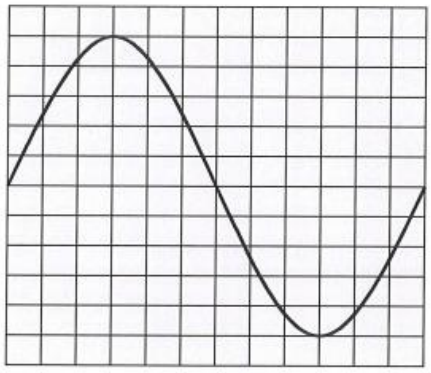

Test Report
PPR-3205

Test object:	Cold Shrink Indoor Termination type CSTI and Cold Shrink Outdoor Termination Type CSTO for screened single core polymeric cables without armour TE Connectivity reference: CSTI-6122-ML-2-13, CSTO-6122-ML-2-13
Test performed:	Requirements according to CENELEC HD 629.1 S3 from 2015-09 (Draft) Table 6 Sequences A1 and A3 and Table 7 for rated voltage U_0/U (U_m) 20,8/36(42) kV
Test result:	All samples passed the test requirements in accordance with the CENELEC HD 629.1 S3:2015 (Draft) table 6 Sequences A1 and A3 and 7 for rated voltage U_0/U (U_m) 20,8/36(42) kV
Pages:	45

Tested by:	**Bayram Cataltepe** (Laboratory Technician)	Signature:	Date: 27.01.17
Prepared by:	**Christoph Baier** (Laboratory Manager)	Signature:	Date: 27.01.17
Released by:	**Per Christian Olving** (Product Manager)	Signature:	Date: 27/1-17

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Content

1 General information 3

1.1 Description of the test objects 3
1.2 Description of the test cables 3
1.3 Test standards 4
1.4 Test facilities 4

2 Test sequence and requirements 5

3 Test setups 6

3.1 AC voltage dry withstand 6
3.2 Partial discharge at ambient temperature 7
3.3 Partial discharge at elevated temperature 8
3.4 Impulse voltage 9
3.5 Heating cycle voltage in air 10
3.6 Immersion test for outdoor terminations 11
3.7 Humidity test for indoor terminations 11

4 Results 12

4.1 AC voltage dry withstand 12
4.2 Partial discharge at ambient temperature 12
4.3 Impulse voltage at elevated temperature 13
4.4 Heating cycle voltage in air 18
4.5 Immersion test for outdoor terminations 19
4.6 Partial discharge at elevated and ambient temperature 21
4.7 Impulse voltage at ambient temperature 23
4.8 AC voltage dry withstand 32
4.9 Partial discharge at ambient temperature 33
4.10 Examination 33
4.11 Humidity test 34
4.12 Examination 36

A. Appendices 37

A.1 Identification of test cable 50mm^2 37
A.2 Identification of test cable 150mm^2 38
A.3 Identification of test cable 95mm^2 39
A.4 Installation instructions 40
A.5 Kit content lists 45

1 General information

1.1 Description of the test objects

Test objects:	4 indoor terminations type CSTI-6122-ML-2-13 installed on 50mm^2 (test objects A), 4 outdoor terminations type CSTO-6122-ML-2-13 installed on 50mm^2 (test objects B), 4 indoor terminations type CSTI-6122-ML-2-13 installed on 150mm^2 (test objects C), 4 outdoor terminations type CSTO-6122-ML-2-13 installed on 150mm^2 (test objects D) 4 indoor terminations type CSTI-6122-ML-2-13 installed on 95mm^2 (test objects E)
Manufacturer:	TE Connectivity Kunshan PRC
TE kit reference:	CSTI-6122-ML-2-13, CSTO-6122-ML-2-13
Part description:	CSTI-35-BD-18-533-FS, CSTO-35-BD-18-533-FS
Rated voltage U_0/U (U_m):	20,8/36 (42) kV
Application range:	screened single core polymeric cables without armour with diameter over insulation from 24,5 mm up to 33,5 mm
Connector type:	Mechanical cable lug BLMT-35/150-13
Installation instructions:	See **Appendix A.4**
List of kit content:	See **Appendix A.5**

1.2 Description of the test cables

Length of each test loop:	4.2 m (without test object)
Cable type:	Single core cable with XLPE insulation, type VDE 0276 N2XSY(see **Appendix A.1**)
Cable conductor material:	Copper
Cable conductor cross-section:	50 mm^2
Rated voltage of cable U_0/U (U_m):	18/30 (36) kV

Length of each test loop:	4.2 m (without test object)
Cable type:	Single core cable with XLPE insulation, type VDE 0276 NA2XS2Y(see **Appendix A.2**)
Cable conductor material:	Aluminium
Cable conductor cross-section:	150 mm^2
Rated voltage of cable U_0/U (U_m):	18/30 (36) kV

Length of each test loop:	3.0 m (without test object)
Cable type:	Single core cable with XLPE insulation, type VDE 0276 NA2XS(F)2Y (see **Appendix A.3**)
Cable conductor material:	Aluminium
Cable conductor cross-section:	95 mm^2
Rated voltage of cable U_0/U (U_m):	18/30 (36) kV

1.3 Test standards

Requirements according to CENELEC HD 629.1 S3 from 2015-09 (Draft): *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*; Table 6 Sequences A1 and A3 and Table 7 for rated voltages U_0/U (U_m) 20,8/36(42) kV

1.4 Test facilities

The installation of the test objects as well as the electrical tests were carried out by technicians of Tyco Electronics Raychem GmbH in the High Voltage Laboratory in Ottobrunn/Germany.

2 Test sequence and requirements

The test requirements are according to CENELEC HD 629.1 S3 from 2015-09 (Draft), Table 6 Sequences A1 and A3 and Table 7 for rated voltage U_0/U (U_m) 20,8/36 (42) kV.

	Test	Test clause of EN 61442	Test requirements	Notes
1	AC voltage dry withstand	4	5 min at 93,5 kV, no breakdown	-
2	Partial discharge at ambient temperature	7	Max. 10 pC at 42 kV	-
3	Impulse voltage at elevated temperature	6	10 impulses of each polarity at ±200 kV, target temperature 95 - 100°C, no breakdown	-
4	Heating cycle voltage in air	9	126 heat cycles, target temperature 95 - 100°C, 52 kV, no breakdown	-
5	Immersion	9.4	10 heat cycles, target temperature 95 - 100°C	Only required for outdoor terminations;
6	Partial discharge at elevated temperature	7	Heating up, target temperature 95 - 100°C, max. 10 pC at 42 kV	-
7	Partial discharge at ambient temperature	7	Max. 10 pC at 42 kV	-
8	Impulse voltage at ambient temperature	6	10 impulses of each polarity at ±200 kV, no breakdown	-
9	AC voltage dry withstand	4	5 min at 93,5 kV, no breakdown	-
10	Partial discharge at ambient temperature	7	Max. 10 pC at 42 kV	-
11	Examination	-	-	-

The test requirements are according to CENELEC HD 629.1 S3 from 2015-09 (Draft), Table 6 Sequences A3 for rated voltage U_0/U (U_m) 20,8/36 (42) kV.

	Test	Test clause of EN 61442	Test requirements	Notes
1	Humidity test	13	300 h at 26 kV	Only required for indoor terminations
2	Examination	-	-	-

3 Test setups

3.1 AC voltage dry withstand

The cable conductors of the test objects were connected to an AC voltage provided by a test transformer, the screens were put on ground potential (**Figure 1**). The voltage measurement was carried out with a capacitive divider. The measuring uncertainty within a range of 10 kV to 300 kV was 0.91%.

Technical data:

TT	Test transformer:	350 kV, 175 kVA, 50 Hz
C-Div	Capacitive divider:	75 pF (high voltage side)
TO	Test object	

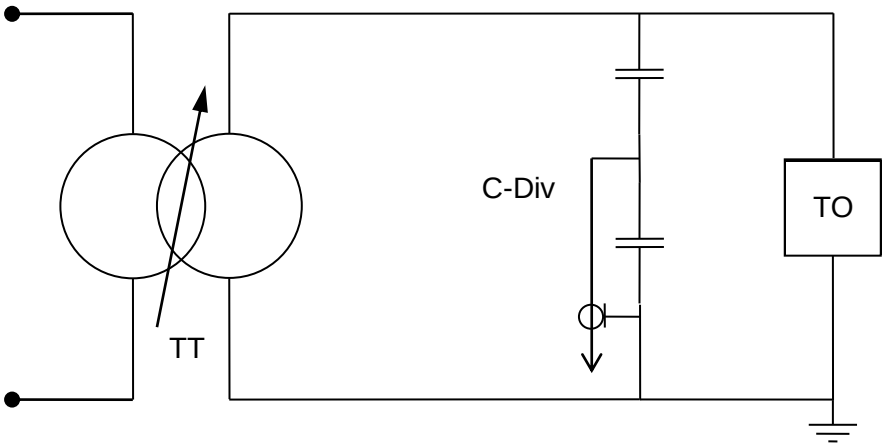


Figure 1: AC voltage dry withstand test setup

Measurement equipment:

Object	Type	Calibration number	Calibration date
Capacitive divider	TUR MCF 75/350 P	000132 D-K-17601-01-00	2015-03
Coaxial cable	-	000132 D-K-17601-01-00	2015-03
AC peak voltmeter	LDIC voltage unit	000132 D-K-17601-01-00	2015-03

3.2 Partial discharge at ambient temperature

The cable conductors of the test objects were connected to an AC voltage provided by a test transformer, the screens were put on ground potential (**Figure 2**). The voltage measurement was carried out with a capacitive divider. The measuring uncertainty within a range of 10 kV to 300 kV was 0.91%. For the extraction of the partial discharge (PD) signals, a coupling capacitor and a quadrupole (i.e. measuring impedance) were used. A coil was installed to block interferences coming from the transformer side of the test setup. Prior to the test, the complete test arrangement including the test object was calibrated using a PD-calibrator.

Technical data:

TT	Test transformer:	350 kV, 175 kVA, 50 Hz
C-Div	Capacitive divider:	75 pF (high voltage side)
C-C	Coupling capacitor:	1000 pF
Q	Quadrupole	
L	Coil	
TO	Test object	

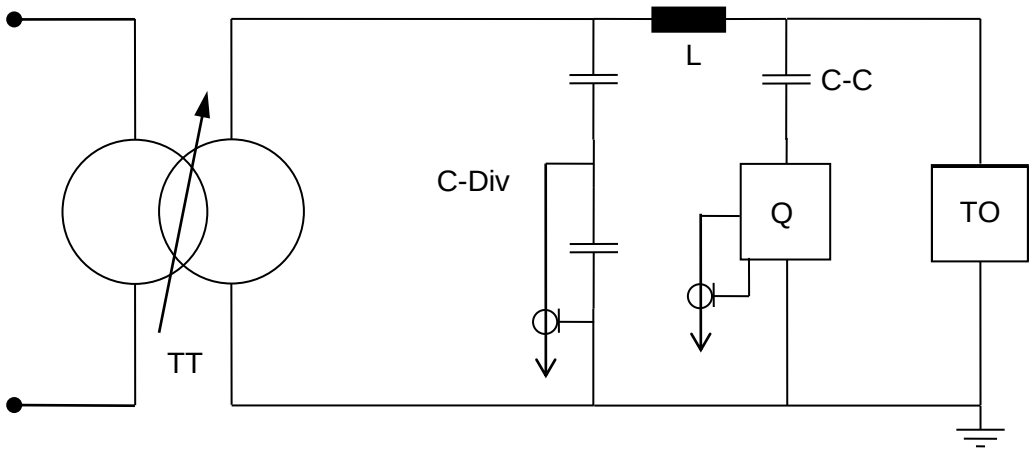


Figure 2: Partial discharge test setup

Measurement equipment:

Object	Type	Calibration number	Calibration date
Capacitive divider	TUR MCF 75/350 P	000132 D-K-17601-01-00	2015-03
Coaxial cable	-	000132 D-K-17601-01-00	2015-03
AC peak voltmeter	LDIC voltage unit	000132 D-K-17601-01-00	2015-03
PD-measurement system	LDIC LDD-5	calibrated with PD-calibrator	n/a
PD-calibrator	LDIC LDC-5	RY-1341 & verified with PD-calibrator tester	2016-06-01
PD-calibrator tester	LDIC LDT-5	RY-1222	2016-07-15

3.3 Partial discharge at elevated temperature

The cable conductors of the test objects were connected to an AC voltage provided by a test transformer, the screens were put on ground potential (**Figure 2**). The voltage measurement was carried out with a capacitive divider. The measuring uncertainty within a range of 10 kV to 300 kV was 0.92%. For the extraction of the partial discharge (PD) signals, a coupling capacitor and a quadrupole (i.e. measuring impedance) were used. A coil was installed to block interferences coming from the transformer side of the test setup. Prior to the test, the complete test arrangement including the test object was calibrated using a PD-calibrator. The test objects were installed in a way that a closed loop was formed, which could be heated using an induced AC current provided by a heating transformer supplied by a variable transformer. The cable should be heated to a conductor temperature 5 - 10 K above the maximum cable conductor temperature in operation, i.e. 95 - 100°C for XLPE-cables. The temperature of the cable conductor was measured in-line using a reference cable of the same type as the test loops with a length of 3 m, a type K thermocouple and fibre optical temperature measurement transmission systems. The current was measured by a clamp meter.

3.4 Impulse voltage

The cable conductors of the test objects were connected to a Marx-generator with 8 stages, a maximum cumulative charging voltage of 800 kV and a maximum impulse energy of 24 kJ, the screens were put on ground potential (**Figure 3**). The voltage measurement was carried out with a resistive-capacitive divider and an impulse measurement system. The measuring uncertainty for the voltage amplitude within a range of 50 kV to 450 kV was 0.88% and for the time max. 4.76%.

Technical data:

Configuration	4 times 2 parallel stages in series:	400 kV max. charging voltage
RC-Div	Damped capacitive divider:	670 pF, 100 Ω (high voltage side)
TO	Test object	

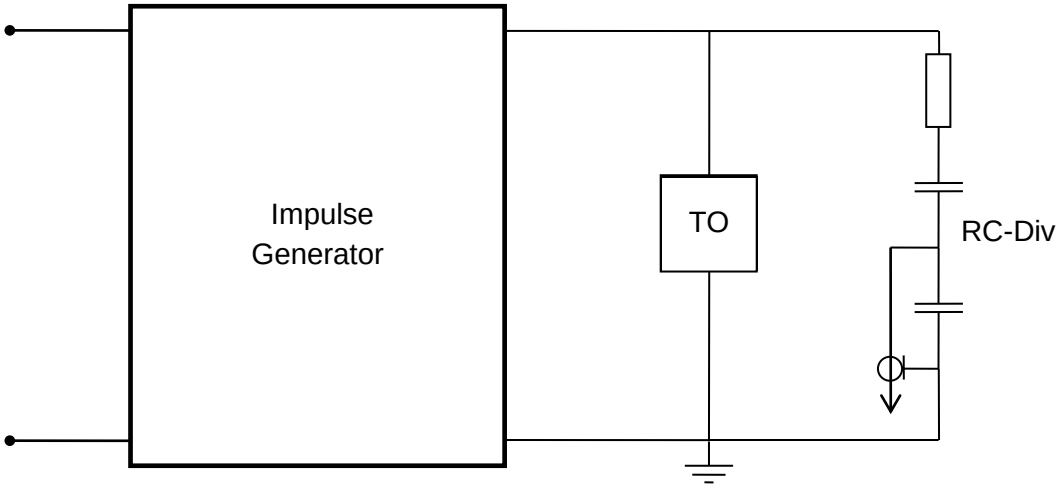


Figure 3: Impulse voltage test setup

Measurement equipment:

Object	Type	Calibration number	Calibration date
Damped capacitive divider	Haefely CS1000	000177 D-K-17601-01-00	2015-03
Coaxial cable	-	000177 D-K-17601-01-00	2015-03
Digital transient re-corder	Haefely DiAS 733	000177 D-K-17601-01-00	2015-03

3.5 Heating cycle voltage in air

The cable conductors of the test objects were connected to an AC voltage provided by a test transformer, the screens were put on ground potential (**Figure 4**).The voltage measurement was carried out with a capacitive divider. The measuring uncertainty within a range of 10 kV to 100 kV was 0.59%. The test objects were installed in a way that a closed loop was formed, which could be heated using an induced AC current provided by a heating transformer supplied by a variable transformer. The cable should be heated to a conductor temperature 5 - 10 K above the maximum cable conductor temperature in operation, i.e. 95 - 100°C for XLPE-cables. The temperature of the cable conductor was measured in-line using a reference cable of the same type as the test loops with a length of 3 m, a type K thermocouple and fibre optical temperature measurement transmission systems. The heating cycles were controlled by an automated regulation system.

Technical data:

TT	Test transformer:	100 kV, 100 kVA, 50 Hz
C-Div	Capacitive divider:	100 pF (high voltage side)
VT	Variable transformer:	230 V, 6.9 kVA, 50 Hz
HT	Heating transformer:	9.2 kVA
TC	Thermocouple:	Type K
TO	Test object	

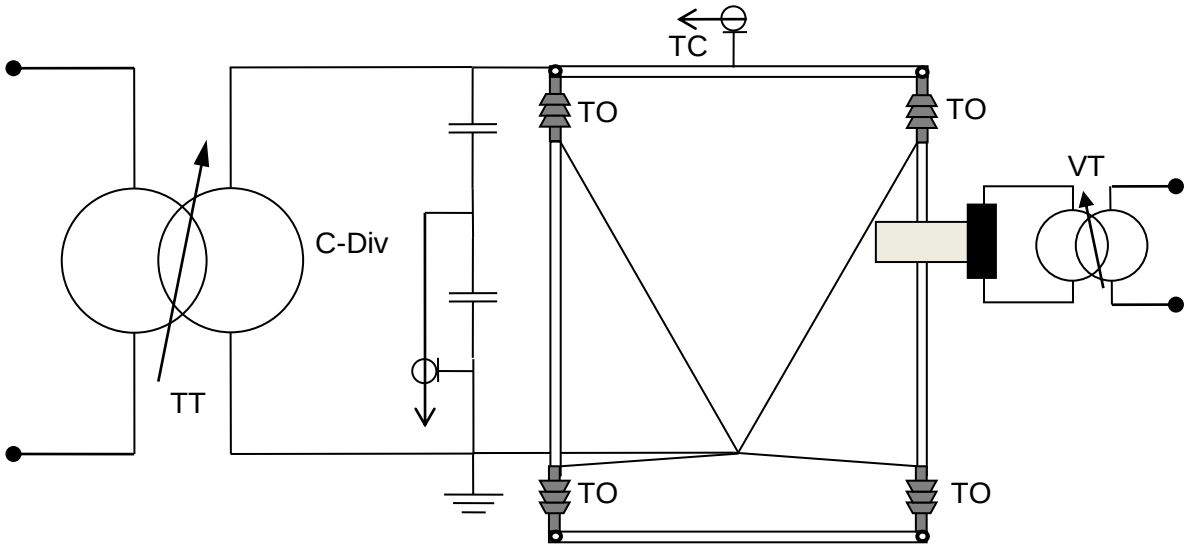


Figure 4: Heating cycle voltage test setup (exemplary for one cable cross section and one type of termination)

3.6 Immersion test for outdoor terminations

The test objects were installed in a way that a closed loop was formed, which could be heated using an induced AC current provided by a heating transformer supplied by a variable transformer. The cable should be heated to a conductor temperature 5 - 10 K above the maximum cable conductor temperature in operation, i.e. 95 - 100°C for XLPE-cables. The temperature of the cable conductor was measured in-line using a reference cable of the same type as the test loops with a length of 3 m, a type K thermocouple and fibre optical temperature measurement transmission systems. The heating cycles were controlled by an automated regulation system. The test objects were mounted upside down in a water tank with a water height of min. 0.3 m above every part of the termination.

3.7 Humidity test for indoor terminations

The test objects were placed in a special chamber with a volume of about 10 m^3. The humidity was produced by means of special nozzles able to spray water into the chamber and adjusted to a flow of (0.4 ± 0.1) l/h/m^3. Prior to the test the conductivity of the water has been adjusted by adding salt resulting in a conductivity of (70 ± 10) mS/m.

4 Results

4.1 AC voltage dry withstand

Date: 2016-10-11
Ambient temperature: 25°C
Ambient relative humidity: 38%
Ambient pressure: 953 hPa

Test objects	Test voltage û/√2	Duration	Result
A	93,3 kV	5 min	No breakdown
B			No breakdown
C	93,5 kV	5 min	No breakdown
D			No breakdown

Note: All test objects installed on the same cable cross section were tested simultaneously.
Requirement: No breakdown shall occur.
Result: All test objects passed the test.

4.2 Partial discharge at ambient temperature

Date: 2016-10-11
Ambient temperature: 25°C
Ambient relative humidity: 38%
Ambient pressure: 953 hPa

Test object	Test voltage û/√2	Calibration charge	Noise	Result
A	42 kV	10 pC	≤ 3 pC	PD-level ≤ 3 pC
B	42 kV	10 pC	≤ 3 pC	PD-level ≤ 3 pC
C	42 kV	10 pC	≤ 3 pC	PD-level ≤ 3 pC
D	42 kV	10 pC	≤ 3 pC	PD-level ≤ 3 pC

Note: All test objects of the same type of termination and cable cross section were tested simultaneously.
Requirement: Partial discharge level shall not exceed 10 pC.
Result: All test objects passed the test.

4.3 Impulse voltage at elevated temperature

The test object were exposed to 10 impulses of positive and negative polarity each. Before each series of 10 impulses, 3 calibration impulses of 50%, 65% and 80% of the test voltage level were applied. The recorded impulses are shown in **Figure 5** to **Figure 8**.

Date: 2016-10-11
Ambient temperature: 25°C
Ambient relative humidity: 38%
Ambient pressure: 953 hPa

Test object	Voltage û	Front time	Time to half-value	Number of impulses	Result
A	±200 kV	1.020 µs to 1.030 µs	49.308 µs to 49.622 µs	10 of each polarity	No breakdown
B					No breakdown
C	±200 kV	1.106 µs to 1.278 µs	50.106 µs to 50.290 µs	10 of each polarity	No breakdown
D					No breakdown

Note: All test objects installed on the same cable cross section were tested simultaneously.
Requirement: Each test object shall withstand 10 positive and 10 negative impulses without breakdown.
Result: All test objects passed the test.

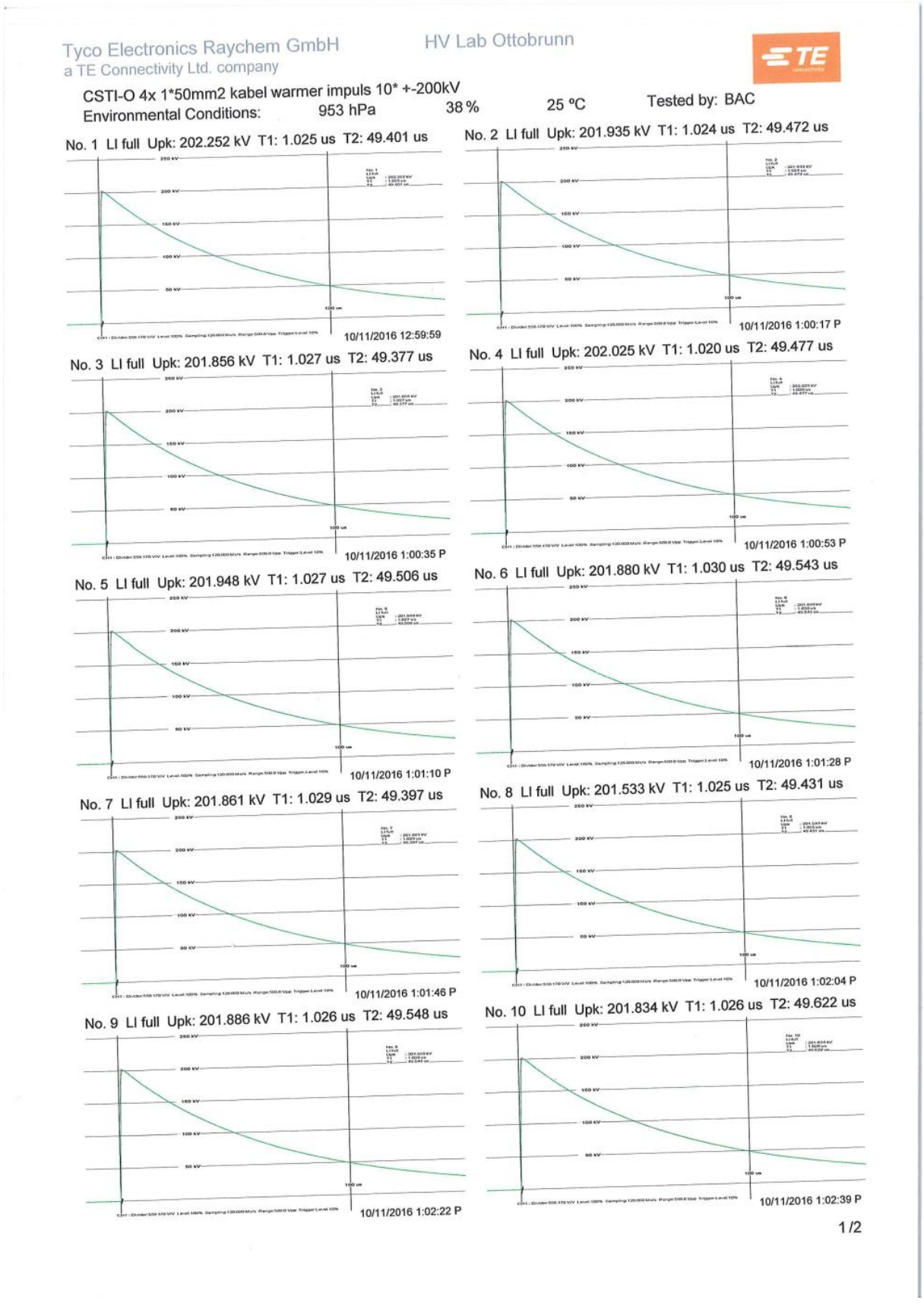


Figure 5: Positive impulses at elevated temperature on test objects A and B (50 mm²)

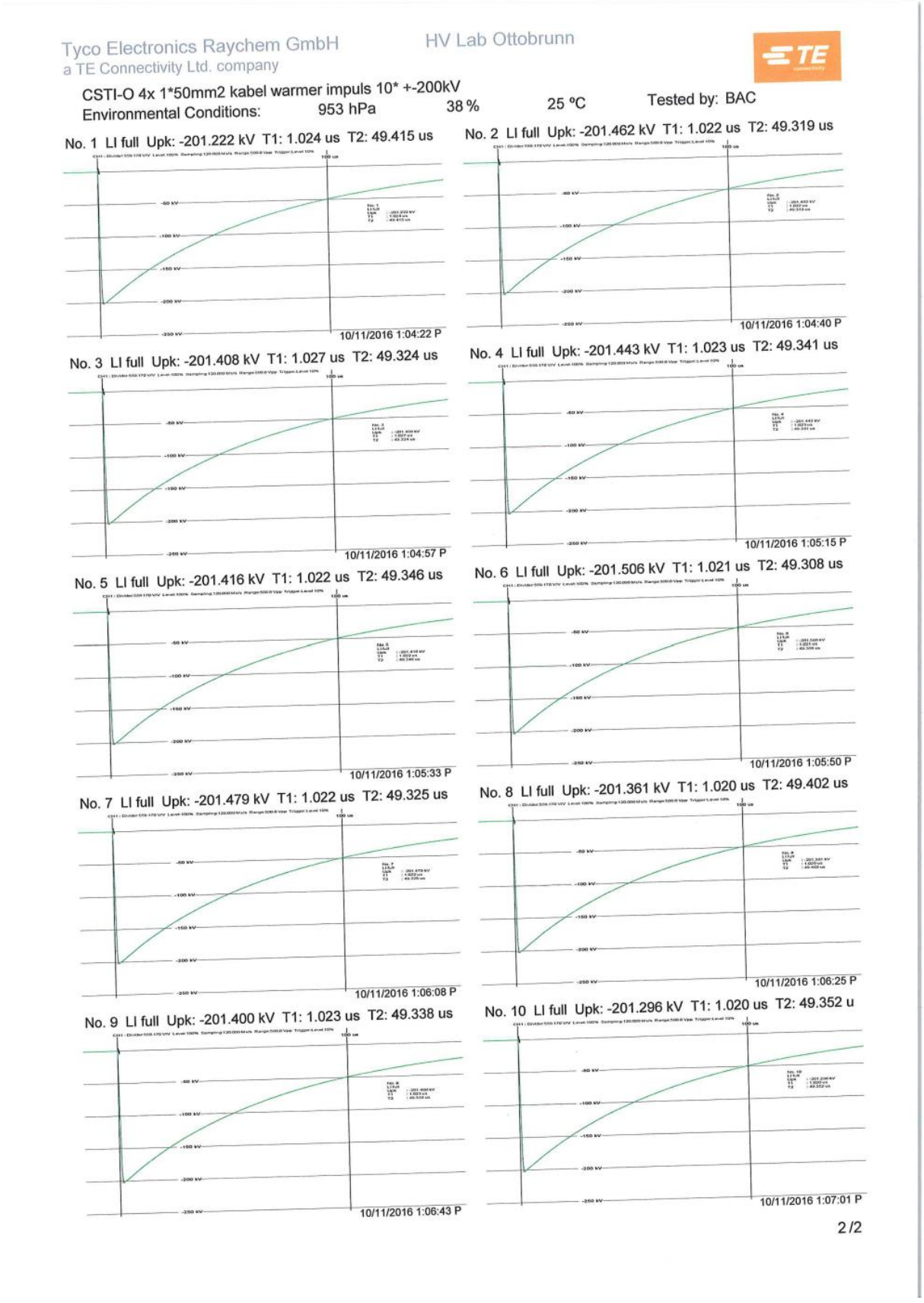


Figure 6: Negative impulses at elevated temperature on test objects A and B (50 mm^2)

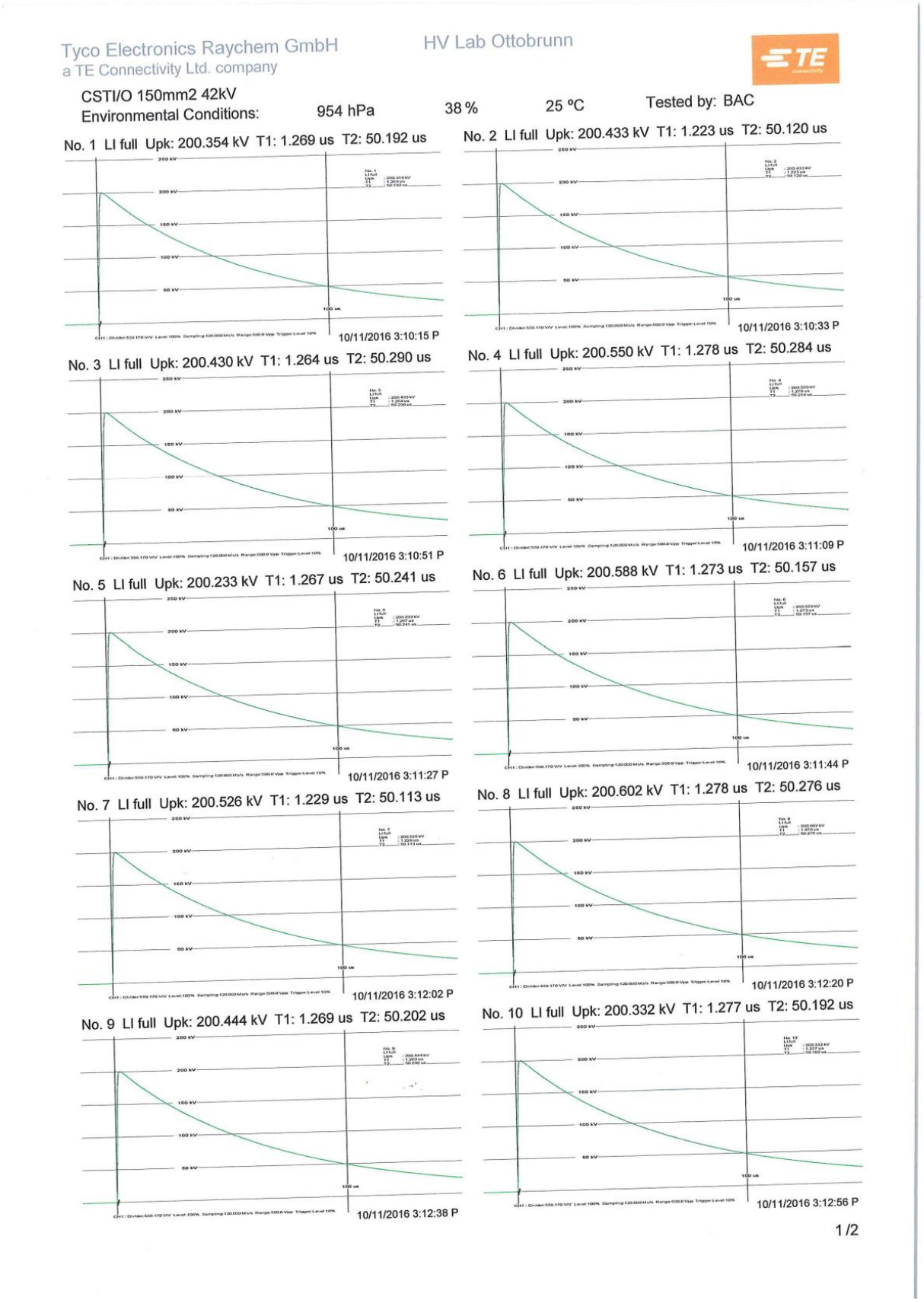


Figure 7: Positive impulses at elevated temperature on test objects C and D (150 mm^2)

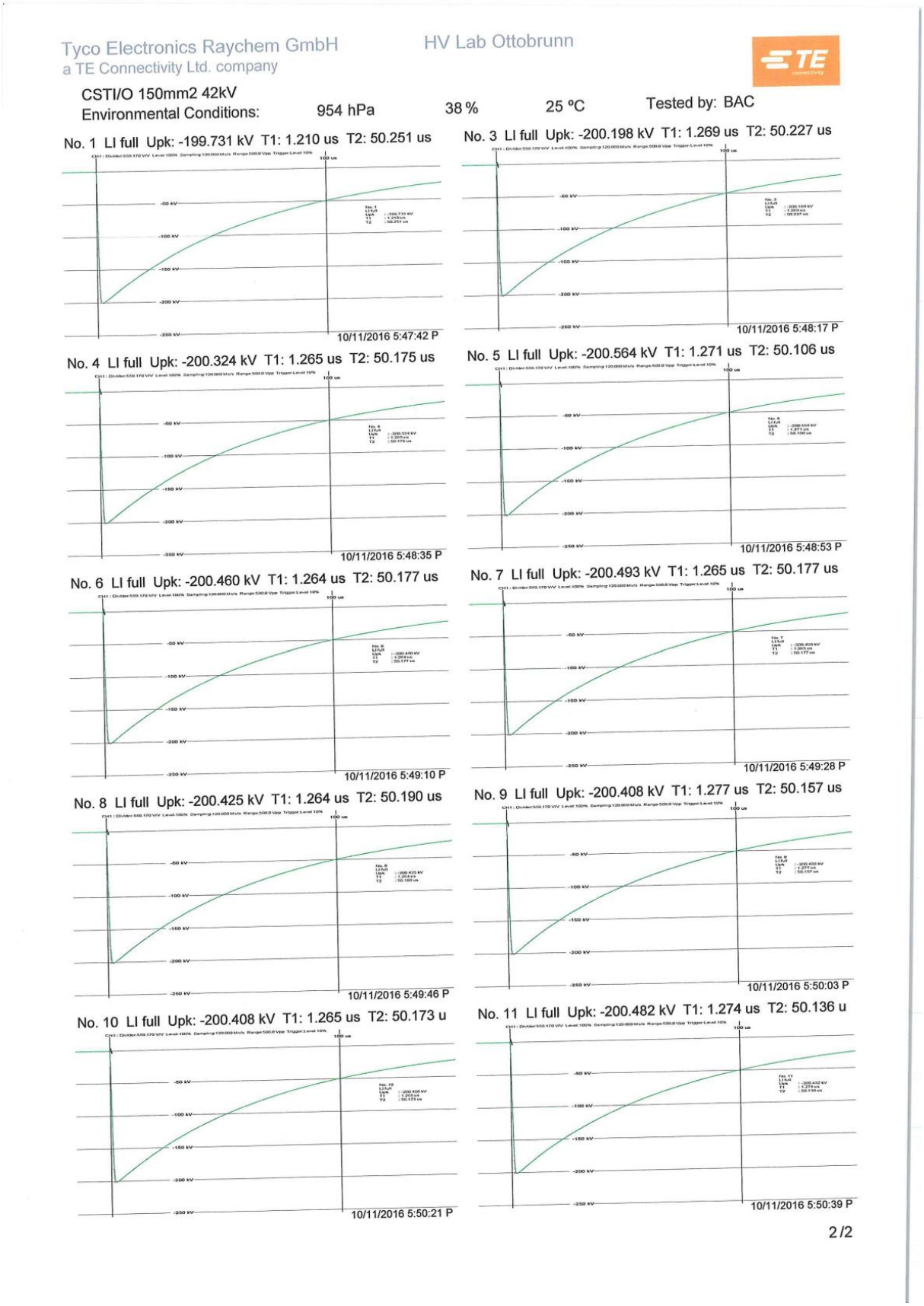


Figure 8: Negative impulses at elevated temperature on test objects C and D (150 mm²)

4.4 Heating cycle voltage in air

The recorded values of the test voltage, heating current, ambient temperature and cable conductor temperature are shown in **Figure 9**.

Date: 2016-10-14 to 2016-12-14

Test object	Test voltage û/√2	Time of heating	Time of cooling	Number of cycles	Result
A	52 kV	5 h	3 h	126	No breakdown
B					No breakdown
C	52 kV	5 h	3 h	126	No breakdown
D					No breakdown

Note: All test objects installed on the same cable cross section were tested simultaneously.

Requirement: No breakdown shall occur.

Result: All test objects passed the test.

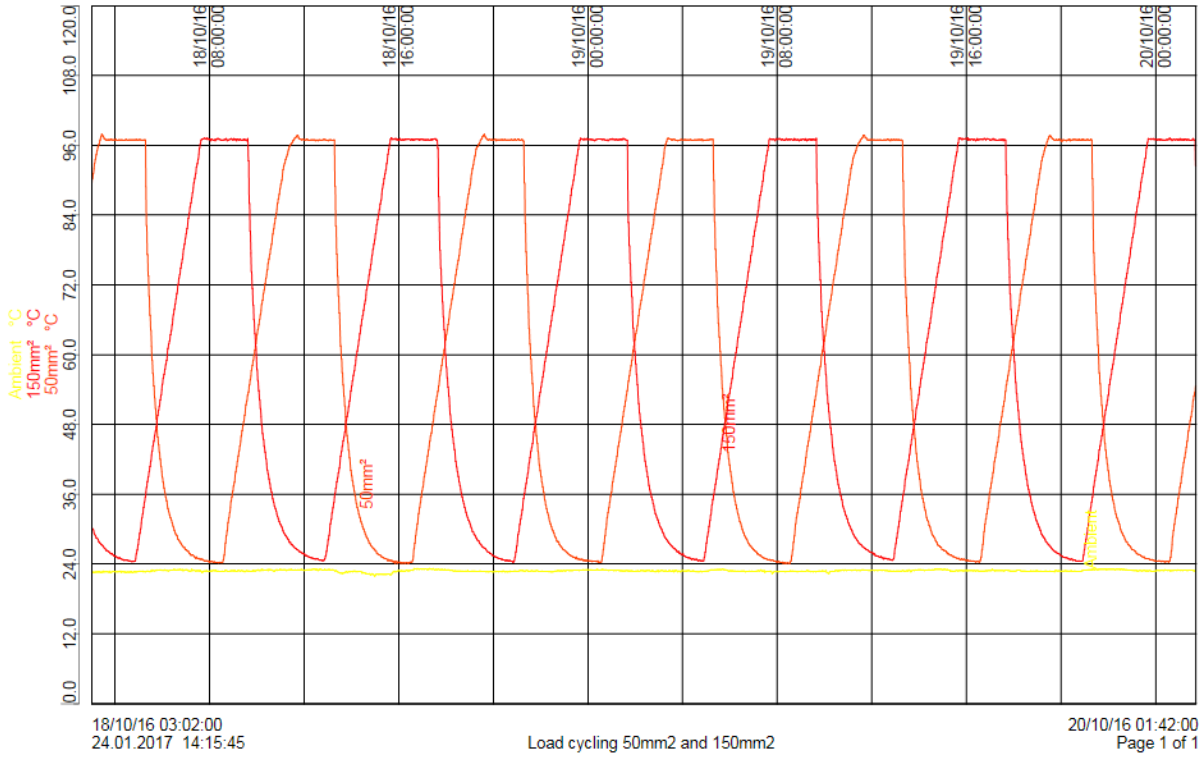


Figure 9: Recorded values of ambient temperature (yellow), cable conductor temperature 50mm2 (orange) and cable conductor temperature 150mm2 (red) during heat cycle voltage test in air

4.5 Immersion test for outdoor terminations

The recorded values ambient temperature and cable conductor temperatures are shown in **Figure 10** and **Figure 11**.

Date: 2017-01-03 to 2017-01-07 (test object B)
2017-01-10 to 2017-01-14 (test object D)

Test object	Time of heating	Time of cooling	Number of cycles	Result
A	n/a			-
B	5 h	3 h	10	
C	n/a			-
D	5 h	3 h	10	

Result: All test objects passed the test.

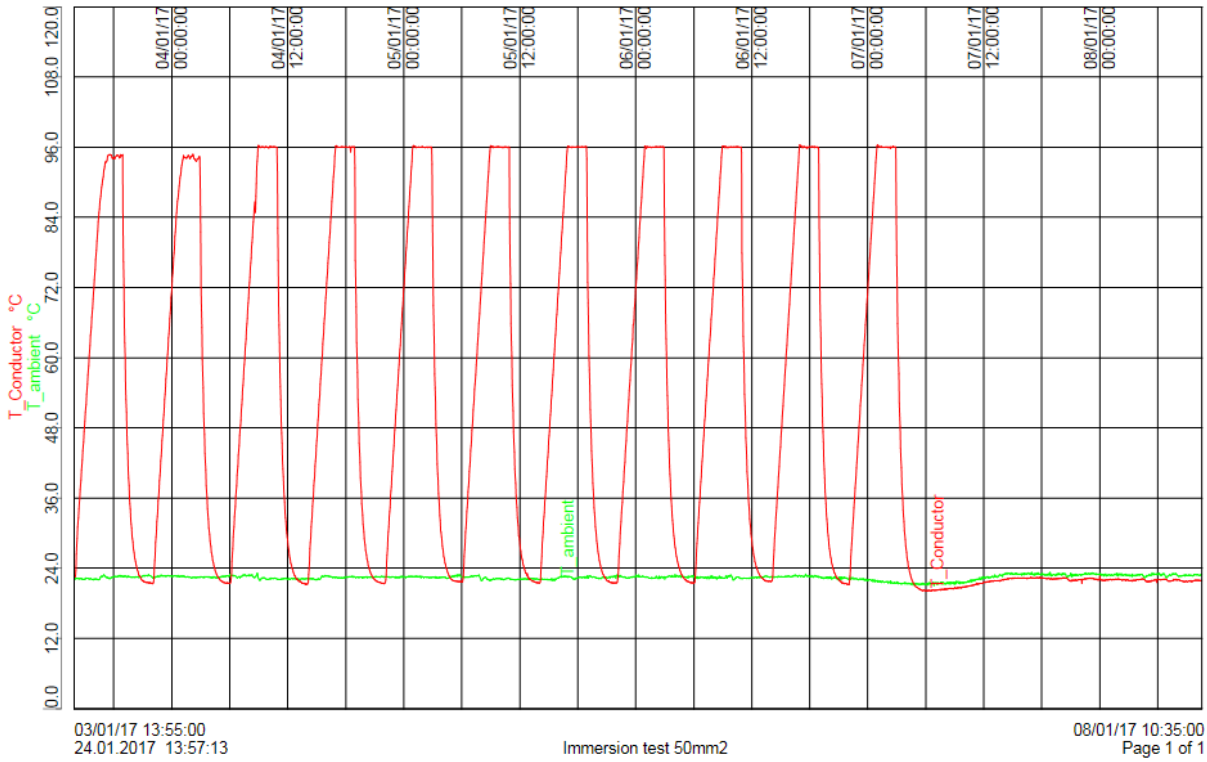


Figure 10: Recorded values of ambient temperature (green) and cable conductor temperature 50 mm^2 (red) during immersion test of test objects B

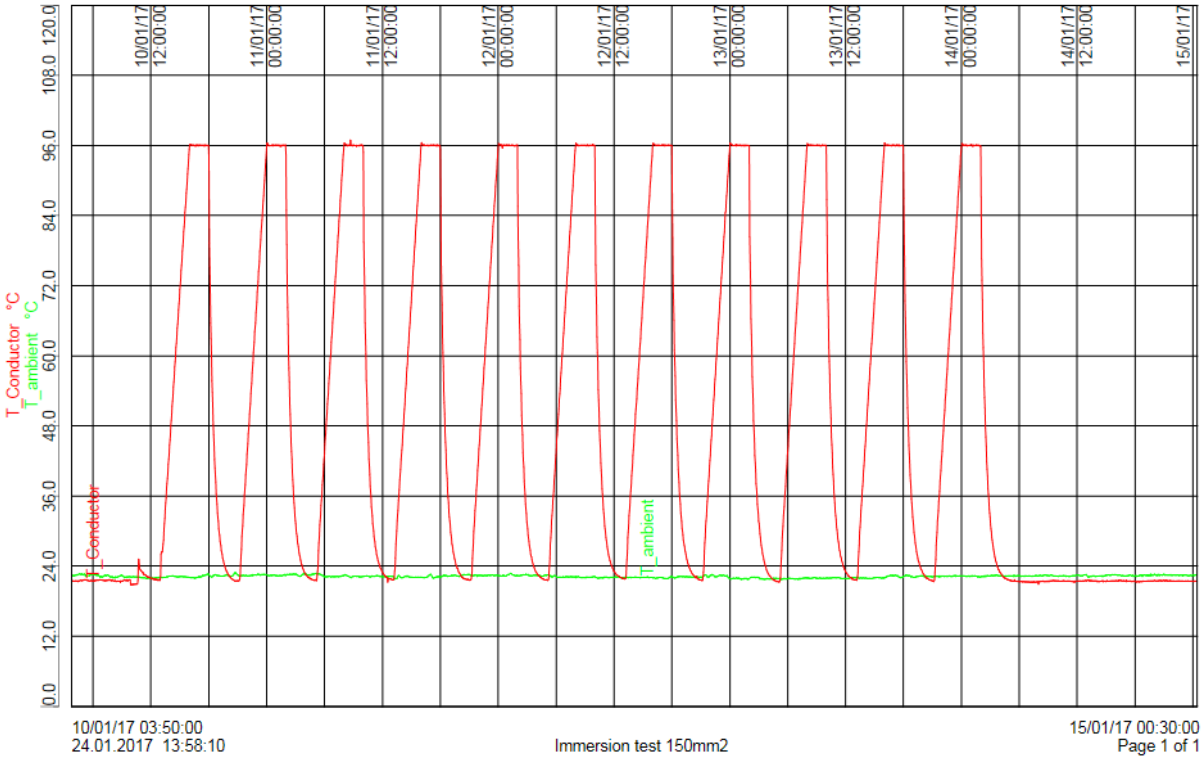


Figure 11: Recorded values of ambient temperature (green) and cable conductor temperature 150 mm^2 (red) during immersion test of test objects D

4.6 Partial discharge at elevated and ambient temperature

4.6.1 Elevated temperature

Date: 2016-12-15 (Test object A and C)
Ambient temperature: 25°C
Ambient relative humidity: 33%
Ambient pressure: 960 hPa

Date: 2017-01-09 (Test object B)
Ambient temperature: 25°C
Ambient relative humidity: 30%
Ambient pressure: 960 hPa

Date: 2017-01-16 (Test object D)
Ambient temperature: 25°C
Ambient relative humidity: 30%
Ambient pressure: 960 hPa

Test object	Test voltage û/√2	Time of heating	Calibration charge	Noise	Result
A	42 kV	5 h	10 pC	≤ 3 pC	PD-level ≤ 3 pC
B					PD-level ≤ 3 pC
C	42 kV	5 h	10 pC	≤ 3 pC	PD-level ≤ 3 pC
D					PD-level ≤ 3 pC

Note: All test objects installed on the same cable cross section were tested simultaneously.
Requirement: Partial discharge level shall not exceed 10 pC.
Result: All test objects passed the test.

4.6.2 Ambient temperature

Date: 2016-12-15 (Test object A and C)
Ambient temperature: 25°C
Ambient relative humidity: 33%
Ambient pressure: 960 hPa

Date: 2017-01-11 (Test object B)
Ambient temperature: 25°C
Ambient relative humidity: 30%
Ambient pressure: 960 hPa

Date: 2017-01-17 (Test object D)
Ambient temperature: 25°C
Ambient relative humidity: 30%
Ambient pressure: 963 hPa

Test object	Test voltage û/√2	Calibration charge	Noise	Result
A	42 kV	10 pC	≤ 3 pC	PD-level ≤ 3 pC
B	42 kV	10 pC	≤ 3 pC	PD-level ≤ 3 pC
C	42 kV	10 pC	≤ 3 pC	PD-level ≤ 3 pC
D	42 kV	10 pC	≤ 3 pC	PD-level ≤ 3 pC

Note: All test objects of the same type of termination and cable cross section were tested simultaneously.
Requirement: Partial discharge level shall not exceed 10 pC.
Result: All test objects passed the test.

4.7 Impulse voltage at ambient temperature

The test object were exposed to 10 impulses of positive and negative polarity each. Before each series of 10 impulses, 3 calibration impulses of 50%, 65% and 80% of the test voltage level were applied. The recorded impulses are shown in **Figure 12** to **Figure 19**.

Date: 2016-12-16 (Test object A and C)
Ambient temperature: 25°C
Ambient relative humidity: 33%
Ambient pressure: 963 hPa

Date: 2017-01-11 (Test object B)
Ambient temperature: 25°C
Ambient relative humidity: 30%
Ambient pressure: 960 hPa

Date: 2017-01-17 (Test object D)
Ambient temperature: 25°C
Ambient relative humidity: 30%
Ambient pressure: 963 hPa

Test object	Voltage û	Front time	Time to half-value	Number of impulses	Result
A	±200 kV	1.201 µs to 1.282 µs	50.130 µs to 50.428 µs	10 of each polarity	No breakdown
B	±200 kV	1.064 µs to 1.098 µs	49.695 µs to 49.920 µs	10 of each polarity	No breakdown
C	±200 kV	1.494 µs to 1.532 µs	50.682 µs to 50.876 µs	10 of each polarity	No breakdown
D	±200 kV	1.280 µs to 1.315 µs	50.109 µs to 50.373 µs	10 of each polarity	No breakdown

Note: All test objects of the same type of termination and cable cross section were tested simultaneously.
Requirement: Each test object shall withstand 10 positive and 10 negative impulses without breakdown.
Result: All test objects passed the test.

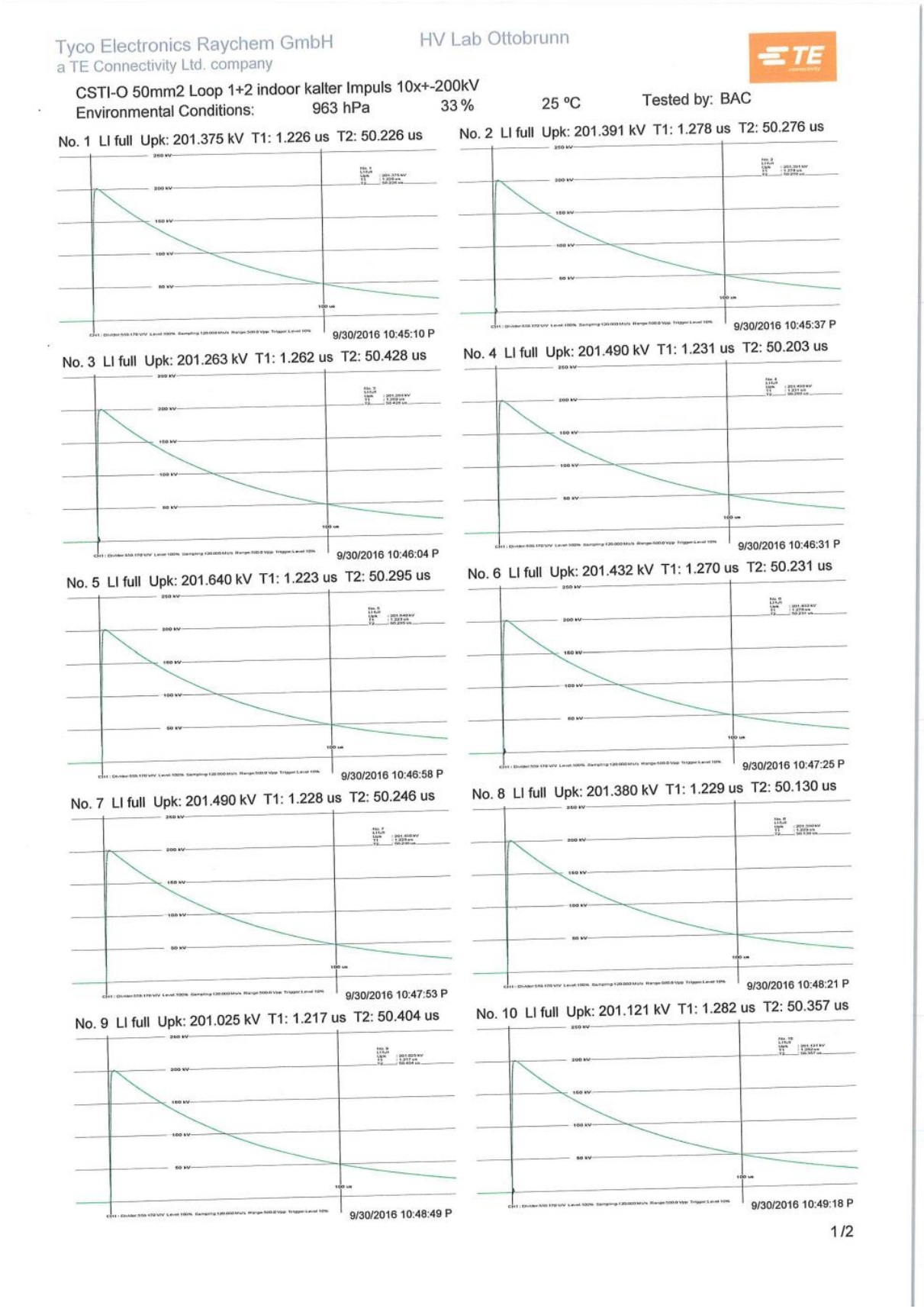


Figure 12: Positive impulses at ambient temperature on test object A (50 mm²)

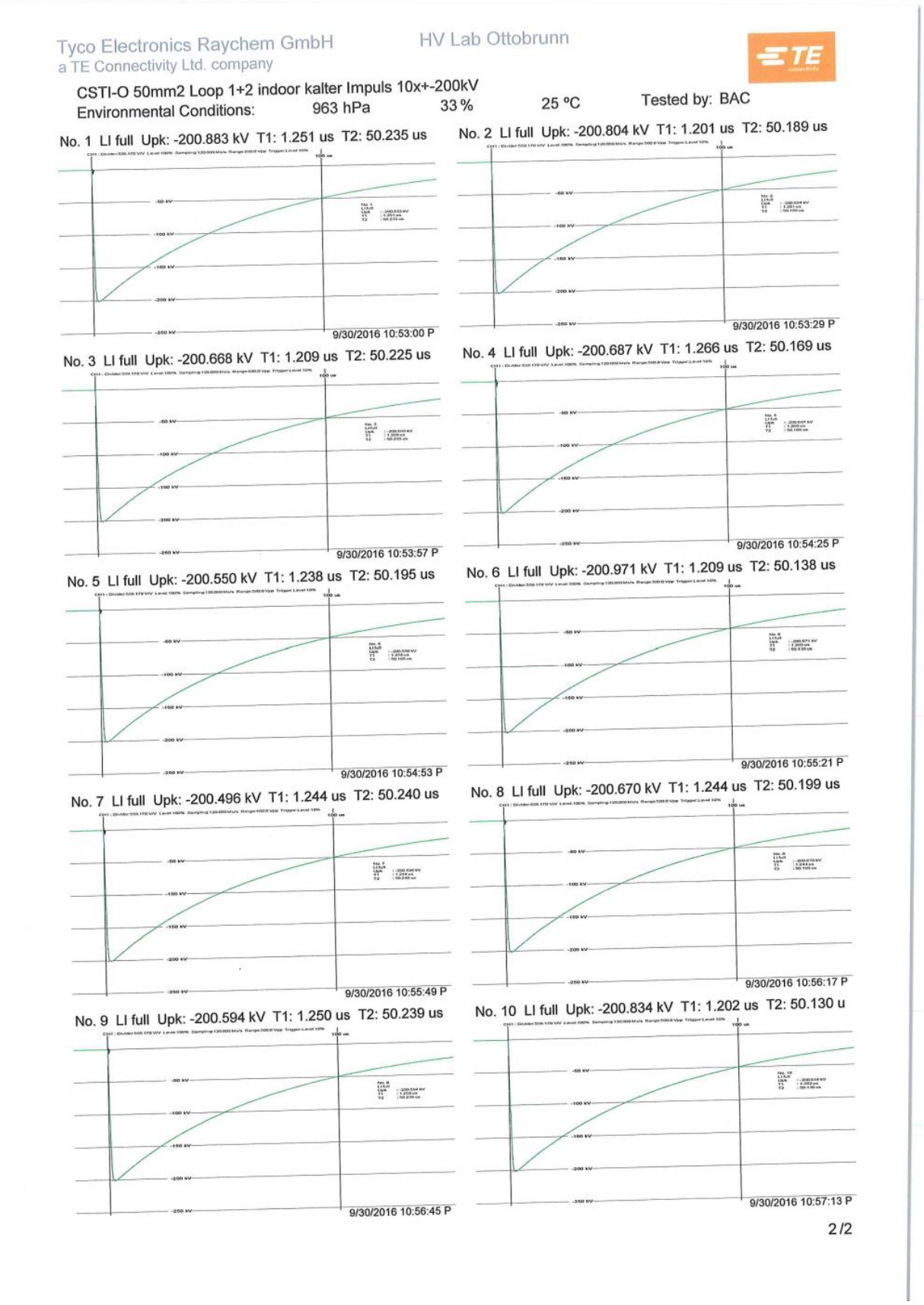


Figure 13: Negative impulses at ambient temperature on test object A (50 mm^2)

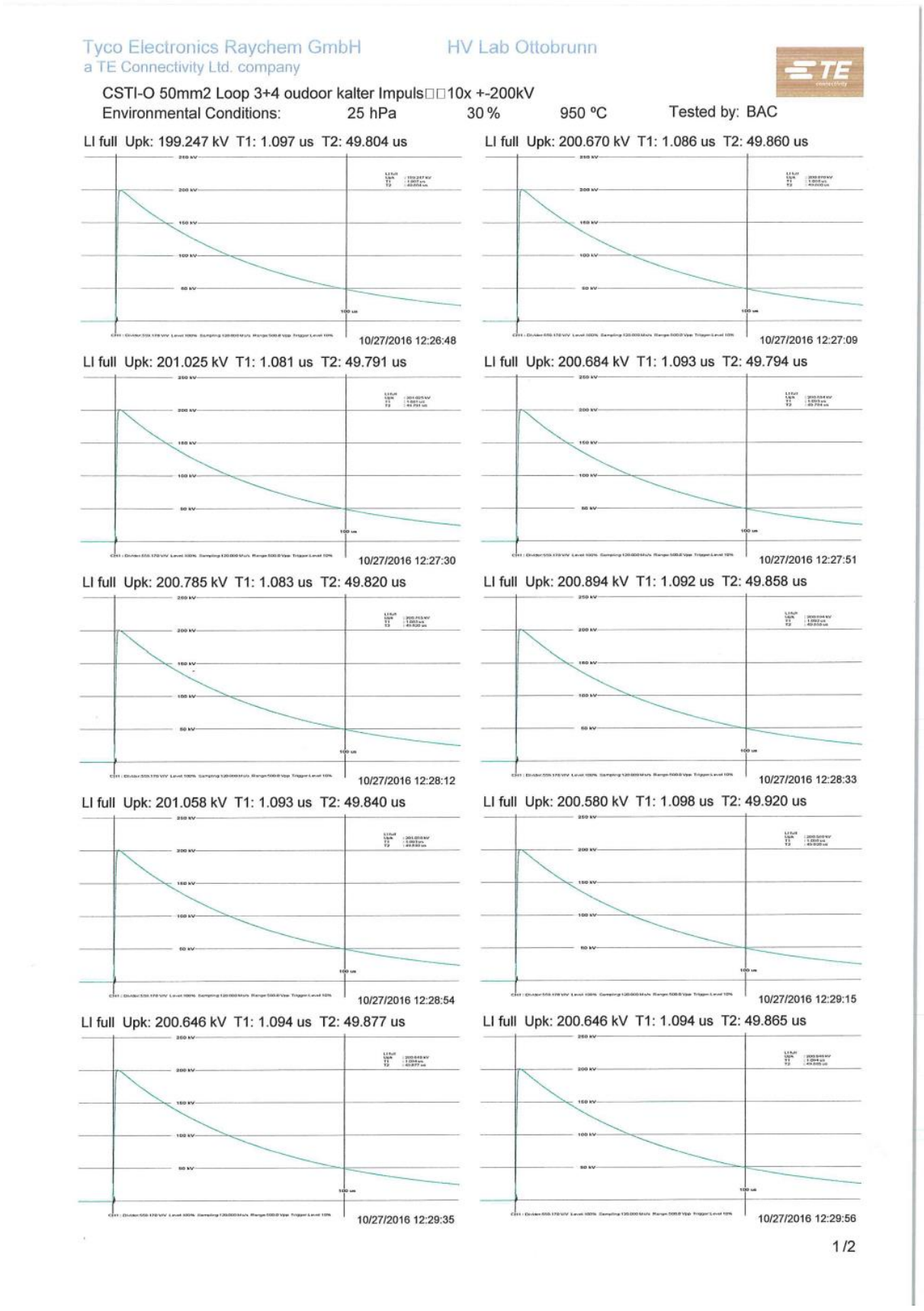


Figure 14: Positive impulses at ambient temperature on test object B (50 mm²)

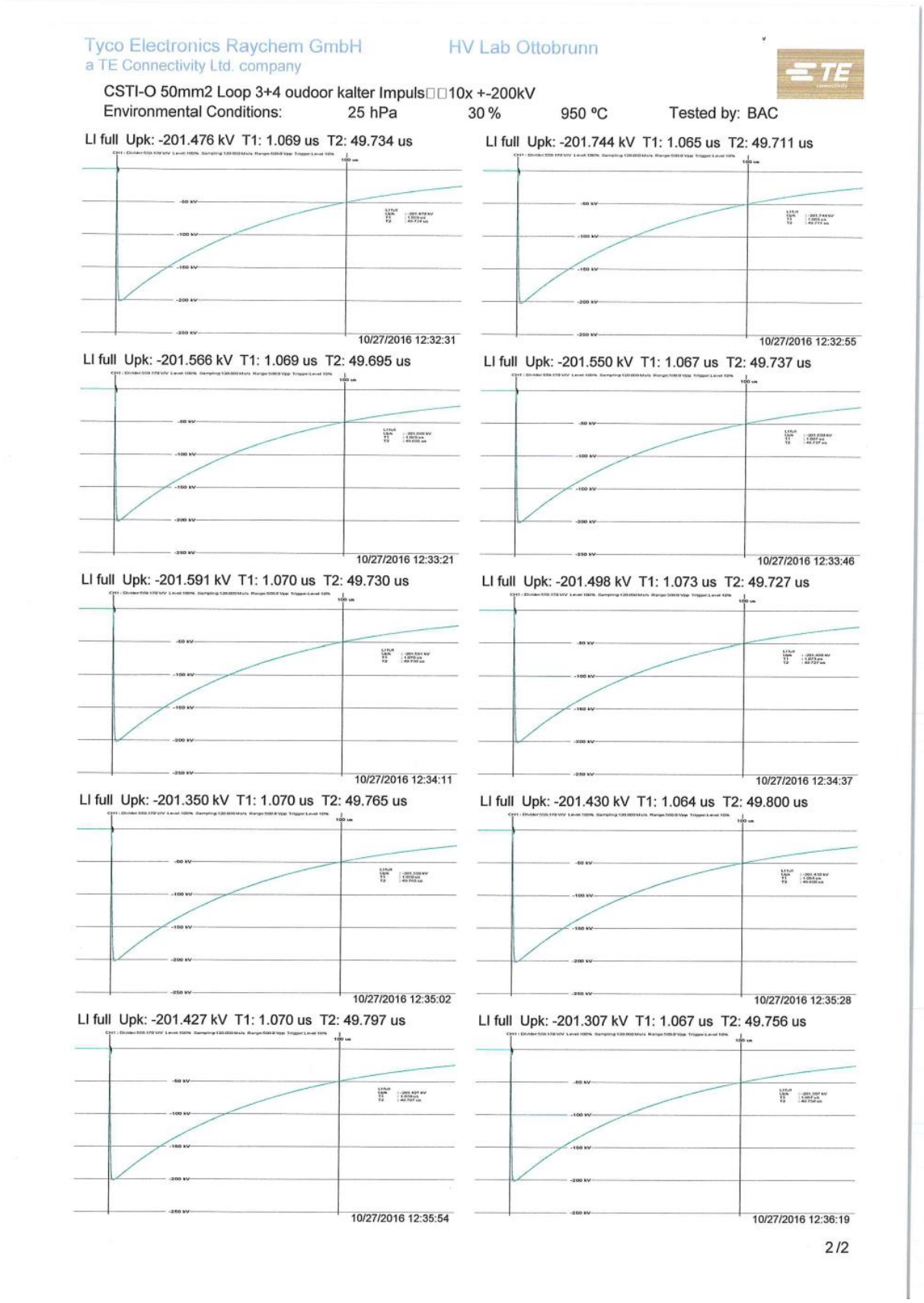


Figure 15: Negative impulses at ambient temperature on test object B (50 mm^2)

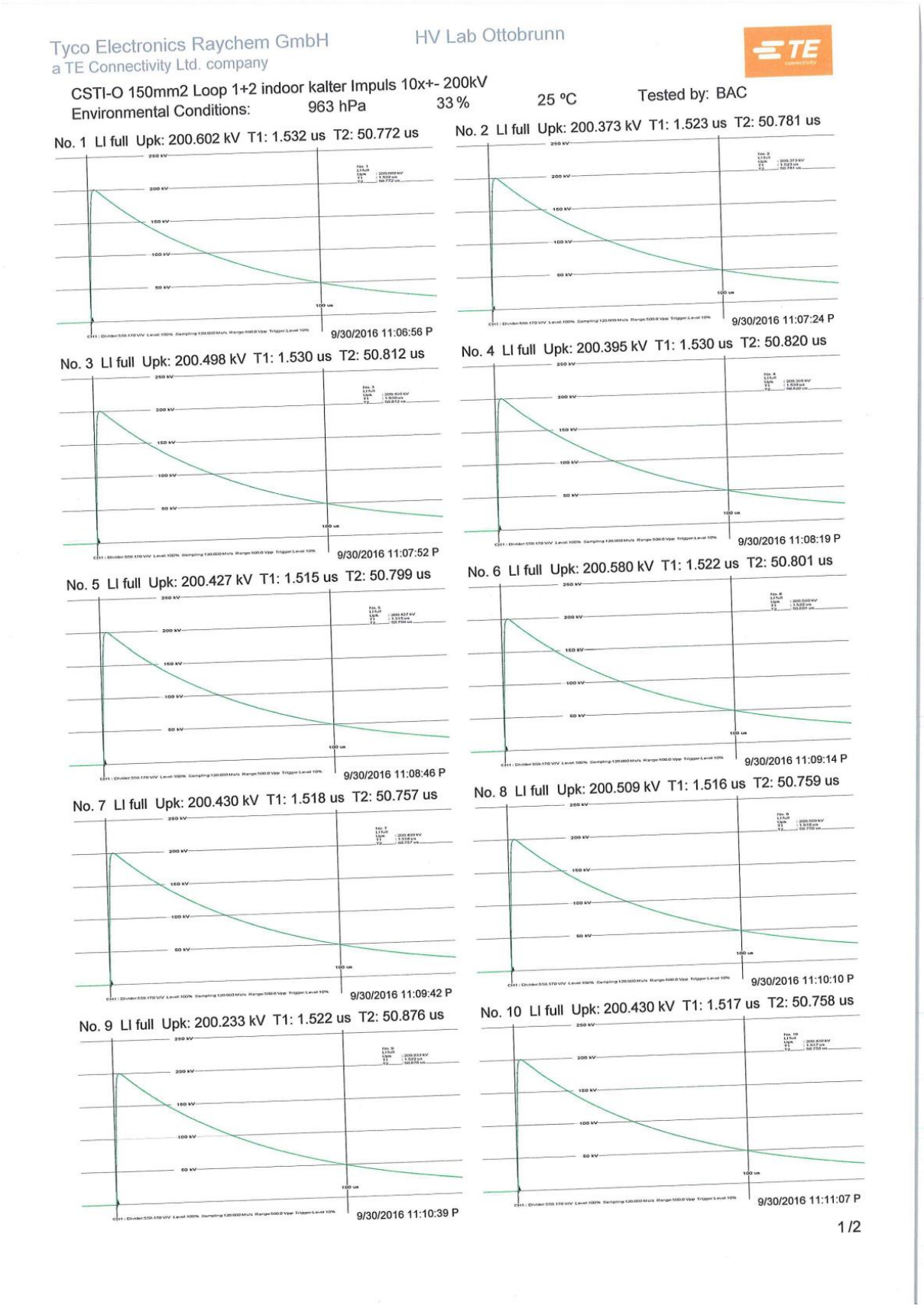


Figure 16: Positive impulses at ambient temperature on test object C (150 mm^2)

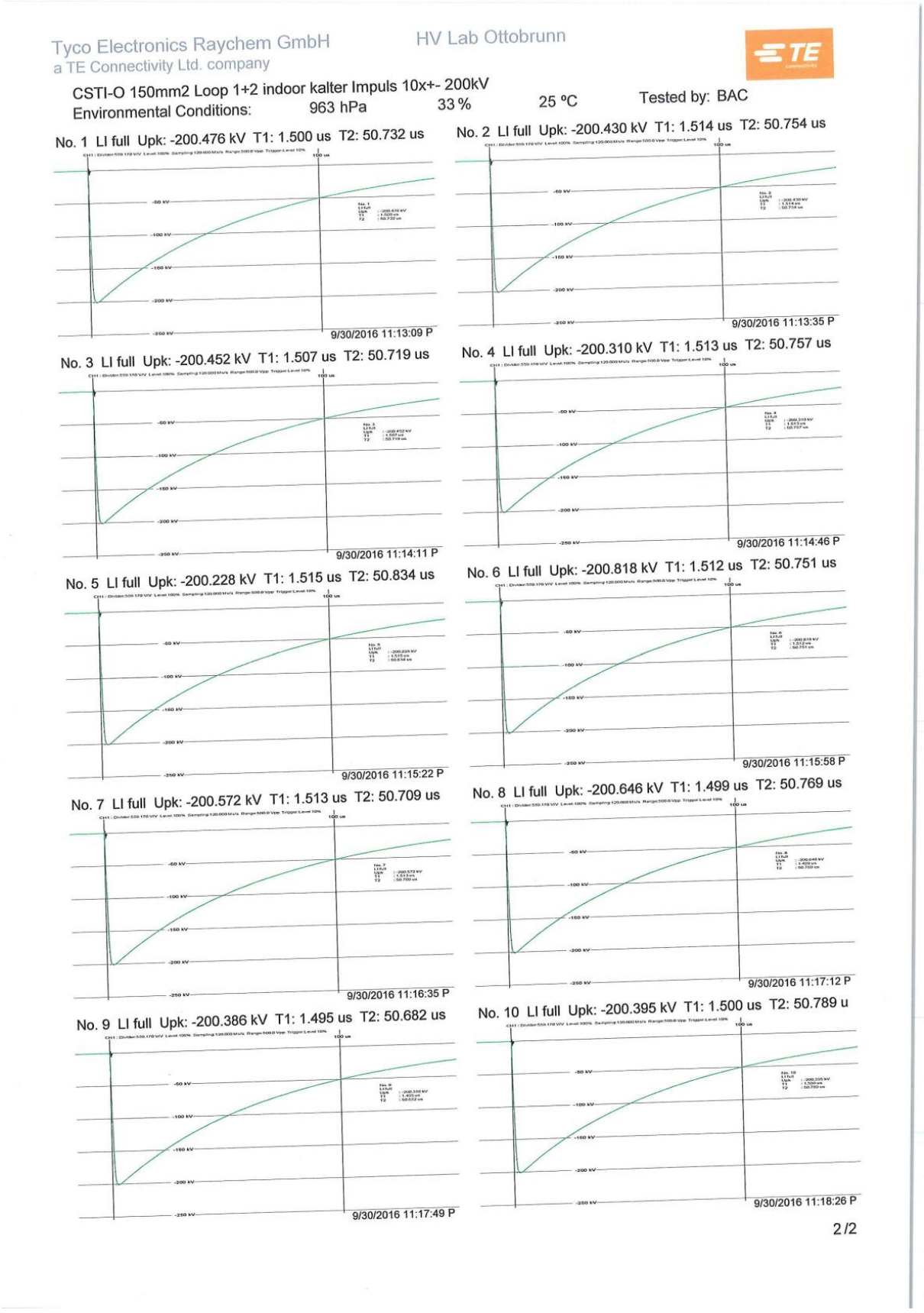


Figure 17: Negative impulses at ambient temperature on test object C (150 mm²)

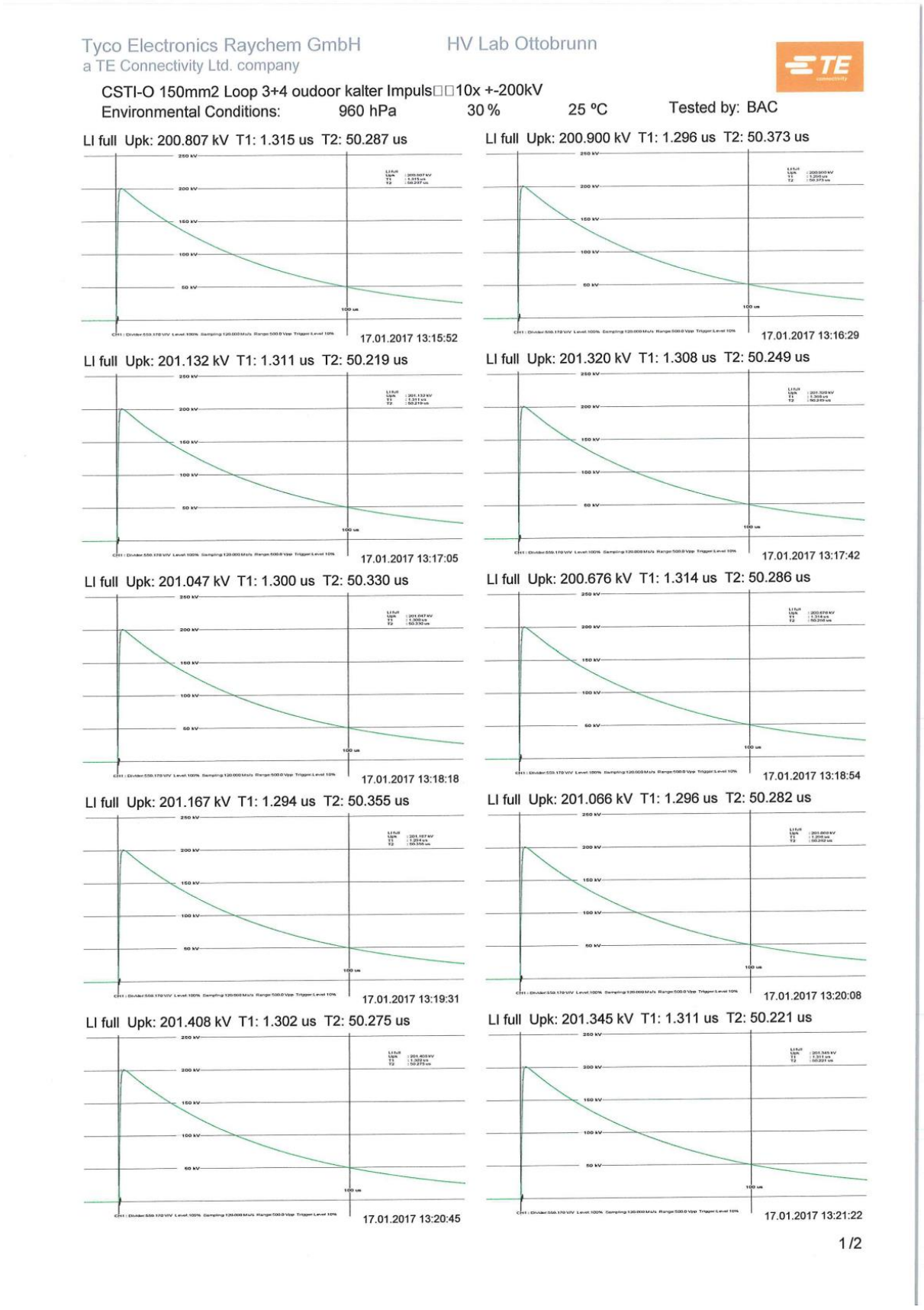


Figure 18: Positive impulses at ambient temperature on test object D (150 mm^2)

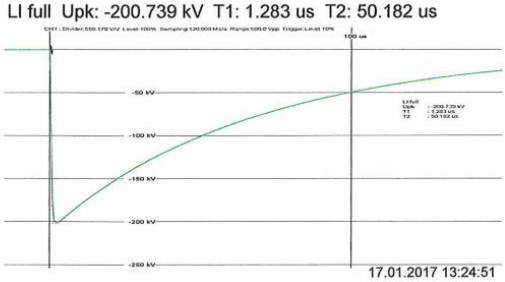
Tyco Electronics Raychem GmbH
a TE Connectivity Ltd. company

HV Lab Ottobrunn

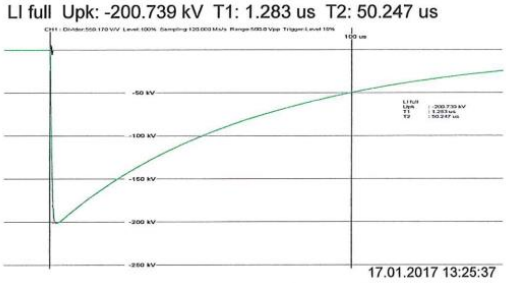
CSTI-O 150mm2 Loop 3+4 oudoor kalter Impuls□□10x +-200kV

Environmental Conditions: 960 hPa 30 % 25 °C Tested by: BAC

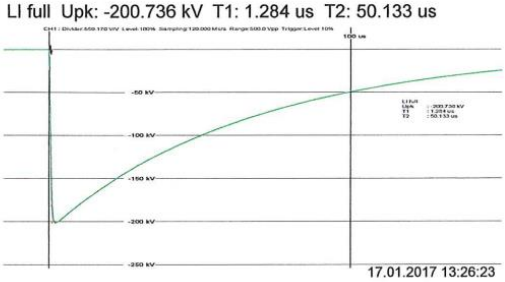
LI full Upk: -200.739 kV T1: 1.283 us T2: 50.182 us



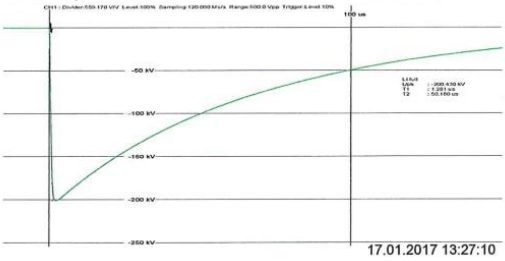
LI full Upk: -200.739 kV T1: 1.283 us T2: 50.247 us



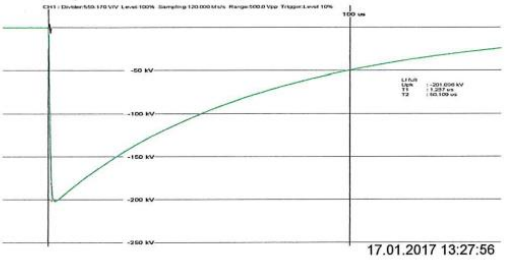
LI full Upk: -200.736 kV T1: 1.284 us T2: 50.133 us



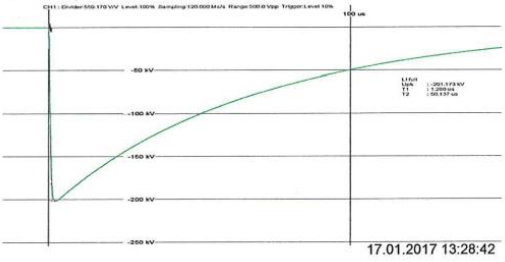
LI full Upk: -200.430 kV T1: 1.281 us T2: 50.180 us



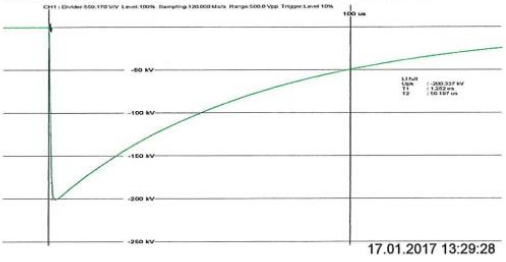
LI full Upk: -201.096 kV T1: 1.287 us T2: 50.109 us



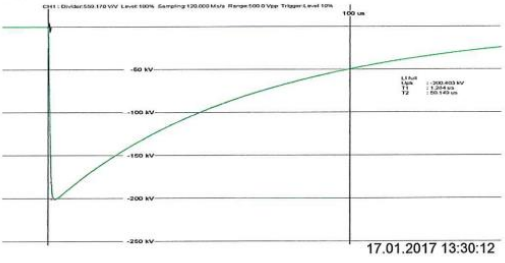
LI full Upk: -201.173 kV T1: 1.280 us T2: 50.137 us



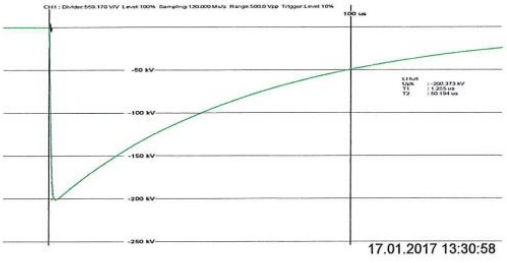
LI full Upk: -200.337 kV T1: 1.282 us T2: 50.197 us



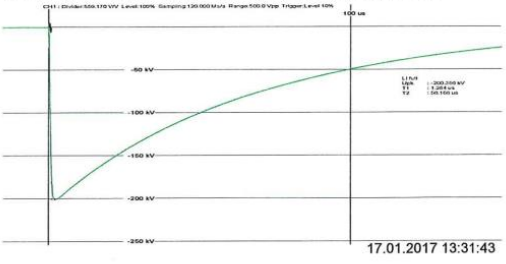
LI full Upk: -200.403 kV T1: 1.284 us T2: 50.149 us



LI full Upk: -200.373 kV T1: 1.285 us T2: 50.194 us



LI full Upk: -200.386 kV T1: 1.284 us T2: 50.166 us



2 /2

Figure 19: Negative impulses at ambient temperature on test object D (150 mm²)

4.8 AC voltage dry withstand

Date: 2016-12-16 (Test object A and C)
Ambient temperature: 25°C
Ambient relative humidity: 33%
Ambient pressure: 963 hPa

Date: 2017-01-11 (Test object B)
Ambient temperature: 25°C
Ambient relative humidity: 30%
Ambient pressure: 960 hPa

Date: 2017-01-17 (Test object D)
Ambient temperature: 25°C
Ambient relative humidity: 30%
Ambient pressure: 963 hPa

Test object	Test voltage û/√2	Duration	Result
A	93,5 kV	5 min	No breakdown
B			No breakdown
C	93,5 kV	5 min	No breakdown
D			No breakdown

Note: All test objects installed on the same cable cross section were tested simultaneously.
Requirement: No breakdown shall occur.
Result: All test objects passed the test.

4.9 Partial discharge at ambient temperature

Date: 2016-12-16 (Test object A and C)
Ambient temperature: 25°C
Ambient relative humidity: 33%
Ambient pressure: 963 hPa

Date: 2017-01-11 (Test object B)
Ambient temperature: 25°C
Ambient relative humidity: 30%
Ambient pressure: 960 hPa

Date: 2017-01-17 (Test object D)
Ambient temperature: 25°C
Ambient relative humidity: 30%
Ambient pressure: 963 hPa

Test object	Test voltage û/√2	Calibration charge	Noise	Result
A	42 kV	10 pC	≤ 3 pC	PD-level ≤ 3 pC
B	42 kV	10 pC	≤ 3 pC	PD-level ≤ 3 pC
C	42 kV	10 pC	≤ 3 pC	PD-level ≤ 3 pC
D	42 kV	10 pC	≤ 3 pC	PD-level ≤ 3 pC

Note: All test objects of the same type of termination and cable cross section were tested simultaneously.
Requirement: Partial discharge level shall not exceed 10 pC.
Result: All test objects passed the test.

4.10 Examination

Date: 2016-12-08 (CSTI-6122-ML-2-13)
2017-01-27 (CSTO-6122-ML-2-13)

The test samples were examined for the following criteria:
(i) cracking in the filling media and/or tape or tube components
(ii) a moisture path bridging a primary seal
(iii) corrosion and/or tracking and/or erosion

(iv) leakage of any insulating material

Test object	Criteria (i)	Criteria (ii)	Criteria (iii)	Criteria (iv)
A	Not found	Not found	Not found	Not found
B	Not found	Not found	Not found	Not found

4.11 Humidity test

The four test objects before and after the humidity test are shown in **Figure 20** to **Figure 27**.

Date: 2016-12-20 – 2017-01-02 (Test object E)

Test object	Test voltage û/√2	Duration	Result
A	26 kV	300 h	No breakdown nor flashover, no more than 3 strips, no substantial damage

Requirement: No breakdown nor flashover, no more than 3 strips, no substantial damage
Result: All test objects passed the test.

Figure 20: Sample 1A before 300 h

Figure 21: Sample 1B before 300 h

Figure 22: Sample 2A before 300 h

Figure 23: Sample 2B before 300 h

Figure 24: Sample 1A after 300 h

Figure 25: Sample 1B after 300 h

Figure 26: Sample 2A after 300 h

Figure 27: Sample 2B after 300 h

4.12 Examination

Date: 2017-01-02 (CSTI-6122-ML-2-13)

The test samples were examined for the following criteria:
(v) cracking in the filling media and/or tape or tube components
(vi) a moisture path bridging a primary seal
(vii) corrosion and/or tracking and/or erosion
(viii) leakage of any insulating material

Test object	Criteria (i)	Criteria (ii)	Criteria (iii)	Criteria (iv)
E	Not found	Not found	Not found	Not found

A. Appendices

A.1 Identification of test cable 50mm^2

Rated voltage U_0/U (U_m): 18/30 (36) kV

Cable construction:	☒ 1-core	☐ 3-core	☐ Individually screen
			☐ Overall screen
Conductors:	☐ Al	☒ Cu	
	☒ Stranded	☐ Solid	
	☒ Circular	☐ Shaped	
	☐ 120mm^2	☐ 150mm^2	☐ 185mm^2
	☐ 240mm^2		
	☒ Other cross section:	50 mm^2	
Insulation:	☒ XLPE	☐ Other:	
	☐ EPR	☐ HEPR	
Insulation screen:	☒ Bonded	☐ Strippable	
Metallic screen:	☒ Wires	☐ Tapes	☐ Extruded
	☐ Al	☒ Cu	☐ Other
Armour:	☐ Wire	☐ Tape	
Oversheath:	☐ PVC	☒ PE (state type)	
Water blocking, if any:	☐ Within conductor	☒ Under oversheath	
Diameters:	Conductor:	8.5 mm	
	Insulation:	25.2 mm	
	Insulation screen:	26.5 mm	
	Oversheath:	33.0 mm	
Cable marking:	VDE0276 FACAB 50301 N2XSY 1 x 50RM/16mm² 18/30 (36)kV 2016		

A.2 Identification of test cable 150mm^2

Rated voltage U_0/U (U_m): 18/30 (36) kV

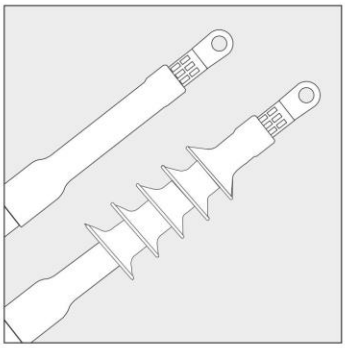
Cable construction:	☒ 1-core	☐ 3-core	☐ Individually screen
			☒ Overall screen
Conductors:	☒ Al	☐ Cu	
	☒ Stranded	☐ Solid	
	☒ Circular	☐ Shaped	
	☐ 120mm^2	☒ 150mm^2	☐ 185mm^2
	☐ 240mm^2		
	☐ Other cross section:	- mm^2	
Insulation:	☒ XLPE	☐ Other:	
	☐ EPR	☐ HEPR	
Insulation screen:	☒ Bonded	☐ Strippable	
Metallic screen:	☒ Wires	☐ Tapes	☐ Extruded
	☐ Al	☒ Cu	☐ Other
Armour:	☐ Wire	☐ Tape	
Oversheath:	☐ PVC	☒ PE (state type)	
Water blocking, if any:	☐ Within conductor	☒ Under oversheath	
Diameters:	Conductor:	13.7 mm	
	Insulation:	30.5 mm	
	Insulation screen:	32.2 mm	
	Oversheath:	40.0 mm	
Cable marking:	FACAB 60102 NA2XS2Y 1 x 150RM/25 30kV 2010		

A.3 Identification of test cable 95mm^2

Rated voltage U_0/U (U_m): 18/30 (36) kV

Cable construction:	☒ 1-core	☐ 3-core	☐ Individually screen
			☒ Overall screen
Conductors:	☒ Al	☐ Cu	
	☒ Stranded	☐ Solid	
	☒ Circular	☐ Shaped	
	☐ 120mm^2	☐ 150mm^2	☐ 185mm^2
	☐ 240mm^2		
	☒ Other cross section:	95 mm^2	
Insulation:	☒ XLPE	☐ Other:	
	☐ EPR	☐ HEPR	
Insulation screen:	☒ Bonded	☐ Strippable	
Metallic screen:	☒ Wires	☐ Tapes	☐ Extruded
	☐ Al	☒ Cu	☐ Other
Armour:	☐ Wire	☐ Tape	
Oversheath:	☐ PVC	☒ PE (state type)	
Water blocking, if any:	☐ Within conductor	☒ Under oversheath	
Diameters:	Conductor:	11.5 mm	
	Insulation:	28.5 mm	
	Insulation screen:	29.9 mm	
	Oversheath:	37.0 mm	
Cable marking:	VDE 0276 NA2XS(F)2Y 1 x 95/16 RM 18/30kV 2015 FACAB 06201		

Raychem
from TE Connectivity



Installation Instruction
EPP-2828-8/16

Raychem
Termination for Screened
Single Core Polymeric Cable
without Armour

Type: CSTI/CSTO
Indoor/Outdoor

36 kV / 42 kV

To view the TE Energy website:

Tyco Electronics Raychem GmbH
a TE Connectivity Ltd. Company
TE Energy
Finsinger Feld 1
85521 Ottobrunn/Munich, Germany
Tel: +49-89-6089-0
Fax: +49-89-6096-345
energy.te.com

Before Starting

Check to ensure that the kit you are going to use is suitable for the size of cables being jointed.

Refer to the kit label and the title of the installation instruction.

Components or working steps may have been modified since you last installed this product.

Carefully read and follow the steps in the installation instruction.

General Instructions

Clean and degrease all parts that will come into contact with adhesive.

If a solvent is used follow the manufacturer's handling instructions.

Check cable ends for ingress of moisture before starting with cable preparation.

For easy strip screen layers always use a round file to cut radially through the core screen.

The Information contained in these installation instructions is for use only by installers trained to make electrical power installations and is intended to describe the correct method of installation for this product. However, TE Connectivity has no control over the field conditions which influence product installation.
It is the user's responsibility to determine the suitability of the installation method in the user's field conditions. TE Connectivity's only obligations are those in TE Connectivity's standard Conditions of Sale for this product and in no case will TE Connectivity be liable for any other incidental, indirect or consequential damages arising from the use or misuse of the products.
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Cable Preparation

Before Starting

Check to ensure that the kit you are going to use fits the cable.
Refer to the kit label and the title of the installation instruction.
Components or work steps may have been improved since you last installed this product.
Carefully read and follow the steps in the installation instruction.

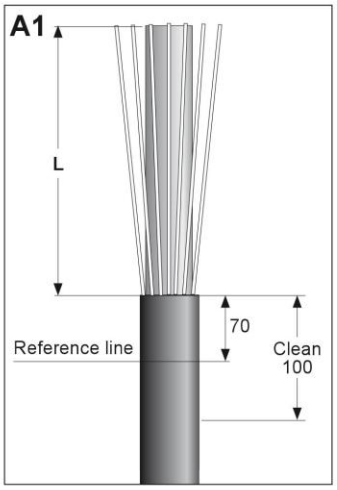
Table for cutback dimensions

	Cable	Termination
Mechanical lug BLMT	Cross Section	Indoor/Outdoor 36 kV/42 kV
	mm^2	mm
BLMT 25/95	95	435
BLMT 35/150	50 Cu	460
BLMT 35/150	150 Al	450
BLMT 95/240	185	475
BLMT 95/240	240	440
BLMT 120/300	120 – 300	
BLMT 185/400	185	475
	400	445
BLMT 500/630	500 Al	485
BLMT 500/630	630 Al	485
BLMT 500/630	630 Cu	485
BLMT 800/1000	1000 Al	460

For cable cross section 50 - 630 mm²

Cut the cable to the required length. Remove the oversheath according to **L**. Clean and degrease the end of the oversheath for approximately 100 mm.

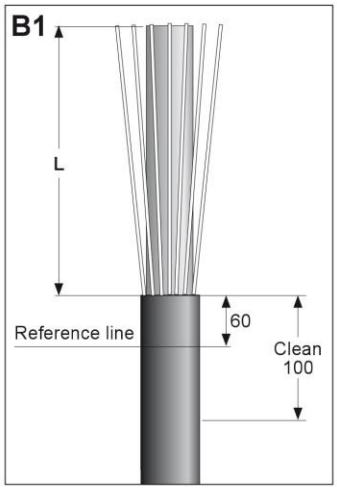
Mark a line 70 mm below the oversheath cut.



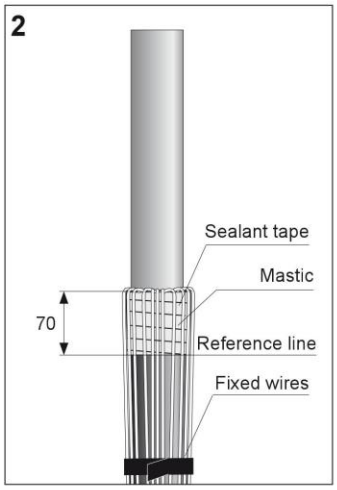
For cable cross section 800 - 100 mm²

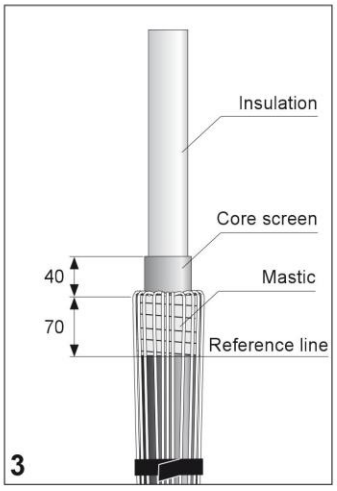
Cut the cable to the required length. Remove the oversheath according to **L**. Clean and degrease the end of the oversheath for approximately 100 mm.

Mark a line 60 mm below the oversheath cut.



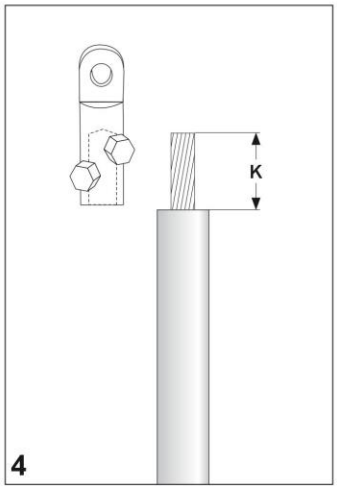
Wrap two layers of sealant tape (grey) with a small overlap and slight tension around the end of the oversheath as shown. Bend the shielding wires back onto the oversheath. Avoid crossing the individual wires. Fix the shielding wires with a tape to the oversheath.



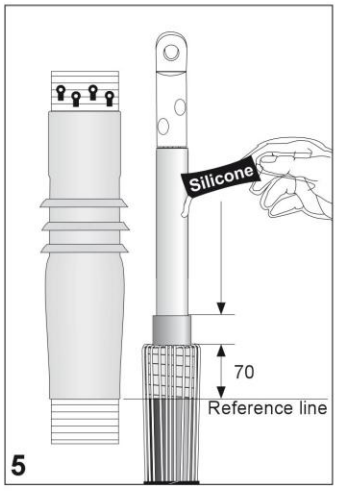


Thoroughly remove the core screen to within 40 mm of the oversheath cut.
The surface of the insulation should be free from all traces of conductive material.
Smooth out any irregularities.

Note: Do not nick the insulation.



Cut back the insulation according to **Mechanical lugs:**
K = depth of cable lug barrel hole
Install the cable lug and remove all sharp edges. Clean and degrease the core insulation and the lug.



Apply a thin layer of silicone grease onto the insulation and the core screen cut.

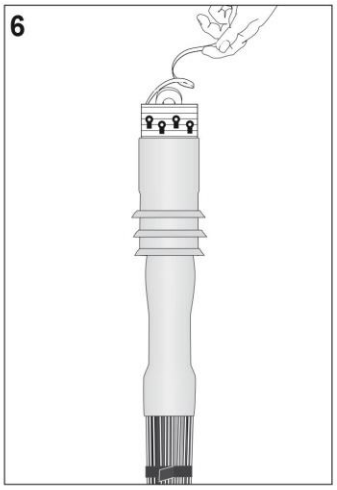
Position the termination body.

Pull the spiral gently until the termination body butts to the reference line.

If the termination is not correctly positioned, it is possible to gently slide it into place.

Remove the spiral holdout completely from the termination by pulling it counterclockwise.

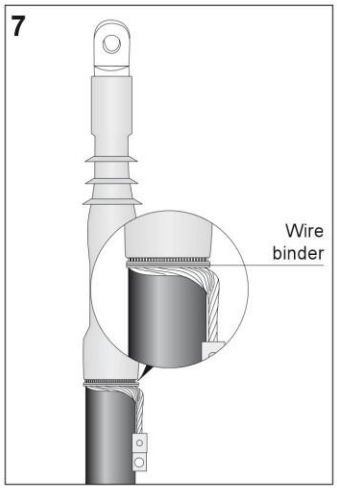
Do not twist the spiral holdout during removal. Avoid the spiral to hook up over the termination.



Degrease and clean the termination.

Fix the shield wires with a wire binder along the lower edge of the termination body. Install the cable lug on the shield wires.

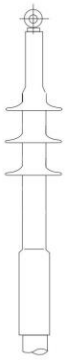
Termination completed.



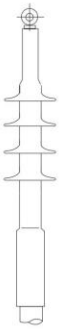
Please dispose of all waste according to local environmental regulations.

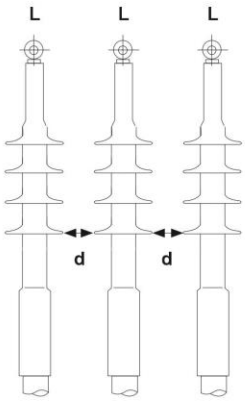
CSTI/CSTO – Product family

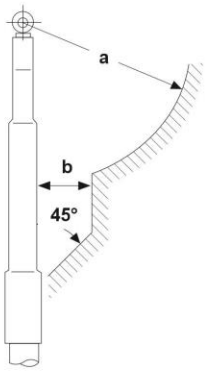
Indoor



Outdoor







Min. clearances		Max. system voltage in kV	
		36	42
a	Air clearance	as for local specifications	
b	ph/ph and ph/ground in mm	35	45
d	Between skirts in mm	25	35

A.5 Kit content lists

CSTI-6122-ML-2-13

482406-000	S1278-1-300(B100)
EK3103-001	EPP-2828-8/16
E74727-000	EPPA-004
724277N001	EXRM-0568
CV2903-000	EPPA-076-5
989771-000	EPPA-029-3-3000
E43601-000	HEL-2070.1-Z-AK
2304321-4	CSTI-35-BD-18-533-FS
F61108-000	BLMT-35/150-13

CSTO-6122-ML-2-13

482406-000	S1278-1-300(B100)
EK3103-001	EPP-2828-8/16
E74727-000	EPPA-004
724277N001	EXRM-0568
CV2903-000	EPPA-076-5
989771-000	EPPA-029-3-3000
E43601-000	HEL-2070.1-Z-AK
2304322-4	CSTO-35-BD-18-533-FS
F61108-000	BLMT-35/150-13