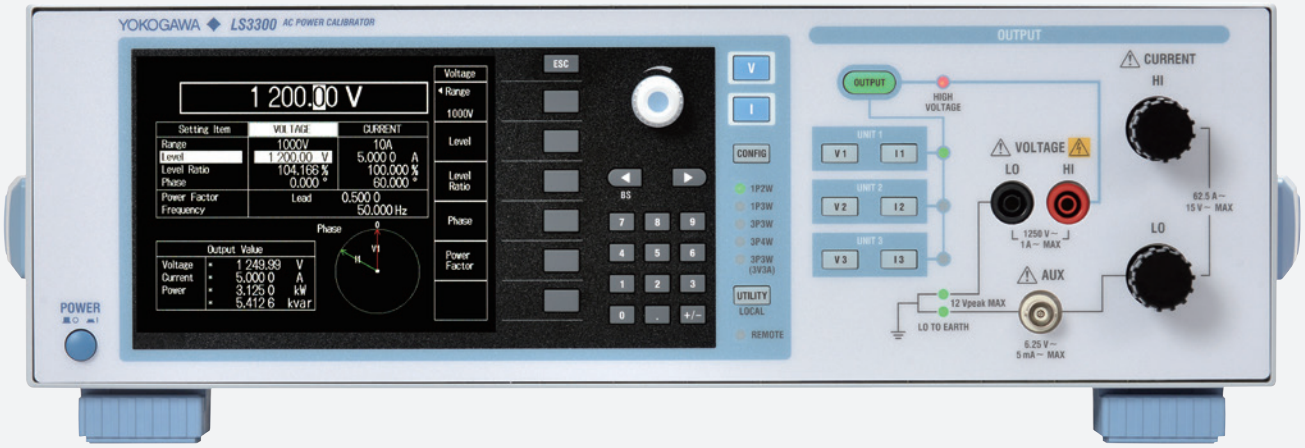
Test&Measurement

YOKOGAWA



Effective solution for AC power calibration

LS3300
AC power calibrator

Precision Making

Bulletin LS3300-01EN

Yokogawa has been supplying precision measuring instruments of the highest quality for over 100 years.

Power meters and measuring instruments much adhere to strict standards to not only make precise voltage and current measurements, but to reliably and accurately calculate power and phase. Thus, calibration of these instruments to maintain integrity and lifespan is of utmost importance to the test and measurement industry. It is with this in mind that Yokogawa is proud to release its latest high precision power calibrator, the LS3300.

The LS3300 provides:

Technology – The LS3300 delivers best-in-class power accuracy of 100 ppm and high output current of 62.5 A.

Confidence – Yokogawa's attention to quality ensures engineers have the peace of mind knowing that the LS3300 is designed to meet the high stability and accuracy needed for testing power meters.

Operability – Combining flexibility of single to three phase calibration and a suite of features for power meter validation, The LS3300 is an excellent choice for efficient, expeditious calibration.

Introduction to broad industrial fields

Accredited calibration laboratories and private calibration companies

Companies that manufacture measurement instruments.

Calibration divisions of companies that manufacture industrial equipment such as office electronics, home appliances, automobiles, motors, etc.

Major instruments subject to calibration

Power meter of 0.15% class (commercial frequency)

Power meter of 0.2% class (commercial frequency)

Clamp-on power meter

Power monitor

AC clamp-on tester

Portable Analog Instruments (W, V, A, PF, etc)

Power transducer

Major Specifications

The LS3300 is a single-phase AC power calibrator that can generate highly accurate, stable, and wide range output current and voltage. New features include an LCD display and a “STABILIZING function” which shows that the output signal is stabilized for calibration efficiency.

High accuracy

AC voltage: ±350 ppm
AC current: ±450 ppm
AC power: ±450 ppm
At 1 year, 10 ppm = 0.001%

High stability

AC voltage, current: ±50 ppm/h
AC power: ±100 ppm/h
From 1 minute to 1 hour after the output is turned on.

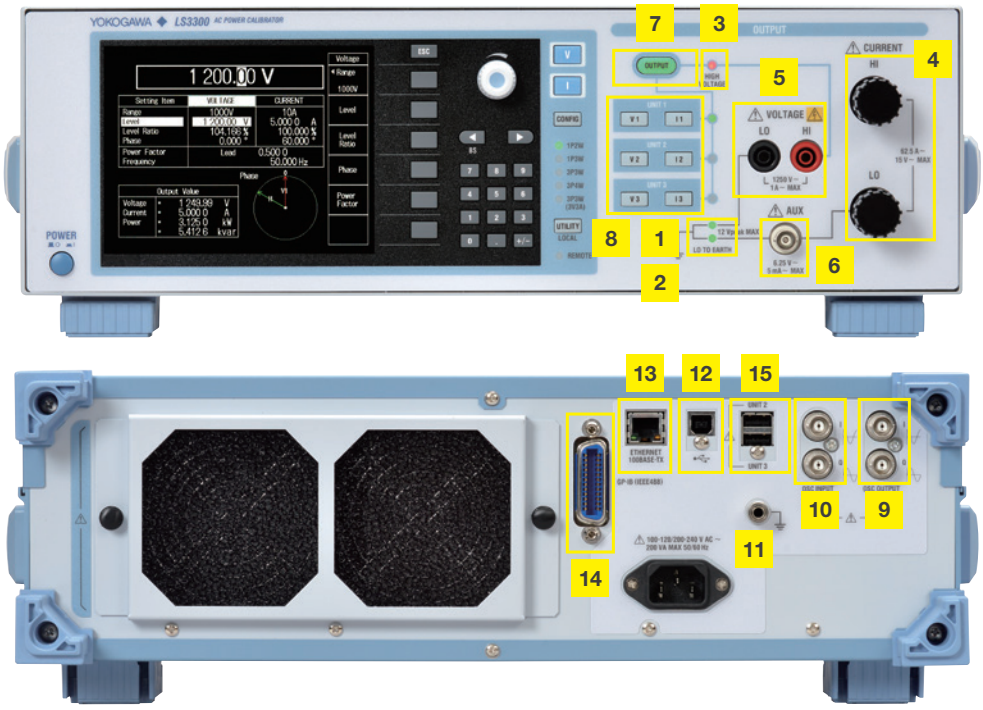
Phase accuracy

±0.03˚ at 50/60 Hz
Between the Voltage and current outputs when used alone.

Wide generation range

AC voltage: 10 mV to 1250 V
AC current: 0.3 mA to 62.5 A
Frequency: 40 to 1200 Hz

Front/rear

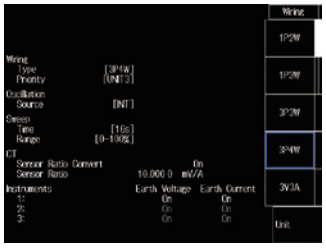


1 LO TO EARTH LAMP (voltage)
2 LO TO EARTH LAMP (current)
3 HIGH VOLTAGE LAMP
4 Current output terminals
5 Voltage output terminals
6 AUX output terminal
7 OUTPUT ON/OFF key
8 Output select key
9 Output terminals for synchronized operation
10 Input terminals for synchrenized operation
11 Functional ground
12 USB port
13 Ethernet port
14 GP-IB connector
15 Link interface (UNIT2/UNIT3)

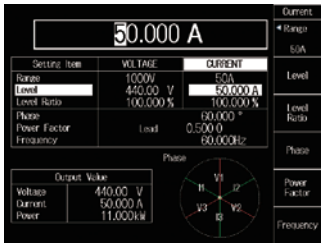
Major Features

Single to three phase power calibration

A single LS3300 unit supports 1P2W, and multiple LS3300 units support 1P3W, 3P3W and 3P4W. It can calibrate AC voltage/ current, active/reactive power, power factor and phase angle.



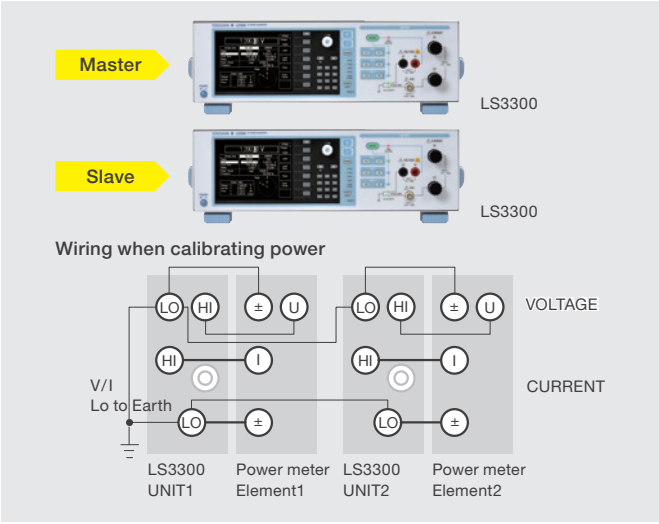
Wiring system setting



Current value setting

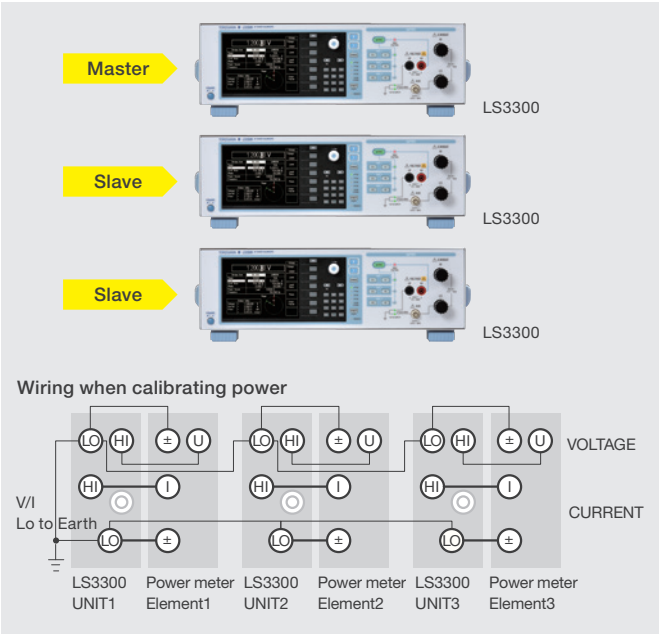
Control and output of three phase power

Multiple LS3300 units can be synchronized through BNC cables. The host can then connect to the master unit via a USB cable and adjust the settings on all units through the master/slave communication. Users can set the values of voltage, current, power, power factor, wiring, and phase from the front panel of the master unit and view each phase in a phase chart in the LCD. Checking the output of each unit from the master unit during three-phase output is done by navigating to [CONFIG] > [Unit] key > menu.



Example of 1P3W and 3P3W

When changing the wiring from 3P3W (three voltages three currents) or 3P4W to 1P3W or 3P3W, users can select from among T phase reference using UNIT2 and S phase reference using UNIT3. The LS3300 supports both references because the reference differs depending on each power meter. They can use either phase reference by setting it on the master unit as needed.



Example of 3P3W (three voltage three current) /3P4W

(1) When outputting balanced three-phase

In the case of balanced phase signals, when users modify settings on the master unit, values on the slave units are set accordingly. Synchronous communication allows output setting changes on the master unit to be migrated to the slave unit. If a fault such as an overload occurs in the slave unit, this information will be conveyed to the master unit, then initiate a shutdown of output.

(2) When outputting unbalanced three-phase signals

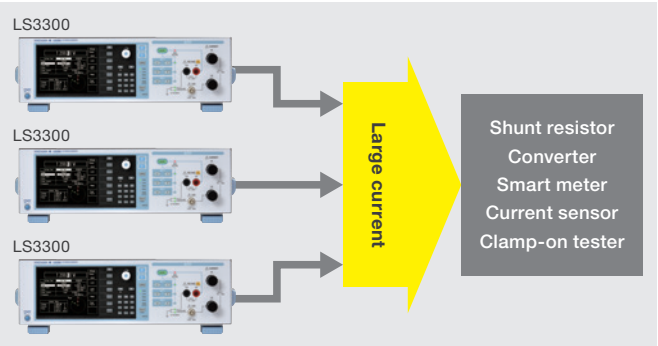
In the case of unbalanced phase signals, users set the conditions of a balanced state for the slave units on the master unit. Then they change the phase setting into single phase and manually set conditions of the unbalanced phase state of each phase of the slave side.

On-Site calibration service

Other power calibration systems in the market utilize a master/slave interface where-in the slave units cannot be operated standalone for single phase output. Each LS3300, on the other hand, is capable of both independent single phase output, as well as synchronized three phase output. Its excellent portability enables feasible on- site calibration service.

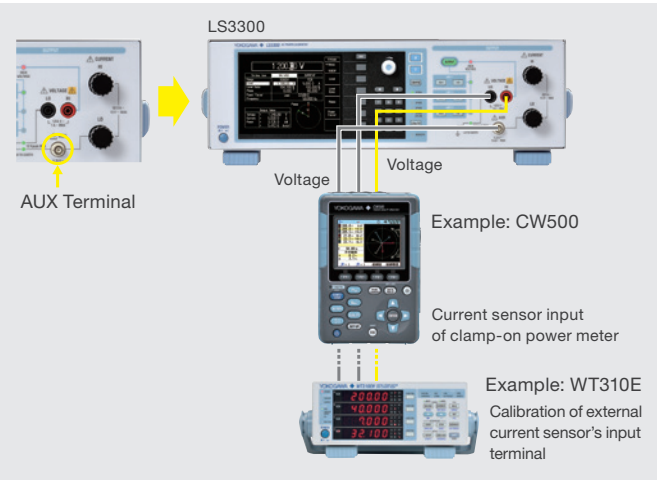
Large current output up to 180 A

When users synchronize three units and connect their output in parallel, the system can output up to 180 A, when [Hi Current] is specified in the Wiring menu. LS3300 supports devices requiring large current such as a current sensor, smart meter, etc.



Diversification of the calibration equipment by AUX output

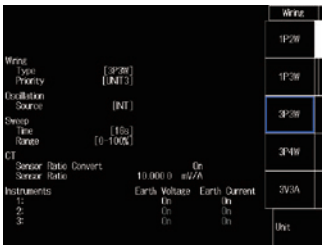
A large current sensor used for industrial equipment and a clamp-on power meter used to monitor energy-saving are widely used in the power measurement market. When a clamp-on power meter unit or external current sensor input (voltage output) is calibrated, an AUX terminal is used. The voltage output range of a current sensor signal (Ext. Sensor) is 0 to 6.25 V.
Users can select either the 500 mV or 5 V range according to the output range of a current sensor.



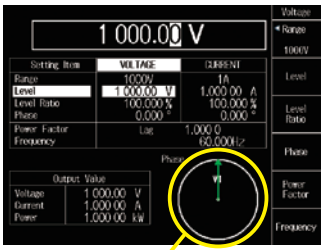
LCD for enhanced viewing capabilities

The LS3300 is equipped with a 5.7-inch color LCD. It shows the wiring and power settings, as well as the phase chart of the generated waveforms, allowing users to quickly and easily view the instrument settings (as seen below).
Users are also be able to view the unit information such as the serial number, version information, and communication settings in the UTILITY menu.
The values of voltage, current, active power and reactive power specified according to the level, level ration and power factor are displayed as output values.

Phase wire settings screen

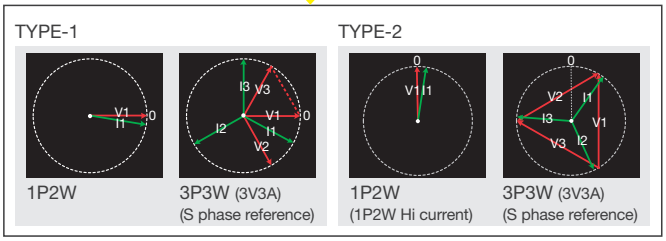


Output settings screen



Zooming the Phase chart

Phase chart*

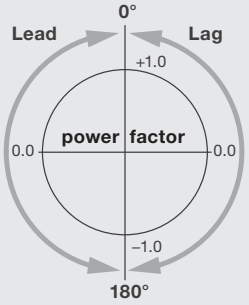


*There are two types of Phase chart:
TYPE1: Phase 0° (reference signal phase) points to the right.
TYPE2: Phase 0° (reference signal phase) points up.

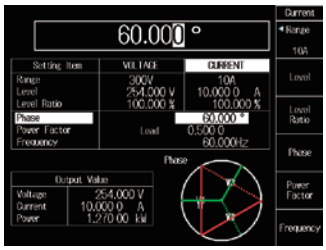
Applications

Power Factor Validation

The power factor is an important element when users judges the energy utilization efficiency of a device. When a power meter is calibrated, accordingly, the power factor value is inspected as well as a power value. The LS3300 covers the range of the power factor from –1.0 to 0 to +1.0 (lead) and from –1.0 to 0 to +1.0 (lag). It also allows the user to adjust the phase angle between voltage and current.



When the power factor is changed, the phase of the current is automatically adjusted



Example of phase setting screen

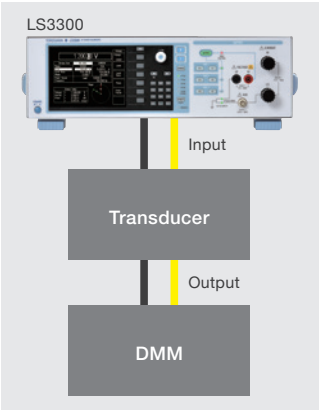
Inspection of phase meter

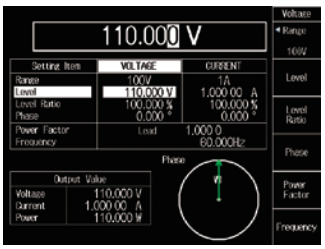
Since the LS3300 guarantees the phase accuracy between units of the master unit voltage (V1) and the slave unit voltage (V2), it can inspect a phase meter. It is equipped with the phase accuracy of ±0.03°and the minimum resolution of 0.001°and allows users to specify an arbitrary value for Lead and Lag of the slave unit voltage (V2) against the master unit voltage (V1).

*The master unit and the slave unit are needed to be connected with each other via a BNC cable for phase synchronization.

In/output adjustment inspection of power transducer

There are different kinds of power transducer instrumentation for AC voltage, current, active power, reactive power, etc. The LS3300 can perform highly accurate output (the voltage accuracy of 350 ppm and current accuracy of 450 ppm), output AC voltage/current separately and set the phase angle of power. With these features, it supports input/output characteristic adjustment and inspection in the power transducer production line and calibration inspection for periodic checkups.





Example of voltage setting screen

Needle sticking tests

This instrument is able to perform the Needle sticking tests with high reproducibility. If users stops sweeping halfway and holds the value near an arbitrary point, s/he can change the level ratio manually and perform up/down sweep again. Users can set the sweep time to 8 s, 16 s, 32 s, or 64 s and the sweep range to 0% to 100%, 0% to 105%, 0% to 110%, or 0% to 120% of the output level. While sweeping voltage (or current), it cannot sweep current (or voltage).

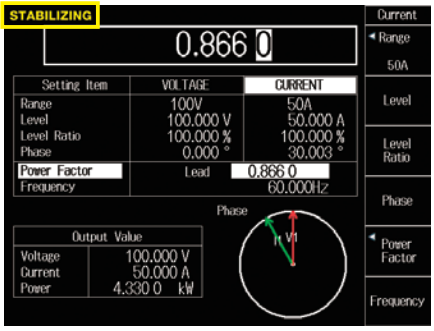
*Power factor and Phase are not available in the sweep function.

Convenient features for calibration

Shortening of calibration time

(1) Notification that output becomes stable

To improve working efficiency, the LS3300 is equipped with a function for notifying the user that the output is stable. When the STABILIZING indication disappears from the LCD two seconds later, it means that the output has become stable. This reduces time spent on working with transient signals that affect measurement accuracy.

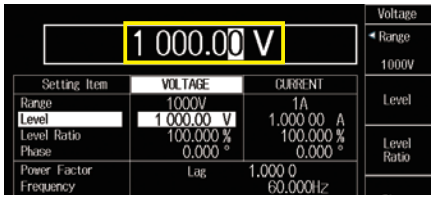


"STABILIZING" indication during output

Safety of calibration

(1) High voltage notification

This is a function for notifying users of dangerous high voltage condition when the high voltage range (300 or 1000 V) is set. When the voltage output is set to 150 V or higher, the device beeps intermittently.



High voltage setting screen

(2) Trip detection

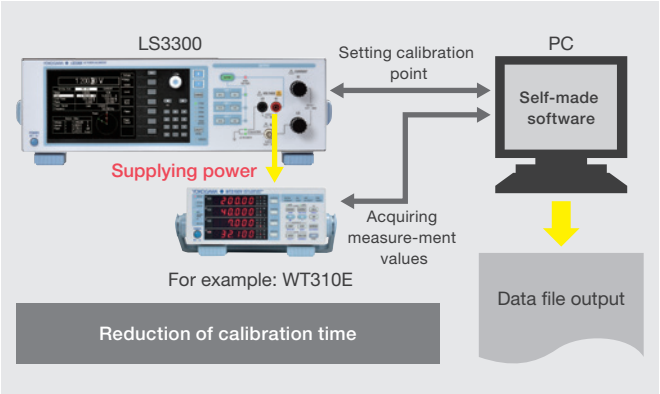
If a load that would cause the output range to be exceeded is connected, this instrument detects the abnormal load to protect itself. This function monitors the error of overcurrent and overvoltage, oscillation, fan malfunction and temparature.

(3) LINE synchronization

The output frequency of this product can be synchronized with commercial power frequency. This feature is useful in checking interference from the power source.

Communication interface

The LS3300 is fitted with USB, Ethernet and GP-IB as standard communication interface to control external devices remotely.



For example: Remote control from a PC automates calibration

Sample program will be released soon

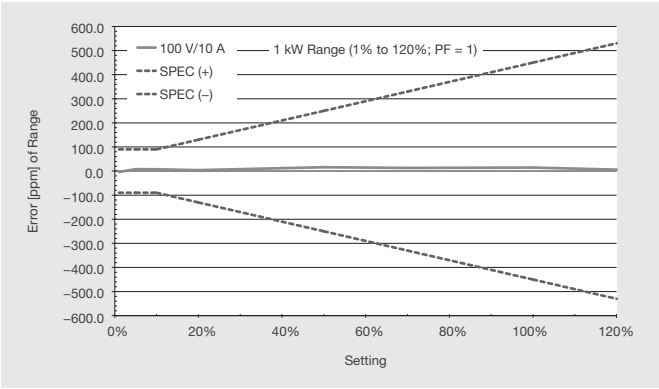
We will provide a free sample program and driver for each communication interface (USB, Ethernet and GP-IB) in our web site for the convenience of users.

LabVIEW measuring instrument driver will be released soon

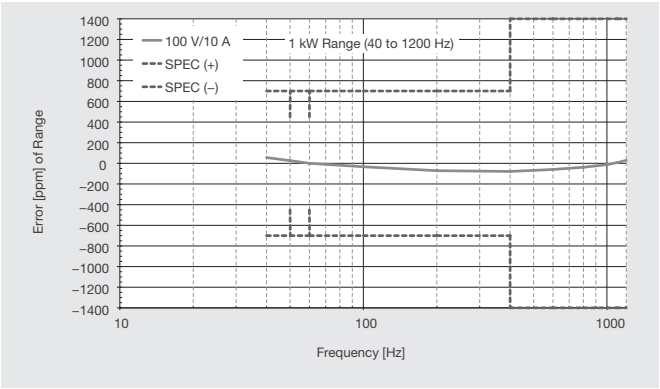
We will provide a free measuring instrument driver for creating a LabVIEW program on our website for the convenience of users.

*LabVIEW is a registered trademark of National Instruments Corporation in the U.S.A.

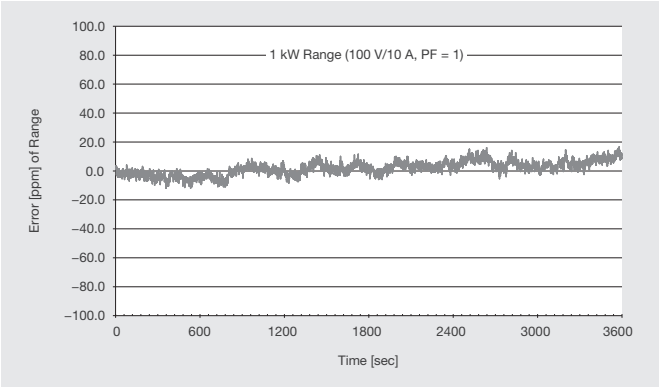
Basic characteristic examples showing high accuracy and stability



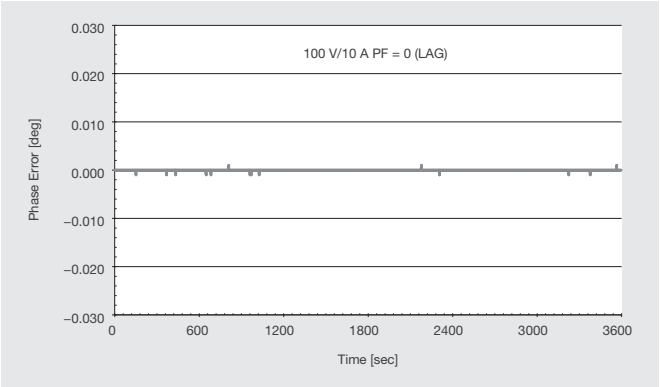
Example of Power linearity characteristic



Example of Frequency - Power accuracy characteristic



Example of Power stability characteristic



Example of Phase stability characteristic

Comparison table to the 2558A (1 year)

		LS3300	2558A
AC voltage	Guaranteed accuracy range	10 mV to 1250 V	1.00 mV to 1200.0 V
	Accuracy 50/60 Hz	±350 ppm	±500 ppm
AC current	Guaranteed accuracy range	0.3 mA to 62.5 A	1.00 mA to 60.0 A
	Accuracy 50/60 Hz	±450 ppm	±650 ppm
Frequency	Output range	40 to 1200 Hz	40 to 1000 Hz
	Accuracy	±100 ppm	±100 ppm
AC power	Guaranteed accuracy range	Range of voltage, current and frequency mentioned above	N/A
	Accuracy 50/60 Hz	±450 ppm	N/A
Power stability		±100 ppm	N/A
Power factor (Lead/Lag)		–1 to 0 to 1	N/A
Phase angle		–180.000° to 359.999°	N/A
Maximum output		Approx. 36 VA	Approx. 36 VA
Dimentions (mm)		426 (W) × 132 (H) × 450 (D)	426 (W) × 132 (H) × 400 (D)

Specifications

Output Range

AC Voltage

Range	Output Range *1	Resolution	Maximum Output	Output Resistance *2
1 V	0 to ± 1.25000 V	10 µV	0.5 A or more	6 mΩ or less
10 V	0 to ± 12.5000 V	100 µV	Approx. 600 mA	6 mΩ or less
30 V	0 to ± 37.5000 V	100 µV	Approx. 60 mA	6 mΩ or less
100 V	0 to ± 125.000 V	1 mV	Approx. 60 mA	6 mΩ or less
300 V	0 to ± 375.000 V	1 mV	Approx. 20 mA	6 mΩ or less
1000 V	0 to ±1250.00 V	10 mV	Approx. 6 mA	6 mΩ or less

AC Current

Range	Output Range *1	Resolution	Maximum Output
30 mA	0 to ± 37.5000 mA	0.1 µA	Approx. 15 V
100 mA	0 to ±125.000 mA	1 µA	Approx. 15 V
1 A	0 to ± 1.25000 A	10 µA	Approx. 15 V
10 A	0 to ± 12.5000 A	100 µA	Approx. 3 V
50 A	0 to ± 62.500 A	1 mA	Approx. 0.6 V

AUX

Range	Output Range *1	Resolution	Maximum Output	Output Resistance
500 mV	0 to ±625.00 mV	10 µV	Approx. 0.1 mA	1 Ω or less
5 V	0 to ± 6.2500 V	100 µV	Approx. 5 mA	1 Ω or less

*1: The output level can be set up to 120% of the range.
For outputs exceeding 120%, the ratio must be set to 100% or higher.
*2: When 758933, 758917, or B8506ZK is in use; excluding aging and the effects of measurement leads

Accuracy

Conditions
Frequency: Using the internal oscillator
Load: Pure resistance
Temperature, humidity: 23°C ±3°C, 20% RH to 80% RH
When the temperature is in the range of 5°C to 20°C or 26°C to 40°C, add the temperature coefficient.
Output terminals: LO terminal grounding
Measurement bandwidth: Up to 50 kHz

AC Voltage

Range	Display Resolution	Accuracy (1 year), ±(% of Setting + % of Range)					
		10% to 125% of range *1			1% to 10% of range *1, *2		
		50/60 Hz	40 Hz ≤ f ≤ 400 Hz *2	400 Hz < f ≤ 1.2 kHz	50/60 Hz	40 Hz ≤ f ≤ 400 Hz	400 Hz < f ≤ 1.2 kHz
1 V	10 µV	0.03 + 0.005	0.05 + 0.01	0.10 + 0.02	0.008	0.015	0.03
10 V	100 µV						
30 V	100 µV						
100 V	1 mV						
300 V	1 mV						
1000 V	10 mV						

AC Current

Range	Display Resolution	Accuracy (1 year), ±(% of Setting + % of Range)					
		10% to 125% of range			1% to 10% of range		
		50/60 Hz	40 Hz ≤ f ≤ 400 Hz *2	400 Hz < f ≤ 1.2 kHz	50/60 Hz	40 Hz ≤ f ≤ 400 Hz *2	400 Hz < f ≤ 1.2 kHz
30 mA	0.1 µA	0.04 + 0.005	0.06 + 0.01	0.12 + 0.02	0.009	0.016	0.032
100 mA	1 µA						
1 A	10 µA						
10 A	100 µA						
50 A	1 mA						

AUX

Range	Display Resolution	Accuracy (1 year), ±(% of Setting + % of Range)					
		10% to 125% of range *1			1% to 10% of range *1		
		50/60 Hz	40 Hz ≤ f ≤ 400 Hz *2	400 Hz < f ≤ 1.2 kHz	50/60 Hz	40 Hz ≤ f ≤ 400 Hz *2	400 Hz < f ≤ 1.2 kHz
500 mV	10 µV	0.04 + 0.01	0.06 + 0.01	0.12 + 0.02	0.014	0.016	0.032
5 V	100 µV						

*1: Excludes voltage drop due to the output resistance
*2: Includes the accuracy specification at LINE synchronization setting. However, there are no fluctuation in frequency and duty in LINE.

Active Power (Watt)

Output range	Accuracy (1 year)					
	±{(% of VA) × PF + % of range + PWRerror (% of VA)} *3, *4, *5			±{% of range + PWRerror (% of VA)} *3, *4, *5		
	10% to 125% of range			1% to 10% of range		
Frequency range	50/60 Hz	40 Hz ≤ f ≤ 400 Hz *6	400 Hz < f ≤ 1.2 kHz	50/60 Hz	40 Hz ≤ f ≤ 400 Hz *6	400 Hz < f ≤ 1.2 kHz
Accuracy	0.040 + 0.005 + PWRerror	0.060 + 0.010 + PWRerror	0.120 + 0.020 + PWRerror	0.009 + PWRerror	0.016 + PWRerror	0.032 + PWRerror

*3: For phase setting Ø, power factor PF = cosØ
Equation for calculating the value to add to the active power accuracy for the phase error (ΔØ)
PWRerror (%) = 100 × {cosØ – cos (Ø + ΔØ)}
Example: For 60 Hz, phase Ø = 60°, ΔØ = +0.03°
PWRerror (%) = 100 × {cos (60) – cos (60.03)} = 0.0453%
*4: Add 0.005% of range for AUX output.
*5: The output range that the power accuracy applies to is for when the voltage and current (including AUX) are at least 1% of the range.
*6: Includes the accuracy specification when LINE synchronization is set. However, no fluctuation in the LINE frequency or duty ratio is assumed.

Reactive Power (VAR)

Output range	Accuracy (1 year)					
	±{(% of VA) × PF + % of range + VARerror (% of VA)} *7, *8, *9			±{% of range + VARerror (% of VA)} *7, *8, *9		
	10% to 125% of range			1% to 10% of range		
Frequency range	50/60 Hz	40 Hz ≤ f ≤ 400 Hz *10	400 Hz < f ≤ 1.2 kHz	50/60 Hz	40 Hz ≤ f ≤ 400 Hz *10	400 Hz < f ≤ 1.2 kHz
Accuracy	0.040 + 0.005 + VARerror	0.060 + 0.010 + VARerror	0.120 + 0.020 + VARerror	0.009 + VARerror	0.016 + VARerror	0.032 + VARerror

*7: For phase setting Ø, power factor PF = sinØ
Equation for calculating the value to add to the reactive power accuracy for the phase error (ΔØ)
VARerror (%) = 100 × {sinØ – sin (Ø + ΔØ)}
Example: For 60 Hz, phase Ø = 60°, ΔØ = +0.03°
VARerror (%) = 100 × {sin (60) – sin (60.03)} = –0.0262%
*8: Add 0.005% of range for AUX output.
*9: The output range that the power accuracy applies to is for when the voltage and current (including AUX) are at least 1% of the range.
*10: Includes the accuracy specification when LINE synchronization is set. However, no fluctuation in the LINE frequency or duty ratio is assumed.

Phase (between the voltage and current outputs when used alone or between the voltage outputs of the master and slave devices when linked)

	Accuracy (1 year)		
Frequency range	50/60 Hz	40 Hz ≤ f ≤ 400 Hz *12	400 Hz < f ≤ 1.2 kHz
Current output (I1) corresponding to voltage (V1) or between the voltage outputs of the master and slave devices when linked *11	±0.03°	±0.10°	±0.40°
AUX output (I1) corresponding to voltage (V1) *11	±0.05°	±0.10°	±0.40°
Slave voltage (V2) corresponding to master voltage (V1) *11	±0.03°	±0.10°	±0.40°

*11: The output level can be set 10% to 125% of the range.
*12: Includes the accuracy specification at LINE synchronization setting. However, there are no fluctuation in frequency and duty in LINE.

Frequency Accuracy (1 year): ±100 ppm

Other specification

Stability

Conditions Output range: 1% to 125% of range
Output state: The same output state is retained (no load fluctuation).
Frequency: Using the internal oscillator.
Add 50 ppm of range for 1 kHz to 1.2 kHz.
Output terminals: LO terminal grounding
Temperature, humidity: 23°C ±3°C, 20% RH to 80% RH, no fluctuation
Other conditions: No fluctuation (such as wind)
Time: From 1 minute to 1 hour after the output is turned on

Item	±(ppm of Setting + ppm of Range)
Voltage	20 + 30
Current	20 + 30
Power (PF = 1)	40 + 60

Temperature coefficient

Item	Specifications	
Voltage output/ Current output/ AUX output	50/60 Hz	±30 ppm/°C of setting, at 5°C to 20°C and 26°C to 40°C
	Other frequencies 40 Hz to 1.2 kHz *1	±50 ppm/°C of setting, at 5°C to 20°C and 26°C to 40°C
Phase	50/60 Hz	±0.001°/°C, at 5°C to 20°C and 26°C to 40°C
	Other frequencies 40 Hz to 1.2 kHz *1	±0.002°/°C, at 5°C to 20°C and 26°C to 40°C

*1: Includes the accuracy specification when LINE synchronization is set.

Response Time

Item	Specifications
Voltage/current/ AUX output	Approx. 2 sec, at 0 -> 100% of the setting (until the output converges to 0.02% of the last value)

Distortion Rate

Conditions Frequency range: 40 Hz to 1.2 kHz
Road: Pure resistance
The load current during voltage generation and the load voltage during current generation are less than or equal to 20% of the maximum output.
Output range: 40% to 125% of range

Item	Specifications
Voltage output	0.07% or smaller
Current output	0.18% or smaller
AUX output	0.10% or smaller

Settings and Display Items

Setting

Items		Setting Value	Resolution
Voltage	Range	1 V, 10 V, 30 V, 100 V, 300 V, 1000 V	Refer to “Output Range”
	Level	0 to 120% (of range)	
	Level Ratio	0 to 120% (of setting) *1	0.001%
	Phase Angle	–180° to +359.999°	0.001°
Current	Range	30 mA, 100 mA, 1 A, 10 A, 50 A, 100 A *2, 150 A *2 AUX Output 500 mV, 5 V	1P2W (HI Current) *2
	Level	0 to 120% (of range)	
	Level Ratio	0 to 120% (of setting) *1	0.001%
	Phase Angle	–180° to +359.999	0.001°
Power Factor		LEAD/LAG –1 to 0 to +1	0.0001
Frequency		40 Hz to 1.2 kHz	0.001 Hz
Wiring *2	kind of wiring	1P2W, 1P2W (Hi Current) *2, 1P3W, 3P3W, 3P3W (3V3A), 3P4W	
Oscillator	INTernal	40 Hz to 1.2 kHz	0.001 Hz
	EXTernal	Input from the external oscillator (I/Q)	Refer to “Explanation of External Input”
	LINE	50/60 Hz	0.001°
Sweep	Time	8 s, 16 s, 32 s, 64 s	
	Range *3	0 to 100%, 0 to 105%, 0 to 110%, 0 to 120%	
AUX	V/A Convertion Ration *4	0.0001 mV/A to 99999.9999 mV/A	0.0001 mV/A
Ground/Ungrounded *5		Voltage and current (including AUX) can be switched separately.	

*1: The output value is determined by “level × level ratio”, but the maximum output is 125% of range.
*2: When synchronous operation is in use and the master wiring is not 1P2W, all the items above are set on the master side.
The 100 A range that becomes available using 1P2W (HI current) can be output with two units.
The accuracy specification twice that of the 50 A range.
The 150 A range can be output with three units.
The accuracy specification three times that of the 50 A range.
*3: The sweep range (%) indicates the level ratio range.
*4: Default value; 1000 mV/A
*5: When the Lo terminal is grounded, voltage cannot be applied between Lo and ground.

Display *1

Item		Display
Voltage (Vout)	Output level	Level setting × Ratio setting
Current (Iout)	Output level	Level setting × Ratio setting
Phase *2		Displays the output phase setting relative to the reference signal
Power Factor (PF) *3		Displays the power factor equivalent to the current phase relative to the voltage
Active Power (W)		Displays the power calculated from active power (W) Vout × Iout × cosØ or Vout × Iout × PF.
Reactive Power (var)		Vout × Iout × sinØ

*1: All output displays show values derived from the above equations.
*2: If the wiring is 1P2W, the voltage and current phases can be set separately.
For other wiring systems, set the current phase relative to the voltage.
The phase is positive when the current leads the voltage.
*3: LEAD indicates that the current phase is leading the voltage. LAG indicates that the current phase is lagging the voltage.

External Input and Output

Master/Slave Synchronous Operation Input and Output (Two terminals each; four terminals total)

Item	Specifications
Input/output voltage	3 V ± 0.1 Vrms, sine wave
Frequency range	40 Hz to 1.2 kHz
Input resistance	Approx. 1 MΩ
Output resistance	Approx. 50 Ω

Terminal		Frequency selection		
		Internal oscillator	EXT *1	LINE (50 Hz to 60 Hz) *2, *3
Input	cos (I)	Not used	Used	Not used
	sin (Q)	Not used	Used	Not used
Output	cos (I)	Internal cos (I) signal	Connected to input terminal cos (I)	Internal cos (I) signal
	sin (Q)	Internal sin (Q) signal	Connected to input terminal sin (Q)	Internal sin (Q) signal

*1: Phase difference between I and Q: Within 90°±0.1°
*2: If the commercial power frequency is less than 45 Hz or greater than 65 Hz, the instrument generates an error and cannot produce output.
*3: If the duty ratio exceeds 50 ±5%, the instrument generates an error and cannot produce output.

Computer Interface

USB for PC Connection

Connector type	Type B connector (receptacle)
Electrical and mechanical	Complies with USB Rev. 2.0
Supported transfer modes	HS (High Speed; 480 Mbps) and FS (Full Speed; 12 Mbps)
Supported protocols	USBTMC-USB488 (USB Test and Measurement Class Ver.1.0)

Ethernet

Connector type	RJ-45 connector
Electrical and mechanical	Conforms to IEEE 802.3
Transmission system	100 BASE-TX/10 BASE-T
Transfer rate	100 Mbps max.
Supported services	VXI-11, DHCP

GP-IB

Electrical and mechanical	Complies with IEEE St’d 488-1978
Functional specifications	SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, C0
Protocol	Complies with IEEE St’d 488.2-1992
Address	0 to 30

Connecting interface

Connector type	Type B connector (receptacle)
Electrical and mechanical	Equivalent to USB Rev. 2.0
Supported system environment	Valid only for the connection between the master and slave LS3300

General Specifications

Item	Specifications
Warm-up time	Approx. 30 minutes
Operating environment	Temperature: 5°C to 40°C
	Humidity: 20% RH to 80% RH (no condensation)
Storage environment	Temperature: –15°C to 60°C
	Humidity: 20% RH to 80% RH (no condensation)
Operating altitude	Up to 2000 m
Installation location	Indoors
Orientation	Horizontal. Vertical installation is prohibited.
Rated supply voltage	100 VAC to 120 VAC, 200 VAC to 240 VAC
Permitted supply voltage range	90 VAC to 132 VAC, 180 VAC to 264 VAC
Rated supply frequency	50 Hz/60 Hz
Permitted power supply frequency range	48 Hz to 63 Hz
Maximum power consumption	Approx. 200 VA
Withstand voltage	1500 VAC for 1 minute between the power supply and case
External dimensions	426 (W) × 132 (H) × 450 (D) mm
Weight	Approx. 20 kg

Model and Suffix code

Model	Suffix code	Description
LS3300		AC Power Calibrator
Power cord	–D	UL/CSA standard, PSE compliant
	–F	VDE standard
	–R	AS standard
	–Q	BS standard
	–H	GB standard
	–N	NBR standard

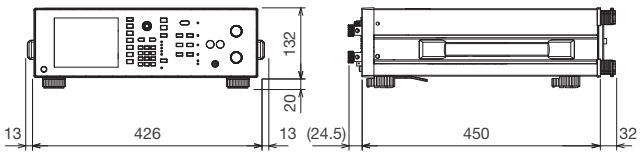
Standard accessories :
Power cord (1), B8506ZK, B8506WA (each 1), B8506ZL Alligator clip adapter set (1), Rubber feet (2 sets (4)), User's manual (1)

Rack Mounting Kits

Model	Product	Description
751535-E3	Rack mounting kit	EIA standalone installation
751535-J3	Rack mounting kit	JIS standalone installation

External dimensions

Unit: mm



Unless otherwise specified, tolerances are ±3% (however, tolerances are ±0.3 mm when below 10 mm).

Related product

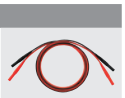
2558A AC Voltage Current Standard

Accuracy Voltage: ±0.04%
Current: ±0.05%
Stability ±50 ppm/h
Frequency range 40 to 1000 Hz
Range Voltage: 1.00 mV to 1200.0 V
Current: 1.00 mA to 60.00 A

2560A Precision DC Calibrator

Accuracy Voltage: ±0.005%
Current: ±0.007%
Stability ±10 ppm/h
Resolution 6.5 digits,
±120000 count display
Range Voltage: ±1224.00 V
Current: –12.2400 A to 36.720 A
Thermocouple, RTD

Accessories

Model	Name	Description	
B8506ZK	Measurement lead set	2 voltage output cables (red and black). 1 m. Rating 1500 V	
B8506WA	Measurement lead set	2 current output cables. 1.5 m. Rating 80 A	
758933	Measurement lead set	2 safety terminal cables (red and black). 1 m. Rating 1000 V	
758917	Measurement lead set	2 safety terminal cables (red and black). 0.75 m. Rating 1000 V	
B8506ZL	⚠ Alligator clipadapter set	2 safety terminal—alligator clip adapters (red and black). Rating 1500 V	
758929	⚠ Alligator clipadapter set	2 safety terminal—alligator clip adapters (red and black). Rating 1000 V	
758922	⚠ Alligator clipadapter set	2 safety terminal—alligator clip adapters (red and black). Rating 300 V	
758921	⚠ Fork terminal adapter	2 safety terminal—fork terminal adapters (red and black).	
758923	Spring clamp Adapter Set	2 safety terminal—spring clamp adapters (red and black).	
758931	Screw fastened Adapter Set	2 safety terminal—screw fastened adapters (red and black).	
366924	BNC Cable	Total length: 1 m	
A1421WL	USB Cable	Total length: 2 m USB2.0 Hi-Speed	

⚠ Due to the nature of this product, it is possible to touch its metal parts. Therefore, there is a risk of electric shock, so the product must be used with caution.

NOTICE
● Before operating the product, read the user's manual thoroughly for proper and safe operation.

Yokogawa's approach to preserving the global environment
- Yokogawa's electrical products are developed and produced in facilities that have received ISO14001 approval.
- In order to protect the global environment, Yokogawa's electrical products are designed in accordance with Yokogawa's Environmentally Friendly Product Design Guidelines and Product Design Assessment Criteria.

This is a Class A instrument based on Emission standards EN61326-1 and EN55011, and is designed for an industrial environment.
Operation of this equipment in a residential area may cause radio interference, in which case users will be responsible for any interference which they cause.

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YMI-KS-MI-SE04

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