



# Precision Making



## ILAC

International Laboratory Accreditation Cooperation is an international organisation for accreditation bodies. They obtain a multi regional agreement - accredited once, accepted everywhere.

## RvA

The Dutch Accreditation Council RvA, by law appointed as the national accreditation body for the Netherlands.

The scope of Yokogawa calibration is downloadable at:  
**Google RvA K 164**

## ISO 17025 Accredited Calibration at high frequencies up to 100 kHz

# Proving the accuracy and performance of your power measurement

### Specifications alone do not guarantee actual performance

Accuracy figures quoted in manufacturers' specifications – and indeed some of the parameters listed in calibration certificates issued by well-established test houses – can be meaningless when taken out of context.

Traditionally, AC power meters have been calibrated at frequencies of 50 to 60 Hz. However, the reason that Yokogawa and other power meter manufacturers offer instruments with much higher power measuring bandwidths is that most applications consume power at higher frequencies.

For example:

- Switch-mode power supplies
- High-frequency electronic lighting ballasts
- Soft starters in motor control systems
- Frequency converters in traction application

There is therefore a question mark over the validity of the specifications of a power meter or analyser.

### A power calibration at only 50 or 60Hz has little value

Calibration of high-frequency power has lagged behind the development of power meters to address these applications, and few national laboratories can provide traceability up to 100 kHz: the frequency at which instruments have to be calibrated to provide accurate results in these application sectors. **Yokogawa is the only industrial (i.e. non-government or national) organisation to offer this capability.**

Pic: European calibration laboratory at the Yokogawa Europe Headquarters in Amersfoort (NL).



### An ISO 17025 accredited calibration proves the accuracy of a power meter

Quality systems such as ISO 9001 aim at confirming the compliance of the management system to a standard, but do not specifically evaluate the technical competence of a laboratory.

Laboratories that are accredited to ISO 17025, like Yokogawa, have demonstrated that they are technically competent and able to produce precise and accurate calibration measurements, which are globally recognised.

This figure shows an ISO 17025 certificate complete with measurement uncertainties, which confirms that the power meter is truly much more accurate than its specification. There is no guarantee that the measurements on an ISO9001 certificate are correct.

#### ISO 17025

##### Power Calibration 100 kHz PF=1

Range	Applied	Measured	±Uncertainty	Unit	Deviation %
100V 50mA	5,000	5,008	0,016	W	0,165
100V 200mA	20,00	20,03	0,06	W	0,132
100V 1A	100,0	100,3	0,3	W	0,257
150V 1A	100,0	100,2	0,3	W	0,201

#### ISO 9001

##### Power Calibration 100 kHz PF=1

Range	Applied	Lowlimit	Measured	Highlimit	Unit	Deviation %	Result
100V 50mA	5,0000	4,9500	5,0083	5,0500	W	0,165	Pass
100V 200mA	20,0000	19,8000	20,026	20,2000	W	0,132	Pass
100V 1A	100,0000	99,0000	100,257	101,0000	W	0,257	Pass
150V 1A	100,0000	98,85	100,20	101,15	W	0,201	Pass

### A calibration of only voltage or current has no value

In reality, mains voltage waveforms are not sinusoidal and exhibit a typical flattening of the peaks due to the loading effects of switch mode power supplies etc. on the distribution network. This causes harmonics in the voltage waveform, which in turn leads to higher amounts of power consumed at higher frequencies by an instrument connected to the distribution system.

It is also not sufficient to just calibrate using voltage and current, as phase shift is one of the most critical factors which determine a high bandwidth power meter's uncertainty.

Stand-by power measurement is just one of the high profile applications which require the precise measurement of power at both high frequency and low power factor.

### A power measuring instrument should be selected whose accuracy is proven for the frequency range of the application

Yokogawa's European Calibration Laboratory is the only industrial (i.e. non-government or national) organisation to offer traceability up to 100 kHz, and thus is the only power meter manufacturer which can directly prove the performance of its own instruments. Only a Yokogawa Calibration Certificate gives the user trust in their instrument's measurements.

### Re-calibrations prove the stability of a power meter

No measurement is ever "correct". There is always an unknown, finite, non-zero difference between a measured value and the corresponding 'true' value. In other words, a user can never be 100% sure that an instrument is operating within its specified tolerance limits.

Regular accredited calibration is a method for gaining quantifiable confidence in a measurement system by comparing the instrument's performance to a standard of known accuracy.

