



YOKOGAWA

European Standards Laboratory
Yokogawa Europe Solutions B.V.
Amersfoort, The Netherlands



CALIBRATION-CERTIFICATE

Certificate number 58520P10133
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Example

Applicant Example Certificate

| | |
|------------|---|
| Instrument | 760901 High Accuracy Element 30A |
| | Manufacturer Yokogawa |
| | Type 760901 |
| | Serial number C2VA06057V |
| | Inventory number CCE_1_1043 |
| | ID numbers used standards CSE820 CSE976 CSE981 CSE965 CSE1029 |
| | Procedure CALWT5000_30A Version: 1 of 22-01-2019 |

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|--------------------|--|
| Calibration method | The Powermeter was compared to the Yokogawa Power Calibration System via a phantom technique. During the calibration the distortion of the applied voltage and current were below 0.1 %. Before calibration the device was powered on for at least 12 hours. |
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| | |
|--------------------------|--------------------------------|
| Environmental conditions | Temperature (23.1 ± 1) °C |
| | Relative Humidity (41 ± 4) %rh |

| | |
|---------------------|------------------|
| Date of Calibration | 06 February 2019 |
|---------------------|------------------|

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| Result | <p>The results of the calibration are shown on the next pages.</p> <p>The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor 2 such that the coverage probability corresponds to approximately 95 %.</p> <p>The standard uncertainty of measurement has been determined in accordance with the EA-4/02 M:2013.</p> <p>The long term stability of the calibrated object is not included in the reported expanded uncertainty measurement.</p> <p>This certificate of calibration is issued in compliance with ISO/IEC 17025:2005</p> |
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| Traceability | The measurements have been executed using standards for which the traceability to (inter)national standards has been demonstrated towards the RvA. |
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| | |
|----------|---------------------------------------|
| Date | 06 February 2019 |
| Name | E.J. Kroon |
| Function | Manager European Standards Laboratory |

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1 MHz Line Filter set for frequencies < 50 kHz.

Voltage Calibration DC

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|------------|----------|--------------|-------|-------------|
| 1.5V | 1.50000 | 1.50006 | 0.00006 | V DC | 0.004 |
| 1.5V | -1.50000 | -1.50010 | 0.00010 | V DC | 0.006 |
| 3V | 3.00000 | 3.00012 | 0.00012 | V DC | 0.004 |
| 3V | -3.00000 | -3.00022 | 0.00022 | V DC | 0.007 |
| 6V | 6.00000 | 6.00039 | 0.00039 | V DC | 0.006 |
| 6V | -6.00000 | -6.00044 | 0.00044 | V DC | 0.007 |
| 10V | 10.00000 | 10.0001 | 0.0001 | V DC | 0.001 |
| 10V | -10.00000 | -10.0004 | 0.0004 | V DC | 0.004 |
| 15V | 15.00000 | 15.0005 | 0.0005 | V DC | 0.003 |
| 15V | -15.00000 | -15.0005 | 0.0005 | V DC | 0.003 |
| 30V | 30.00000 | 30.0006 | 0.0006 | V DC | 0.002 |
| 30V | -30.00000 | -30.0011 | 0.0011 | V DC | 0.004 |
| 60V | 60.00000 | 60.0027 | 0.0027 | V DC | 0.004 |
| 60V | -60.00000 | -60.0032 | 0.0032 | V DC | 0.005 |
| 100V | 110.00000 | 109.999 | 0.001 | V DC | -0.001 |
| 100V | -110.00000 | -110.001 | 0.001 | V DC | 0.001 |
| 100V | 100.00000 | 100.000 | 0.000 | V DC | 0.000 |
| 100V | -100.00000 | -100.000 | 0.000 | V DC | 0.000 |
| 100V | 50.00000 | 49.999 | 0.001 | V DC | -0.002 |
| 100V | -50.00000 | -50.001 | 0.001 | V DC | 0.002 |
| 100V | 10.00000 | 10.000 | 0.000 | V DC | -0.004 |
| 100V | -10.00000 | -10.000 | 0.000 | V DC | 0.000 |
| 100V | 1.00000 | 0.999 | 0.001 | V DC | -0.100 |
| 100V | -1.00000 | -1.001 | 0.001 | V DC | 0.100 |
| 150V | 150.00000 | 150.005 | 0.005 | V DC | 0.003 |
| 150V | -150.00000 | -150.007 | 0.007 | V DC | 0.004 |
| 300V | 300.00000 | 300.008 | 0.008 | V DC | 0.003 |
| 300V | -300.00000 | -300.017 | 0.017 | V DC | 0.006 |
| 600V | 600.00000 | 600.024 | 0.024 | V DC | 0.004 |
| 600V | -600.00000 | -600.034 | 0.034 | V DC | 0.006 |
| 1000V | 1.00000 | 1.0000 | 0.0000 | kV DC | -0.002 |
| 1000V | -1.00000 | -1.0000 | 0.0000 | kV DC | 0.001 |

Voltage Calibration 10 Hz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|-----------|----------|--------------|------|-------------|
| 1.5V | 1.50000 | 1.49984 | 0.00016 | V AC | -0.011 |
| 3V | 3.00000 | 2.9995 | 0.0005 | V AC | -0.016 |
| 6V | 6.00000 | 5.9994 | 0.0006 | V AC | -0.011 |
| 10V | 10.00000 | 10.0003 | 0.0003 | V AC | 0.003 |
| 15V | 15.00000 | 14.9974 | 0.0026 | V AC | -0.017 |
| 30V | 30.00000 | 29.995 | 0.005 | V AC | -0.016 |
| 60V | 60.00000 | 60.009 | 0.009 | V AC | 0.014 |
| 100V | 100.00000 | 100.005 | 0.005 | V AC | 0.005 |

Voltage Calibration 60 Hz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|----------|----------|--------------|-------|-------------|
| 1.5V | 1.5000 | 1.4999 | 0.0005 | V AC | -0.006 |
| 3V | 3.0000 | 3.0001 | 0.0004 | V AC | 0.004 |
| 6V | 6.0000 | 6.0006 | 0.0009 | V AC | 0.009 |
| 10V | 10.0000 | 10.0003 | 0.0006 | V AC | 0.003 |
| 15V | 15.0000 | 15.0005 | 0.0011 | V AC | 0.003 |
| 30V | 30.0000 | 30.0012 | 0.0022 | V AC | 0.004 |
| 60V | 60.0000 | 60.0003 | 0.0004 | V AC | 0.005 |
| 100V | 110.0000 | 110.001 | 0.007 | V AC | 0.001 |
| 100V | 100.0000 | 99.999 | 0.007 | V AC | -0.001 |
| 100V | 50.0000 | 50.000 | 0.004 | V AC | 0.000 |
| 100V | 10.0000 | 10.004 | 0.002 | V AC | 0.040 |
| 100V | 1.0000 | 1.014 | 0.018 | V AC | 1.359 |
| 150V | 150.0000 | 150.008 | 0.010 | V AC | 0.005 |
| 300V | 300.0000 | 300.009 | 0.019 | V AC | 0.003 |
| 600V | 600.0000 | 600.02 | 0.04 | V AC | 0.003 |
| 1000V | 1.0000 | 1.0000 | 0.0002 | kV AC | -0.001 |

Voltage Calibration 1 kHz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|----------|----------|--------------|-------|-------------|
| 1.5V | 1.5000 | 1.5002 | 0.0006 | V AC | 0.012 |
| 3V | 3.0000 | 3.0006 | 0.0005 | V AC | 0.021 |
| 6V | 6.0000 | 6.0011 | 0.0009 | V AC | 0.019 |
| 10V | 10.0000 | 10.0015 | 0.0006 | V AC | 0.015 |
| 15V | 15.0000 | 15.0012 | 0.0011 | V AC | 0.008 |
| 30V | 30.0000 | 30.0022 | 0.0022 | V AC | 0.007 |
| 60V | 60.0000 | 60.005 | 0.004 | V AC | 0.009 |
| 100V | 100.0000 | 100.003 | 0.007 | V AC | 0.003 |
| 150V | 150.0000 | 150.011 | 0.010 | V AC | 0.007 |
| 300V | 300.0000 | 300.024 | 0.019 | V AC | 0.008 |
| 600V | 600.0000 | 600.04 | 0.04 | V AC | 0.006 |
| 1000V | 1.0000 | 1.0000 | 0.0002 | kV AC | 0.004 |

Voltage Calibration 10 kHz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|----------|----------|--------------|------|-------------|
| 1.5V | 1.50000 | 1.50185 | 0.00022 | V AC | 0.124 |
| 3V | 3.0000 | 3.0031 | 0.0004 | V AC | 0.104 |
| 6V | 6.0000 | 6.0052 | 0.0008 | V AC | 0.087 |
| 10V | 10.0000 | 10.0062 | 0.0013 | V AC | 0.062 |
| 15V | 15.0000 | 14.9976 | 0.0018 | V AC | -0.016 |
| 30V | 30.0000 | 29.996 | 0.014 | V AC | -0.013 |
| 60V | 60.0000 | 59.982 | 0.010 | V AC | -0.031 |
| 100V | 100.0000 | 99.968 | 0.015 | V AC | -0.032 |
| 150V | 150.0000 | 149.923 | 0.020 | V AC | -0.051 |
| 300V | 300.0 | 299.9 | 0.4 | V AC | -0.019 |
| 600V | 600.0 | 599.7 | 0.4 | V AC | -0.044 |

**Voltage Calibration 50 kHz**

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|------|-------------|
| 1.5V | 1.5000 | 1.5030 | 0.0003 | V AC | 0.198 |
| 3V | 3.0000 | 3.0051 | 0.0006 | V AC | 0.171 |
| 6V | 6.0000 | 6.0077 | 0.0012 | V AC | 0.128 |
| 10V | 10.0000 | 10.0095 | 0.0020 | V AC | 0.095 |
| 15V | 15.000 | 14.992 | 0.004 | V AC | -0.050 |
| 30V | 30.000 | 29.982 | 0.008 | V AC | -0.061 |
| 60V | 60.000 | 59.983 | 0.011 | V AC | -0.028 |
| 100V | 100.000 | 99.936 | 0.025 | V AC | -0.064 |

Voltage Calibration 100 kHz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|------|-------------|
| 1.5V | 1.5000 | 1.5062 | 0.0006 | V AC | 0.411 |
| 3V | 3.0000 | 3.0113 | 0.0009 | V AC | 0.375 |
| 6V | 6.0000 | 6.0158 | 0.0028 | V AC | 0.264 |
| 10V | 10.000 | 10.024 | 0.004 | V AC | 0.237 |
| 15V | 15.000 | 15.005 | 0.007 | V AC | 0.032 |
| 30V | 30.000 | 30.007 | 0.012 | V AC | 0.024 |
| 60V | 60.00 | 59.96 | 0.07 | V AC | -0.059 |
| 100V | 100.00 | 99.93 | 0.10 | V AC | -0.069 |

Current Calibration DC

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|-----------|----------|--------------|-------|-------------|
| 500mA | 500.00 | 499.96 | 0.08 | mA DC | -0.008 |
| 500mA | -500.00 | -499.88 | 0.10 | mA DC | -0.025 |
| 1A | 1.10000 | 1.09992 | 0.00019 | A DC | -0.008 |
| 1A | 1.00000 | 0.99993 | 0.00020 | A DC | -0.007 |
| 1A | 0.50000 | 0.50000 | 0.00009 | A DC | 0.001 |
| 1A | 0.10000 | 0.10002 | 0.00002 | A DC | 0.022 |
| 1A | 0.01000 | 0.01003 | 0.00002 | A DC | 0.300 |
| 1A | -1.10000 | -1.10012 | 0.00006 | A DC | 0.011 |
| 1A | -1.00000 | -1.00012 | 0.00009 | A DC | 0.012 |
| 1A | -0.50000 | -0.49992 | 0.00010 | A DC | -0.016 |
| 1A | -0.10000 | -0.09996 | 0.00002 | A DC | -0.044 |
| 1A | -0.01000 | -0.00996 | 0.00002 | A DC | -0.397 |
| 2A | 2.00000 | 1.99966 | 0.00016 | A DC | -0.017 |
| 2A | -2.00000 | -2.00002 | 0.00013 | A DC | 0.001 |
| 5A | 5.00000 | 4.99910 | 0.00024 | A DC | -0.018 |
| 5A | -5.00000 | -5.00000 | 0.00007 | A DC | 0.001 |
| 10A | 10.00000 | 9.9988 | 0.0004 | A DC | -0.012 |
| 10A | -10.00000 | -9.9998 | 0.0014 | A DC | -0.002 |
| 20A | 20.00000 | 19.9979 | 0.0011 | A DC | -0.010 |
| 20A | -20.00000 | -19.9966 | 0.0012 | A DC | -0.017 |
| 30A | 20.00000 | 19.9985 | 0.0011 | A DC | -0.007 |
| 30A | -20.00000 | -19.9952 | 0.0012 | A DC | -0.024 |

Current Calibration AC at 10 Hz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|-------|-------------|
| 500mA | 500.00 | 499.92 | 0.09 | mA AC | -0.016 |
| 1A | 1.00000 | 0.99990 | 0.00009 | A AC | -0.010 |
| 2A | 2.00000 | 1.99960 | 0.00019 | A AC | -0.020 |

Current Calibration AC at 60 Hz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|----------|----------|--------------|-------|-------------|
| 500mA | 500.00 | 499.91 | 0.05 | mA AC | -0.018 |
| 1A | 1.10000 | 1.09988 | 0.00005 | A AC | -0.011 |
| 1A | 1.00000 | 0.99990 | 0.00005 | A AC | -0.010 |
| 1A | 0.50000 | 0.49996 | 0.00005 | A AC | -0.009 |
| 1A | 0.10000 | 0.09998 | 0.00002 | A AC | -0.016 |
| 1A | 0.01000 | 0.00993 | 0.00002 | A AC | -0.683 |
| 2A | 2.00000 | 1.99965 | 0.00012 | A AC | -0.018 |
| 5A | 5.00000 | 4.9995 | 0.0004 | A AC | -0.010 |
| 10A | 10.00000 | 9.9991 | 0.0021 | A AC | -0.009 |
| 20A | 20.00000 | 19.998 | 0.004 | A AC | -0.012 |
| 30A | 20.00000 | 19.997 | 0.004 | A AC | -0.013 |

Current Calibration AC at 1 kHz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|-------|-------------|
| 500mA | 500.00 | 499.92 | 0.07 | mA AC | -0.015 |
| 1A | 1.00000 | 0.99989 | 0.00007 | A AC | -0.011 |
| 2A | 2.00000 | 1.99957 | 0.00013 | A AC | -0.022 |
| 5A | 5.0000 | 4.9996 | 0.0004 | A AC | -0.008 |
| 10A | 10.0000 | 9.9991 | 0.0009 | A AC | -0.009 |
| 20A | 20.000 | 19.998 | 0.004 | A AC | -0.011 |
| 30A | 20.000 | 19.997 | 0.004 | A AC | -0.014 |

Current Calibration AC at 10 kHz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|-------|-------------|
| 500mA | 500.00 | 499.97 | 0.13 | mA AC | -0.007 |
| 1A | 1.00000 | 0.99995 | 0.00007 | A AC | -0.005 |
| 2A | 2.00000 | 1.99977 | 0.00022 | A AC | -0.012 |
| 5A | 5.0000 | 5.0000 | 0.0003 | A AC | 0.001 |
| 10A | 10.0000 | 10.0004 | 0.0009 | A AC | 0.004 |
| 20A | 20.000 | 20.001 | 0.023 | A AC | 0.004 |
| 30A | 20.000 | 20.001 | 0.023 | A AC | 0.006 |

Current Calibration AC at 50 kHz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|-------|-------------|
| 500mA | 500.00 | 499.89 | 0.07 | mA AC | -0.022 |
| 1A | 1.0000 | 1.0001 | 0.0006 | A AC | 0.013 |
| 2A | 2.00000 | 2.00084 | 0.00015 | A AC | 0.042 |

Current Calibration AC at 100 kHz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|-------|-------------|
| 500mA | 500.00 | 499.87 | 0.27 | mA AC | -0.027 |
| 1A | 1.00000 | 1.00002 | 0.00022 | A AC | 0.002 |
| 2A | 2.0000 | 2.0039 | 0.0018 | A AC | 0.197 |

External Current Calibration DC. For current 1000mV/A is set.

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|----------|----------|--------------|------|-------------|
| 1V | 1.00000 | 0.99989 | 0.00008 | A DC | -0.011 |
| 1V | -1.00000 | -0.99994 | 0.00005 | A DC | -0.006 |

External Current Calibration 10 Hz. For current 1000mV/A is set.

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|------|-------------|
| 1V | 1.00000 | 0.99978 | 0.00010 | A AC | -0.022 |

External Current Calibration 60 Hz. For current 1000mV/A is set.

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|-------|-------------|
| 50mV | 50.000 | 49.980 | 0.012 | mA AC | -0.040 |
| 100mV | 100.000 | 99.980 | 0.014 | mA AC | -0.020 |
| 200mV | 200.000 | 199.958 | 0.018 | mA AC | -0.021 |
| 500mV | 500.000 | 499.890 | 0.026 | mA AC | -0.022 |
| 1V | 1.00000 | 0.99982 | 0.00013 | A AC | -0.018 |
| 2V | 2.00000 | 1.99967 | 0.00018 | A AC | -0.016 |
| 5V | 5.00000 | 5.00416 | 0.00020 | A AC | 0.083 |

External Current Calibration 1 kHz. For current 1000mV/A is set.

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|-------|-------------|
| 50mV | 50.000 | 49.980 | 0.011 | mA AC | -0.040 |
| 100mV | 100.000 | 99.975 | 0.011 | mA AC | -0.025 |
| 200mV | 200.000 | 199.961 | 0.010 | mA AC | -0.019 |
| 500mV | 500.000 | 499.925 | 0.023 | mA AC | -0.015 |
| 1V | 1.00000 | 0.99990 | 0.00012 | A AC | -0.010 |
| 2V | 2.00000 | 1.99979 | 0.00008 | A AC | -0.010 |
| 5V | 5.00000 | 5.00449 | 0.00022 | A AC | 0.090 |

External Current Calibration 10 kHz. For current 1000mV/A is set.

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|-------|-------------|
| 50mV | 50.000 | 49.984 | 0.012 | mA AC | -0.033 |
| 200mV | 200.000 | 199.984 | 0.009 | mA AC | -0.008 |
| 1V | 1.00000 | 1.00062 | 0.00008 | A AC | 0.062 |
| 2V | 2.00000 | 2.00125 | 0.00011 | A AC | 0.063 |
| 5V | 5.00000 | 5.00855 | 0.00026 | A AC | 0.171 |

External Current Calibration 50 kHz. For current 1000mV/A is set.

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|-------|-------------|
| 50mV | 50.000 | 50.014 | 0.011 | mA AC | 0.028 |
| 200mV | 200.000 | 200.005 | 0.011 | mA AC | 0.003 |
| 1V | 1.00000 | 1.00080 | 0.00008 | A AC | 0.080 |
| 2V | 2.00000 | 2.00147 | 0.00010 | A AC | 0.073 |
| 5V | 5.00000 | 5.00629 | 0.00024 | A AC | 0.126 |

External Current Calibration 100 kHz. For current 1000mV/A is set.

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|-------|-------------|
| 50mV | 50.000 | 50.008 | 0.018 | mA AC | 0.015 |
| 200mV | 200.000 | 199.989 | 0.016 | mA AC | -0.006 |
| 1V | 1.00000 | 1.00149 | 0.00011 | A AC | 0.149 |
| 2V | 2.00000 | 2.00235 | 0.00030 | A AC | 0.118 |
| 5V | 5.00000 | 5.0093 | 0.0003 | A AC | 0.186 |

Power Calibration DC Constant 100 V

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|------------|----------|----------|--------------|------|-------------|
| 100V 1A | 100.000 | 99.984 | 0.011 | W | -0.016 |
| 100V 1A | -100.000 | -99.983 | 0.011 | W | -0.017 |
| 100V 1A | 50.000 | 49.992 | 0.004 | W | -0.017 |
| 100V 1A | -50.000 | -49.996 | 0.002 | W | -0.008 |
| 100V 1A | 10.000 | 10.003 | 0.002 | W | 0.026 |
| 100V 1A | -10.000 | -9.998 | 0.002 | W | -0.016 |
| 100V 1A | 1.000 | 1.001 | 0.002 | W | 0.133 |
| 100V 1A | -1.000 | -0.998 | 0.002 | W | -0.159 |
| 100V 500mA | 50.0000 | 49.9889 | 0.0028 | W | -0.022 |
| 100V 500mA | 50.0000 | 49.9890 | 0.0028 | W | -0.022 |
| 100V 1A | 100.000 | 99.986 | 0.011 | W | -0.014 |
| 100V 1A | -100.000 | -99.982 | 0.011 | W | -0.018 |
| 100V 2A | 200.000 | 199.964 | 0.013 | W | -0.018 |
| 100V 2A | -200.000 | -200.000 | 0.013 | W | 0.000 |
| 100V 5A | 500.000 | 499.916 | 0.024 | W | -0.017 |
| 100V 5A | -500.000 | -499.813 | 0.016 | W | -0.037 |
| 100V 10A | 1.00000 | 0.99987 | 0.00014 | kW | -0.013 |
| 100V 10A | -1.00000 | -0.99998 | 0.00014 | kW | -0.002 |
| 100V 20A | 2.00000 | 1.99973 | 0.00012 | kW | -0.014 |
| 100V 20A | -2.00000 | -1.99962 | 0.00012 | kW | -0.019 |
| 100V 30A | 2.00000 | 1.99976 | 0.00012 | kW | -0.012 |
| 100V 30A | -1.00000 | -0.99989 | 0.00014 | kW | -0.011 |



Power Calibration DC Constant 1 A

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|----------|----------|----------|--------------|------|-------------|
| 100V 1A | 110.000 | 109.986 | 0.011 | W | -0.013 |
| 100V 1A | -110.000 | -109.984 | 0.012 | W | -0.015 |
| 100V 1A | 100.000 | 99.987 | 0.011 | W | -0.013 |
| 100V 1A | -100.000 | -99.985 | 0.011 | W | -0.015 |
| 100V 1A | 50.000 | 49.994 | 0.006 | W | -0.012 |
| 100V 1A | -50.000 | -49.993 | 0.009 | W | -0.014 |
| 100V 1A | 10.000 | 9.997 | 0.002 | W | -0.026 |
| 100V 1A | -10.000 | -10.000 | 0.002 | W | -0.003 |
| 10V 1A | 10.0000 | 9.9991 | 0.0019 | W | -0.009 |
| 10V 1A | -10.0000 | -9.9995 | 0.0022 | W | -0.005 |
| 15V 1A | 15.0000 | 14.9983 | 0.0012 | W | -0.011 |
| 15V 1A | -15.0000 | -14.9987 | 0.0015 | W | -0.009 |
| 30V 1A | 30.0000 | 29.9966 | 0.0010 | W | -0.011 |
| 30V 1A | -30.0000 | -29.9969 | 0.0010 | W | -0.010 |
| 60V 1A | 60.000 | 59.994 | 0.006 | W | -0.009 |
| 60V 1A | -60.000 | -59.995 | 0.006 | W | -0.009 |
| 100V 1A | 100.000 | 99.985 | 0.011 | W | -0.015 |
| 100V 1A | -100.000 | -99.987 | 0.011 | W | -0.013 |
| 150V 1A | 150.000 | 149.983 | 0.016 | W | -0.012 |
| 150V 1A | -150.000 | -149.985 | 0.016 | W | -0.010 |
| 300V 1A | 300.00 | 299.97 | 0.03 | W | -0.011 |
| 300V 1A | -300.00 | -299.97 | 0.03 | W | -0.009 |
| 600V 1A | 600.00 | 599.95 | 0.06 | W | -0.009 |
| 600V 1A | -600.00 | -599.96 | 0.06 | W | -0.007 |
| 1000V 1A | 1.00000 | 0.99986 | 0.00011 | kW | -0.014 |
| 1000V 1A | -1.00000 | -0.99987 | 0.00011 | kW | -0.013 |

Power Calibration 10 Hz PF=1 constant 1 A

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 15V 1A | 15.000 | 14.999 | 0.003 | W | -0.008 |
| 30V 1A | 30.000 | 29.998 | 0.006 | W | -0.006 |
| 60V 1A | 60.000 | 59.997 | 0.012 | W | -0.006 |
| 100V 1A | 100.000 | 99.990 | 0.021 | W | -0.010 |

Power Calibration 10 Hz PF=1 constant 100 V

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|------------|---------|----------|--------------|------|-------------|
| 100V 500mA | 50.000 | 49.995 | 0.008 | W | -0.010 |

Power Calibration 60 Hz PF=1 constant 1 A

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|----------|---------|----------|--------------|------|-------------|
| 1.5V 1A | 1.5000 | 1.5001 | 0.0023 | W | 0.008 |
| 3V 1A | 3.000 | 3.000 | 0.005 | W | 0.010 |
| 6V 1A | 6.000 | 6.000 | 0.009 | W | 0.004 |
| 15V 1A | 15.000 | 14.999 | 0.003 | W | -0.005 |
| 30V 1A | 30.000 | 29.998 | 0.006 | W | -0.006 |
| 60V 1A | 60.000 | 59.996 | 0.012 | W | -0.007 |
| 100V 1A | 110.000 | 109.989 | 0.023 | W | -0.010 |
| 100V 1A | 100.000 | 99.990 | 0.021 | W | -0.010 |
| 100V 1A | 50.000 | 49.993 | 0.011 | W | -0.014 |
| 100V 1A | 10.000 | 9.999 | 0.002 | W | -0.007 |
| 100V 1A | 1.000 | 1.000 | 0.002 | W | -0.027 |
| 150V 1A | 150.00 | 149.99 | 0.03 | W | -0.004 |
| 300V 1A | 300.00 | 299.98 | 0.06 | W | -0.007 |
| 600V 1A | 600.00 | 599.96 | 0.12 | W | -0.007 |
| 1000V 1A | 1.00000 | 0.99990 | 0.00021 | kW | -0.010 |

Power Calibration 60 Hz PF=1 constant 100 V

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|------------|---------|----------|--------------|------|-------------|
| 100V 500mA | 50.000 | 49.993 | 0.008 | W | -0.013 |
| 100V 1A | 10.000 | 10.000 | 0.002 | W | -0.004 |
| 100V 1A | 1.000 | 1.000 | 0.002 | W | -0.012 |
| 100V 2A | 200.00 | 199.97 | 0.04 | W | -0.017 |
| 100V 5A | 500.00 | 499.95 | 0.10 | W | -0.011 |
| 100V 10A | 1.00000 | 0.99992 | 0.00021 | kW | -0.008 |
| 100V 20A | 2.0000 | 1.9998 | 0.0004 | kW | -0.010 |
| 100V 20A | 2.0000 | 1.9998 | 0.0004 | kW | -0.012 |

Power Calibration 1 kHz PF=1 constant 1 A

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|----------|---------|----------|--------------|------|-------------|
| 6V 1A | 6.0000 | 6.0010 | 0.0025 | W | 0.017 |
| 15V 1A | 15.000 | 14.999 | 0.003 | W | -0.004 |
| 30V 1A | 30.000 | 30.000 | 0.006 | W | -0.001 |
| 60V 1A | 60.000 | 59.999 | 0.012 | W | -0.002 |
| 100V 1A | 100.000 | 99.991 | 0.021 | W | -0.009 |
| 150V 1A | 150.00 | 150.00 | 0.03 | W | -0.003 |
| 300V 1A | 300.00 | 299.99 | 0.06 | W | -0.003 |
| 600V 1A | 600.00 | 599.98 | 0.12 | W | -0.004 |
| 1000V 1A | 1.00000 | 0.99992 | 0.00021 | kW | -0.008 |

Power Calibration 1 kHz PF=1 constant 100 V

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|------------|---------|----------|--------------|------|-------------|
| 100V 500mA | 50.000 | 49.991 | 0.015 | W | -0.018 |
| 100V 2A | 200.00 | 199.96 | 0.06 | W | -0.018 |
| 100V 5A | 500.00 | 499.96 | 0.10 | W | -0.007 |
| 100V 10A | 1.0000 | 1.0000 | 0.0003 | kW | -0.005 |
| 100V 20A | 2.0000 | 1.9999 | 0.0006 | kW | -0.007 |
| 100V 20A | 2.0000 | 1.9998 | 0.0006 | kW | -0.009 |

Power Calibration 10 kHz PF=1 constant 1 A

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 6V 1A | 6.0000 | 6.0047 | 0.0029 | W | 0.079 |
| 15V 1A | 15.000 | 14.998 | 0.005 | W | -0.016 |
| 30V 1A | 30.000 | 29.996 | 0.009 | W | -0.013 |
| 60V 1A | 60.000 | 59.991 | 0.018 | W | -0.015 |
| 100V 1A | 100.00 | 99.98 | 0.03 | W | -0.021 |

Power Calibration 10 kHz PF=1 constant 100 V

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|------------|---------|----------|--------------|------|-------------|
| 100V 500mA | 50.000 | 49.988 | 0.015 | W | -0.025 |
| 100V 2A | 200.00 | 199.94 | 0.06 | W | -0.030 |
| 100V 5A | 500.00 | 499.93 | 0.15 | W | -0.015 |
| 100V 10A | 1.0000 | 0.9999 | 0.0003 | kW | -0.010 |

Power Calibration 50 kHz PF=1 constant 1 A

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 6V 1A | 6.000 | 6.000 | 0.011 | W | -0.008 |
| 15V 1A | 15.000 | 14.991 | 0.009 | W | -0.057 |
| 30V 1A | 30.000 | 29.980 | 0.018 | W | -0.065 |
| 60V 1A | 60.00 | 59.97 | 0.04 | W | -0.045 |
| 100V 1A | 100.00 | 99.95 | 0.06 | W | -0.047 |

**Power Calibration 50 kHz PF=1 constant 100 V**

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|------------|---------|----------|--------------|------|-------------|
| 100V 500mA | 50.000 | 49.960 | 0.015 | W | -0.080 |
| 100V 2A | 200.00 | 199.94 | 0.12 | W | -0.032 |

Power Calibration 100 kHz PF=1 constant 1 A

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 6V 1A | 6.000 | 5.982 | 0.006 | W | -0.300 |
| 15V 1A | 15.000 | 14.997 | 0.009 | W | -0.020 |
| 30V 1A | 30.000 | 29.982 | 0.018 | W | -0.060 |
| 60V 1A | 60.00 | 59.98 | 0.04 | W | -0.029 |
| 100V 1A | 100.00 | 99.97 | 0.06 | W | -0.034 |

Power Calibration 100 kHz PF=1 constant 100 V

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|------------|---------|----------|--------------|------|-------------|
| 100V 500mA | 50.00 | 49.97 | 0.12 | W | -0.069 |
| 100V 2A | 200.00 | 200.30 | 0.13 | W | 0.152 |

For current 1V/A is set in the instrument

External Current Power Calibration DC. Constant 60 V

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|--------|---------|----------|--------------|------|-------------|
| 60V 1V | 60.000 | 59.998 | 0.008 | W | -0.003 |
| 60V 1V | -60.000 | -59.999 | 0.007 | W | -0.002 |

External Current Power Calibration 10 Hz. PF=1. Constant 60 V

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|--------|---------|----------|--------------|------|-------------|
| 60V 1V | 60.000 | 59.994 | 0.008 | W | -0.010 |

External Current Power Calibration 60 Hz. PF=1. Constant 60 V

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-----------|---------|----------|--------------|------|-------------|
| 60V 50mV | 3.0000 | 2.9988 | 0.0007 | W | -0.041 |
| 60V 100mV | 6.0000 | 5.9991 | 0.0007 | W | -0.016 |
| 60V 500mV | 30.0000 | 29.9943 | 0.0022 | W | -0.019 |
| 60V 200mV | 12.0000 | 11.9979 | 0.0013 | W | -0.018 |
| 60V 1V | 60.000 | 59.990 | 0.007 | W | -0.017 |
| 60V 5V | 300.000 | 300.260 | 0.016 | W | 0.087 |
| 60V 10V | 300.000 | 300.265 | 0.017 | W | 0.088 |

External Current Power Calibration 1 kHz. PF=1. Constant 60 V

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-----------|---------|----------|--------------|------|-------------|
| 60V 50mV | 3.0000 | 2.9990 | 0.0006 | W | -0.035 |
| 60V 100mV | 6.0000 | 5.9991 | 0.0009 | W | -0.014 |
| 60V 500mV | 30.0000 | 29.9976 | 0.0016 | W | -0.008 |
| 60V 200mV | 12.0000 | 11.9982 | 0.0011 | W | -0.015 |
| 60V 1V | 60.000 | 59.998 | 0.008 | W | -0.003 |
| 60V 5V | 300.000 | 300.294 | 0.019 | W | 0.098 |
| 60V 10V | 300.000 | 300.295 | 0.020 | W | 0.098 |

External Current Power Calibration 10 kHz. PF=1. Constant 60 V

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|--------|---------|----------|--------------|------|-------------|
| 60V 1V | 60.000 | 60.024 | 0.007 | W | 0.040 |
| 60V 5V | 300.000 | 300.444 | 0.026 | W | 0.148 |

External Current Power Calibration 50 kHz. PF=1. Constant 60 V

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|--------|---------|----------|--------------|------|-------------|
| 60V 1V | 60.000 | 60.008 | 0.006 | W | 0.014 |
| 60V 5V | 300.00 | 300.15 | 0.04 | W | 0.049 |

External Current Power Calibration 100 kHz. PF=1. Constant 60 V

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|--------|---------|----------|--------------|------|-------------|
| 60V 1V | 60.000 | 60.067 | 0.013 | W | 0.112 |
| 60V 5V | 300.00 | 300.41 | 0.07 | W | 0.136 |

Power Calibration 60Hz PF=0 lag. Constant 1 A

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 15V 1A | 0.0000 | -0.0003 | 0.0009 | W | - |
| 100V 1A | 0.000 | -0.001 | 0.006 | W | - |
| 150V 1A | 0.000 | -0.007 | 0.018 | W | - |

Power Calibration 60Hz PF=0 Lead Constant 1 A

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 15V 1A | 0.000 | -0.001 | 0.006 | W | - |
| 100V 1A | 0.000 | 0.002 | 0.006 | W | - |
| 150V 1A | 0.000 | -0.020 | 0.018 | W | - |

Power Calibration 1 kHz PF=0 lag

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 100V 1A | 0.00 | 0.00 | 0.12 | W | - |

Power Calibration 10 kHz PF=0 lag

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 100V 1A | 0.00 | 0.10 | 0.24 | W | - |

Power Calibration 50 kHz PF=0 lag

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 100V 1A | 0.0 | 0.1 | 0.7 | W | - |

Power Calibration 100 kHz PF=0 lag

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 100V 1A | 0.0 | 0.2 | 1.3 | W | - |

Power Calibration 1 kHz PF=0 lead

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 100V 1A | 0.00 | -0.04 | 0.12 | W | - |

Power Calibration 10 kHz PF=0 lead

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 100V 1A | 0.00 | -0.12 | 0.24 | W | - |

Power Calibration 50 kHz PF=0 lead

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 100V 1A | 0.0 | -0.1 | 0.7 | W | - |

Power Calibration 100 kHz PF=0 lead

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 100V 1A | 0.0 | -0.2 | 1.3 | W | - |

6th Voltage Harmonic (60 Hz) synchronized to 10 Hz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|------|-------------|
| 100V | 100.000 | 100.004 | 0.007 | V AC | 0.004 |

20th Voltage Harmonic (1 kHz) synchronized to 50 Hz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|------|-------------|
| 100V | 100.000 | 99.944 | 0.007 | V AC | -0.056 |

25th Voltage Harmonic (10 kHz) synchronized to 400 Hz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|------|-------------|
| 100V | 100.000 | 99.974 | 0.008 | V AC | -0.026 |

20th Voltage Harmonic (50 kHz) synchronized to 2.5 kHz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|------|-------------|
| 100V | 100.000 | 99.925 | 0.008 | V AC | -0.075 |

6th Current Harmonic (60 Hz) synchronized to 10 Hz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|------|-------------|
| 1A | 1.00000 | 1.00002 | 0.00006 | A AC | 0.002 |

20th Current Harmonic (1 kHz) synchronized to 50 Hz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|------|-------------|
| 1A | 1.00000 | 0.99999 | 0.00007 | A AC | -0.001 |

25th Current Harmonic (10 kHz) synchronized to 400 Hz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|-------|---------|----------|--------------|------|-------------|
| 1A | 1.00000 | 1.00009 | 0.00007 | A AC | 0.009 |

1st Power Harmonic synchronized to 60 Hz

| Range | Applied | Measured | ±Uncertainty | Unit | Deviation % |
|---------|---------|----------|--------------|------|-------------|
| 100V 1A | 100.000 | 100.000 | 0.022 | W | 0.000 |

Comments : No comment