



**YOKOGAWA**

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



**CALIBRATION-CERTIFICATE**

Certificate number 59640P10139  
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*Example*

Applicant *Applicant*  
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Instrument WT310E Digital Power Analyzer  
Manufacturer Yokogawa  
Type WT310E-C2-F/C7  
Serial number C3YA05028E  
Inventory number CCE\_1\_1550

Calibration method The calibration is performed at the permanent laboratory in Amersfoort.  
The Powermeter was compared to the Yokogawa Power Calibration System via a phantom technique.  
During the calibration the distortion of the applied voltage were below 0.1 % up to 50 kHz and <0.3 % at 100 kHz. For current <0.8 % up to 10 kHz, <1 % at 50 kHz and <3 % at 100 kHz in 2 MHz BW  
Before calibration the device was powered on for at least 12 hours.

Average Environmental conditions during calibration Temperature (24.0 ± 1.0) °C  
Relative Humidity (44 ± 4) %rh

Date of Calibration 02 March 2022

Result The results of the calibration are shown on the next pages.  
  
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 %.  
The standard uncertainty of measurement has been determined in accordance with the EA-4/02M:2013.  
The long term stability of the calibrated object is not included in the reported expanded uncertainty measurement.  
This certificate of calibration is issued in compliance with ISO/IEC 17025:2017  
The reported results do only apply to the instrument calibrated.

Traceability The measurements have been executed using standards for which the traceability to (inter)national standards has been demonstrated towards the RvA.

Date 02 March 2022  
Name E.J. Kroon  
Function Manager European Standards Laboratory

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The Raad voor Accreditatie is member of the European Co-operation for Accreditation (EA) and is one of the signatories to the ILAC Mutual Recognition Arrangements (MRA) for the mutual recognition of calibration Certificates.

This certificate is issued provided neither the Yokogawa Standards Laboratory nor the Raad voor Accreditatie assumes any liability. Reproduction of the complete certificate is permitted. Parts of the certificate may only be reproduced after written permission of Yokogawa. Calibration certificates without signature are not valid



**YOKOGAWA**  
**ELEMENT 1**

Example

**Voltage Calibration DC**

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
600 V	60.00	60.01	0.02	V DC	0.017
600 V	-60.00	-59.97	0.02	V DC	-0.050
600 V	100.00	100.02	0.02	V DC	0.020
600 V	-100.00	-99.98	0.02	V DC	-0.020
600 V	300.00	300.00	0.02	V DC	0.000
600 V	-300.00	-299.97	0.02	V DC	-0.010
600 V	600.00	600.04	0.02	V DC	0.007
600 V	-600.00	-599.97	0.02	V DC	-0.006

**Voltage Calibration AC RMS 60 Hz**

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
15 V	15.000	15.000	0.002	V AC	-0.002
30 V	30.000	30.000	0.002	V AC	-0.001
60 V	60.000	60.000	0.006	V AC	0.000
150 V	150.00	150.00	0.02	V AC	-0.001
300 V	300.00	299.99	0.04	V AC	-0.004

**Voltage Calibration AC RMS 1 kHz**

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
15 V	15.000	15.000	0.002	V AC	-0.003
30 V	30.000	29.999	0.002	V AC	-0.002
60 V	60.000	60.000	0.005	V AC	-0.001
150 V	150.00	150.00	0.02	V AC	-0.002
300 V	300.00	300.00	0.02	V AC	0.001
600 V	600.00	599.62	0.17	V AC	-0.064

**Voltage Calibration AC RMS 10 kHz**

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
15 V	15.000	15.005	0.002	V AC	0.035
30 V	30.000	30.011	0.002	V AC	0.036
60 V	60.000	60.018	0.007	V AC	0.031
150 V	150.00	150.05	0.02	V AC	0.032
300 V	300.00	300.08	0.13	V AC	0.026
600 V	600.0	599.7	0.6	V AC	-0.045

**Voltage Calibration AC RMS 50 kHz**

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
15 V	15.000	15.043	0.002	V AC	0.285
30 V	30.000	30.081	0.010	V AC	0.271
60 V	60.000	60.160	0.020	V AC	0.266
150 V	100.00	100.27	0.04	V AC	0.274

**Voltage Calibration AC RMS 100 kHz**

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
150 V	100.00	98.74	0.10	V AC	-1.264

**Voltage Calibration AC MEAN 60 Hz**

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
150 V	150.00	150.00	0.02	V AC	-0.001

**Voltage Calibration Linearity at AC RMS 60 Hz**

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
600 V	60.00	60.00	0.02	V AC	-0.002
600 V	100.00	100.00	0.02	V AC	-0.001
600 V	300.00	299.98	0.04	V AC	-0.005
600 V	600.00	600.01	0.10	V AC	0.001

**Current Calibration DC**

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
1 A	0.1000	0.0998	0.0002	A DC	-0.203
1 A	-0.1000	-0.1002	0.0002	A DC	0.195
1 A	0.2000	0.1997	0.0002	A DC	-0.157
1 A	-0.2000	-0.2002	0.0002	A DC	0.111
1 A	0.6000	0.5997	0.0002	A DC	-0.052
1 A	-0.6000	-0.6004	0.0004	A DC	0.062
1 A	1.0000	0.9997	0.0002	A DC	-0.027
1 A	-1.0000	-1.0003	0.0005	A DC	0.031
5 A	5.0000	4.9994	0.0012	A DC	-0.011
5 A	-5.0000	-5.0011	0.0008	A DC	0.021

### AC Current Calibration 10 Hz

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
1 A	1.0000	1.0000	0.0002	A AC	0.002

### AC Current Calibration 60 Hz

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
5 mA	5.0000	4.9986	0.0017	mA AC	-0.029
10 mA	10.000	9.999	0.002	mA AC	-0.008
20 mA	20.000	19.997	0.004	mA AC	-0.016
100 mA	100.00	100.00	0.02	mA AC	-0.002
500 mA	500.00	499.98	0.07	mA AC	-0.005
1 A	0.1000	0.1000	0.0002	A AC	-0.015
1 A	0.2000	0.2000	0.0002	A AC	-0.023
1 A	0.6000	0.5999	0.0002	A AC	-0.012
1 A	1.0000	1.0000	0.0002	A AC	-0.004
2 A	2.0000	2.0000	0.0004	A AC	-0.002
5 A	5.0000	5.0000	0.0008	A AC	0.000
10 A	10.000	10.000	0.002	A AC	0.002
20 A	20.000	20.000	0.002	A AC	0.001

### AC Current Calibration 1 kHz

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
10 mA	10.000	10.000	0.002	mA AC	0.000
1 A	1.0000	1.0002	0.0002	A AC	0.017
5 A	5.0000	5.0010	0.0007	A AC	0.020

### AC Current Calibration 10 kHz

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
10 mA	10.000	10.001	0.002	mA AC	0.013
1 A	1.0000	1.0016	0.0002	A AC	0.159

### AC Current Calibration 50 kHz

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
10 mA	10.000	10.054	0.008	mA AC	0.539
50 mA	50.000	50.007	0.010	mA AC	0.015
1 A	1.0000	1.0057	0.0006	A AC	0.570
1 A	1.0000	1.0057	0.0006	A AC	0.571

### Power Calibration DC

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
60 V 1 A	60.00	59.98	0.02	W	-0.025
60 V 1 A	-60.00	-59.97	0.02	W	-0.042
150 V 1 A	100.00	99.97	0.02	W	-0.033
150 V 1 A	-100.00	-99.96	0.02	W	-0.042
600 V 1 A	600.00	599.88	0.15	W	-0.020
600 V 1 A	-600.00	-599.78	0.15	W	-0.036

### Power Calibration 60 Hz PF=1

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
15 V 1 A	15.000	15.000	0.002	W	0.000
30 V 1 A	30.000	29.999	0.005	W	-0.002
60 V 1 A	60.00	60.00	0.02	W	-0.003
150 V 1 A	150.00	149.99	0.02	W	-0.006
300 V 1 A	300.00	299.99	0.05	W	-0.005
600 V 1 A	60.00	59.99	0.02	W	-0.011
600 V 1 A	100.00	100.00	0.02	W	-0.003
600 V 1 A	600.00	600.02	0.07	W	0.004
150 V 5 mA	500.00	500.12	0.17	mW	0.024
150 V 10 mA	1.0000	1.0001	0.0002	W	0.007
150 V 20 mA	2.0000	2.0001	0.0004	W	0.003
150 V 100 mA	10.000	9.999	0.002	W	-0.009
150 V 2 A	200.00	199.98	0.02	W	-0.009
150 V 5 A	500.00	499.98	0.07	W	-0.005
150 V 10 A	1.000	1.000	0.002	kW	-0.008
150 V 20 A	2.000	2.000	0.002	kW	-0.006

### Power Calibration 1 kHz PF=1

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
150 V 1 A	100.00	100.01	0.02	W	0.009
150 V 10 mA	1.0000	0.9999	0.0002	W	-0.010

### Power Calibration 10 kHz PF=1

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
150 V 1 A	100.00	100.20	0.06	W	0.202
150 V 10 mA	1.0000	1.0005	0.0005	W	0.053

**Power Calibration 50 kHz PF=1**

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
150 V 1 A	100.00	101.08	0.17	W	1.080
150 V 10 mA	1.0000	1.0088	0.0008	W	0.880
150 V 50 mA	5.000	5.012	0.007	W	0.234

**Power Calibration 100 kHz PF=1**

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
150 V 1 A	100.00	99.59	0.17	W	-0.409
150 V 50 mA	5.000	4.910	0.007	W	-1.791

**Power Calibration 60Hz PF=0 Lag**

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
150 V 1 A	0.00	0.01	0.02	W	-

**Power Calibration 60Hz PF=0 Lead**

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
150 V 1 A	0.00	-0.01	0.02	W	-

Comments : No comment

For information, the deviation is given as a percentage (in %) of the measured value to the applied value.  $\% = ((\text{Measured} - \text{Applied}) / \text{Applied}) \cdot 100\%$

Capacitive loads are leading (current leads voltage), and inductive loads are lagging (current lags voltage).