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CALIBRATION CERTIFICATE

Date of issue: 24 October 2019 Certificate No.: 2019/EE1030/1

OBJECT OF CALIBRATION	Multifunction Electrical Installations Meter Meter type: MPI-502 Serial number: EE1030 Manufacturer: SONEL S.A.
APPLICANT	SONEL S.A., Wokulskiego Str 11, 58-100 Swidnica, Poland
CALIBRATION METHOD	According to "Voltage, current, and resistance digital meters calibration", version 1.01, edition 02/10/2017.
ENVIRONMENTAL CONDITIONS	Ambient temperature: 23°C ± 2°C Relative humidity: 50% ± 10%
DATE OF CALIBRATION	17 September 2019
TRACEABILITY	This certificate provides traceability of measurement results to the International System of Units (SI).
CALIBRATION RESULTS	The results have been presented on pages 2/3 to 3/3 of this certificate including uncertainty of measurement.
UNCERTAINTY OF MEASUREMENT	Uncertainty of measurement has been evaluated in compliance with EA-4/02 M:2013. The expanded uncertainty assigned corresponds to a coverage probability of 95% and the coverage factor $k = 2$.

Approved by:

SONEL S.A.
Operational Director
mgr inż. Tomasz Wiśniewski

1. Voltage measurement L-N, Alternating voltage measurement L-N

Range	Reference value	Measured value	Measurment error	Uncertainty of measurement	Maximum permissible error
299.9 V	20.000 V	20.000 V	0.000 V	0.060 V	1.000 V
	290.00 V	289.70 V	-0.30 V	0.24 V	6.40 V
500 V	490.00 V	490.00 V	0.00 V	0.68 V	11.80 V

2. Short circuit loop impedance Z L-N measurement

Range	Reference value	Measured value	Measurment error	Uncertainty of measurement	Maximum permissible error
19.99 Ω	0.1313 Ω	0.1300 Ω	-0.0013 Ω	0.0067 Ω	0.0366 Ω
	19.413 Ω	19.470 Ω	0.057 Ω	0.016 Ω	1.001 Ω
199.9 Ω	190.41 Ω	190.60 Ω	0.19 Ω	0.13 Ω	9.82 Ω
1999 Ω	1900.4 Ω	1883.0 Ω	-17.4 Ω	1.3 Ω	98.0 Ω

3. Short circuit loop impedance Z L-L measurement

Range	Reference value	Measured value	Measurment error	Uncertainty of measurement	Maximum permissible error
19.99 Ω	0.443 Ω	0.470 Ω	0.027 Ω	0.012 Ω	0.052 Ω

4. Short circuit loop impedance Z L-PE measurement

Range	Reference value	Measured value	Measurment error	Uncertainty of measurement	Maximum permissible error
19.99 Ω	19.483 Ω	19.460 Ω	-0.023 Ω	0.017 Ω	1.004 Ω
199.9 Ω	190.48 Ω	190.50 Ω	0.02 Ω	0.13 Ω	9.82 Ω
1999 Ω	1900.5 Ω	1883.0 Ω	-17.5 Ω	1.3 Ω	98.0 Ω

5. Short circuit loop impedance Z L-PE 15 mA RCD measurement, Un = 230/400 V

Range	Reference value	Measured value	Measurment error	Uncertainty of measurement	Maximum permissible error
19.99 Ω	19.483 Ω	19.480 Ω	-0.003 Ω	0.017 Ω	1.269 Ω
199.9 Ω	190.48 Ω	191.90 Ω	1.42 Ω	0.13 Ω	11.93 Ω
1999 Ω	1900.5 Ω	1903.0 Ω	2.5 Ω	1.3 Ω	119.0 Ω

6. Low-voltage resistance measurements (Rx)

Range	Reference value	Measured value	Measurment error	Uncertainty of measurement	Maximum permissible error
199.9 Ω	1.072 Ω	1.000 Ω	-0.072 Ω	0.059 Ω	0.332 Ω
	190.00 Ω	190.50 Ω	0.50 Ω	0.13 Ω	6.00 Ω
1999 Ω	400.05 Ω	399.00 Ω	-1.05 Ω	0.63 Ω	15.00 Ω
	700.03 Ω	698.00 Ω	-2.03 Ω	0.71 Ω	24.00 Ω
	1900.0 Ω	1891.0 Ω	-9.0 Ω	1.3 Ω	60.0 Ω

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7. Low-voltage circuit continuity and resistance measurements (Rcont)

Range	Reference value	Measured value	Measurment error	Uncertainty of measurement	Maximum permissible error
19.99 Ω	0.2012 Ω	0.2000 Ω	-0.0012 Ω	0.0081 Ω	0.0340 Ω
	5.0110 Ω	4.9900 Ω	-0.0210 Ω	0.0094 Ω	0.1302 Ω
	10.001 Ω	9.950 Ω	-0.051 Ω	0.012 Ω	0.230 Ω
199.9 Ω	49.994 Ω	49.600 Ω	-0.394 Ω	0.066 Ω	1.300 Ω
	99.992 Ω	99.300 Ω	-0.692 Ω	0.084 Ω	2.300 Ω
	189.93 Ω	188.80 Ω	-1.13 Ω	0.13 Ω	4.10 Ω
400 Ω	389.98 Ω	389.00 Ω	-0.98 Ω	0.63 Ω	10.80 Ω

8. RCD 100 mA earth resistance RE measurement

Range	Reference value	Measured value	Measurment error	Uncertainty of measurement	Nominal indication interval	
500 Ω	140.0 Ω	144.0 Ω	4.0 Ω	1.1 Ω	135.0 Ω	152.0 Ω
	400.0 Ω	411.0 Ω	11.0 Ω	1.1 Ω	395.0 Ω	425.0 Ω

9. RCD break time measurement

Range	Reference value	Measured value	Measurment error	Uncertainty of measurement	Maximum permissible error
300 ms	10.00 ms	10.00 ms	0.00 ms	0.59 ms	2.00 ms
	185.00 ms	185.00 ms	0.00 ms	0.60 ms	6.00 ms

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