

INSPECTION REPORT

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B9014920

Client ELCON MEGARAD S.p.A.
Via Nazionale, 110 – Arcella (Avellino) – Italy

Subject Inspection to tests on heat shrinkable outdoor terminations for single core plastic or rubber insulated cables with wire screen, types:

- 1- ELCOTERM TES – 2484X/W-3X1—NL02
- 2- ELCOTERM TES – 2484X/W-3X1—NL03
- 3- ELCOTERM TES – 2484X/W-3X1—NL05

manufactured by ELCON MEGARAD S.p.A., Via Nazionale, 110 - Arcella (Avellino) – Italy

Place and date of inspection ELCON MEGARAD S.p.A.
Via Nazionale, 110 – Arcella (Avellino) – Italy
May 10th to 22nd, 2019

Notes -

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N. of pages 7 **N. of pages annexed** -

Issue date September 9th, 2019

Prepared TCE/CER/PRO – Antonio VELE

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ISP N° 024E

Membro degli Accordi di Mutuo Riconoscimento EA, IAF e ILAC
Signatory of EA, IAF and ILAC Mutual Recognition agreements

Stefano Bossi

CESI S.p.A.
Testing & Certification Division
Business Area Certification
Il Responsabile
(Roberto Piccin)

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1 GENERAL

This report concerns the inspection activity requested by ELCON MEGARAD S.p.A. to tests on heat shrinkable outdoor terminations for single core plastic or rubber insulated cables with wire screen, types:

- ELCOTERM TES – 2484X/W-3X1—NL02
- ELCOTERM TES – 2484X/W-3X1—NL03
- ELCOTERM TES – 2484X/W-3X1—NL05

manufactured by ELCON MEGARAD S.p.A., Via Nazionale, 110 - Arcella (Avellino) – Italy.

During the inspection were present:

- ELCON MEGARAD S.p.A.: Mr. Generoso De Simone
Mr. Ciro Del Vecchio
Mr. Franco Lombardo
- CESI: Mr. Antonio Vele

This activity was carried out by CESI as Type A Inspection Body, in the field of ACCREDIA accreditation No.024E of conformity with the Standard EN ISO/IEC 17020 and the application guidelines of the Standard itself ILAC-P15.

2 RATINGS

All the following data were found in the documents supplied by ELCON MEGARAD S.p.A.

ELCOTERM TES – 2484X/W-3X1-NL02	
Manufacturer: ELCON MEGARAD S.p.A.	
Factory: Via Nazionale, 110 – Arcella (Avellino) – Italy	
Heat shrinkable outdoor termination for single core plastic or rubber insulated cables with wire screen	
ELCON MEGARAD CODE	FN20036
LOT NUMBER	A1217U SERIAL 0001
VOLTAGES	Uo/U=12,7/22kV Um=24kV
CABLES RANGE	1x25mm ² Cu
CABLE MARKING	HXCMK 1x25rs + as25 12/20kV - XLPE
DRAWING	862X/NL02

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ELCOTERM TES – 2484X/W-3X1-NL03	
Manufacturer: ELCON MEGARAD S.p.A.	
Factory: Via Nazionale, 110 – Arcella (Avellino) – Italy	
Heat shrinkable outdoor termination for single core plastic or rubber insulated cable with wire screen	
ELCON MEGARAD CODE	FN20034
LOT NUMBER	A1218U – A1221 SERIAL 0001
VOLTAGES	Uo/U=12,7/22kV Um=24kV
CABLES RANGE	1x95 - 240mm ² Cu/Al
CABLE MARKING	YMeKrvaslqwd Fca 1x95rs + as25 12/20kV – XLPE YMeKrvaslqwd Fca 1x240Alrm + as35 12/20kV - XLPE
DRAWING	862X/NL03

ELCOTERM TES – 2484X/W-3X1-NL05	
Manufacturer: ELCON MEGARAD S.p.A.	
Factory: Via Nazionale, 110 – Arcella (Avellino) – Italy	
Heat shrinkable outdoor termination for single core plastic or rubber insulated cable with wire screen	
ELCON MEGARAD CODE	FN19364
LOT NUMBER	A1222 SERIAL 0001
VOLTAGES	Uo/U=12,7/22kV Um=24kV
CABLES RANGE	1x800mm ² Al
CABLE MARKING	YMeKrvaslqwd Fca 1x800Alrm + as50 12/20kV - XLPE
DRAWING	862X/NL05

3 IDENTIFICATION OF THE TESTED SAMPLES

The dimensions of the tested Heat-shrinkable outdoor terminations, indicated above, were found in compliance with the relevant Installation Instructions supplied by the Manufacturer (reference document 4.2[1]).

4 REFERENCE DOCUMENTS

4.1 Normative documents

- [1] CENELEC HD 629.1 S3:2019: "Test requirements on accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36(42) kV. Part 1: cables with extruded insulation".
- [2] CEI EN 61442 Ed. 2 (2006): "Test methods for accessories for power cables with rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV)".

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4.2 Documents used for the identification of the tested sample

- [1] ELCON MEGARAD S.p.A. Installation Instructions ECOTERM TES – 2484X/W-3X1 (CESI registration number B9014925).

4.3 Manufacturer's Test Reports

- [1] ELCON MEGARAD S.p.A. Test Report No. 119_19 dated 2019/07/22 (CESI registration number B9014924).

4.4 Other documents

- [1] Laboratory check-list (CESI registration number B7007676).

5 ASSESSMENT OF LABORATORY ADEQUACY

The adequacy of the laboratory for the performance of the required tests was assessed. The details of the checks performed by CESI Inspector Mr. Antonio Vele during a recent inspection to the same laboratory can be considered still valid and are reported in the laboratory check-list (reference document 4.4[1]).

On the basis of the modalities of performing and managing the tests, the competence of the laboratory staff charged with the performance of the tests themselves was ascertained.

The measuring instruments used are indicated in ELCON MEGARD Test Report (reference document 4.3[1]). For each instrument, the following data have been reported: description, manufacturer, type, serial number or internal code, the expiry date of calibration, precision.

The adequacy and calibration state of the measuring instruments used were verified, checking the calibration dates indicated on the labels of the instruments and the relevant certificates.

6 TESTS PERFORMED

Before the tests on heat shrinkable outdoor terminations, the following activities were carried out.

1. Quality and quantity check of the components mentioned in the bill of materials:
The components were found new and in good state
2. Witnessing of the test loop assembling:
The assembling of the heat shrinkable outdoor terminations was done according to the Installation Instructions

For the tests, the following compositions of the cable lines were installed:

COMPOSITION LINE			
LINE	TERMINATION 1	CABLE	TERMINATION 2
AT045-19	ELCOTERM TES- 2484X/W-3X1-NL02 Cables Lug NEXANS 16-95 mm ²	1x25 mm ² Cu	ELCOTERM TES- 2484X/W-3X1-NL02 Cables Lug NILED 25-95 mm ²

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AT046-19	ELCOTERM TES- 2484X/W-3X1-NL03 Cables Lug TE 50-240 mm ²	1x95 mm ² Cu	ELCOTERM TES- 2484X/W-3X1-NL03 Cable Lug PFISTERER 50-240 mm ²
AT047-19 AT053-19	ELCOTERM TES- 2484X/W-3X1-NL03 Cables Lug TE 50-240 mm ² Cable Lug PFISTERER 50-240 mm ²	1x240 mm ² Al	ELCOTERM TES- 2484X/W-3X1-NL03 Cables Lug NILED 16-95 mm ² Cable Lug NEXANS 70-240 mm ²
AT054-19	ELCOTERM TES- 2484X/W-3X1-NL05 Cables Lug TE 630-800 mm ²	1x800 mm ² Al	ELCOTERM TES- 2484X/W-3X1-NL03 Cable Lug PFISTERER 300/630-800 mm ²

In presence of CESI Inspector, the following tests were performed:

Normative document	Clause	Sequence	Test	Test Report	Test results
HD 629.1 S3	Table 11 - Item 1	A1	AC voltage withstand dry test (4,5 U _o)	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 2	A1	AC voltage withstand wet test (4 U _o)	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 3	A1	Partial discharge at ambient temperature (2U _o)	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 4	A1	Impulse voltage at elevated temperature	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 5	A1	Heating cycle voltage in air (2,5U _o)	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 6	A1	Immersion	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 7	A1	Partial discharge at elevated and ambient temperature (2U _o)	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 11	A1	Impulse voltage at ambient temperature	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 12	A1	AC voltage withstand dry test (4,5U _o)	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 13	A1	Partial discharge at ambient temperature (2U _o)	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 15	A1	Visual examination according to annex C	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 1	A2	AC voltage withstand dry test (4,5 U _o)	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 13	A2	Impulse voltage at ambient temperature	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 1	A2	AC voltage withstand dry test (4,5 U _o)	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 15	A2	Visual examination according to annex C	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 14	A3	Salt fog (1,25U _o)	4.3[1]	Passed
HD 629.1 S3	Table 11 - Item 15	A3	Visual examination according to annex C	4.3[1]	Passed
HD 629.1 S3	Table 17 - Item 1	-	AC voltage dry withstand test (4,5 U _o)	4.3[1]	Passed

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Normative document	Clause	Sequence	Test	Test Report	Test results
HD 629.1 S3	Table 17 - Item 2	-	Partial discharge at ambient temperature (2Uo)	4.3[1]	Passed
HD 629.1 S3	Table 17 - Item 3	-	Impulse voltage at ambient temperature	4.3[1]	Passed
HD 629.1 S3	Table 17 - Item 4	-	Heating cycle voltage in air (2,5Uo)	4.3[1]	Passed
HD 629.1 S3	Table 17 - Item 5	-	AC voltage dry withstand test (4,5 Uo)	4.3[1]	Passed
HD 629.1 S3	Table 17 - Item 6		Partial discharge at elevated and ambient temperature(2Uo)	4.3[1]	Passed
HD 629.1 S3	Table 17 - Item 7	-	Visual examination according to annex C	4.3[1]	Passed

7 NON CONFORMITIES

During the inspection no non conformities were found.

8 CONCLUSIONS

On the basis of the results obtained it is possible to conclude that the Heat-shrinkable outdoor terminations for single-core plastic or rubber insulated cables with wire screen types:

- ELCOTERM TES – 2484X/W-3X1—NL02 code FN20036
- ELCOTERM TES – 2484X/W-3X1—NL03 code FN20034
- ELCOTERM TES – 2484X/W-3X1—NL05 code FN19364

manufactured by ELCON MEGARAD S.p.A., Via Nazionale, 110 - Arcella (Avellino) – Italy, passed the tests listed in item 6.

TEST REPORT

N° 119_19



ELCOTERM TES-2484X/W-3X1-NL02
ELCOTERM TES-2484X/W-3X1-NL03
ELCOTERM TES-2484X/W-3X1-NL05

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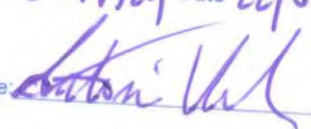
Reg. No.

B904924

Date

22/07/2019

Signature:

A handwritten signature in blue ink, appearing to read 'Antonio Viti'.

Prepared by: Francesco Lombardo

Approved by: Generoso De Simone

CLIENT: ENEXIS**TEST LABORATORY:** ELCON MEGARAD S.p.A.
Arcella – Avellino – ITALY**TEST OBJECT:**

Heat shrinkable outdoor termination for single core plastic or rubber insulated cable with wire screen.

TYPE: **ELCOTERM TES – 2484X/W-3X1-NL02**
ELCOTERM TES – 2484X/W-3X1-NL03
ELCOTERM TES – 2484X/W-3X1-NL05**VOLTAGE:** $U_0 / U = 12,7/22 \text{ kV}$ (U_m 24 kV)
SECTIONS: 1x25mm² Cu / 1x95mm² Cu / 1x240mm² Al / 1x800mm² Al
HXCMK 1x25rs + as25 12/20kV - XLPE
YMeKvaslqwd Fca 1x95rs + as25 12/20kV - XLPE
YMeKvaslqwd Fca 1x240Alrm + as35 12/20kV - XLPE
YMeKvaslqwd Fca 1x800Alrm + as50 12/20kV - XLPE**NORMATIVE:** CENELEC HD 629.1 S3:2019**TEST METHODS:** CEI EN 61442:2006**CONTROL:**

The components mentioned in the bill of materials of the drawing
862X/NL02 + 862X/NL03 + 862X/NL05 have been identified and found in good state.
Assembled by ELCON MEGARAD operator, according to the installation instruction.

DATE OF TEST: 10 MAY to 22 JULY 2019**TEST RESULT:**

The test results comply with the requirements of the reference normative document.
See page 3+4



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Operator
Francesco Lombardo



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TEST SEQUENCE

CENELEC HD 629.1 S3:2019 - Table 11

Sequence A1

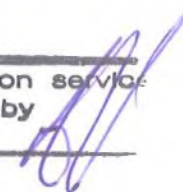
N°	Test	Requirements	Parameters	Result
01	A.C. voltage withstand dry (4,5U ₀)	No breakdown nor flashover	57 kV / 5 min.	Passed
02	A.C. voltage withstand wet (4 U ₀)	No breakdown nor flashover	51 kV / 1 min.	Passed
03	Partial discharge at ambient temperature (2U ₀)	max. 10 pC	25 kV	Passed
04	Impulse voltage at elevated temperature	No breakdown nor flashover	125 kV 10 of each polarity	Passed
05	Heating cycle voltage in air (2,5U ₀)	No breakdown nor flashover	32 kV / 126 cycles	Passed
06	Immersion	-	10 cycles	Passed
07	Partial discharge at elevated temperature (2U ₀)	max. 10 pC	25 kV	Passed
08	Partial discharge at ambient temperature (2U ₀)	max. 10 pC	25 kV	Passed
09	Impulse voltage at ambient temperature	No breakdown nor flashover	125 kV 10 of each polarity	Passed
10	A.C. voltage withstand dry (4,5U ₀)	No breakdown nor flashover	57 kV / 5 min.	Passed
11	Partial discharge at ambient temperature (2U ₀)	max. 10 pC	25 kV	Passed
12	Visual examination	According to Annex C	-	Passed

Sequence A2

13	A.C. voltage withstand dry (4,5U ₀)	No breakdown nor flashover	57 kV / 5 min.	Passed
14	Thermal short circuit screen	No breakdown	N° 2 to 5 kA / 1 s	Passed
15	Thermal short circuit conductor	No breakdown	N° 2 to 27,8 kA / 1 s	Passed
16	Impulse voltage at ambient temperature	No breakdown nor flashover	125 kV 10 of each polarity	Passed
17	A.C. voltage withstand dry (4,5U ₀)	No breakdown nor flashover	57 kV / 5 min.	Passed
18	Visual examination	According to Annex C	-	Passed

Sequence A3

19	Salt fog (1,25 U ₀)	No breakdown no more than 3 trips	16 kV / 1000 h	Passed
20	Visual examination	According to Annex C	-	Passed

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TEST SEQUENCE

CENELEC HD 629.1 S3:2019 - Table 17

Sequence

N°	Test	Requirements	Parameters	Result
21	A.C. voltage withstand dry (4,5Uo)	No breakdown nor flashover	57 kV / 5 min.	Passed
22	Partial discharge at ambient temperature (2Uo)	max. 10 pC	25 kV	Passed
23	Impulse voltage at ambient temperature	No breakdown nor flashover	125 kV 10 of each polarity	Passed
24	Heating cycle voltage in air (2,5Uo)	No breakdown nor flashover	32 kV / 12 cycles	Passed
25	A.C. voltage withstand dry (4,5Uo)	No breakdown nor flashover	57 kV / 5 min.	Passed
26	Partial discharge at elevated temperature (2Uo)	max. 10 pC	25 kV	Passed
27	Partial discharge at ambient temperature (2Uo)	max. 10 pC	25 kV	Passed
28	Visual examination	According to Annex C	-	Passed

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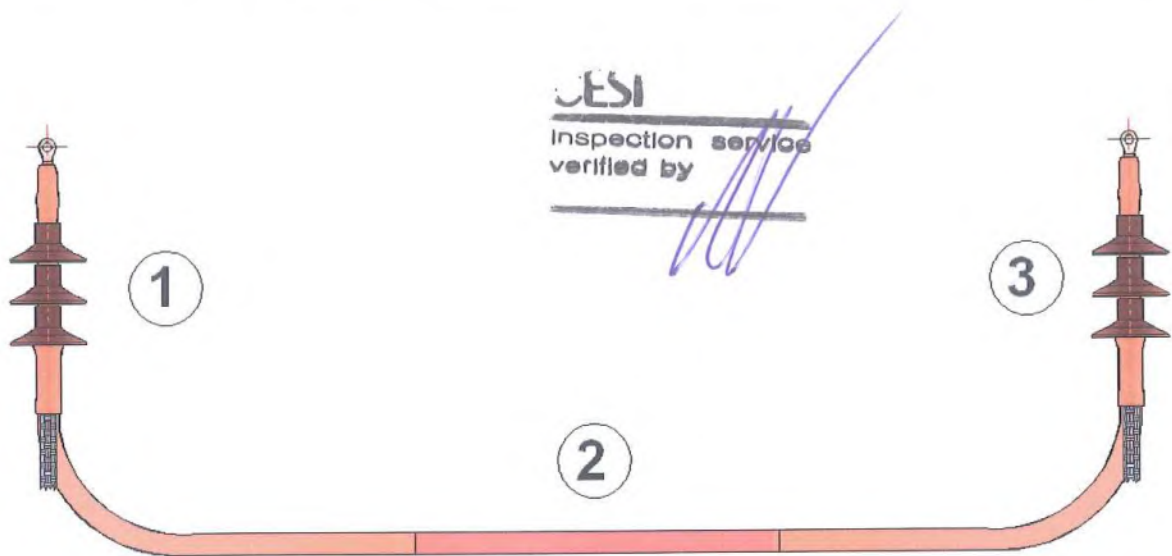


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COMPOSITION OF THE CABLE LINE

Line	Termination 1	Cable 2	Termination 3
AT045-19	ELCOTERM TES – 2484X/W-3X1-NL02 Cable Lug NEXANS 16-95mm ²	1x25mm ² Cu	ELCOTERM TES – 2484X/W-3X1-NL02 Cable Lug NILED 25-95mm ²
AT046-19	ELCOTERM TES – 2484X/W-3X1-NL03 Cable Lug TE 50-240mm ²	1x95mm ² Cu	ELCOTERM TES – 2484X/W-3X1-NL03 Cable Lug PFISTERER 50-240mm ²
AT047-19 ÷ AT053-19	ELCOTERM TES – 2484X/W-3X1-NL03 Cable Lug TE 50-240mm ² Cable Lug PFISTERER 50-240mm ²	1x240mm ² Al	ELCOTERM TES – 2484X/W-3X1-NL03 Cable Lug NILED 50-240mm ² Cable Lug NEXANS 70-240mm ²
AT054-19	ELCOTERM TES – 2484X/W-3X1-NL05 Cable Lug TE 630-800mm ²	1x800mm ² Al	ELCOTERM TES – 2484X/W-3X1-NL05 Cable Lug PFISTERER 300/630-800mm ²



Indicative scheme of cable line

Lombardo
ELCON MEGARAD
Operator
Francesco Lombardo

Generoso De Simone
ELCON MEGARAD
H.V. Lab. Responsible
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TEST 01	A.C. voltage withstand dry
Line:	AT046-19 + AT047-19 + AT054-19
Date:	10/05/2019
Applied Voltage:	57 kV
Testing time:	5 min.
Result:	No breakdown nor flashover
Measuring Test Equipment: AT 213	

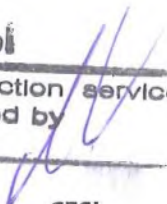
TEST 02	A.C. voltage withstand wet
Line:	AT046-19 + AT047-19 + AT054-19
Date:	10/05/2019
Applied Voltage:	51 kV
Testing time:	1 min.
Result:	No breakdown nor flashover
Measuring Test Equipment: AT 213	

TEST 03	Partial discharge at ambient temperature		
Line:	AT046-19	AT047-19	AT054-19
Date:	10/05/2019		
Applied Voltage:	25 kV		
Partial discharge level:	1,2 pC	1 pC	1 pC
Result:	These values are lower than maximum permissible value 10 pC.		
Note: Calibrated before the test.			
Measuring Test Equipment: AT 213, AT 219			

TEST 04	Impulse voltage at elevated temperature	
Line:	AT046-19 + AT047-19 + AT054-19	
Date:	16/05/2019	
Polarity:	+ Positive	- Negative
Applied Voltage:	125 kV	
Testing:	N° 10	
Result:	No breakdown nor flashover	
Measuring Test Equipment : AT 169 , AT 226		


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TEST 05	Heating Cycles voltage in air
Line:	AT046-19 + AT047-19 + AT054-19
Date:	17/05/2019 – 01/07/2019
Test Voltage:	32 kV
Number of cycles:	N° 126
Result:	No breakdown nor flashover
Note: Each heating cycle is completed in 8h and it is carried out in 5h of heating ON with injection of the loading current and 3h heating OFF, with natural cooling of the cable until ambient temperature. During the heating time, the cable conductor keeps a value of temperature 5-10K above the maximum cable conductor (90°C) temperature for at least 2 hours.	
Measuring Test Equipment : AT 228 / AT 229 / AT 181 - AT 183 / AT 280 - AT 289	

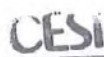
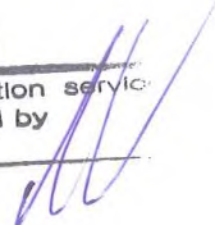
TEST 06	Immersion
Line:	AT046-19 + AT047-19 + AT054-19
Date:	02/07/2019 – 05/07/2019
Number of cycles:	N° 10
Result:	No breakdown nor flashover
Note: Each heating cycle is completed in 8h and it is carried out in 5h of heating ON with injection of the loading current and 3h heating OFF, with natural cooling of the cable until ambient temperature. During the heating time, the cable conductor keeps a value of temperature 5-10K above the maximum cable conductor (90°C) temperature for at least 2 hours.	
Measuring Test Equipment : AT 228 / AT 229 / AT 181 - AT 183 / AT 280 - AT 289	

TEST 07	Partial discharge at elevated temperature		
Line:	AT046-19	AT047-19	AT054-19
Date:	11/07/2019		
Applied Voltage:	25 kV		
Partial discharge level:	1 pC	1 pC	2 pC
Result:	These values are lower than maximum permissible value 10 pC.		
Note: Calibrated before the test.			
Measuring Test Equipment: AT 213, AT 219			


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TEST 08	Partial discharge at ambient temperature		
Line:	AT046-19	AT047-19	AT054-19
Date:	11/07/2019		
Applied Voltage:	25 kV		
Partial discharge level:	1 pC	2 pC	2 pC
Result:	These values are lower than maximum permissible value 10 pC.		
Note: Calibrated before the test.			
Measuring Test Equipment: AT 213, AT 219			

TEST 09	Impulse voltage at ambient temperature	
Line:	AT046-19 + AT047-19 + AT054-19	
Date:	11/07/2019	
Polarity:	+ Positive	- Negative
Applied Voltage:	125 kV	
Testing:	N° 10	
Result:	No breakdown nor flashover	
Measuring Test Equipment : AT 169 , AT 226		

TEST 10	A.C. voltage withstand dry		
Line:	AT046-19 + AT047-19 + AT054-19		
Date:	11/07/2019		
Applied Voltage:	57 kV		
Testing time :	5 min.		
Result:	No breakdown nor flashover		
Measuring Test Equipment: AT 213			

TEST 11	Partial discharge at ambient temperature		
Line:	AT046-19	AT047-19	AT054-19
Date:	11/07/2019		
Applied Voltage:	25 kV		
Partial discharge level:	1 pC	1 pC	1,5 pC
Result:	These values are lower than maximum permissible value 10 pC.		
Note: Calibrated before the test.			
Measuring Test Equipment: AT 213, AT 219			


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TEST 12	Visual examination
Line:	AT046-19 + AT047-19 + AT054-19
Date :	12/07/2019
Note: According to Annex C : - No presence of water or moisture beyond the sealing barriers. - No presence of corrosion on any metallic parts. - No electrical degradation in primary insulation. - No mechanical degradation. - No thermal degradation. - No leakage of insulating material. - No obvious shrinkage of cable components.	

TEST 13	A.C. voltage withstand dry
Line:	AT051-19 + AT052-19 + AT053-19
Date:	16/05/2019
Applied Voltage:	57 kV
Testing time :	5 min.
Result:	No breakdown nor flashover
Measuring Test Equipment: AT 213	

TEST 14	Thermal short circuit screen
Line:	AT051-19 + AT052-19 + AT053-19
Number:	N° 2
Applied current:	5 kA
Testing time:	1 s
Result:	No breakdown
Note: Earth lug at break and at crimping.	
Measuring Test: SVEPPI – SIEMENS see Test Report N° RP LS 19/164A	

TEST 15	Thermal short circuit conductor
Line:	AT051-19 + AT052-19 + AT053-19
Number:	N° 2
Applied current:	27,8 kA
Testing time:	1 s
Result:	No breakdown
Measuring Test: SVEPPI - SIEMENS see Test Report N° RP LS 19/164A	



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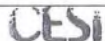
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TEST 16	Impulse voltage at ambient temperature	
Line:	AT051-19 + AT052-19 + AT053-19	
Date:	12/07/2019	
Polarity:	+ Positive	- Negative
Applied Voltage:	125 kV	
Testing:	N° 10	
Result:	No breakdown nor flashover	
Measuring Test Equipment : AT 169 , AT 226		

TEST 17	A.C. voltage withstand dry	
Line:	AT051-19 + AT052-19 + AT053-19	
Date:	12/07/2019	
Applied Voltage:	57 kV	
Testing time :	5 min.	
Result:	No breakdown nor flashover	
Measuring Test Equipment: AT 213		

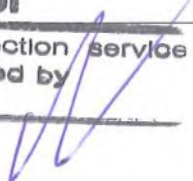
TEST 18	Visual examination	
Line:	AT051-19 + AT052-19 + AT053-19	
Date :	12/07/2019	
Note: According to Annex C : • No presence of water or moisture beyond the sealing barriers. • No presence of corrosion on any metallic parts. • No electrical degradation in primary insulation. • No mechanical degradation. • No thermal degradation. • No leakage of insulating material. • No obvious shrinkage of cable components.		

TEST 19	Salt fog	
Line:	AT048-19 + AT049-19 + AT050-19	
Date:	30/05/2019 – 11/07/2019	
Test Voltage:	16 kV	
Duration:	1000 h	
Result:	No failure	
Note: Water conductivity : 1600±200 mS/m.		
Measuring Test Equipment : AT 301 / AT 162		




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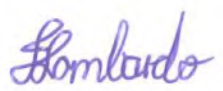
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TEST 20	Visual examination
Line:	AT048-19 + AT049-19 + AT050-19
Date :	12/07/2019
Note: According to Annex C : - No presence of water or moisture beyond the sealing barriers. - No presence of corrosion on any metallic parts. - No electrical degradation in primary insulation. - No mechanical degradation. - No thermal degradation. - No leakage of insulating material. - No obvious shrinkage of cable components.	

TEST 21	A.C. voltage withstand dry
Line:	AT045-19
Date:	10/05/2019
Applied Voltage:	57 kV
Testing time:	5 min.
Result:	No breakdown nor flashover
Measuring Test Equipment: AT 213	

TEST 22	Partial discharge at ambient temperature
Line:	AT045-19
Date:	10/05/2019
Applied Voltage:	25 kV
Partial discharge level:	5 pC
Result:	These values are lower than maximum permissible value 10 pC.
Note: Calibrated before the test.	
Measuring Test Equipment: AT 213, AT 219	

TEST 23	Impulse voltage at ambient temperature
Line:	AT045-19
Date:	16/05/2019
Polarity:	+ Positive - Negative
Applied Voltage:	125 kV
Testing:	N° 10
Result:	No breakdown nor flashover
Measuring Test Equipment : AT 169 , AT 226	


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TEST 24	Heating Cycles voltage in air
Line:	AT045-19
Date:	17/05/2019 – 21/05/2019
Test Voltage:	32 kV
Number of cycles:	N° 12
Result:	No breakdown nor flashover
Note: Each heating cycle is completed in 8h and it is carried out in 5h of heating ON with injection of the loading current and 3h heating OFF, with natural cooling of the cable until ambient temperature. During the heating time, the cable conductor keeps a value of temperature 5-10K above the maximum cable conductor (90°C) temperature for at least 2 hours.	
Measuring Test Equipment : AT 228 / AT 229 / AT 181 - AT 183 / AT 280 - AT 289	

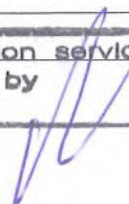
TEST 25	A.C. voltage withstand dry
Line:	AT045-19
Date:	30/05/2019
Applied Voltage:	57 kV
Testing time :	5 min.
Result:	No breakdown nor flashover
Measuring Test Equipment: AT 213	

TEST 26	Partial discharge at elevated temperature
Line:	AT045-19
Date:	30/05/2019
Applied Voltage:	25 kV
Partial discharge level:	4,5 pC
Result:	These values are lower than maximum permissible value 10 pC.
Note: Calibrated before the test.	
Measuring Test Equipment: AT 213, AT 219	

TEST 27	Partial discharge at ambient temperature
Line:	AT045-19
Date:	30/05/2019
Applied Voltage:	25 kV
Partial discharge level:	4,5 pC
Result:	These values are lower than maximum permissible value 10 pC.
Note: Calibrated before the test.	
Measuring Test Equipment: AT 213, AT 219	


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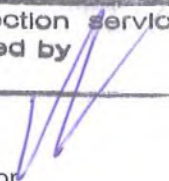
TEST 28	Visual examination
Line:	AT045-19
Date :	30/05/2019
Note: According to Annex C : - No presence of water or moisture beyond the sealing barriers. - No presence of corrosion on any metallic parts. - No electrical degradation in primary insulation. - No mechanical degradation. - No thermal degradation. - No leakage of insulating material. - No obvious shrinkage of cable components.	

MEASURING INSTRUMENTS

Description	Manufacturer	Supplier's code	Next calibration	Elcon ID	Accuracy
Power supply area No. 2 for dielectric test	AME	Reg. No. 2334	18/04/2020	AT 228	3%
Power supply area No. 3 for dielectric test	AME	Reg. No. 2333	13/04/2022	AT 213	3%
PD calibrator unit CAL542	OMICRON	Reg. No. HH462D	14/03/2022	AT 219	1%
Impulse voltage Measuring system	DR. STRAUSS	Reg. No. TR-AS 100-12	06/04/2022	AT 226	3%
Ohmic capacitive divider	HAEFELY	Reg. No. 99100314.1	06/04/2022	AT 169	3%
Thermocouple type "T"	ITALCOPPIE	Not applicable	07/11/2019	AT 181	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	07/11/2019	AT 182	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	07/11/2019	AT 183	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 280	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 281	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 283	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 284	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 285	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 286	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 287	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 288	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 289	2%
Digital multimeter	AGILENT	MY53205896	11/09/2019	AT 229	1%
Data logger	AGILENT	MY49022503	28/01/2022		1%
Conductivity meter	HANNA INSTRUMENT	Not applicable	06/03/2020	AT 162	2%
Power supply salt fog	SPECIALTRASFO	Not applicable	17/04/2020	AT 301	3%
Meteorological Station	FISCHER	Not applicable	10/03/2020	AT 161	3%


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EXAMPLE OF IMPULSE WAVE SHAPE

Ambient temperature: 20°C / Humidity: 60 % / Air pressure: 976hPa



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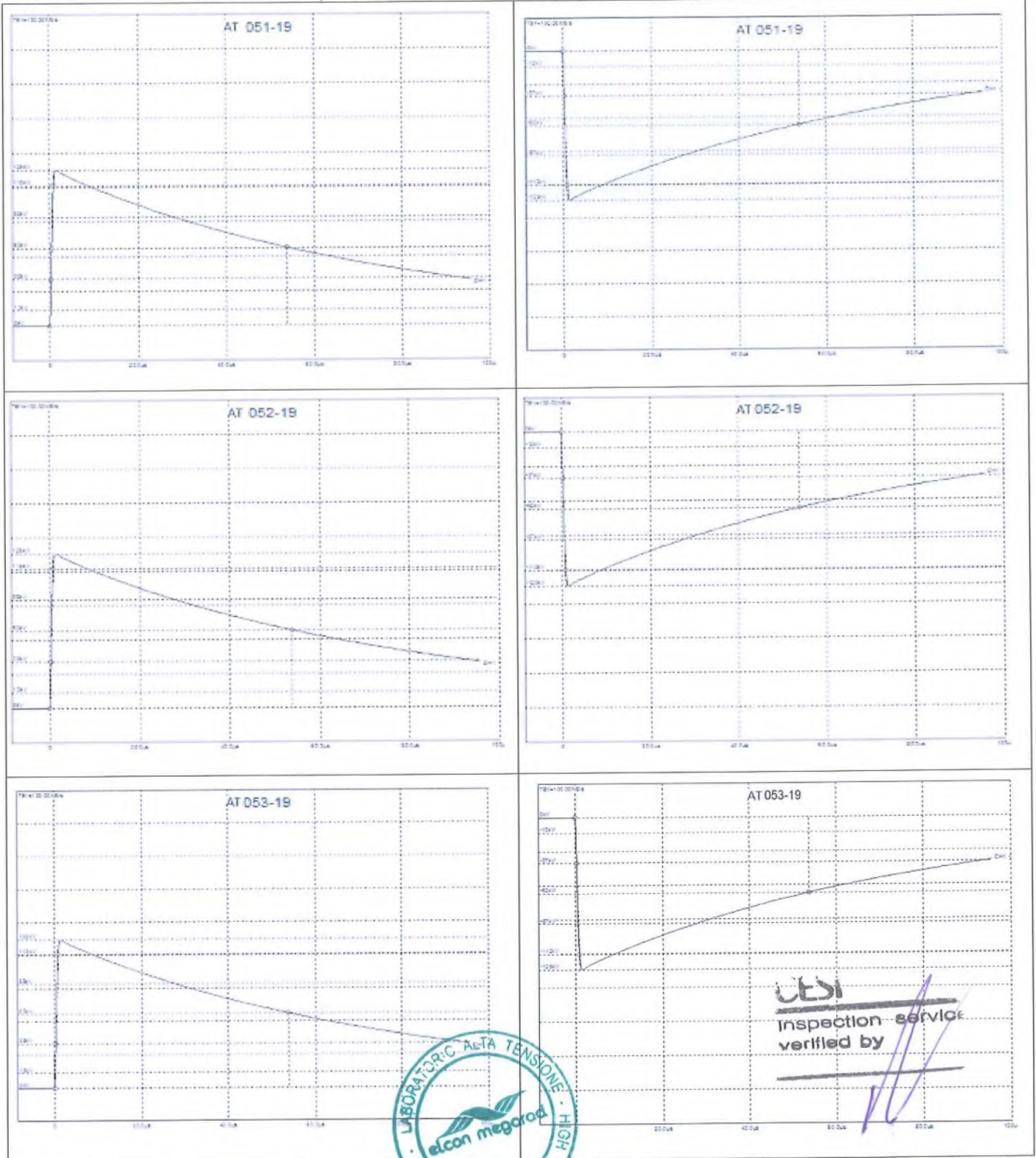
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EXAMPLE OF IMPULSE WAVE SHAPE

Ambient temperature: 22°C / Humidity: 49% / Air pressure: 981hPa



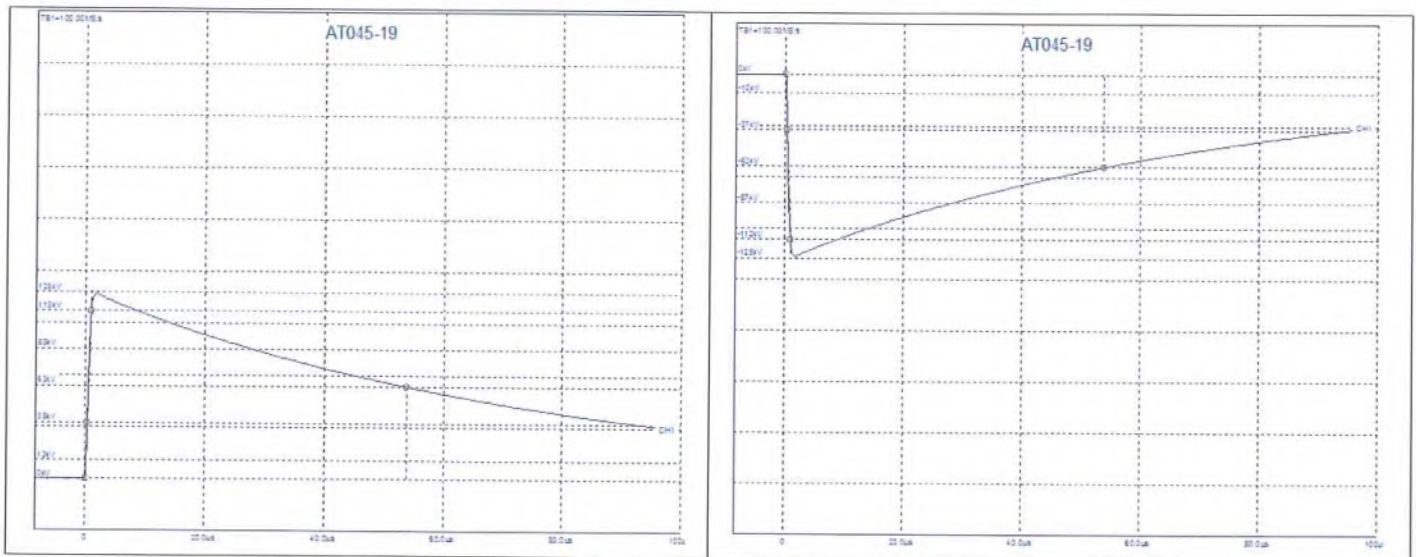
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EXAMPLE OF IMPULSE WAVE SHAPE

Ambient temperature: 20°C / Humidity: 60 % / Air pressure: 976hPa



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TEST CONFIGURATION

AC -TEST



PD -TEST



IMPULSE -TEST



WET -TEST

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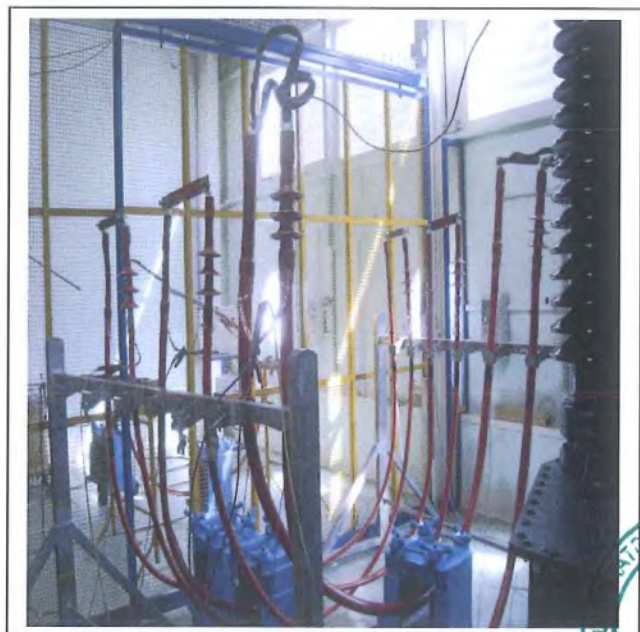
IMMERSION -TEST



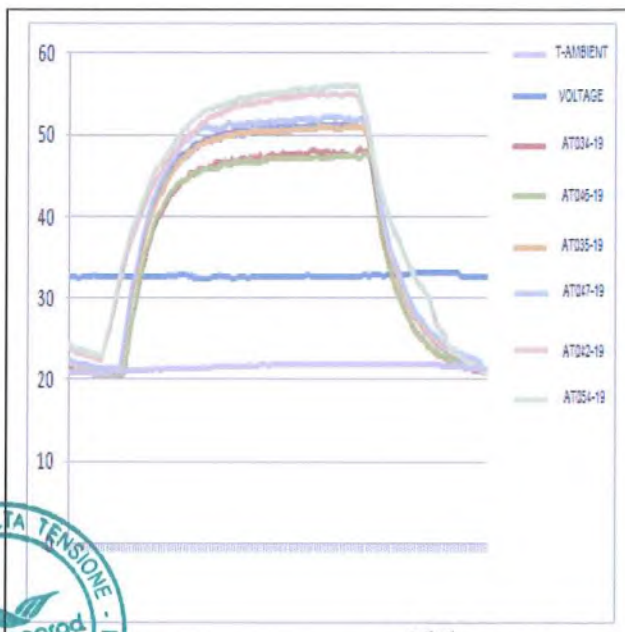
SALT FOG -TEST



HEATING CYCLE IN AIR -TEST



**DIAGRAMS FOR
HEATING CYCLE IN AIR -TEST**



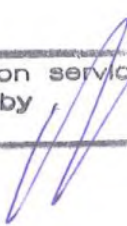
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CONFIGURATION FOR ASSEMBLY



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INSPECTION REPORT

APPROVED

B9014922

Client ELCON MEGARAD S.p.A.
Via Nazionale, 110 – Arcella (Avellino) – Italy

Subject Inspection to tests on heat shrinkable indoor terminations for single core plastic or rubber insulated cables with wire screen, types:
1- ELCOTERM TIS – 2482X/W-3X1-NL02
2- ELCOTERM TIS – 2482X/W-3X1-NL03
3- ELCOTERM TIS – 2482X/W-3X1-NL05
manufactured by ELCON MEGARAD S.p.A., Via Nazionale, 110 - Arcella (Avellino) – Italy

Place and date of inspection ELCON MEGARAD S.p.A.
Via Nazionale, 110 – Arcella (Avellino) – Italy
May 10th to 22nd, 2019

Notes

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N. of pages 7 **N. of pages annexed** -

Issue date September 9th, 2019

Prepared TCE/CER/PRO – Antonio VELE

Verified TCE/CER/PRO – Stefano BOSSI

Stefano Bossi

Approved TCE/CER – Roberto PICCIN

CESI S.p.A.

Testing & Certification Division
Business Area Certification
Il Responsabile

(Roberto Piccin)

Roberto Piccin



ISP N° 024E

Membro degli Accordi di Mutuo Riconoscimento EA, IAF e ILAC
Signatory of EA, IAF and ILAC Mutual Recognition agreements

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1 GENERAL

This report concerns the inspection activity requested by ELCON MEGARAD S.p.A. to tests on heat shrinkable indoor terminations for single core plastic or rubber insulated cables with wire screen, types:

- ELCOTERM TIS – 2482X/W-3X1-NL02
- ELCOTERM TIS – 2482X/W-3X1-NL03
- ELCOTERM TIS – 2482X/W-3X1-NL05

manufactured by ELCON MEGARAD S.p.A., Via Nazionale, 110 - Arcella (Avellino) – Italy.

During the inspection were present:

- ELCON MEGARAD S.p.A.: Mr. Generoso De Simone
Mr. Ciro Del Vecchio
Mr. Franco Lombardo
- CESI: Mr. Antonio Vele

This activity was carried out by CESI as Type A Inspection Body, in the field of ACCREDIA accreditation No.024E of conformity with the Standard EN ISO/IEC 17020 and the application guidelines of the Standard itself ILAC-P15.

2 RATINGS

All the following data were found in the documents supplied by ELCON MEGARAD S.p.A.

ELCOTERM TIS – 2482X/W-3X1-NL02	
Manufacturer: ELCON MEGARAD S.p.A.	
Factory: Via Nazionale, 110 – Arcella (Avellino) – Italy	
Heat shrinkable indoor termination for single core plastic or rubber insulated cables with wire screen	
ELCON MEGARAD CODE	FN19361
LOT NUMBER	A1211U SERIAL 0001
VOLTAGES	Uo/U=12,7/22kV Um=24kV
CABLES RANGE	1x25mm ² Cu
CABLE MARKING	HXCMK 1x25rs + as25 12/20kV - XLPE
DRAWING	823X/NL02

ELCOTERM TIS – 2482X/W-3X1-NL03	
Manufacturer: ELCON MEGARAD S.p.A.	
Factory: Via Nazionale, 110 – Arcella (Avellino) – Italy	
Heat shrinkable indoor termination for single core plastic or rubber insulated cable with wire screen	
ELCON MEGARAD CODE	FN19362
LOT NUMBER	A1212U – A1215 SERIAL 0001
VOLTAGES	Uo/U=12,7/22kV Um=24kV
CABLES RANGE	1x95 - 240mm ² Cu/Al
CABLE MARKING	YMeKrvslqwd Fca 1x95rs + as25 12/20kV – XLPE
DRAWING	YMeKrvslqwd Fca 1x240Alrm + as35 12/20kV - XLPE

ELCOTERM TIS – 2482X/W-3X1-NL05	
Manufacturer: ELCON MEGARAD S.p.A.	
Factory: Via Nazionale, 110 – Arcella (Avellino) – Italy	
Heat shrinkable indoor termination for single core plastic or rubber insulated cable with wire screen	
ELCON MEGARAD CODE	FN19363
LOT NUMBER	A1216 SERIAL 0001
VOLTAGES	Uo/U=12,7/22kV Um=24kV
CABLES RANGE	1x800mm ² Al
CABLE MARKING	YMeKrvslqwd Fca 1x800Alrm + as50 12/20kV - XLPE
DRAWING	823X/NL05

3 IDENTIFICATION OF THE TESTED SAMPLE

The dimensions of the tested heat-shrinkable indoor terminations, indicated above, were found in compliance with the relevant Installation Instructions supplied by the Manufacturer (reference document 4.2[1]).

4 REFERENCE DOCUMENTS

4.1 Normative documents

- [1] CENELEC HD 629.1 S3:2019: "Test requirements on accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36(42) kV. Part 1: cables with extruded insulation".
- [2] CEI EN 61442 Ed. 2 (2006): "Test methods for accessories for power cables with rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV)".

4.2 Documents used for the identification of the tested sample

- [1] ELCON MEGARAD S.p.A. Installation Instructions ECOTERM TIS – 2484X/W-3X1-NL (CESI registration number B9014927).

4.3 Manufacturer's Test Reports

[1] ELCON MEGARAD S.p.A. Test Report No. 120_19 dated 2019/07/22 (CESI registration number B9014926).

4.4 Other documents

[1] Laboratory check-list (CESI registration number B7007676).

5 ASSESSMENT OF LABORATORY ADEQUACY

The adequacy of the laboratory for the performance of the required tests was assessed. The details of the checks performed by CESI Inspector Mr. Antonio Vele during a recent inspection to the same laboratory can be considered still valid and are reported in the laboratory check-list (reference document 4.4[1]).

On the basis of the modalities of performing and managing the tests, the competence of the laboratory staff charged with the performance of the tests themselves was ascertained.

The measuring instruments used are indicated in ELCON MEGARD Test Report (reference document 4.3[1]). For each instrument, the following data have been reported: description, manufacturer, type, serial number or internal code, the expiry date of calibration, precision.

The adequacy and calibration state of the measuring instruments used were verified, checking the calibration dates indicated on the labels of the instruments and the relevant certificates.

6 TESTS PERFORMED

Before the tests on heat shrinkable indoor terminations, the following activities were carried out.

1. Quality and quantity check of the components mentioned in the bill of materials:
The components were found new and in good state
2. Witnessing of the test loop assembling:
The assembling of the heat shrinkable indoor terminations was done according to the Installation Instructions

For the tests, the following compositions of the cable lines were installed:

COMPOSITION LINE			
LINE	TERMINATION 1	CABLE	TERMINATION 2
AT033-19	ELCOTERM TIS – 2482X/W-3X1-NL02 Cables Lug TE 16-95 mm ²	1x25 mm ² Cu	ELCOTERM TIS – 2482X/W-3X1-NL02 Cables Lug PFISTERER 10-95 mm ²
AT034-19	ELCOTERM TIS – 2482X/W-3X1-NL03 Cables Lug TE 50-240 mm ²	1x95 mm ² Cu	ELCOTERM TIS – 2482X/W-3X1-NL03 Cable Lug PFISTERER 50-240 mm ²

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AT035-19 AT041-19	ELCOTERM TIS – 2482X/W-3X1-NL03 Cables Lug TE 50-240 mm ² Cable Lug PFISTERER 50-240 mm ²	1x240 mm ² Al	ELCOTERM TIS – 2482X/W-3X1-NL03 Cables Lug NILED 50-95 mm ² Cable Lug NEXANS 70-240 mm ²
AT042-19	ELCOTERM TIS – 2482X/W-3X1-NL05 Cables Lug TE 630-800 mm ²	1x800 mm ² Al	ELCOTERM TIS – 2482X/W-3X1-NL05 Cable Lug PFISTERER 50 300/630-800 mm ²

In presence of CESI Inspector, the following tests were performed:

Normative document	Clause	Sequence	Test	Test Report	Test results
HD 629.1 S3	Table 10 - Item 1	A1	AC voltage dry withstand test (4,5 U _o)	4.3[1]	Passed
HD 629.1 S3	Table 10 - Item 2	A1	Partial discharge at ambient temperature (2U _o)	4.3[1]	Passed
HD 629.1 S3	Table 10 - Item 3	A1	Impulse voltage at elevated temperature	4.3[1]	Passed
HD 629.1 S3	Table 10 - Item 4	A1	Heating cycle voltage in air (2,5U _o)	4.3[1]	Passed
HD 629.1 S3	Table 10 - Item 5	A1	Partial discharge at elevated and ambient temperature (2U _o)	4.3[1]	Passed
HD 629.1 S3	Table 10 - Item 9	A1	Impulse voltage at ambient temperature	4.3[1]	Passed
HD 629.1 S3	Table 10 - Item 10	A1	AC voltage withstand dry (4,5U _o)	4.3[1]	Passed
HD 629.1 S3	Table 10 - Item 11	A1	Partial discharge at ambient temperature (2U _o)	4.3[1]	Passed
HD 629.1 S3	Table 10 - Item 13	A1	Visual examination according to annex C	4.3[1]	Passed
HD 629.1 S3	Table 10 - Item 1	A2	AC voltage dry withstand test (4,5 U _o)	4.3[1]	Passed
HD 629.1 S3	Table 10 - Item 9	A2	Impulse voltage at ambient temperature	4.3[1]	Passed
HD 629.1 S3	Table 10 - Item 1	A2	AC voltage dry withstand test (4,5 U _o)	4.3[1]	Passed
HD 629.1 S3	Table 10 - Item 13	A2	Visual examination according to annex C	4.3[1]	Passed
HD 629.1 S3	Table 17 - Item 12	A3	Humidity (1,25U _o)	4.3[1]	Passed
HD 629.1 S3	Table 10 - Item 13	A3	Visual examination according to annex C	4.3[1]	Passed
HD 629.1 S3	Table 17 - Item 1	-	AC voltage dry withstand test (4,5 U _o)	4.3[1]	Passed
HD 629.1 S3	Table 17 - Item 2	-	Partial discharge at ambient temperature (2U _o)	4.3[1]	Passed
HD 629.1 S3	Table 17 - Item 3	-	Impulse voltage at ambient temperature	4.3[1]	Passed
HD 629.1 S3	Table 17 - Item 4	-	Heating cycle voltage in air (2,5U _o)	4.3[1]	Passed

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Normative document	Clause	Sequence	Test	Test Report	Test results
HD 629.1 S3	Table 17 - Item 5	-	AC voltage dry withstand test (4,5 U _o)	4.3[1]	Passed
HD 629.1 S3	Table 17 - Item 2		Partial discharge at ambient and elevated temperature (2U _o)	4.3[1]	Passed
HD 629.1 S3	Table 17 - Item 7	-	Visual examination according to annex C	4.3[1]	Passed

7 NON CONFORMITIES

During the inspection no non conformities were found.

8 CONCLUSIONS

On the basis of the results obtained it is possible to conclude that the heat-shrinkable indoor terminations for single-core plastic or rubber insulated cables with wire screen types:

- ELCOTERM TIS – 2482X/W-3X1-NL02 code FN19361
- ELCOTERM TIS – 2482X/W-3X1-NL03 code FN19362
- ELCOTERM TIS – 2482X/W-3X1-NL05 code FN19363

manufactured by ELCON MEGARAD S.p.A., Via Nazionale, 110 - Arcella (Avellino) – Italy, passed the tests listed in item 6.

TEST REPORT

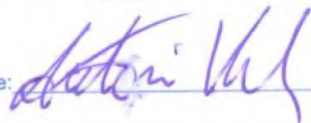
N° 120_19



ELCOTERM TIS-2482X/W-3X1-NL02
ELCOTERM TIS-2482X/W-3X1-NL03
ELCOTERM TIS-2482X/W-3X1-NL05

CESI

Reg. No. B3014926 Date 22/07/2019

Signature: 



Prepared by: Francesco Lombardo

Approved by: Generoso De Simone

CLIENT: ENEXIS**TEST LABORATORY:** ELCON MEGARAD S.p.A.
Arcella – Avellino – ITALY**TEST OBJECT:**

Heat shrinkable indoor termination for single core plastic or rubber insulated cable with wire screen.

TYPE:**ELCOTERM TIS – 2482X/W-3X1-NL02****ELCOTERM TIS – 2482X/W-3X1-NL03****ELCOTERM TIS – 2482X/W-3X1-NL05****VOLTAGE:** $U_0 / U = 12,7/22 \text{ kV} (U_m 24 \text{ kV})$ **SECTIONS:** $1 \times 25 \text{ mm}^2 \text{ Cu} / 1 \times 95 \text{ mm}^2 \text{ Cu} / 1 \times 240 \text{ mm}^2 \text{ Al} / 1 \times 800 \text{ mm}^2 \text{ Al}$

HXCMK 1x25rs + as25 12/20kV - XLPE

YMeKrvslqwd Fca 1x95rs + as25 12/20kV - XLPE

YMeKrvslqwd Fca 1x240Alrm + as35 12/20kV - XLPE

YMeKrvslqwd Fca 1x800Alrm + as50 12/20kV - XLPE

NORMATIVE:

CENELEC HD 629.1 S3:2019

TEST METHODS:

CEI EN 61442:2006

CONTROL:

The components mentioned in the bill of materials of the drawing

823X/NL02 + 823X/NL03 + 823X/NL05 have been identified and found in good state.

Assembled by ELCON MEGARAD operator, according to the installation instruction.

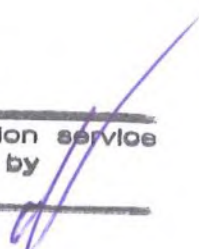
DATE OF TEST:

10 MAY to 22 JULY 2019

TEST RESULT:

The test results comply with the requirements of the reference normative document.

See page 3

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Francesco Lombardo**ELCON MEGARAD**
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TEST SEQUENCE

CENELEC HD 629.1 S3:2019 - Table 10

Sequence A1

N°	Test	Requirements	Parameters	Result
01	A.C. voltage withstand dry (4,5U _o)	No breakdown nor flashover	57 kV / 5 min.	Passed
02	Partial discharge at ambient temperature (2U _o)	max. 10 pC	25 kV	Passed
03	Impulse voltage at elevated temperature	No breakdown nor flashover	125 kV 10 of each polarity	Passed
04	Heating cycle voltage in air (2,5U _o)	No breakdown nor flashover	32 kV / 126 cycles	Passed
05	Partial discharge at elevated temperature (2U _o)	max. 10 pC	25 kV	Passed
06	Partial discharge at ambient temperature (2U _o)	max. 10 pC	25 kV	Passed
07	Impulse voltage at ambient temperature	No breakdown nor flashover	125 kV 10 of each polarity	Passed
08	A.C. voltage withstand dry (4,5U _o)	No breakdown nor flashover	57 kV / 5 min.	Passed
09	Partial discharge at ambient temperature (2U _o)	max. 10 pC	25 kV	Passed
10	Visual examination	According to Annex C	-	Passed

Sequence A2

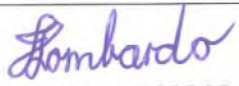
11	A.C. voltage withstand dry (4,5U _o)	No breakdown nor flashover	57 kV / 5 min.	Passed
12	Thermal short circuit screen	No breakdown	N° 2 to 5 kA / 1 s	Passed
13	Thermal short circuit conductor	No breakdown	N° 2 to 27,8 kA / 1 s	Passed
14	Impulse voltage at ambient temperature	No breakdown nor flashover	125 kV 10 of each polarity	Passed
15	A.C. voltage withstand dry (4,5U _o)	No breakdown nor flashover	57 kV / 5 min.	Passed
16	Visual examination	According to Annex C	-	Passed

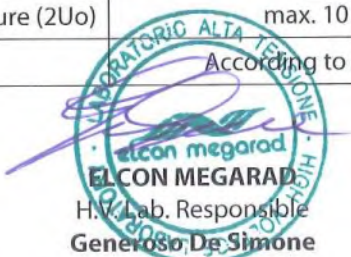
Sequence A3

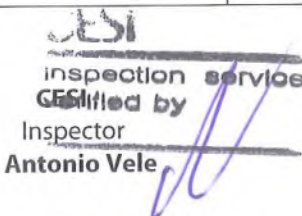
17	Humidity (1,25 U _o)	No breakdown no more than 3 trips	16 kV / 300 h	Passed
18	Visual examination	According to Annex C	-	Passed

CENELEC HD 629.1 S3:2019 - Table 17

N°	Test	Requirements	Parameters	Result
19	A.C. voltage withstand dry (4,5U _o)	No breakdown nor flashover	57 kV / 5 min.	Passed
20	Partial discharge at ambient temperature (2U _o)	max. 10 pC	25 kV	Passed
21	Impulse voltage at ambient temperature	No breakdown nor flashover	125 kV 10 of each polarity	Passed
22	Heating cycle voltage in air (2,5U _o)	No breakdown nor flashover	32 kV / 12 cycles	Passed
23	A.C. voltage withstand dry (4,5U _o)	No breakdown nor flashover	57 kV / 5 min.	Passed
24	Partial discharge at elevated temperature (2U _o)	max. 10 pC	25 kV	Passed
25	Partial discharge at ambient temperature (2U _o)	max. 10 pC	25 kV	Passed
26	Visual examination	According to Annex C	-	Passed

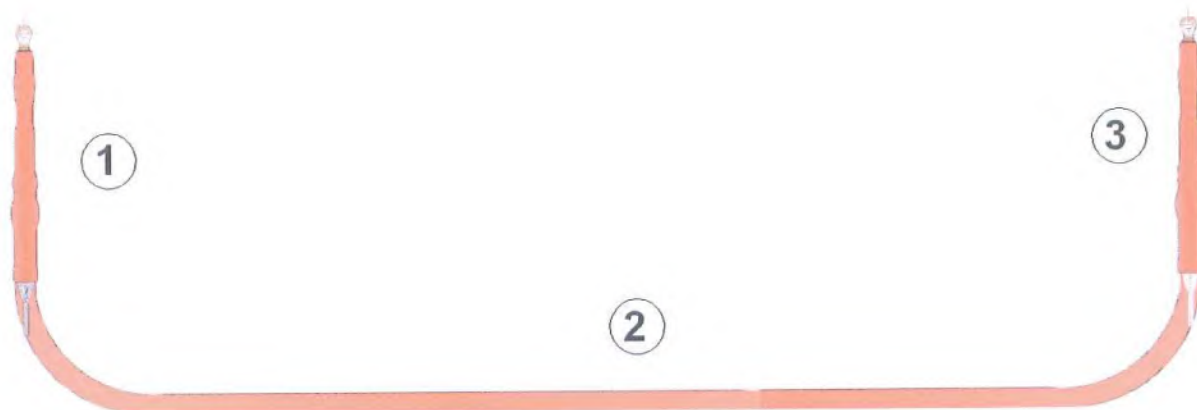

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COMPOSITION OF THE CABLE LINE

Line	Termination 1	Cable 2	Termination 3
AT033-19	ELCOTERM TIS – 2482X/W-3X1-NL02 Cable Lug TE 16-95mm ²	1x25mm ² Cu	ELCOTERM TIS – 2482X/W-3X1-NL02 Cable Lug PFISTERER 10-95mm ²
AT034-19	ELCOTERM TIS – 2482X/W-3X1-NL03 Cable Lug TE 50-240mm ²	1x95mm ² Cu	ELCOTERM TIS – 2482X/W-3X1-NL03 Cable Lug PFISTERER 50-240mm ²
AT035-19 ÷ AT041-19	ELCOTERM TIS – 2482X/W-3X1-NL03 Cable Lug TE 50-240mm ² Cable Lug PFISTERER 50-240mm ²	1x240mm ² Al	ELCOTERM TIS – 2482X/W-3X1-NL03 Cable Lug NILED 50-240mm ² Cable Lug NEXANS 70-240mm ²
AT042-19	ELCOTERM TIS – 2482X/W-3X1-NL05 Cable Lug TE 630-800mm ²	1x800mm ² Al	ELCOTERM TIS – 2482X/W-3X1-NL05 Cable Lug PFISTERER 300/630-800mm ²



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Indicative scheme of cable line


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TEST 01	A.C. voltage withstand dry		
Line:	AT034-19 + AT035-19 + AT042-19		
Date:	10/05/2019		
Applied Voltage:	57 kV		
Testing time:	5 min.		
Result:	No breakdown nor flashover		
Measuring Test Equipment: AT 213			

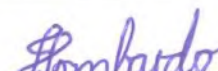
TEST 02	Partial discharge at ambient temperature		
Line:	AT034-19	AT035-19	AT042-19
Date:	10/05/2019		
Applied Voltage:	25 kV		
Partial discharge level:	2,9 pC	2,2 pC	1 pC
Result:	These values are lower than maximum permissible value 10 pC.		
Note: Calibrated before the test.			
Measuring Test Equipment: AT 213, AT 219			

TEST 03	Impulse voltage at elevated temperature	
Line:	AT034-19 + AT035-19 + AT042-19	
Date:	16/05/2019	
Polarity:	+ Positive	- Negative
Applied Voltage:	125 kV	
Testing:	N° 10	
Result:	No breakdown nor flashover	
Measuring Test Equipment : AT 169 , AT 226		




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TEST 04	Heating Cycles voltage in air
Line:	AT034-19 + AT035-19 + AT042-19
Date:	17/05/2019 – 01/07/2019
Test Voltage:	32 kV
Number of cycles:	N° 126
Result:	No breakdown nor flashover
Note: Each heating cycle is completed in 8h and it is carried out in 5h of heating ON with injection of the loading current and 3h heating OFF, with natural cooling of the cable until ambient temperature. During the heating time, the cable conductor keeps a value of temperature 5-10K above the maximum cable conductor (90°C) temperature for at least 2 hours.	
Measuring Test Equipment : AT 228 / AT 229 / AT 181 - AT 183 / AT 280 - AT 289	


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TEST 05	Partial discharge at elevated temperature		
Line:	AT034-19	AT035-19	AT042-19
Date:	11/07/2019		
Applied Voltage:	25 kV		
Partial discharge level:	2 pC	2 pC	3 pC
Result:	These values are lower than maximum permissible value 10 pC.		
Note: Calibrated before the test.			
Measuring Test Equipment: AT 213, AT 219			

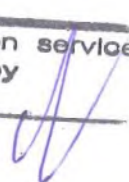
TEST 06	Partial discharge at ambient temperature		
Line:	AT034-19	AT035-19	AT042-19
Date:	11/07/2019		
Applied Voltage:	25 kV		
Partial discharge level:	2 pC	3 pC	4 pC
Result:	These values are lower than maximum permissible value 10 pC.		
Note: Calibrated before the test.			
Measuring Test Equipment: AT 213, AT 219			

TEST 07	Impulse voltage at ambient temperature	
Line:	AT034-19 + AT035-19 + AT042-19	
Date:	11/07/2019	
Polarity:	+ Positive	- Negative
Applied Voltage:	125 kV	
Testing:	N° 10	
Result:	No breakdown nor flashover	
Measuring Test Equipment : AT 169 , AT 226		

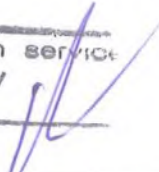
TEST 08	A.C. voltage withstand dry	
Line:	AT034-19 + AT035-19 + AT042-19	
Date:	11/07/2019	
Applied Voltage:	57 kV	
Testing time :	5 min.	
Result:	No breakdown nor flashover	
Measuring Test Equipment: AT 213		


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TEST 09	Partial discharge at ambient temperature		
Line:	AT034-19	AT035-19	AT042-19
Date:	11/07/2019		
Applied Voltage:	25 kV		
Partial discharge level:	2 pC	2 pC	3,5 pC
Result:	These values are lower than maximum permissible value 10 pC.		
Note: Calibrated before the test.			
Measuring Test Equipment: AT 213, AT 219			

TEST 10	Visual examination
Line:	AT034-19 + AT035-19 + AT042-19
Date :	12/07/2019
Note: According to Annex C : • No presence of water or moisture beyond the sealing barriers. • No presence of corrosion on any metallic parts. • No electrical degradation in primary insulation. • No mechanical degradation. • No thermal degradation. • No leakage of insulating material. • No obvious shrinkage of cable components.	
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TEST 11	A.C. voltage withstand dry		
Line:	AT036-19 + AT037-19 + AT038-19		
Date:	16/05/2019		
Applied Voltage:	57 kV		
Testing time :	5 min.		
Result:	No breakdown nor flashover		
Measuring Test Equipment: AT 213			

TEST 12	Thermal short circuit screen		
Line:	AT036-19 + AT037-19 + AT038-19		
Number:	N° 2		
Applied current:	5 kA		
Testing time:	1 s		
Result:	No breakdown		
Note: Earth lug at break and at crimping.			
Measuring Test: SVEPPI – SIEMENS see Test Report N° RP LS 19/164A			


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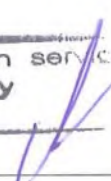
TEST 13	Thermal short circuit conductor
Line:	AT036-19 + AT037-19 + AT038-19
Number:	N° 2
Applied current:	27,8 kA
Testing time:	1 s
Result:	No breakdown
Measuring Test: SVEPPI - SIEMENS see Test Report N° RP LS 19/164A	

TEST 14	Impulse voltage at ambient temperature
Line:	AT036-19 + AT037-19 + AT038-19
Date:	12/07/2019
Polarity:	+ Positive - Negative
Applied Voltage:	125 kV
Testing:	N° 10
Result:	No breakdown nor flashover
Measuring Test Equipment : AT 169 , AT 226	

TEST 15	A.C. voltage withstand dry
Line:	AT036-19 + AT037-19 + AT038-19
Date:	12/07/2019
Applied Voltage:	57 kV
Testing time :	5 min.
Result:	No breakdown nor flashover
Measuring Test Equipment: AT 213	

TEST 16	Visual examination
Line:	AT036-19 + AT037-19 + AT038-19
Date :	12/07/2019
Note: According to Annex C : - No presence of water or moisture beyond the sealing barriers. - No presence of corrosion on any metallic parts. - No electrical degradation in primary insulation. - No mechanical degradation. - No thermal degradation. - No leakage of insulating material. - No obvious shrinkage of cable components.	

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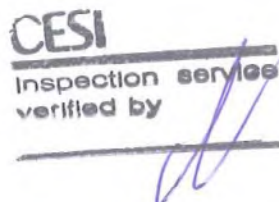



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TEST 17	Humidity
Line:	AT039-19 + AT040-19 + AT041-19
Date:	17/05/2019 – 30/05/2019
Test Voltage:	16 kV
Duration:	300 h
Result:	No failure
Note: Water conductivity : 70±10 mS/m.	
Measuring Test Equipment : AT 301 / AT 162	

TEST 18	Visual examination
Line:	AT039-19 + AT040-19 + AT041-19
Date :	30/05/2019
Note: According to Annex C : - No presence of water or moisture beyond the sealing barriers. - No presence of corrosion on any metallic parts. - No electrical degradation in primary insulation. - No mechanical degradation. - No thermal degradation. - No leakage of insulating material. - No obvious shrinkage of cable components.	
	

TEST 19	A.C. voltage withstand dry
Line:	AT033-19
Date:	10/05/2019
Applied Voltage:	57 kV
Testing time:	5 min.
Result:	No breakdown nor flashover
Measuring Test Equipment: AT 213	

TEST 20	Partial discharge at ambient temperature
Line:	AT033-19
Date:	10/05/2019
Applied Voltage:	25 kV
Partial discharge level:	5 pC
Result:	These values are lower than maximum permissible value 10 pC.
Note: Calibrated before the test.	
Measuring Test Equipment: AT 213, AT 219	


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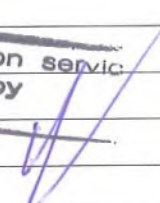
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TEST 21	Impulse voltage at ambient temperature	
Line:	AT033-19	
Date:	16/05/2019	
Polarity:	+ Positive	- Negative
Applied Voltage:	125 kV	
Testing:	N° 10	
Result:	No breakdown nor flashover	
Measuring Test Equipment : AT 169 , AT 226		

TEST 22	Heating Cycles voltage in air	
Line:	AT033-19	
Date:	17/05/2019 – 21/05/2019	
Test Voltage:	32 kV	
Number of cycles:	N° 12	
Result:	No breakdown nor flashover	
Note: Each heating cycle is completed in 8h and it is carried out in 5h of heating ON with injection of the loading current and 3h heating OFF, with natural cooling of the cable until ambient temperature. During the heating time, the cable conductor keeps a value of temperature 5-10K above the maximum cable conductor (90°C) temperature for at least 2 hours.		
Measuring Test Equipment : AT 228 / AT 229 / AT 181 - AT 183 / AT 280 - AT 289		

TEST 23		A.C. voltage withstand dry	
Line:	AT033-19		CESI Inspection service verified by 
Date:	30/05/2019		
Applied Voltage:	57 kV		
Testing time :	5 min.		
Result:	No breakdown nor flashover		
Measuring Test Equipment: AT 213			

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TEST 24	Partial discharge at elevated temperature	
Line:	AT033-19	
Date:	30/05/2019	
Applied Voltage:	25 kV	
Partial discharge level:	6 pC	
Result:	These values are lower than maximum permissible value 10 pC.	
Note: Calibrated before the test.		
Measuring Test Equipment: AT 213, AT 219		


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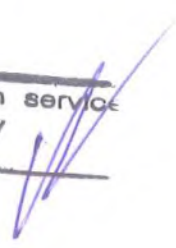

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TEST 25	Partial discharge at ambient temperature
Line:	AT033-19
Date:	30/05/2019
Applied Voltage:	25 kV
Partial discharge level:	5 pC
Result:	These values are lower than maximum permissible value 10 pC.
Note: Calibrated before the test.	
Measuring Test Equipment: AT 213, AT 219	

TEST 26	Visual examination
Line:	AT033-19
Date :	30/05/2019
Note: According to Annex C : - No presence of water or moisture beyond the sealing barriers. - No presence of corrosion on any metallic parts. - No electrical degradation in primary insulation. - No mechanical degradation. - No thermal degradation. - No leakage of insulating material. - No obvious shrinkage of cable components.	

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MEASURING INSTRUMENTS

Description	Manufacturer	Supplier's code	Next calibration	Elcon ID	Accuracy
Power supply area No. 2 for dielectric test	AME	Reg. No. 2334	18/04/2020	AT 228	3%
Power supply area No. 3 for dielectric test	AME	Reg. No. 2333	13/04/2022	AT 213	3%
PD calibrator unit CAL542	OMICRON	Reg. No. HH462D	14/03/2022	AT 219	1%
Impulse voltage Measuring system	DR. STRAUSS	Reg. No. TR-AS 100-12	06/04/2022	AT 226	3%
Ohmic capacitive divider	HAEFELY	Reg. No. 99100314.1	06/04/2022	AT 169	3%
Thermocouple type "T"	ITALCOPPIE	Not applicable	07/11/2019	AT 181	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	07/11/2019	AT 182	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	07/11/2019	AT 183	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 280	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 281	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 283	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 284	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 285	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 286	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 287	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 288	2%
Thermocouple type "T"	ITALCOPPIE	Not applicable	10/04/2020	AT 289	2%
Digital multimeter	AGILENT	MY53205896	11/09/2019	AT 229	1%
Data logger	AGILENT	MY49022503	28/01/2022		1%
Conductivity meter	HANNA INSTRUMENT	Not applicable	06/03/2020	AT 162	2%
Power supply salt fog	SPECIALTRASFO	Not applicable	17/04/2020	AT 301	3%
Meteorological Station	FISCHER	Not applicable	10/03/2020	AT 161	3%

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EXAMPLE OF IMPULSE WAVE SHAPE

Humidity: 60 % / Air pressure: 976hPa



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EXAMPLE OF IMPULSE WAVE SHAPE

Humidity: 49% / Air pressure: 981hPa



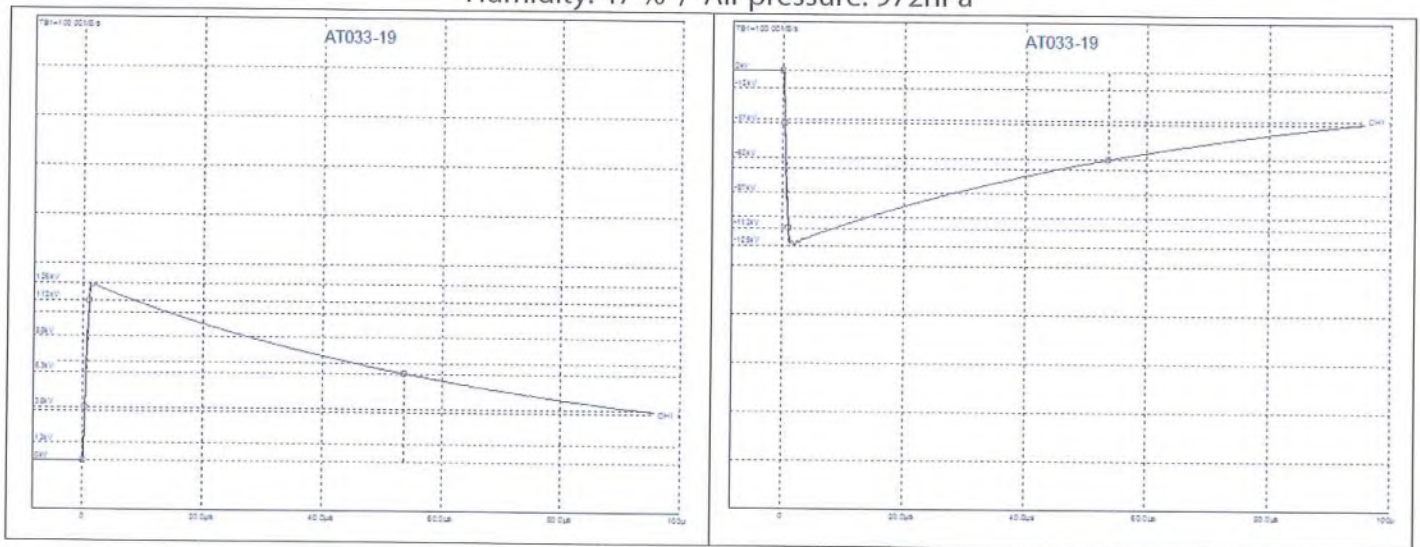
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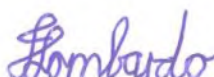
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EXAMPLE OF IMPULSE WAVE SHAPE

Humidity: 47 % / Air pressure: 972hPa



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TEST CONFIGURATION

AC -TEST



PD -TEST



IMPULSE -TEST



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HUMIDITY -TEST



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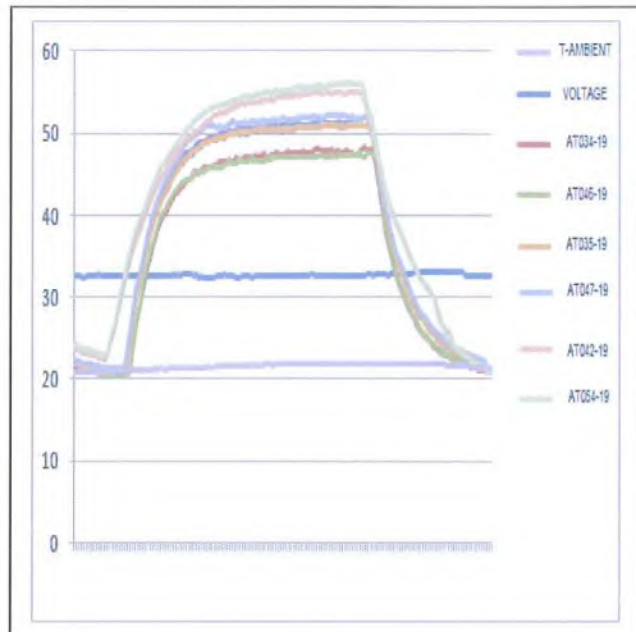
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HEATING CYCLE IN AIR -TEST

**DIAGRAMS FOR
HEATING CYCLE IN AIR -TEST**



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CONFIGURATION FOR ASSEMBLY



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