The world’s best seller

WT300E Series
Digital Power Meter
The WT300E series is the enhanced version of Yokogawa’s 5th generation of compact power meters. The world’s best-selling power meter is the instrument of choice for a wide range of applications in production testing, quality assurance and Research & Development.

WT300E power meters are easy to use, cost effective and accurate for diverse applications such as the testing of electric devices, the development and evaluation of home appliances and induction cookers, battery and DC driven device testing, and conformance tests on uninterruptable power supplies.

The exceptional low power performance of the WT300E and power consumption software enables users to easily test their instruments to Energy Star, SPEC and standby power standards.

**The WT300E delivers**

**Expertise**
The WT300E represents over 30 years of reliability and innovation in the compact power meter segment. With the widest range of quality power measurement solutions, users can be confident that Yokogawa always provides the right solution for their needs.

**Performance**
WT300E power meters offer precision measurements at low cost, thus providing true customer satisfaction.

**Space**
The small footprint and compact size of the WT300E makes it ideal for ad-hoc bench use and for rack mounting.
30+ years of Compact Power Meter expertise and reliability.

- **1915** YOKOGAWA founded
- **1979** First Compact Digital Power Meter 2509
- **1992** 2534/2535
- **1995** WT110/WT130
- **2002** WT210/WT230
- **2012** WT300 series
- **2015** Latest Compact Digital Power Meter WT300E series
Features and benefits

Improvement of basic power accuracy
The WT300E series has realized basic power accuracy ±0.15% (50/60 Hz) by all measurement ranges. It is the highest level accuracy in a compact power meter category. The influence at low power factor has improved to 2 times better (0.1% of S) than that of the previous models.

Wide current ranges
The WT300E series cover broad ranges of current input from few mA up to 40 A rms. It can measure waveforms which include both AC and DC. Users can make use of it from low currents of standby power to high currents of induction cooking.

The WT300E series lineup

| WT310E series | WT310EH: 1 Input element model/High current model |
| WT330E series | WT332E: 2 Input elements model/WT333E: 3 Input elements model |

- 50 µA - 20 A
- 5 mA - 40 A

Current range and broad bandwidth

Fast display and data update rate
The fast display and 100 ms maximum data update rate of the WT300E series offers customers a short tact time in their testing procedures.

Consistent Basic Measurement Accuracy for all input ranges.

Auto data update rate function for fluctuating input
The WT300E series can chase fluctuating input frequencies like motor by changing the data update rate automatically. It can cover from the lowest 0.1 Hz input.

Users can select “AUTO” data update rate added to fixed settings of the previous models. It can detect cycles of input signal automatically and measure it correctly.

Integration measurement auto ranging function
Conventionally, when power meters operate in an integration mode to measure power consumption and standby power, the measuring ranges need to be fixed.

However, if the level of the input exceeds the maximum of the selected range, the results will be incorrect and the test will need to be repeated with higher ranges applied.

The WT300E series has a high speed automatic ranging capability in integration mode which removes this need to repeat the test and integration is continuous and accurate.

This function is not only available for ±Wh but also for Ah and DC current.

The mode of Crest Factor “6A”
In the case of Crest factor “6A”, the rated range of voltage or current is displayed up to 260% and it is possible displayed up to 280%.

When measuring with high resolution in current range, users can prevent frequent range change by the above mode.
Options and capabilities

A wide range of communication interfaces such as USB, GP-IB or RS-232 (selectable) and Ethernet (optional)

Users therefore have the flexibility to choose according to their application needs e.g. from production lines to engineering test benches. Users can use WTViewerFreePlus software to set up all kinds of measurements. Additionally, the numeric values, waveform display* and trend graphs of the measurement data can be displayed and saved.

*Waveform display requires the /G5 Harmonic option

Connectivity of Modbus/TCP*1 with YOKOGAWA’s recorders and Ethernet*1 with PLC

Measured digital data of the WT series can be acquired by YOKOGAWA’s recorder GP10*2 and GM*3 via Ethernet or Modbus/TCP directly. It is possible to make use of the GA10*2 data logging software.

And also, it can be connected with YOKOGAWA’s PLC, FA-M3V*2 by VXI-11 protocol for production fields.

*1 /C7 Ethernet option is required.
*2 GP10/GM/GA10/FA-M3V are manufactured by Yokogawa Electric Corporation.
*3 /E2 and /MC options are required.

D/A output for measurement recording

The D/A option is used to output voltage, current, power and other measured data for recording to data loggers (±5 Vdc outputs).
(WT310E/WT310EH 4 CH, WT332E/WT333E 12 CH)

Comparator Function

The WT300E series outputs +5 V, 0 V, or −5 V. To replace the output with a relay contact output, like the WT210/WT220 comparator function, provide their own relay and relay driving circuit.

Current sensor input

Users have the option to select either 2.5 V to 10 V range (/EX1 option) or 50 mV to 2 V range (/EX2 option) inputs for measuring large currents using current clamps or current sensors with voltage outputs.

Automatic zero adjustment

The WT300E series compensates for any drift in the zero level by automatically performing a zero adjustment when the input ranges are changed. This is achieved in less than 100 ms and does not require the wiring to be disconnected.
Applications

Production line or QA testing of electric devices
- Compact half rack mount size helps customers build smaller test systems with a better Return on Investment.
- D/A output function and Modbus/TCP* function for data recording
- Multiple communication interfaces. USB, RS-232 or GP-IB and Ethernet capability.

The simultaneous measurement of power consumption parameters such as U, I, P, frequency, power factor and harmonics for production line or QA testing results in reduced tact times. Thus testing is faster and lowcost. The DA output and communication interfaces enable data to be remotely and flexibly captured.

“Modbus/TCP” function is supplied with the Ethernet (/C7 option).

Testing to international standards, such as IEC62301, Energy Star and SPECpower*1
- The WT310E has a high measurement resolution of maximum 100 µW under the 5 mA range setting.
- Simultaneous measurement of normal power parameters, harmonic components and THD.
- Dynamic input capability of crest factor maximum 300 (Peak value/minimum effective RMS value)
- Free PCM software for IEC62301*2 testing

The WT310E together with the power consumption measurement (PCM) software enables users to perform standby power testing according to international standard.

*1 Coming soon
*2 The IEC62301 E2.0 is a reference standard in the EN50564: 2011 Directive. This software corresponds to a test method of those two standards.

Development and evaluation tool for home appliances
- 5 mA range helps small current measurement (WT310E)
- Auto ranging function under Integration mode
- Range skip (range configuration) function provides the ability to select the usable ranges in advance. Auto ranging enables the WT300E series to rapidly adapt to changing input conditions.

The range skip function reduces the range change transition period. The WT310E can measure both large and small currents accurately in a single test. This can reduce the total evaluation period or removes the need to use two rather than one power meters for the application, thereby saving capital cost.

Evaluation of large current equipment such as induction heaters/cookers
- Direct high current measurement up to 40 Arms without using external current sensors (WT310EH).
- Auto ranging function for Integration mode

The WT310EH allows 40 Arms to be directly inputted without the requirement to use current clamps or current sensors. This not only provides more precise measurement but also saves on investment costs. The wide current ranges are from 1 A to 40 A and voltage ranges are from 15 V to 600 V.

Users can use it for the evaluation of special waveform driven devices such as IH cookers and heaters.
Automotive—Battery or DC driven device evaluation

- Accurate DC measurement: 0.3% total (WT310EH: 0.5% total)
- Direct high current measurement up to 40 A without any external current sensor (WT310EH).
- Charge/Discharge (±Wh, ±Ah) energy measurement for batteries

The WT310EH can measure currents up to 40 A directly. This provides a cost effective and accurate method for testing DC driven devices in vehicles without having to use extra sensors.

Evaluation testing of special waveform driven devices and distorted waveforms (including DC component)

- DC, 0.1 Hz to 100 kHz broad bandwidth capability (WT310E: maximum 6 A over 30 kHz, WT310EH: Up to 20 kHz)
- Average active power measurement under integration mode

The WT300E series has a broad frequency capability of DC and from 0.1 Hz to 100 kHz. It can measure the RMS value of distorted waveforms like square waveforms or special waveform driven devices. The average active power measurement function gives accurate power consumption data for fluctuating power devices such as Intermittent waveform operated devices. Therefore the users can perform accurate distorted waveform measurements without using special mode settings.

Duration testing and efficiency measurement for industrial motors and rotating machinery

- Integration measurement for long period
- Modbus/TCP Protocol for data recording
- DC, 0.1 Hz to 100 kHz broad bandwidth capability (WT310E: maximum 6 A over 30 kHz, WT310EH: Up to 20 kHz)

The WT300E series provides reliable current integration (Ah) and energy (Wh) measurement for up to 10000 hours (approx. 1 year). The Modbus/TCP communication with /C7 option is used to save and monitor the measurement results up to maximum 200 ch. YOKOGAWA GA10 data gathering software can be used to save data along with other parameters such as temperatures, torque and rotation speed by this Modbus/TCP Protocol.

Conformance and evaluation testing of uninterruptable power supplies (UPS)

- Maximum order setting for THD calculations
- Efficiency measurements using a single power meter
- Average active power measurement under integration mode

The WT300E series enables users to conduct conformity tests according to UPS performance testing standards. The WT300E series is used to measure and calculate input & output levels, the efficiency, frequency and THD. The average active power data also provides accurate values of power consumption. The WT300E series along with the WTViewerFreePlus software helps to simultaneously measure all the necessary parameters required to test a UPS thereby reducing the evaluation time.
Software

Free PC application software
WTViewerFreePlus (included)

The WTViewerFreePlus software can capture measured numeric values, harmonic values and waveform data. The data can be transferred to a PC via a USB, GP-IB/RS-232 or Ethernet communication interface, and it can be displayed* and saved on the PC.

*Waveform display requires /G5 Harmonic option.

Setting Window
As well as using the WT300E series front panel to setup the powermeter, users can use the software to quickly set up your favorite conditions. It also shows all the setting parameters and the status at a glance. In particular, you can set up the range-skip function (range configuration setting) and specify the maximum order used for the THD calculation.

Power Consumption Measurement Software (Free)

The Power Consumption Measurement Software together with a WT310E (or another WT series instrument) provides a trustworthy power measurement solutions for testing the standby and off mode power of household products and office equipment. The solution enables testing to be performed according to the IEC62301 Ed1.0 and Ed2.0 standards which specify the use of special algorithms for determining the power stability in the device under test. The software thus gathers all the required measurement data from the WT310E, which includes not only voltage/current/power/frequency but also the total harmonic distortion (THD) and the crest factor (CF) of the AC power supply. The WT310E need to install with the harmonic option (/G5) and that a low distortion power supply is used for the test.

*The IEC62301 E2.0 is a reference standard in the EN50564: 2011 Directive. This software corresponds to a test method of those two standards.

Measurement Window
The software can display items which cannot be shown on the display of the WT300E series, such as multiple numeric measurement parameters, the harmonics data of each order, bar graphs, trend graphs and voltage & current waveforms. The free software thus adds additional performance to the WT300E series.

Multiple units & users support function
New version of WTViewerFreePlus gives the ability to connect up to four WT300E series units (with same model code). The enables to collect the measurement data from multiple units. The WT300E series provides flexibility to users by offering various communication interfaces such as USB, Ethernet, GP-IB and RS-232. With the “Device Search” feature, it allows the WT300E series to connect to the PC automatically. The software assists to set up the favorite conditions and measure power parameters up to 200 items simultaneously.

*The simultaneous measurement function might be delayed for up to one update period.
Support tools for creating dedicated programs!

LabVIEW Drivers

Data acquisition is possible using LabVIEW. LabVIEW drivers can be downloaded from our Web site. (Free of charge)

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

Programming tool samples

To help users create dedicated programs for their system, some sample programs which support Visual Basic/Visual C++/Visual Basic .NET and Visual C# are prepared*. The sample programs support communication via USB, GP-IB/RS-232 or Ethernet interfaces and can be downloaded from product web site.

* Visual Basic, Visual C++, Visual Basic .NET and Visual C# are registered trademarks of Microsoft Corporation in the U.S.A.

Comparison between WT210/230 series, WT300 series and WT300E series

Enhancement points from the WT310/WT330

<table>
<thead>
<tr>
<th></th>
<th>WT300 series</th>
<th>WT310/WT330</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic power measurement accuracy (50/60 Hz)</td>
<td>0.1% of reading + 0.05% of range</td>
<td>0.1% of reading + 0.1% of range</td>
</tr>
<tr>
<td>Influence of power factor</td>
<td>When power factor (j) = 0 (S: apparent power) ±0.1% of S for 45 Hz ≤ f ≤ 66 Hz</td>
<td>When power factor (j) = 0 (S: apparent power) ±0.2% of S for 45 Hz ≤ f ≤ 66 Hz</td>
</tr>
<tr>
<td>Frequency bandwidth</td>
<td>DC, 0 Hz to 100 Hz (WT310EH DC, 0.1 Hz to 20 kHz)</td>
<td>DC, 0 Hz to 100 Hz (WT310EH DC, 0.5 Hz to 100 kHz)</td>
</tr>
<tr>
<td>Direct input Current range</td>
<td>WT310E: 12 ranges/5 mA to 20 A, WT310EH: 6 ranges/1 to 40 A</td>
<td>WT310: 12 ranges/5 mA to 20 A, WT310HC: 6 ranges/1 to 40 A</td>
</tr>
<tr>
<td>External current input</td>
<td>EXT: 2,5/5/10 [V] (EX2: 50 m/100 m/200 m/500 m/1/2 [V] (OP))</td>
<td>EXT: 2,5/5/10 [V] (EX2: 50 m/100 m/200 m/500 m/1/2 [V] (OP))</td>
</tr>
<tr>
<td>Expansion of effective input range for voltage &amp; current (CF = 6A)</td>
<td>2% to 260%*</td>
<td></td>
</tr>
<tr>
<td>Data Update rate</td>
<td>100 m/250 m/500 m/15/30/60 sec, Auto</td>
<td>100 m/250 m/500 m/15/30/60 sec</td>
</tr>
<tr>
<td>Harmonic measurement</td>
<td>Yes (OP, /G5)</td>
<td>Yes (OP /HRM)</td>
</tr>
<tr>
<td>TTH calculation maximum order setting</td>
<td>Yes (OP, 1 to 500)</td>
<td>Yes (OP, 1 to 500)</td>
</tr>
<tr>
<td>Auto ranging of integration</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Communication interface</td>
<td>GP-IB, RS-232</td>
<td>GP-IB or RS-232</td>
</tr>
<tr>
<td>IEEE standard for GP-IB</td>
<td>IEEE488.2</td>
<td>IEEE488.2</td>
</tr>
</tbody>
</table>

* 1: WT310EH input range is 2% to 260% (20 A range only up to 200%)
* 2: WT310EH input range is 2% to 260% (20 A range only up to 220%)
* 3: Simultaneous, mode independent measurement using the WTViewerFreePlus PC software.

* A command compatible mode for the previous WT200 series is prepared. (IEEE488.2 only)

In that mode, the WT300E series and WT300 series works identically to a WT200 series except for the Store (and recall operation) and the Compare functions.

* Modbus/TCP communication requires /C7 Ethernet option.
Basic Characteristics

Example of Frequency—power Accuracy Characteristics

Total power Error with rated range input for an arbitrary power factor
(f = 50/60 Hz)

Example of frequency versus power accuracy characteristic
(power specification for cosθ = 0)

Effect of common mode voltage on reading value
(Common Voltage 600 Vrms)

*Performance of WT332E/WT333E is same as that of WT310E

Front and Rear

Key switches

1. Function setting
2. Element setting
3. U/I range setting
4. Integration setting

Standard features

5. Voltage input terminals
6. Current Input terminals
7. USB communication interface
8. GP-IB/RS-232

Optional features

9. External current sensor input
10. Ethernet
11. D/A output connector
Specifications

Input

Input terminal type
Voltage
Current
Input format
Floating input through resistive voltage divider
Floating input through shunt
Measurement range
Voltage
Current
Input impedance
Measurement range
Input terminal type
Input
Current
Direct input
Current
Direct input
Voltage
Peak value of 2.8 kV or RMS value of 2.0 kV, whichever is less.
Voltage
Peak value of 150 A or RMS value of 44.4 A, whichever is less.
External current sensor input
Peak value less than or equal to 10 times of the rated range.
Continuous maximum allowable input
Voltage
Peak value of 1.5 kV or RMS value of 1 kV, whichever is less.
Continuous maximum common mode voltage
Voltage
600 Vrms CAT II
Influence of common mode voltage
Frequency filter
Select OFF or ON (cutoff frequency of 500 Hz).
Frequency filter
Select OFF or ON (cutoff frequency of 500 Hz).
A/D converter
Simultaneous conversion of voltage and current inputs.
Resolution: 16 bits. Maximum conversion rate: Approx. 10 µs.

Accuracy
Requirement Temperature: 23 ± 5°C, Humidity: 30 to 75%RH.
Accuracy (at 12 months)
A/D converter
Simultaneous conversion of voltage and current inputs.
Resolution: 16 bits. Maximum conversion rate: Approx. 10 µs.
DC
±0.1% of reading + 0.02% of range
±0.2% of reading + 0.2% of range
±0.2% of reading + 0.2% of range
±0.2% of reading + 0.2% of range
±0.2% of reading + 0.2% of range
±0.1% of reading + 0.02% of range
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±0.1% of reading + 0.02% of range
Specifications

- **Influence of temperature changes after zero-level compensation or range change**: Add 0.02% of range + (0.0001 × I) to the DC voltage accuracy. Add the following to the DC current accuracy. WT310E: (5 mA/10 mA/20 mA/50 mA/100 mA/200 mA ranges); 5 µA; WT310EH: 0.5 A/1 A/2 A/5 A/10 A/20 A A ranges) and WT332W/WT333W direct current input: 50 µA; WT310EH direct current input: 1 mA. 
  
- **Accuracy of apparent power S**
  
- **Influence of temperature changes after zero-level compensation or range change**: Add 0.0001 × I to the DC voltage accuracy. Add the following to the DC current accuracy. WT310E: (5 mA/10 mA/20 mA/50 mA/100 mA/200 mA ranges); 5 µA; WT310EH: 0.5 A/1 A/2 A/5 A/10 A/20 A A ranges) and WT332W/WT333W direct current input: 50 µA; WT310EH direct current input: 1 mA. 
  
- **Accuracy of power Factor**
  
- **Accuracy of crest factor 6A**: Add 0.00013 × I2% of reading to the AC current accuracies. Add 0.0000001 × U2% of reading to the DC power accuracies. WT310EH: 0.0000001 × U2% of reading + 0.0000001 × U2% of range to the DC power accuracies. U is the voltage reading (V). 
  
- **Accuracy of AC power S**

**WT300E Series**

**Active Power Accuracy**

**Accuracy Requirements**

- Same as the conditions for voltage and current. 
- **Power factor**: 1 

**Accuracy at 12 months**

(The accuracy shown below is the sum of the reading and range errors.) 
- "1" in the read error equation is the input signal frequency in kHz.

**Measurements in Frequency Range**

**Data update interval**

**Measurement Frequency Range**

<table>
<thead>
<tr>
<th>Data update interval</th>
<th>Measurement Frequency Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 s</td>
<td>DC, 20 Hz ≤ f ≤ 100 kHz</td>
</tr>
<tr>
<td>0.5 s</td>
<td>DC, 10 Hz ≤ f ≤ 100 kHz</td>
</tr>
<tr>
<td>1 s</td>
<td>DC, 2 Hz ≤ f ≤ 100 kHz</td>
</tr>
<tr>
<td>2 s</td>
<td>DC, 1 Hz ≤ f ≤ 100 kHz</td>
</tr>
<tr>
<td>5 s</td>
<td>DC, 0.5 Hz ≤ f ≤ 100 kHz</td>
</tr>
<tr>
<td>10 s</td>
<td>DC, 0.2 Hz ≤ f ≤ 100 kHz</td>
</tr>
<tr>
<td>20 s</td>
<td>DC, 0.1 Hz ≤ f ≤ 100 kHz</td>
</tr>
</tbody>
</table>

**G/T**

*Limited to the measurement lower limit frequency by the Timeout setting.*

**Timeout**

<table>
<thead>
<tr>
<th>Timeout</th>
<th>Lower limit frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 s</td>
<td>2.0 Hz</td>
</tr>
<tr>
<td>5 s</td>
<td>0.5 Hz</td>
</tr>
<tr>
<td>10 s</td>
<td>0.2 Hz</td>
</tr>
<tr>
<td>20 s</td>
<td>0.1 Hz</td>
</tr>
</tbody>
</table>

*Only for direct current input of WT310EH, the maximum measurement range is 20 kHz.*

**When the line filter is turned ON**

45 to 65 Hz: Add 0.3% of reading. Less than 45 Hz: Add 1% of reading.

**Temperature coefficient**

Same as the temperature coefficient for voltage and current.

**Accuracy when the crest factor is set to 6 or 6A**

Accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 3.

**Accuracy of apparent power S**

Voltage accuracy = current accuracy

**Accuracy of reactive power Q**

Accuracy of apparent power + j(y(10000–4) – j(1–4)) = 100% of range

**Accuracy of power Factor**

a) q = j(0.0002) = [cos φ + j(sin φ)] (influence from the power factor when k = 10%)

**Accuracy of phase difference**

q = j(0.0002) + sin [influence from the power factor when k = 10%] (deg) 1 digit

When voltage and current are at the measurement range rated input

When the line filter is turned ON

45 to 65 Hz: Add 0.3% of reading. Less than 45 Hz: Add 1% of reading.
Voltage, Current, and Active Power Measurements

Measurement method
Digital sampling method

Crest factor
3 or 6 (6A)

Wiring system
WT310E, WT310EH (One element model)
Single-phase, two-wire (1P2W)
WT332E (Two element model)
Select from: single-phase, three-wire (1P3W), or three-phase, three-wire (3P3W)
WT333E (Three element model)
Select from: single-phase, three-wire (1P3W), three-phase, four-wire (3P4W), or three-voltage, three-current (3V3A)

Range select
Select manual or auto ranging.

Auto range
Range up
This range is upped when any of the following conditions are met.
• Crest factor 3: Ums or Ims exceeds 130% of the current or voltage measurement range.
• Crest factor 6: Ums or Ims exceeds 130% of the current or voltage measurement range.

Range down
This range is downed when any of the following conditions are met.
• Crest factor 3: Ums or Ims is less than or equal to 30% of the measurement range.
• Crest factor 6: Ums or Ims is less than or equal to 125% of the next lower measurement range.

Display mode switching
Select RMS (the true RMS value of the current and voltage), VOLTAGE MEAN (the rectified mean value calibrated to the RMS value of the voltage and the true RMS value of the current), or DC (simple average of voltage and current).

Measurement synchronization source
Select voltage, current, or the entire period of the data update interval for the signal used to achieve synchronization during measurement.

Line filter
Select OFF or ON (outofrequency of 500 Hz).

Peak measurement
Measures the peak value of voltage, current or power from the instantaneous voltage, instantaneous current, or instantaneous power that is sampled.

Zero-level compensation
Removes the internal offset of the WT310E/WT310EH/WT332E/WT333E.

Frequency Measurement

Calculated value

P = ∑Pi
Q = ∑Qi
S = ∑Si
Efficiency

P = cos−1 S
P = P1 + P3
Q = Q1 + Q3
S = 3P1 + 3P3

Accuracy

When the input signal level is 30% or more of the measurement range if the crest factor is set to 3, 60% or more if the crest factor is set to 6 or 6A.

* Frequency filter ON when measuring voltage or current of 200 Hz or less.

Accuracy: ±0.06% of reading

Computation
Computing equation of apparent power (S), reactive power (Q), power factor (φ), and phase angle (ϕ) and crest factor.

* For Q [var], when the current leads the voltage, the Q value is displayed as a negative value; when the current lags the voltage, the Q value is displayed as a positive value. The value of Q∑ may be negative, because it is calculated from the Q of each element with the signs included.

Lead and lag detection (Phase angle ϕ is D lead and G lag)
The lead and lag of the voltage and current inputs can be detected correctly for the following:
• Sine waves
• When the measured value is 50% or more (100% or more when the crest factor is 6 or 6A) of the measurement range
• Frequency: 30 Hz to 2 kHz (WT310EH: 1 kHz)
• Phase difference: ±5° to 175°

Scaling
Set the current sensor transformation ratio, VT ratio, CT ratio, and power factor when applying the external current sensor, VT, or CT output to the instrument.

Significant digits: Selected automatically according to significant digits in the voltage and current ranges.

Selectable range: 0.001 to 9999

Averaging
Select the method from the following two types.
• Exponential averaging method
• Moving average method

Average power during integration
Computes the average active power within the integration period.

Intigration
Mode
Select manual integration mode, standard integration mode, or repetitive integration mode.

* Auto Update Rate cannot use the Integration mode.

Timer
Automatically stops integration by setting a timer.

Selectable range: 0 hours 00 minutes 00 seconds to 10000 hours 00 minutes 00 seconds (Set automatically to manual integration mode for 0 hours 00 minutes 30 seconds)

Count overflow
WP: 999999 MWh ~ 99999 MWH, q: 999999 MAh ~ 999999 MAh

Holds the elapsed integration time and integration value and stops integration when the elapsed time of integration reaches the maximum integration time of 10200 hours or when the integrated value reaches the maximum or minimum displayable integration value (99999999 MWh or 99999999 MAh)

Accuracy
(1) Power accuracy (or current accuracy) ±0.1% of reading (fixed range)

* In the case of auto range: The measurement is not carried out during a range change.

The first measurement data after the range change is added for the period which measurement was not carried out.

Range setting
Auto range or fixed range is available for Integration.

For details on range switching, see section of "Voltage, Current, and Active Power Measurements"
**Specifications**

**Valid Frequency Ranges for Integration**
- **Active power**: DC to 45 kHz
- **DC, lower limit frequency determined by the data update interval to 45 kHz**
- **When the measurement mode is-VOLTSINE**: DC to 45 kHz
- **When the measurement mode is-VOLTAGE-DC to 45 kHz**
- **When the measurement mode is-B弑CE**: DC to 45 kHz

**Timer accuracy**: ±0.02%

**Remote control**
Start, stop and reset operations are available using an external remote signal.

**Harmonic Measurement (DG Option)**
- **Measured item**: All installed elements.
- **Method**: PLL synchronization method
- **Frequency range**: Fundamental frequency of the PLL source is in the range of 10 Hz to 1.2 kHz.

**PLL source**
- **Select voltage or current of each input element**.
  - **Input level**: 50% or more of the rated measurement range when the crest factor is 3.
  - **100% or more of the rated measurement range when the crest factor is 6 or 6A.**
  - **The frequency filter must be turned on when the fundamental frequency is less than or equal to 200 Hz.**

**FFT data length**
- **1024**

**Window function**
- **Rectangular**

<table>
<thead>
<tr>
<th>Sample rate, window width, and upper limit of analysis</th>
<th>Sample rate</th>
<th>Window Width</th>
<th>Upper Limit of Analysis orders</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Hz to 75 Hz</td>
<td>f × 12</td>
<td>1</td>
<td>75</td>
</tr>
<tr>
<td>75 Hz to 150 Hz</td>
<td>f × 512</td>
<td>32</td>
<td>150</td>
</tr>
<tr>
<td>150 Hz to 300 Hz</td>
<td>f × 256</td>
<td>16</td>
<td>300</td>
</tr>
<tr>
<td>300 Hz to 600 Hz</td>
<td>f × 128</td>
<td>8</td>
<td>600</td>
</tr>
<tr>
<td>600 Hz to 1200 Hz</td>
<td>f × 64</td>
<td>4</td>
<td>1200</td>
</tr>
</tbody>
</table>

**Frequency**
- **The upper limit of analysis orders can be decreased.**

**Accuracy**
- **The accuracy shown below is the sum of reading and range errors.**
  - When Line Filter is OFF

<table>
<thead>
<tr>
<th>Fundamental Frequency</th>
<th>Sample rate</th>
<th>Window Width</th>
<th>Upper Limit of Analysis orders</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 kHz &lt; f ≤ 5 kHz</td>
<td>f × 64</td>
<td>8</td>
<td>5 kHz</td>
</tr>
<tr>
<td>5 kHz &lt; f ≤ 10 kHz</td>
<td>f × 128</td>
<td>8</td>
<td>10 kHz</td>
</tr>
<tr>
<td>&gt;10 kHz</td>
<td>f × 512</td>
<td>32</td>
<td>512 kHz</td>
</tr>
</tbody>
</table>

**Data update interval**
- **Select 5 or 4 digits**

<table>
<thead>
<tr>
<th>Display item</th>
<th>When the number of displayed digits is 5</th>
<th>When the number of displayed digits is 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>U, I, P, S, Q*</td>
<td>99999</td>
<td>9999</td>
</tr>
<tr>
<td>f</td>
<td>1.000 to 1.000</td>
<td>1.00 to 1.00</td>
</tr>
<tr>
<td>φ</td>
<td>G180.0 to d180.0</td>
<td>G180.0 to d180.0</td>
</tr>
<tr>
<td>R**, R'*, R**</td>
<td>99999</td>
<td>9999</td>
</tr>
<tr>
<td>W, WPs, Ws, Ws*</td>
<td>When the unit is MWh or MWh</td>
<td>999999 (−999999 for negative watt hour and ampere hour)</td>
</tr>
</tbody>
</table>

**WT310E Series**

**Display type**
- 7-segment LED

**Maximum display (display range)**

<table>
<thead>
<tr>
<th>When Line Filter is OFF</th>
<th>Display A indication</th>
<th>Display resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 hours 59 minutes 59 seconds</td>
<td>0.00.00 to 99.99.99</td>
<td>1 s</td>
</tr>
<tr>
<td>100 hours 9999 hours 59 minutes 59 seconds</td>
<td>00.00 to 99.99.99</td>
<td>1 minute</td>
</tr>
<tr>
<td>10000 hours 10000 hours 1 hour</td>
<td>10000</td>
<td>1 hour</td>
</tr>
</tbody>
</table>

**Efficiency**
- **WT313/EW**
- **WT313**

<table>
<thead>
<tr>
<th>When the number of displayed digits is 5</th>
<th>When the number of displayed digits is 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>U, I, P</td>
<td>999999</td>
</tr>
<tr>
<td>W, WPs, Ws, Ws*</td>
<td>When the unit is MWh or MWh</td>
</tr>
<tr>
<td>When the measured value exceeds 140% of the rated range</td>
<td>999999</td>
</tr>
<tr>
<td>When the measured value exceeds two times of the above</td>
<td>999999</td>
</tr>
</tbody>
</table>

**Unit symbols**
- m, k, V, A, W, VA, var, °, Hz, h±, TIME, %

**Data update interval**
- **Select 0.1 s, 0.25 s, 0.5 s, 1 s, 2 s, 5 s, 10 s, 20 s or Auto.**
- **In the case of Auto Update Rate cannot use the Integration function and store the measurement data.**

**Auto range monitor**
- The indicator illuminates when the input signal meets the conditions for auto range switching.

**Overrange display**
- **Overrange**: +∞ is displayed for the following conditions.
- **Crest factor 3 or 6**

<table>
<thead>
<tr>
<th>When the measured value exceeds 140% of the rated range</th>
<th>9999999</th>
<th>999999</th>
</tr>
</thead>
<tbody>
<tr>
<td>When the measured value exceeds 110% of the rated range</td>
<td>9999999</td>
<td>999999</td>
</tr>
</tbody>
</table>

**Hold**
Holds the displayed value.

**Single update**
Updates the displayed value once each time the SINGLE key is pressed during Hold.

**MAX hold**
Holds the maximum displayed value of U, I, P, S, Q, Uspk, Ipak and Ppak.
Update Interval
100 kΩ
Minimum load
16 bits
D/A conversion resolution
Accuracy
±(accuracy of each measurement item + 0.2% of FS) (FS = 5 V)

Electrical and mechanical
Complies with IEEE St’d 488-1978 (JIS C 1901-1987)

Storage environment
Indoors
Installation location
Temperature: 5°C to 40°C

Supported services
DHCP, remote control (Vx-11, Modbus/TCP)

General Specifications
Warm-up time
Approx. 30 minutes
Operating environment
Temperature: 5°C to 40°C
Humidity: 20%RH to 80%RH (No condensation)
Elevation: 2000 m or less
Installation location
Indoors
Storage environment
Temperature: −25°C to 60°C
Humidity: 20%RH to 80%RH (No condensation)

External Current Sensor Input (/EX1 and /EX2 options)
Allows input of output voltage type current sensor signal. For detailed input specifications, see “Input.”
Measurement range of the /EX1 option
Crest factor: 3, 5, 8, 12, 24
Crest factor 3 and 5: 0.5 mA, 1 mA, 10 mA, 100 mA, 1 V, 10 V
Crest factor 8, 12, 24: 0.15 mA, 0.5 mA, 5 mA, 50 mA, 100 mA
Input range: ±5 V FS (approx. ±7.5 V maximum) against each rated value.

D/A Output (DA4, /DA12 Options)
Output voltage
±5 V FS (approx. ±7.5 V maximum) against each rated value.
Number of output channels
4 outputs for products with the /DA4
12 outputs for products with the /DA12 option
Output items
Current, Voltage, Frequency, Phase, Power Factor, Power, Energy, Time
Frequency: 50/60 Hz

Safety standard
Compliant standard EN61010-1, EN61010-2-030
Installation category (overvoltage category) CAT II
Measurement Category CAT II*2

Compliant standard EN61326-1
Class A
EN55011
Class A, Group 1
EN61000-3-2
EMC Regulatory Arrangement in Australia and New Zealand
EN61000-3-3

Immunity
Compliant standard EN61326-1 Table 2 (for industrial locations)
Influence in the immunity environment
Measurement input: Within ±30% of range
D/A output: Within ±2.5% of FS

Cable conditions
Same as the cable conditions for emission above.

*1 Applies to products with CE marks. For information on other products, contact your nearest YOKOGAWA dealer.

*2 The overvoltage category (installation category) is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. CAT II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board.

*3 This instrument is measurement category II product. Do not use it for Measurement Category III, and IV. Measurement category II applies to measurement of power source circuits, such as entrance cables to breakers. Measurement category III applies to measurement of facility circuits, such as distribution boards and circuit breakers. Measurement category IV applies to measurement of other circuits that are not directly connected to a main power supply. Measurement category II applies to electrical equipment that is powered through a fixed installation, such as a wall outlet wired to a distribution board, and to measurement performed on such wiring.

*4 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand capabilities. Pollution Degree 2 applies to industrial environments, buildings and cable systems, for low-voltage installations.

*5 Use cables of length 3 m or less.
*6 Use cables of length 5 m or less.
*7 Use cables of length 30 m or less.
### Operation of this equipment in a residential area

In a residential area, the equipment may cause radio interference. Therefore, use in such areas is not recommended. If interference occurs, use the equipment in an industrial environment.

#### Power Cord

- UL, CSA standard, PSE compliant
- VDE standard
- AS standard
- BS standard
- GB standard
- NBR standard

#### Optional function

- Ethernet interface
- Communication Interface
- DA4 D/A output (4 CH)
- GP-IB
- RS-232
- USB
- RS-422/485
- Optional function /C7 Ethernet interface
- Optional function /C7 Ethernet interface

#### Rack Mount

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Description</th>
<th>Order Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>751533-E2</td>
<td>Rack mounting kit For WT310E/WT310EH S/EIA single mount</td>
<td>1</td>
</tr>
<tr>
<td>751533-J2</td>
<td>Rack mounting kit For WT310E/WT310EH S/JIS single mount</td>
<td>1</td>
</tr>
<tr>
<td>751534-E2</td>
<td>Rack mounting kit For WT310E/WT310EH J/EIA dual mount</td>
<td>1</td>
</tr>
<tr>
<td>751534-J2</td>
<td>Rack mounting kit For WT310E/WT310EH J/JIS dual mount</td>
<td>1</td>
</tr>
<tr>
<td>751534-E3</td>
<td>Rack mounting kit For WT332E/WT333E S/EIA single mount</td>
<td>1</td>
</tr>
<tr>
<td>751534-J3</td>
<td>Rack mounting kit For WT332E/WT333E J/JIS single mount</td>
<td>1</td>
</tr>
<tr>
<td>751535-E3</td>
<td>Rack mounting kit For WT332E/WT333E EIA dual mount</td>
<td>1</td>
</tr>
<tr>
<td>751535-J3</td>
<td>Rack mounting kit For WT332E/WT333E J/JIS dual mount</td>
<td>1</td>
</tr>
</tbody>
</table>

Ask Yokogawa for information on rack mounts in which WT310E/WT310EH and WT333E/WT333E are combined.

#### 3-Year Warranty

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.

#### NOTICE

- Any company's names and product names mentioned in this document are trade names, trademarks or registered trademarks of their respective companies.

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

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### AC/DC Current Sensors

<table>
<thead>
<tr>
<th>Model</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>758917</td>
<td>Measurement lead</td>
<td>0.75 m safety terminal cable with 2 leads (red and black) in a set</td>
</tr>
<tr>
<td>701959</td>
<td>Safety mini-clip set (hook type)</td>
<td>2 pieces (red and black) in one set. Rating 1000 V</td>
</tr>
<tr>
<td>758922</td>
<td>Small alligator clip adapter</td>
<td>Safety terminal-alligator clip adapter, containing 2 pieces (red and black) in a set</td>
</tr>
<tr>
<td>758929</td>
<td>Large alligator clip adapter</td>
<td>Safety terminal-alligator clip adapter, containing 2 pieces (red and black) in a set</td>
</tr>
<tr>
<td>758921</td>
<td>Fork terminal adapter</td>
<td>Safety terminal-fork terminal adapter, containing 2 pieces (red and black) in a set</td>
</tr>
<tr>
<td>758924</td>
<td>Conversion adapter</td>
<td>BNC-binding post adapter</td>
</tr>
<tr>
<td>758933</td>
<td>Safety terminal adapter</td>
<td>Spring clamp type 2 adapters (red and black) in a set</td>
</tr>
<tr>
<td>758931</td>
<td>Safety terminal adapter</td>
<td>Screw-in type 2 adapters (red and black) in a set</td>
</tr>
<tr>
<td>705926</td>
<td>Connection Cable</td>
<td>26-pin cable for options DA4 and DA12</td>
</tr>
</tbody>
</table>

#### Clamp on Probe

<table>
<thead>
<tr>
<th>Model</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>751552</td>
<td>Current Clamp on Probe</td>
<td>AC 1000 Arms (1400 Apeak)</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Model</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
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<td>Safety mini-clip set (hook type)</td>
<td>2 pieces (red and black) in one set. Rating 1000 V</td>
</tr>
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<td>758933</td>
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<td>Spring clamp type 2 adapters (red and black) in a set</td>
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<tr>
<td>758931</td>
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<tr>
<td>705926</td>
<td>Connection Cable</td>
<td>26-pin cable for options DA4 and DA12</td>
</tr>
</tbody>
</table>

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**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.

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