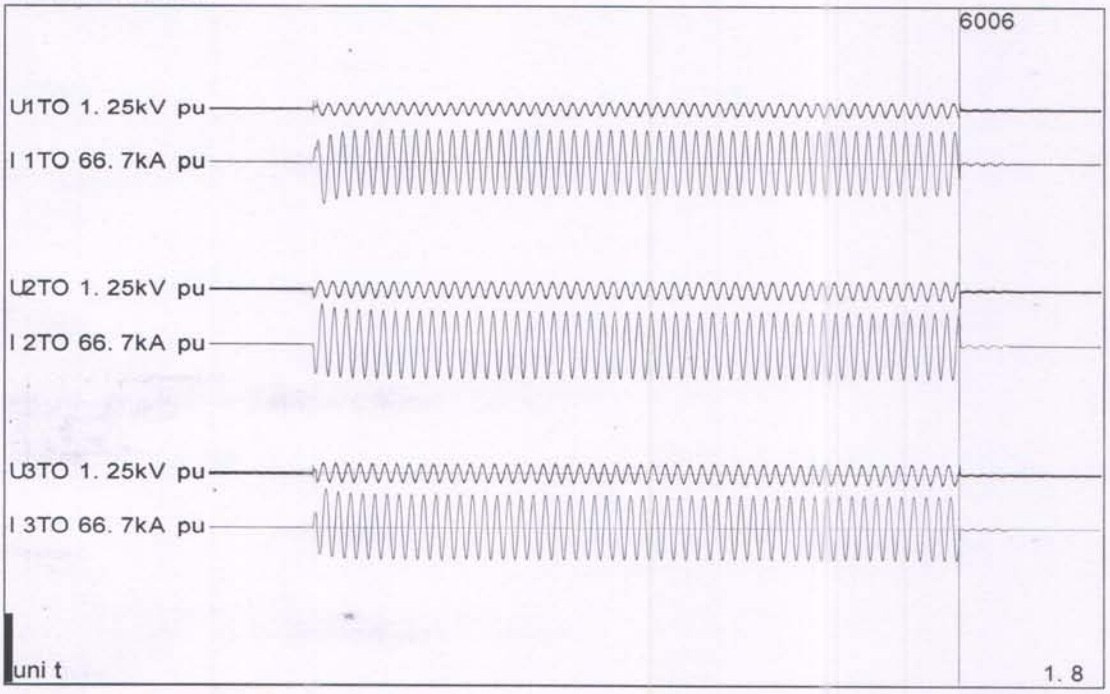
Phase		-	-	-
Peak value of current	kA	-42,6	38,7	38,1
Symmetrical current, beginning	kA	23,0	23,5	23,3
Symmetrical current, middle	kA	22,7	23,1	22,8
Symmetrical current, end	kA	22,5	22,9	22,7
Symmetrical current, average	kA	22,8	23,3	22,1
Average current, three phase	kA	22,7		
Current duration	s	1,05	1,05	1,05
Thermal equivalent		22,5 kA during 1,06 s		

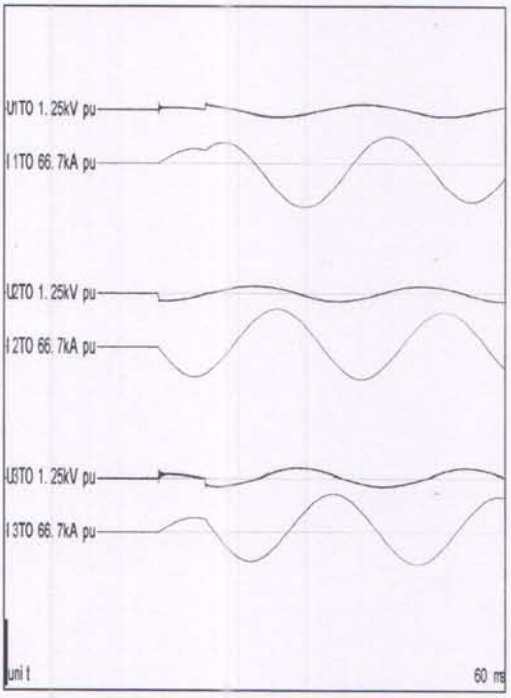
Ambient temperature 13,5 °C

Remarks:

Version: 1

Thermal short-circuit test





Test number: **150128-6006**

Phase		-	-	-
Peak value of current	kA	-42,3	38,6	37,9
Symmetrical current, beginning	kA	23,0	23,4	23,2
Symmetrical current, middle	kA	22,6	23,0	22,7
Symmetrical current, end	kA	22,5	22,9	22,6
Symmetrical current, average	kA	22,8	23,2	22,0
Average current, three phase	kA		22,7	
Current duration	s	1,05	1,05	1,05
Thermal equivalent		22,5 kA during 1,10 s		

Ambient temperature 13,5 °C

Remarks:

Version: 1

5.7 Condition / inspection after test

Requirement
No visible deterioration may occur.

Result

No visible change. No visible damage.
The object passed the test.

5.8 Impulse voltage at ambient temperature

Standard and date

Standard IEC 60502-4, Table 6, test number 10
Test date 29 January 2015

Environmental conditions

Ambient temperature 20 °C

Characteristic test data

Temperature of test object 20 °C
Specified test voltage 95 kV

Testing arrangement		Polarity	Voltage applied	No. of impulses	See figure on next pages
Voltage applied to	Earthed		(% of test voltage)		
Conductor 1 test loop 3	Metal screens and conductor 2 and 3	Positive	50	1	1 (waveshape)
			65	1	2
			80	1	2
			100	10	3 and 4
Conductor 1 test loop 3	Metal screens and conductor 2 and 3	Negative	50	1	5 (waveshape)
			65	1	6
			80	1	6
			100	10	7 and 8
Conductor 2 test loop 3	Metal screens and conductor 1 and 3	Positive	50	1	9 (waveshape)
			65	1	10
			80	1	10
			100	10	11 and 12
Conductor 2 test loop 3	Metal screens and conductor 1 and 3	Negative	50	1	13(waveshape)
			65	1	14
			80	1	14
			100	10	15 and 16
Conductor 3 test loop 3	Metal screens and conductor 1 and 2	Positive	50	1	17 (waveshape)
			65	1	18
			80	1	18
			100	10	19 and 20
Conductor 3 test loop 3	Metal screens and conductor 1 and 2	Negative	50	1	21 (waveshape)
			65	1	22
			80	1	22
			100	10	23 and 24

Note

On request of the client the applied LI voltage was 95 kV instead of 75 kV.

Requirement

Each core of the cable and accessory shall withstand without failure 10 positive and 10 negative voltage impulses.

Result

The object passed the test.

5.9 AC voltage dry

Standard and date

Standard IEC 60502-4, Table 6, test number 11
Test date 29 January 2015

Environmental conditions

Ambient temperature 20 °C
Temperature of test object 20 °C

Testing arrangement		Voltage applied, 50 Hz		Duration
Voltage applied to	Earth connected to	... x U_0	(kV)	(min)
Conductor 1,2 and 3 of test loop 3	Metal screens	2,5	16	15

Requirement

No breakdown or flashover shall occur.

Result

The object passed the test.

5.10 Examination

Standard and date

Standard	IEC 60502-4, Table 6, test number 12
Test date	5 February 2015

Environmental conditions

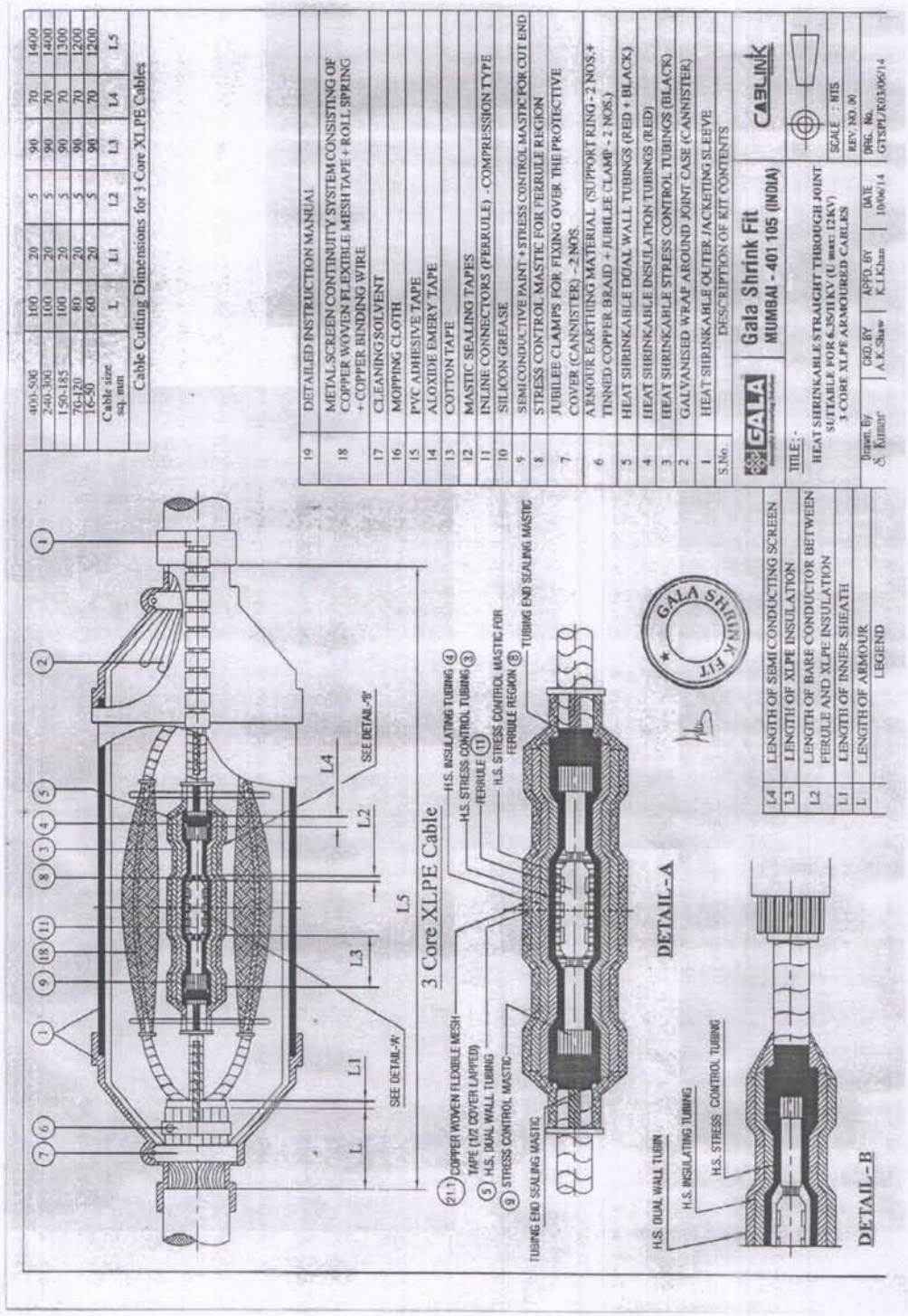
Ambient temperature	20	°C
Temperature of test object	20	°C

Test loop	Observations[1)]
3	None of the following has been detected: - cracking in the filling material and/or tape or tubing components - a moisture path bridging a primary seal - corrosion and/or tracking and/or erosion which would, in time, lead to a failure of the accessory - leakage of any insulating material
1) Photographs of the examination are presented on the next page	

Result

The results are for information only.

6 DRAWING



Version: 1

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 to125 °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%