

CALIBRATION CERTIFICATE

number: **E-26-0191**

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Customer	Electro Power Solution SH.P.K RRUGA "DIBRES", KOMPLEKSI "HALILI" 1015 Tirane, Albania
Instrument	Digital Transformer Analyser
Manufacturer	Metrel
Type	MI 3280
Serial No.	22481404
Calibration procedure	Calibration was carried out by comparison of values indicated, or set, on the object calibrated, with values of measurands, realized with measurement standards. Detailed descriptions, where necessary, are given along with measurement results.
Environmental conditions	Temperature: 22.3 °C ± 1 °C Relative humidity: 30 % ± 10 %
Date of calibration	2026-02-03
Calibration results	are given on the following pages

This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI). The SA is one of the signatories of multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$, which for a nominal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA Publication EA-4/02.

Performed by:	Approved by:	Date of issue:
	Head of Calibration Laboratory	
Matic Rodošek 	Jure Božnar 	 METREL [®] Merilna in testna oprema d.o.o. Ljubljanska cesta 77 1354 Horjul 2026-02-03

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Object calibrated (UUC):

Digital Transformer Analyser

Calibrated parameters:

- AC current
- AC voltage
- DC resistance

Calibration procedure:

- L-KP-ACI
- L-KP-ACV
- L-KP-DCR

Metrel template: Tester naprav Metrel MI 3280 DT Analyser_a6

The calibration was carried out with resistor decades, multimeter and transformer.

Measurement conditions:

For the purpose of temperature stabilization, the UUC was stored in the measurement room prior to calibration for at least four hours.

UUC power supply: Battery

Calibration was performed using test leads/accessories owned by calibration laboratory.

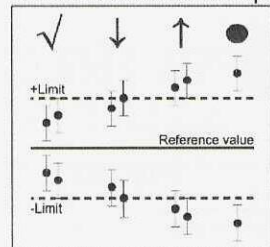
The tables includes following data:

Range	Set on UUC (function, subfunction)
Reference	Set or indicated value on the standard
UUC	Set or indicated value on the calibration item
Uncertainty	Expanded measurement uncertainty ($k = 2$)
Error	UUC - Reference
Limit	Limit of error, specifications

Limits of error for individual measured parameters are stated along with the measurement results and are calculated from manufacturer's specification given in:

Instruction Manual, Metrel, Digital Transformer Analyser MI 3280, Version 1.3.4, Code No. 20 752 598.

The statement of compliance is based on a 95% coverage probability for the expanded uncertainty.



- ✓ - Compliance with the specification limit.
- - Non-compliance with the specification limit.
- ↓ - It is not possible to state compliance although the error is within the limit.
- ↑ - It is not possible to state non-compliance although the error is outside the limit.

Measurement results and their respective uncertainties refer to the measurements carried out during calibration and have no implication to the long term stability of the object. The results relate only to the object of calibration.

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MEASUREMENT RESULTS

1. RATIO, Turn Ratio (1 Phase)

i - AC test current

Terminals H0, X0 parallel and H1, X1 parallel, both connected on load resistor with reference A-meter in seria.

Type: VT

Range mA	Test Voltage Frequency	Load V; Hz; Ω	Reference mA	UUC mA	Uncertainty mA	Error mA	Limit mA	
99,9	10; 55; 270		36,4	36,1	0,3	-0,3	± 0,9	√
999	80; 65; 270		255,8	256	4	0	± 7	√
A	V; Hz; Ω		A	A	A	A	A	
1,1	10; 70; 6,5		1,07	1,07	0,02	0,00	± 0,04	√

r - Turn Ratio

Terminals H0, H1 to primar and X0, X1 to secundar of reference transformer (see manual Figure E.1).

Type: VT

Range r	Test Voltage Frequency	Reference r	UUC r	Uncertainty r	Error r	Limit r	
	V; Hz						
8000	80; 55	7000	7000,2	8,2	0,2	± 70,2	√
1999,9	80; 55	1000	1000,0	0,6	0,0	± 5,2	√
999,99	40; 70	100	100,01	0,06	0,01	± 0,22	√
99,999	5; 65	10	10,007	0,006	0,007	± 0,022	√
9,9999	1; 55	1	1,0000	0,0001	0,0000	± 0,0022	√

2. RATIO, Turn Ratio (3 Phases)

r - Turn Ratio

Terminals H to primar and X to secundar of reference transformer. (see manual Figure E.3)

H-X Configuration: Y-y, Vector Group: YNyn0

Range r	Test Voltage Frequency	Reference r	UUC r	Uncertainty r	Error r	Limit r	
	V; Hz						
A; 99,999	80; 55	10	10,005	0,006	0,005	± 0,022	√
B; 99,999	80; 55	10	10,005	0,006	0,005	± 0,022	√
C; 99,999	80; 55	10	10,005	0,006	0,005	± 0,022	√

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3. Rwind, Resistance (1 Phase)

Side to measure: Both

DC resistance, 4 wire.

Range Ω	Reference Ω	UUC Ω	Uncertainty Ω	Error Ω	Limit Ω	
RH; 999,9	900,0	901,2	3,3	1,2	$\pm 18,2$	✓
RX; 999,9	900,0	902,9	2,4	2,9	$\pm 18,2$	✓
RH; 99,99	90,72	90,54	0,23	-0,18	$\pm 1,83$	✓
RX; 99,99	90,72	90,66	0,22	-0,06	$\pm 1,83$	✓
RH; 9,999	8,931	8,908	0,021	-0,023	$\pm 0,181$	✓
RX; 9,999	8,931	8,918	0,021	-0,013	$\pm 0,181$	✓
m Ω	m Ω	m Ω	m Ω	m Ω	m Ω	
RH; 999,9	913,0	915,4	2,4	2,4	$\pm 18,5$	✓
RX; 999,9	913,0	916,6	2,3	3,6	$\pm 18,5$	✓
RH; 999,9	100,0	99,7	0,3	-0,3	$\pm 2,2$	✓
RX; 999,9	100,0	99,9	0,3	-0,1	$\pm 2,2$	✓
RH; 999,9	10,0	9,7	0,1	-0,3	$\pm 0,4$	✓
RX; 999,9	10,0	10,0	0,1	0,0	$\pm 0,4$	✓

4. Rwind, Resistance (3 Phases)

Side to measure: Both

H-X Configuration: Y-y, Vector Group: YNyn0

DC resistance, 4 wire.

Range Ω	Reference Ω	UUC Ω	Uncertainty Ω	Error Ω	Limit Ω	
RHA; 999,9	500,4	500,4	1,3	0,0	$\pm 10,2$	✓
RHB; 999,9	500,1	501,7	1,4	1,6	$\pm 10,2$	✓
RHC; 999,9	500,4	502,2	1,8	1,8	$\pm 10,2$	✓
RXA; 9,999	4,991	4,982	0,012	-0,009	$\pm 0,102$	✓
RXB; 9,999	5,003	4,994	0,012	-0,009	$\pm 0,102$	✓
RXC; 9,999	5,000	4,991	0,012	-0,009	$\pm 0,102$	✓