

FUNDACIÓN PARA EL FOMENTO  
DE LA INNOVACIÓN INDUSTRIAL



# LCOE

## LABORATORIO CENTRAL OFICIAL DE ELECTROTECNIA

FUNDACIÓN PARA EL FOMENTO DE LA INNOVACIÓN INDUSTRIAL

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## TEST REPORT

## 2023 05 3G 0XXX

<b>OBJECT</b>	Three-phase oil-immersed power transformer 50 kVA 24 kV
<b>MANUFACTURER</b>	XXXXXXXX
<b>TYPE</b>	50I / 24 / 20B2 - GST001 R.04 (T1C1784)
<b>IDENTIFICATION</b>	XXXX
<b>APPLICANT</b>	Fundación para el Fomento de la Innovación Industrial <i>José Gutiérrez Abascal, 2</i> <i>28006 Madrid</i>
<b>TEST DATES</b>	From 25 <sup>th</sup> to 29 <sup>th</sup> May 2023
<b>RESULTS</b>	TESTS PASSED according to UNE-EN 60076-1-2-10 Standards and UE 548/2014 Tier 2 Regulation

**This report consists of 13 pages in total and 2 annexes**

Authorized signatory and date of issue

Mr. -- ---- ----

Technical Manager of LCOE HV Lab

### CONDITIONS OF VALIDITY OF THIS DOCUMENT:

- The results of the tests refer exclusively to the sample which was tested.
- The above-mentioned sample is the one described in the report and is the sample originally received. LCOE is not responsible of the technical information and documentation provided by the applicant or manufacturer referent to the test object.
- Partial reproduction of this document is prohibited.

## INDEX

<b>1</b>	<b>IDENTIFICATION OF THE TEST OBJECT.....</b>	<b>3</b>
1.1	DESCRIPTION OF THE TEST OBJECT.....	3
1.2	RATED CHARACTERISTICS ASSIGNED BY THE MANUFACTURER.....	3
1.3	RATING PLATE AND PICTURES OF TEST OBJECT.....	4
<b>2</b>	<b>GENERAL INFORMATION.....</b>	<b>6</b>
2.1	TESTS CARRIED OUT BY.....	6
2.2	DECISION RULES AND MEASUREMENT UNCERTAINTY.....	6
2.3	STANDARDS APPLIED.....	6
2.4	ADDITIONAL INFORMATION.....	6
<b>3</b>	<b>PERFORMED TESTS.....</b>	<b>7</b>
3.1	MEASUREMENT OF WINDING RESISTANCE.....	7
3.2	MEASUREMENT OF VOLTAGE RATIO AND CHECK OF PHASE DISPLACEMENT.....	8
3.3	MEASUREMENT OF SHORT-CIRCUIT IMPEDANCE AND LOAD LOSSES.....	9
3.4	MEASUREMENT OF NO-LOAD LOSSES AND CURRENT.....	10
3.5	TEMPERATURE-RISE TEST.....	11
3.6	DETERMINATION OF SOUND LEVELS.....	12
<b>4</b>	<b>SUMMARY AND CONCLUSIONS.....</b>	<b>13</b>

**Annex 1:** Determination of sound levels.

**Annex 2:** Decision rules and measurement uncertainty.

## 1 IDENTIFICATION OF THE TEST OBJECT

Three-phase power transformer 50 kVA 24 kV.

### 1.1 Description of the test object

Manufacturer:	XXXXX
Type:	50I / 24 / 20B2 - GST001 R.04
Identification:	XXXX
Year of Manufacture:	2023
According to Standard:	Commission Regulation (EU) n° 548/2014 Tier 2 UNE 21428

### 1.2 Rated characteristics assigned by the manufacturer

Rated Power:	50 kVA
Frequency:	50 Hz
Rated Voltage:	
Primary voltage:	22 / 21 / 20.5 / 20 / 19.5 / 19 kV
Secondary voltage:	420 V
Rated Current:	
Primary current:	1.44 A
Secondary current:	68.7 A
Rated power-frequency withstand test voltage:	50 kV (HV) / 10 kV (LV)
Rated lightning impulse withstand test voltage:	125 kV (HV) / 20 kV (LV)
Vector group:	Dyn11
Short-circuit impedance 75°C:	4.0 %
Sound level:	39 dB (A)
No load losses:	81 W
Load losses at 75 °C:	750 W
Losses class:	Ao-10% Ak
Material of HV / LV windings:	Al / Al
Insulating Liquid:	Mineral Oil Nynas Lybra
Oil Volume:	120 L
Magnetic Core weight:	215 kg
Un-tanking weight:	280 kg
Total weight:	530 kg

### 1.3 Rating plate and pictures of test object

*Figure 1.1 Rating plate of power transformer.*

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*Figure 1.2 Picture of power transformer. Measurement of no-load losses.*

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## 2 GENERAL INFORMATION

### 2.1 Tests carried out by

Tests have been performed in LCOE High Voltage laboratory placed at Tecnogetafe, Eric Kandel Street, number 1 – 28906 Getafe (Madrid).

<u>Name</u>	<u>Company</u>
Ms. -- ---- ----	LCOE High Voltage Lab
Mr. -- ---- ----	LCOE High Voltage Lab
Mr. -- ---- ----	LCOE High Voltage Lab

### 2.2 Decision rules and measurement uncertainty

Decision rules and statement of conformity for each type of test and a summary of main LCOE measurement uncertainties is included in Annex 2 of this test report. Uncertainty calculations can be provided to the applicant upon request.

### 2.3 Standards applied

Tests have been performed according to the following standards:

- UNE-EN 60076-1:2013, "*Transformadores de potencia. Parte 1: Generalidades*", Spanish official version of the European Standard EN 60076-1:2011, which adopts the modified International Standard IEC 60076-1:2011.
- UNE-EN 60076-2:2013, "*Transformadores de potencia. Parte 2: Calentamiento de transformadores sumergidos en líquido*", Spanish official version of European Standard EN 60076-2:2011, which adopts International Standard IEC 60076-2:2011.
- UNE-EN 60076-10:2017, "*Transformadores de potencia. Parte 10: Determinación de los niveles de ruido*", Spanish official version of the European Standard EN 60076-10:2016, which adopts the International Standard IEC 60076-10:2016.

Furthermore, tests have been performed on power transformer according to following Standards and specifications:

- Regulation (EU) nº 548/2014. Directive 2009/125/EC with regard to Eco design requirements for small, medium and large power transformers. 21<sup>st</sup> May 2014. European Commission.
- UNE-EN 21428-1:2021, "*Transformadores trifásicos de distribución sumergidos en un líquido aislante, 50 Hz, de 25 kVA a 3 150 kVA con tensión más elevada para el material hasta 36 kV. Parte 1: Requisitos generales. Complemento nacional.*" AENOR. December 2021.

### 2.4 Additional Information

In this report, test voltage values corresponding to power frequency dielectric tests are expressed in peak value divided by root of two.

### 3 PERFORMED TESTS

#### 3.1 Measurement of winding resistance

- Test date: 25<sup>th</sup> May 2023
- Procedure: UNE-EN 60076-1 section 11.2

Measurement of winding resistance was performed on power transformer according to section 11.2 of UNE-EN 60076-1 Standard.

Measurement was made with direct current and simultaneous readings of current and voltage were taken to measure the resistance of low voltage and high voltage windings of the transformer.

- Test results:

<i>Winding. 20 000 V / 420 V</i>	<i>Resistance <math>T_{amb}</math></i>	<i>Resistance <math>T_{ref} (75\text{ °C})</math></i>
1U – 1V	97.83 $\Omega$	120.7 $\Omega$
1U – 1W	98.13 $\Omega$	121.1 $\Omega$
1V – 1W	97.79 $\Omega$	120.7 $\Omega$
2u – 2v	38,24 m $\Omega$	47,19 m $\Omega$
2u – 2w	38,48 m $\Omega$	47,49 m $\Omega$
2v – 2w	38,06 m $\Omega$	46,97 m $\Omega$
Ambient temperature	18.2 $^{\circ}\text{C}$	
Oil temperature	18.1 $^{\circ}\text{C}$	

- Conclusion: **Test Passed**

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**3.2 Measurement of voltage ratio and check of phase displacement**

- Test date: 25<sup>th</sup> May 2023
- Procedure: UNE-EN 60076-1 section 11.3

The voltage ratio of each tap and vector group of the power transformer was verified according to section 11.3 of UNE-EN 60076-1 Standard.

- Test results. Rated voltage 20 000 V / 420 V.

Tap	Theoretical Voltage Ratio	Phase Measurement	Measured Voltage Ratio	Voltage ratio Phase-phase	Difference (%)
1	22000 V / 420 V	1U-1V / 2u-2n	52.24	52.381	-0.275
		1V-1W / 2v-2n	52.23		
		1W-1U / 2w-2n	52.25		
2	21000 V / 420 V	1U-1V / 2u-2n	50.03	50.000	0.043
		1V-1W / 2v-2n	50.01		
		1W-1U / 2w-2n	50.03		
3	20500 V / 420 V	1U-1V / 2u-2n	48.83	48.810	0.028
		1V-1W / 2v-2n	48.81		
		1W-1U / 2w-2n	48.83		
4	20000 V / 420 V	1U-1V / 2u-2n	47.64	47.619	0.023
		1V-1W / 2v-2n	47.62		
		1W-1U / 2w-2n	47.64		
5	19500 V / 420 V	1U-1V / 2u-2n	46.44	46.429	0.010
		1V-1W / 2v-2n	46.42		
		1W-1U / 2w-2n	46.44		
6	19000 V / 420 V	1U-1V / 2u-2n	45.24	45.238	-0.002
		1V-1W / 2v-2n	45,22		
		1W-1U / 2w-2n	45,24		
<i>Verification of the vector group</i>					Dyn11

The power transformer satisfies the specified voltage transformation ratios and the vector group rated by the manufacturer.

- Conclusion: **Test Passed**



**3.3 Measurement of short-circuit impedance and load losses**

- Test date: 25<sup>th</sup> May 2023
- Procedure: UNE-EN 60076-1 section 11.4

Measurement of short-circuit impedance and load losses was performed on power transformer according to section 11.4 of UNE-EN 60076-1 Standard.

The transformer was powered from the high voltage side with tap changer in position 4 and low voltage side short-circuited. Load losses and short-circuit impedance were measured.

- Test results:

<i>Load losses and impedance voltage</i>	
Measured Load losses referred to 75 °C	725 W
Rated load losses	750 W
Maximum load losses, A <sub>k</sub>	750 W
Measured total losses referred to 75 °C	807 W
Rated total losses	831 W
Short-circuit impedance (75 °C)	314.3 Ω
Measured Impedance voltage (%)	3,93 %
Rated Impedance voltage (%)	4,00 %
Reference temperature	75 °C
Selected Tap	4 (20 000 V)

Measured load losses are lower than limit specified by Commission Regulation (EU) No 548/2014 and not greater by more than ± 15 % of declared value by the manufacturer.

Measured impedance voltage of the power transformer is between the limits of ± 10 % of rated value declared by the manufacturer.

- Conclusion: **Test Passed**

NO TEXT BELOW THE LINE

**3.4 Measurement of no-load losses and current**

- Test date: 25<sup>th</sup> May 2023
- Procedure: UNE-EN 60076-1 section 11.5

Measurement of no-load losses and current was performed on power transformer according to section 11.5 of UNE-EN 60076-1 standard.

The transformer was powered from the low voltage side with tap changer in position 4, rated voltage 20 000 V, and with high voltage windings opened. No-load losses and excitation voltage were measured.

- Test results:

<i>No load-losses and excitation current</i>	
Test voltage Ur	420 V
Test frequency	50 Hz
Selected Tape	4 (20 000 V)
Measured No-load losses at 90 % Ur	65.7 W
Measured No-load losses at 100 % Ur	81.7 W
Measured No-load losses at 110 % Ur	99.9 W
Rated no-load losses	81 W
Maximum no-load losses A <sub>o</sub> – 10 %	81 W
Excitation current at 100 % Ur	0,54 A (0,79 %)
Ambient Temperature	17.8 °C

Measured no load losses at 100 % Ur are lower than limit specified by Commission Regulation (EU) No 548/2014 and not greater by more than ± 15 % of declared value by the manufacturer.

- Conclusion: **Test Passed**

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### 3.5 Temperature-rise test

- Test date: 25<sup>th</sup> and 26<sup>th</sup> May 2023
- Procedure: UNE-EN 60076-2

Temperature-rise test was performed on the three-phase power transformer according to UNE-EN 60076-2 Standard.

The transformer was supplied at reduced voltage applied on high-voltage bushings with the low-voltage terminals short-circuited.

A current corresponding to the total losses is applied until thermal stabilization is reached to measure the internal temperature of the oil. Then test current is reduce up to maximum rated current for one hour and the temperature-rise of the windings was determined by means of the resistance variation method.

The measurement of temperature in different parts of the transformer and of the dielectric oil was performed by using several thermocouples.

- Test results:

<i>Temperature-rise test</i>	
Selected Tape	4 (20 000 V)
Test Frequency	50 Hz
Total losses during the test	807 W
Reference Temperature	75 °C
Ambient temperature at the end of the test	18.8 °C
HV 1U-1V resistance in hot state	114.2 Ω
LV 2u-2v resistance in hot state	44,26 mΩ
Temperature rise of low voltage winding	38.2 K ± 3,0 K
Temperature rise of high voltage winding	40.6 K ± 3,0 K
Limit value of windings	65 K
Temperature rise of upper part of the oil	28.6 K ± 2,0 K
Limit value of insulating oil	60 K

The measured temperature-rise of transformer windings was lower than 65 K, the limit specified by UNE-EN 60076-2 Standard.

The measured temperature-rise of transformer temperature oil was lower than 60 K, the limit specified by UNE-EN 60076-2 Standard.

- Conclusion: **Test Passed**

### 3.6 Determination of sound levels

- Test date: 29<sup>th</sup> May 2023
- Procedure: UNE-EN 60076-10

Determination of sounds levels was performed on power transformer according to IEC 60076-10 Standard. Before the measurements, 8 measuring points were evenly distributed along the prescribed contour, spaced 0.3 m away from the principal radiating surface.

At every pre-set measuring point, the A – weighted background noise level was recorded immediately before and after each test measurement in order to apply corrections as is established in paragraph 11.2 of the applied Standard.

The total spatially averaged A – weighted sound pressure level was determined as an arithmetic mean of the background noise level measurements, recorded at the points defined above, when the transformer is powered at its rated voltage and frequency.

The corrected total spatially averaged A – weighted sound pressure level,  $L_{pA}$ , is calculated by correcting the total spatially averaged A – weighted sound pressure level for steady-state background noise and test environment, according to section 11.2 of the applied Standard. Measurement surface area, S, is calculated by applying section 10.1, as well as the sound absorption area, A, of the test room is determined according to section 11.2.5.3 of IEC 60076-10 Standard.

Finally, sound power level of the test object,  $L_{WA}$ , is calculated as it is reported on section 12 of the applied Standard.

- Test results:

<i>Determination of sound levels</i>	
Equivalent Measurement surface, S	5.08 m <sup>2</sup>
Weighted sound pressure ( $L_{pA}$ )	29.9 dB
Sound power level ( $L_{WA}$ )	36.9 ± 3,0 dBA
Rated sound power level	< 39 dBA
Test voltage LV side	420 V
Test frequency	50 Hz
Selected Tape	4 (20 000 V)

The measured sound power level according to UNE-EN 60076-10 Standard is lower than 39 dBA, the sound power level value rated by the manufacturer of the power transformer.

- Conclusion: **Test Passed**

#### 4 SUMMARY AND CONCLUSIONS

The following tests according to UNE-EN 60076-1, UNE-EN 60076-2 and UNE-EN 60076-10 Standards have been performed on power transformer manufactured by XXXX, type 50I / 24 / 20B2 - GST001 R.04 and identification XXXX.

- Measurement of windings resistance.
- Measurement of voltage ratio and check of phase displacement.
- Measurement of short-circuit impedance and load losses.
- Measurement of no-load losses and current.
- Temperature-rise test.
- Determination of sound power levels.

All tests performed on the power transformer have been passed according to UNE-EN 60076 Standards and both no load losses and load losses satisfy limit values specified by Commission Regulation (EU) No 548/2014.

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# **Annex 1**

## **Determination of sound levels**

**Test application details**

Sound power level determination method	Sound pressure method
Test procedure	Point-by-point

**Identification of sound measuring equipment**

Equipment	Trademark	Type	Serial Number	LCOE ID
Sonometer	Brüel & Kjær	2250 LIGHT	3028711	III-4-SONO-002
Microphone	Brüel & Kjær	4950	3207060	III-4-SONO-002
Calibration source	Brüel & Kjær	4231	2733917	III-2-SONO-001

**Data for calculation of the measurement surface area**

Length of the measurement distance ( $x$ )	0,3 m
Prescribed contour ( $l_m$ )	5,08 m
Height of the principal radiating surface ( $h$ )	0,70 m

**Test results**

Measurement surface area ( $S$ )	5,1 m <sup>2</sup>	
Test room dimensions	Length	5,5 m
	Height	2,8 m
	Width	3,6 m
Wall and roof surface ( $S_{V1}$ )	70,8 m <sup>2</sup>	
Wall and roof acoustic absorption coefficient ( $\alpha_1$ )	0,3	
Floor surface ( $S_{V2}$ )	19,8 m <sup>2</sup>	
Floor acoustic absorption coefficient ( $\alpha_2$ )	0,1	
Sound absorption area ( $A$ )	23,2 m <sup>2</sup>	
Environmental correction factor ( $K$ )	2,73	

**Sound pressure measurements**

Measurement points (*)	Averaged A - weighted background noise levels, $L_{bgAi}$		Averaged A - weighted sound pressure levels, $L_{pAi}$
	Before	After	
1	20,4	20,2	32,1
2	20,1	20,6	34,4
3	19,3	20,6	36,9
4	20,6	21,8	29,7
5	21,3	21,4	31,7
6	20,3	21,2	32,7
7	19,5	20,2	30,3
8	20,5	20,2	29,0

(\*) Diagram of the measurement points positions along the prescribed contour is available to the applicant.

# Annex 2

## Decision rules and measurement Uncertainty



➤ **Decision Rules and Statements of Conformity**

Criteria related to decision rules and statement of conformity adopted, according to ILAC-G8:09/2019 guide, are described below.

- *Binary Statement for Simple Acceptance Rule*

A binary decision rule exists when the result is limited to two choices (pass or fail). Statements of conformity are reported as:

- Pass – the measured value is below the acceptance limit,  $AL = TL$ .
- Fail – the measured value is above the acceptance limit,  $AL = TL$ .

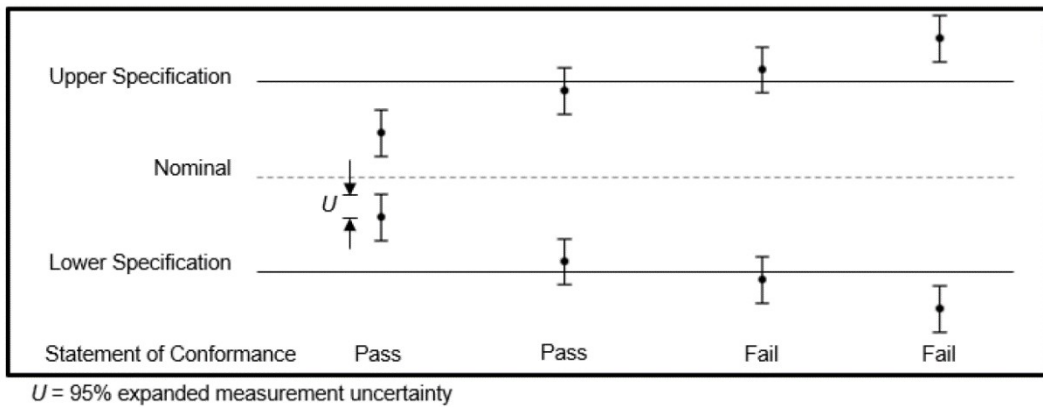


Figure 1. Graphical representation of a Binary statement – Simple Acceptance

- *Non – binary Statement with Guard Band*

A non – binary decision rule exists when multiple terms may express the result (pass, conditional pass, conditional fail, fail). Statements of conformity are reported as:

- Pass – the measured result is below the acceptance limit,  $AL = TL - w$ .
- Conditional Pass – the measured result is inside the guard band and below the tolerance limit in the interval  $[TL - w, TL]$ .
- Conditional Fail – the measured result is above the tolerance limit but below the tolerance limit added to the guard band, in the interval  $[TL, TL + w]$ .
- Fail – the measured result is above the tolerance limit added to the guard band,  $TL + w$ .

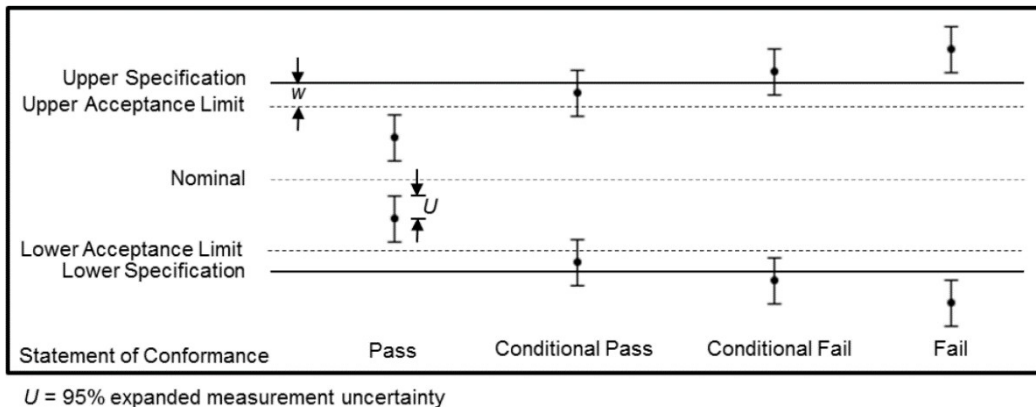


Figure 2. Graphical representation of a non – Binary statement with a guard band ( $w = U$ ).

➤ **Decision rule applied for each type of test**

Decision rules adopted by LCOE for each type of test are shown in the next table, they are categorized into the different Laboratories:

<b>LCOE Lab</b>	<b>Type test</b>	<b>Decision rule adopted</b>
<b>Tecnogetafe High Voltage Lab</b>	Temperature rise test	Non-binary Statement with Guard Band
	Tests for accuracy	Non-binary Statement with Guard Band
	Losses measurement	Non-binary Statement with Guard Band
	Leakage current measurement	Non-binary Statement with Guard Band
	Determination of sound levels	Non-binary Statement with Guard Band
	Measurement of resistance and impedance	Non-binary Statement with Guard Band
	Measurement of capacitance and tg	Non-binary Statement with Guard Band
<b>Tecnogetafe High Voltage Lab</b>	Dielectric tests	Defined by testing method
	Partial discharges test	Binary Statement for Simple Acceptance Rule
	Radio-interference voltage test	Binary Statement for Simple Acceptance Rule
	Other tests	Binary Statement for Simple Acceptance Rule
<b>High Power Lab</b>	Internal arc test	Defined by testing method
	Short circuit test	Defined by testing method
	Measurement of resistance and impedance	Non-binary Statement with Guard Band
	Other tests	Binary Statement for Simple Acceptance Rule

➤ **LCOE Measurement Uncertainties**

<b>Dielectric Tests</b>			
<b>Test / Magnitude</b>	<b>Range &amp; Frequency</b>	<b>Measured parameter</b>	<b>Expanded Uncertainty, U</b>
<b>DC Voltage U</b> <i>Resistive Divider, HV Probe</i>	up to 200 kV	DC	± 2.0 %
<b>AC Voltage U</b> <i>RC Divider</i>	up to 1000 kV (50 – 60 Hz)	RMS / Peak	± 3.0 %
	up to 500 kV (20 – 200 Hz)	RMS / Peak	± 3.0 %
<b>Lightning Impulses LI</b> <i>RC Divider, Oscilloscope</i>	Up to 2000 kV	$U_t$	± 3.0 %
	0.84 $\mu$ s to 1.56 $\mu$ s	$T_1$	± 10.0 %
	40 $\mu$ s to 60 $\mu$ s	$T_2$	± 10.0 %
<b>Switching Impulses SI</b> <i>RC Divider, Oscilloscope</i>	Up to 1600 kV	$U_t$	± 3.0 %
	175 $\mu$ s to 325 $\mu$ s	$T_1$	± 10.0 %
	2000 $\mu$ s to 3000 $\mu$ s	$T_2$	± 10.0 %
<b>Measurement of Test Current</b>			
<b>Test / Magnitude</b>	<b>Range &amp; Frequency</b>	<b>Measured parameter</b>	<b>Expanded Uncertainty, U</b>
<b>Current I</b> <i>Shunt, Rogowski Coil</i>	Up to 6000 A (50 – 60 Hz)	RMS	± 2.0 %
<b>Leakage current I</b> <i>Impedance &amp; multimeter</i>	5 $\mu$ A < I ≤ 500 $\mu$ A (50 – 60 Hz)	RMS	± 3.0 %
	500 $\mu$ A < I ≤ 400 mA (50 – 60 Hz)	RMS	± 2.0 %
<b>Other Tests</b>			
<b>Test / Magnitude</b>	<b>Range</b>	<b>Measured parameter</b>	<b>Expanded Uncertainty, U</b>
<b>Resistance R</b> <i>Bridge, multimeter</i>	20 $\mu$ $\Omega$ < R ≤ 1000 $\mu$ $\Omega$		± 3.0 %
	1 m $\Omega$ < R ≤ 40 m $\Omega$		± 2.0 %
	40 m $\Omega$ < R ≤ 4000 $\Omega$		± 1.0 %
	4000 $\Omega$ < R ≤ 100 M $\Omega$		± 2.0 %
<b>Partial Discharges</b> <i>Coupling capacitor &amp; Impedance</i>	0.5 pC to 100 nC	$Q_{IEC}$ (pC)	± 15 %
<b>RIV</b> <i>Coupling capacitor &amp; Impedance</i>	50 $\mu$ V to 5000 $\mu$ V	RIV ( $\mu$ V)	± 10 %

<b>Specific Tests on Transformers</b>
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Test / Magnitude	Range	Measured parameter	Expanded Uncertainty, U
<b>Temperature rise</b> <i>Liquid Immersed Transformer</i> <i>Instrument Transformers</i>	1 K to 100 K	Windings	± 3 K
		Oil & External	± 2 K
<b>Temperature rise</b> <i>Dry-type power Transformer</i>	1 K to 200 K	Windings	± 4 K
		External	± 2 K
<b>Losses Power Transformers</b> <i>Power analyzer, instrument transformers</i>	100 W to 50 000 W	Load losses / No-load losses	± 2.0 %
<b>Short – circuit impedance</b> <i>Power analyzer, instrument transformers</i>	0.5 % to 20 %	± 2.0 %	
<b>Temperature T</b> <i>Thermocouples, recorder</i>	-100 °C ≤ T ≤ 200 °C	Temperature of external parts	± 2 °C
<b>Noise level</b> <i>Sound meter</i>	20 dBA to 150 dBA	Power Sound Level (dBA)	± 3 dBA

**Test for accuracy of instrument transformers**

Test / Magnitude	Range & Frequency	Measured parameter	Expanded Uncertainty, U
<b>Accuracy VT, CVT</b> <i>Standard Transformer, Bridge</i>	24 kV up to 500 kV (50 – 60 Hz)	Ratio error	± 0.02 %
		Phase error	± 0.5 min
<b>Accuracy CT</b> <i>Standard Transformer, Bridge</i>	5 A up to 8000 A (50 – 60 Hz)	Ratio error	± 0.05 %
		Phase error	± 1.0 min

**Tests at High Power Lab**

Test / Magnitude	Range & Frequency	Measured parameter	Expanded Uncertainty, U
<b>Short-circuit current</b> <i>Rogowski Coil, Resistive coaxial shunt, Oscilloscope</i>	Up to 80 kA (50 – 60 Hz)	RMS	± 3.0 %
	Up to 200 kA (50 – 60 Hz)	Peak	± 3.0 %
<b>Test voltage</b> <i>Resistive Divider, Oscilloscope</i>	Up to 100 kV (50 – 60 Hz)	RMS	± 3.0 %
<b>Transient recovery voltage</b> <i>Resistive Divider, Oscilloscope</i>	Up to 100 kV (10 – 20 kHz)	Peak	± 5.0 %

**Environmental Conditions**

Test / Magnitude	Range	Expanded Uncertainty, U
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<b>Ambient Temperature T</b> <i>Thermo hygrometer</i>	-40 °C to +100 °C	$\pm 2$ °C
<b>Relative Humidity HR</b> <i>Thermo hygrometer</i>	20 % to 90 %	$\pm 3$ %
<b>Atmospheric Pressure P</b> <i>Barometer</i>	$\pm 3$ hPa	

**Note 1:** *The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95%.*