

WT300 SERIES

DIGITAL POWER METER

THE 5TH GENERATION OF THE WORLD'S BEST SELLING POWER METER



High Performance and Reliability

- Basic Accuracy of 0.1% of Reading
- Low Current Measurement down to 50 micro-Amps
- DC, 0.5 Hz to 100 kHz Frequency Range
- Standard USB, and GPIB or RS232 Interfaces





Yokogawa's new compact WT300 series for reliable power measurement

The WT300 series is the 5th generation of Yokogawa's compact power meter portfolio. The world's best selling power meter is the power meter of choice in multiple industries from production lines to R&D applications.



YOKOGAWA WT310HC Buttle, PONTE NATION

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WT310(1ch)

WT310HC(1ch, MAX40A)

WT332(2ch)/WT333(3ch)

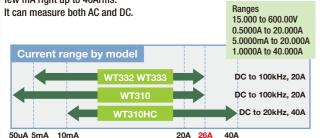
Wide current input range with high performance and reliability

Wide current input ranges

Fast display and data update rate

0.1% of reading + 0.1% of range (50Hz/60Hz)

The WT300 series offers customers a wide range of current inputs from a few mA right up to 40Arms.



The fast display and 100ms maximum data update rate of the WT300 series

offers customers a short tact time in their testing procedures.

Consistent Basic Measurement Accuracy for all input ranges.

Simultaneous measurement of all parameters

A WT300 series can measure all DC and AC parameters. It can also measure harmonics and perform integration simultaneously without changing the measurement mode. The WTViewerFreePlus software is used to monitor and save all these parameters.



Example of WTViewerFreePlus display

Convenient measurement functions

- MAX hold function

The maximum values of RMS/PEAK voltage & current active power, reactive power and apparent power can be held.

- Line filter and frequency filter capability

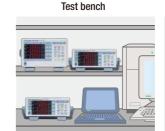
These filter functions will cut off unnecessary noise & harmonic components for fundamental waveform measurements.

PC, Data Logger and External Sensors connectivity

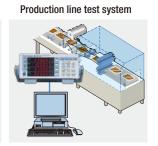
The WT300 series offers a wide range of communication interfaces such as USB, GP-IB or RS-232 (Selectable) and Ethernet (Optional).

Customers therefore have the flexibility to choose according to their application needs e.g. from production lines to engineering test benches. Customers 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







D/A output for measurement recording

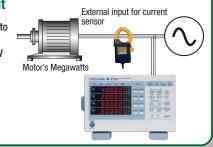
The D/A option is used to output Voltage, Current, Power and other measured data for recording to data loggers (+/-5Vdc outputs).

(WT310/WT310HC 4CH, WT332/WT333 12CH)



Current sensor input

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



First in Class* and First in Industry*

First in class: Auto ranging function available in selected ranges

The auto-range function is used to select/change the range automatically in specific ranges. This results in shorter range changing times and thus quicker and more efficient testing.

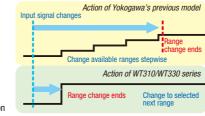


Image of Range skip (configuration) function operation

First in industry: 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 WT300 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.

* According to YOKOGAWA survey by Dec, 2012

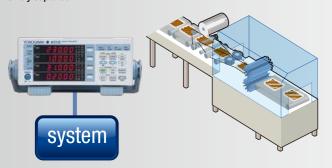
WT300 power meters are easy to use, cost effective and accurate for a wide range of applications in Production, Testing, Evaluation and R&D.

For Home appliances and Office equipment

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 (ROI).
- D/A output function for data recording
- Multiple communication interfaces, USB, RS-232 or GP-IB and Ethernet capability.

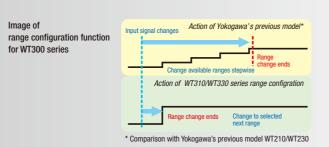
The simultaneous measurement of power consumption parameters such as U. I. P. frequency. Power Factor and Harmonics for production line or QA testing results in reduced tact times. Thus testing is faster and cheaper. The DA output and communication interfaces enable data to be remotely and



Development and evaluation tool for home appliances

- 5mA range helps small current measurement (WT310)
- 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 WT300 series to rapidly adapt to changing input conditions.

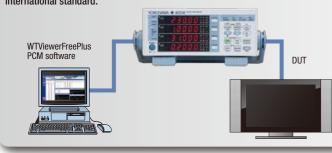
The range skip function reduces the range change transition period. The WT310 can measure both large and small currents accurately in a single test. This can reduce the total evaluation period or removes the need to use two rather than one power meters for the application, thereby saving capital cost,



Testing to international standards, such as IEC62301. **Energy Star and SPECpower**

- The WT310 has a high measurement resolution of Max. 100µW under the 5mA range setting.
- Simultaneous measurement of normal power parameters. harmonic components and THD.
- Dynamic input capability of crest factor Max 300 (Peak value / minimum effective RMS value)
- Free PCM software for IEC62301 testing

The WT310 together with the power consumption measurement (PCM) software enables users to perform standby power testing according to international standard



Evaluation of large current equipment such as Induction Heaters/Cookers

- Direct high current measurement up to 40Arms without using external current sensors (WT310HC).
- Auto ranging function for Integration mode

The WT310HC allows 40Arms 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 1A to 40A and voltage ranges are from 15 V to 600 V. Customers can use it for the evaluation of special waveform driven devices such as IH cookers and heaters.



Please visit the URL below which shows many applications and examples. It will be regularly updated with the latest applications.

For Industrial equipment and Transportation

Automotive - Battery or DC driven device evaluation

- Accurate DC measurement: 0.3% total (WT310HC: 0.5% total)
- Direct high current measurement up to 40A without any external current sensor (WT310HC).
- Charge/Discharge (+/-Wh, +/-Ah) energy measurement for batteries

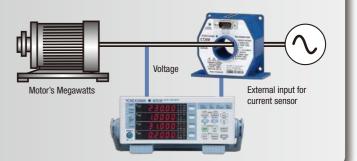
The WT310HC can measure currents up to 40A directly. This provides a cost effective and accurate method for testing DC driven devices in vehicles without having to use extra sensors.



Duration testing and efficiency measurement for industrial motors and rotating machinery

- Integration measurement for long period
- D/A output function for data recording
- DC, 0.5Hz to 100kHz broad bandwidth capability

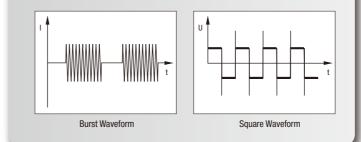
The WT300 series provides reliable current integration (Ah) and Energy (Wh) measurement for up to 10,000 hours (approx. 1 year). The D/A option is used to save and monitor the measurement results (WT310/WT310HC: 4ch, WT332/WT333: 12ch). An external recorder or data logger like, a ScopeCorder, can be used to save this D/A function data along with other parameters such as temperatures, torque and rotation speed.



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

- DC, 0.5Hz to 100kHz broad bandwidth capability
- Average active power measurement under integration mode

The WT300 series has a broad frequency capability of DC and from 0.5Hz to 100kHz. 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 burst waveform operated devices. Therefore the customer can perform accurate distorted waveform measurements without using special mode settings.



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 WT300 series enables users to conduct conformity tests according to UPS performance testing standards. The WT300 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 WT300 series along with the WTViewerFreePlus software helps to simultaneously measure all the necessary parameters required to test a UPS thereby reducing the evaluation time.



http://tmi.yokogawa.com/technical-library/application-notes/

WTViewerFreePlus For WT300 Series (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

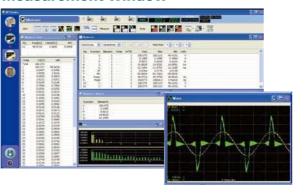
* Waveform display requires /G5 Harmonic option.

Setting Window



As well as using the WT300 series front panel to setup the powermeter, you 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.

Measurement Window



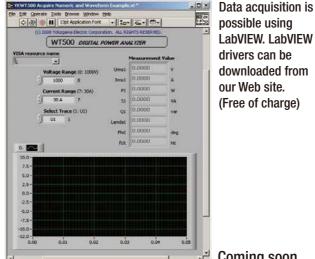
The software can display items which cannot be shown on the display of the WT300 series, such as multiple numeric measurement parameters, the harmonics data of each order, bar graphs, trend graphs and voltage & current waveforms. The free software thus adds additional performance to the WT300 series.

* Please check the Instruction manual in the CD for more information

Support tools for creating dedicated programs!

LabVIEW Drivers

* LabVIEW is a registered trademark of NATIONAL INSTRUMENTS Corporation in the U.S.A.

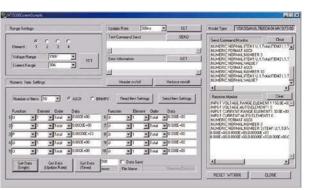


possible using LabVIEW. LabVIEW drivers can be downloaded from our Web site. (Free of charge)

Coming soon

Programming tool samples

To help you create dedicated programs for your system, we provide sample programs which support Visual Basic/Visual C++/Visual Basic .NET and Visual C# *. The sample programs support communication via USB, GP-IB/RS-232 or Ethernet interfaces and can be downloaded from our Web site.



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

Standby power measurement conforming to IEC62301 Ed2.0

Power Consumption Measurement Software (Free)

The Power Consumption Measurement Software together with a WT310 (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 WT310, 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. We therefore also recommend that the WT310 is installed with the harmonic option (/G5) and that a low distortion power supply is used for the test.



Configuring and Establishing a New Connection between the WT310



Comparison between WT210/230 series and WT310/330 series

| | | WT310/WT332/WT333 | WT310HC | WT210/WT230 |
|-------------------------------|---|--|--|--|
| DC power measurement accracy | | 0.1% of reading+0.2% of range | 0.3% of reading+0.2% of range | 0.3% of reading+0.2% of range |
| | | 5m/10m/20m/50m/100m/200m/ | | 5m/10m/20m/50m/100m/200m/ |
| Current range | Direct input | 0.5/1/2/5 /10/20[A] (WT310) | 1/2/5/10/20/40[A] | 0.5/1/2/5 /10/20[A] (WT210) |
| (Crest factor=3) | | 0.5/1/2/5/10/20[A] (WT332/WT333) | | 0.5/1/2/5/10/20[A] (WT230) |
| | External current input | EX1: 2.5//5/10[V] | EX1: 2.5//5/10[V] | EX1: 2.5/5/10[V] |
| | External current input | EX2: 50m/100m/200m/500m/1/2[V] (0P.) | EX2: 50m/100m/200m/500m/1/2[V] (OP.) | EX2: 50m/100m/200m[V] (0P.) |
| Effective input range for vol | tage & currnet (CF=3) | 1% to 130% | 1% to 100% (40A range only) | 1% to 130% |
| Maximum displaying value | for voltage & current (CF=3) | 1% to 140% | 1% to 110% (40A range only) | 1% to140% |
| | | Power reading x {power reading error + | Power reading x (power reading error + | Add the power reading x |
| | 0 <pf<1< td=""><td>(power range / apparent power reading) +</td><td>(power range / apparent power reading) +</td><td>$\{ tan \emptyset \ x \ (influence \ when \ PF = 0) \}\%.$</td></pf<1<> | (power range / apparent power reading) + | (power range / apparent power reading) + | $\{ tan \emptyset \ x \ (influence \ when \ PF = 0) \}\%.$ |
| | | tanØ x (influence when PF = 0)} % | tanØ x (influence when PF = 0)} % | |
| Simultaneous measuremen | t of RMS, VotageMEAN & DC | Yes *1 | Yes *1 | No |
| Frequecy measurement | | 2 channels (voltage and current) | 2 channels (voltage and current) | selected voltage or current (one) |
| Number of display item | | 4 items | 4 items | 3 items |
| Sampling rate | | Approximately 100 kS/s | Approximately 100 kS/s | Approximately 50 kS/s |
| Harmoinc measurement | | Yes (OP, / G5) | Yes (OP, / G5) | Yes (OP, / HRM) |
| THD calculation maximum (| order setting | Yes (OP, 1-50th) | Yes (OP, 1-50th) | No |
| Auto ranging of integaration | 1 | Yes | Yes | No |
| | USB | Yes | Yes | No |
| Communication interface | GP-IB | Yes GP-IB or RS-232 | Yes GP-IB or RS-232 | Yes (OP) GP-IB or RS-232C |
| CONTINUING AUGIT INTENIACE | RS-232 | Yes GP-IB or RS-232 | Yes GP-IB or RS-232 | Yes (OP) GP-IB or RS-232C |
| | Ethernet | Yes (OP) | Yes (OP) | No |
| IEEE stanndard for GP-IB | | IEEE488.2 | IEEE488.2 | IEEE488.1 and IEEE488.2 |
| Comparetor function | | No | No | Yes |
| Viewer software (setting & o | data capturing) | Free (included) | Free (included) | Free (download) |

*1: 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 WT300 series works identically to a WT200 series except for the Store (and recall operation) and the Compare functions

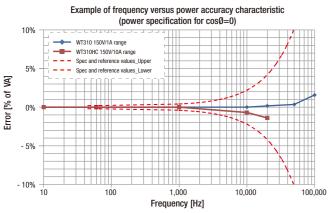
Superior points

Rear View

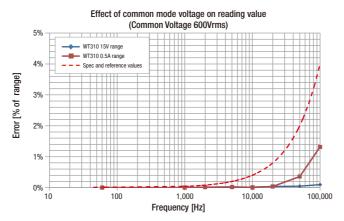
- **1** Voltage input terminals
- Current Input terminals
- **6** External current sensor input
- USB communication interface
- GP-IB/RS-232 (Standard)
- (i) Ethernet (Optional)
- D/A output connector







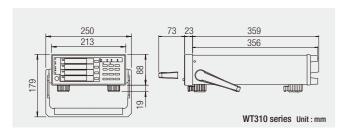
Total power Error with rated range input for an arbirtary power factor 0.01% 0.100 0.001 0.010 1 000

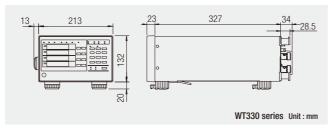


Power Factor

* Performance of WT332/WT333 is same as that of WT310

Exterior View





Specification

| Input | | | Crest factor 3: |
|---------------------|---|-----------------|---|
| Item | Specifications | | EX1: 2.5V/5V/10V or EX2: 50mV/100mV/200mV/500mV/1V/2V |
| Input terminal type | Voltage | | Crest factor 6: |
| | Plug-in terminal (safety terminal)) | | EX1: 1.25V/2.5V/5V or EX2: 25mV/50mV/100mV/250mV/500mV/1V |
| | Current | Input impedance | Voltage |
| | Direct input: Large binding post | | Input resistance: Approx. 2 MΩ, input capacitance: Approx. 13 pF in parallel |
| | External current sensor input option: isolated BNC connector | | with the resistance |
| Input format | Voltage | | Current |
| | Floating input through resistive voltage divider | | Direct input |
| | Current | | • WT310 |
| | Floating input through shunt | | Crest factor 3: 5mA/10mA/20mA/50mA/100mA/200mA |
| Measurement range | Voltage | | Crest factor 6: 2.5mA/5mA/10mA/25mA/50mA/100mA |
| | Crest factor 3: 15V/30V/60V/150V/300V/600V | | at the above range setting, |
| | Crest factor 6: 7.5V/15V/30V/75V/150V/300V | | Input resistance: Approx. 500mΩ, |
| | Current | | Input inductance: Approx. 0.1uH in series with the resistance |
| | Direct input: | | Crest factor 3: 0.5A/1A/2A/5A/10A/20A |
| | Crest factor 3: | | Crest factor 6: 0.25A/0.5A/1A/2.5A/5A/10A |
| | WT310: 5mA/10mA/20mA/50mA/100mA/200mA/0.5A/1A/2A/5A/10A/20A | | at the above range setting, |
| | WT310HC: 1A/2A/5A/10A/20A/40A | | Input resistance: Approx. 6 m Ω + 10 m Ω (max)*Factory setting |
| | WT332 and WT333: 0.5A/1A/2A/5A/10A/20A | | Input inductance: Approx. 0.1uH in series with the resistance |
| | Crest factor 6: | | • WT310HC |
| | WT310: 2.5mA/5mA/10mA/25mA/50mA/100mA/0.25A/0.5A/1A/2.5A/5A/10A | | Crest factor 3: 1A/2A/5A/10A/20A/40A |
| | WT310HC: 0.5A/1A/2.5A/5A/10A/20A | | Crest factor 6: 0.5A/1A/2.5A/5A/10A/20A |
| | WT332 and WT333: 0.25A/0.5A/1A/2.5A/5A/10A | | Input resistance: Approx. 5mΩ,input inductance: Approx. 0.1uH in series |
| | External current sensor input (/EX1,/EX2): | | with the resistance |

Specification

 WT332/WT333 Crest factor 3: 0.5A/1A/2A/5A/10A/20A Crest factor 6: 0.25A/0.5A/1A/2.5A/5A/10A Crest factor 3: 2.5V/5V/10V

Crest factor 3: 2.5V/5V/10V Crest factor 6: 1.25V/2.5V/5V Crest factor o: 1.25/vt.25/v/S plup fresitance: Approx. 100kΩ input resistance: Approx. 100kΩ
• External current sensor input (/EX2): Crest factor 3: 50mV/100mV/200mV/500mV/1V/2V Crest factor 6: 25mV/50mW/100mV/250mV/500mV/1V input resistance: Approx. 20kΩ

Instantaneous maximum

Peak value of 2.8 kV or RMS value of 2.0 kV, whichever is less.

Crest factor 3: 5mA/10mA/20mA/50mA/100mA/200mA Crest factor 6: 2.5mA/5mA/10mA/25mA/50mA/100mA at the above range setting, Peak value of 150A or RMS value of 100 A, whichever is less. Crest factor 3: 0.5A/1A/2A/5A/10A/20A

Crest factor 6: 0.25A/0.5A/1A/2.5A/5A/10A orest factor 3: 1A/2A/5A/10A/20A/40A

Crest factor 6: 0.5A/1A/2.5A/5A/10A/20A Peak value of 450A or RMS value of 300 A, whichever is less

Peak value of 450 A of HMS value of 300 A, whichever is less External current sensor input Peak value less than or equal to 10 times of the rated range. WT332/MT332 Crest factor 3: 0.5A/1A/2A/5A/10A/20A Crest factor 6: 0.25A/0.5A/1A/2.5A/5A/10A Peak value of 450A or RMS value of 300 A, whichever is less

allowable input

Peak value of 2kV or RMS value of 1.5kV, whichever is less

Peak value of 2kV of HMS value of 1.5kV, whichever is less Current

• Direct input

• WT310

Crest factor 3: 5mA/10mA/20mA/50mA/100mA/20mA Crest factor 6: 2.5mA/5mA/10mA/25mA/50mA/100mA

at the above range setting, Peak value of 30A or RMS value of 20A, whichever is less. Crest factor 3: 0.5A/1A/2A/5A/10A/20A

crest factor 6: 0.25A/0.5A/1A/2.5A/5A/10A
at the above range setting,
Peak value of 150A or RMS value of 40A, whichever is less.

Crest factor 3: 1A/2A/5A/10A/20A/40A Crest factor 6: 0.5A/1A/2.5A/5A/10A/20A

Peak value of 150A or RMS value of 44A, whichever is less.

Peak value of 150A or RIMS value of 44A, whitchever is less.

WT332WT333
Crest factor 3: 0.5A/1A/2A/5A/10A/20A
Crest factor 6: 0.25A/0.5A/1A/2.5A/5A/10A
Peak value of 150A or RIMS value of 40A, whichever is less.

 External current sensor input Peak value less than or equal to 10 times of the rated range

Continuous maximum

Peak value of 1.5kV or RMS value of 1kV, whichever is less.

Crest factor 3: 0.5A/1A/2A/5A/10A/20A Crest factor 6: 0.25A/0.5A/1A/2.5A/5A/10A

at the above range setting, Peak value of 100A or RMS value of 30A, whichever is less. Crest factor 6: 2.5mA/10mA/20mA/25mA/100mA/100mA/200mA

at the above range setting, Peak value of 30A or RMS value of 20A, whichever is less.

 WT310HC Crest factor 3: 1A/2A/5A/10A/20A/40A

Crest factor 3: 1A/2A/5A/10A/20A/40A Crest factor 6: 0.5A/1A/2.5A/5A/10A/20A Peak value of 100A or RMS value of 44A, whichever is less. • WT332/WT333 Crest factor 3: 0.5A/1A/2A/5A/10A/20A Crest factor 6: 0.25A/0.5A/1A/2.5A/5A/10A

Peak value of 100A or RMS value of 30A, whichever is less.

External current sensor input

Peak value less than or equal to 5 times of the rated range.

Continuous maximum Common- mode voltage (during 50/60 Hz input)

600Vrms CAT II

Influence of common
mode voltage
When 600 Vrms is applied between the input terminal and with the voltage input
terminals shorted, current input terminals open and external current sensor input Double the following values when the crest factor is set to 6.

At 50/60 Hz

At 50/60 Hz

-80 dB or more (±0.01% of range or less)
Up to 100 kHz (reference value)
0.01% of range or more. f is frequency of input signal in kHz.
15 V, 30 V, 60 V, 150 V, 300 V, 600 V ranges, 0.5 A, 1 A, 2 A, 5 A, 10 A, 20 A ranges of WT310/WT332/WT332, 1 A, 2 A, 5 A, 10 A, 20 A, 40A ranges of WT310HC and, external current sensor input (/EX2 Option)

W1310HC and, external current sensor input (PAZ Option)
Within ± {\begin{align*} (Maxmum rated range) \times 0.001 \times f\) of range} \end{align*} \times 0.001 \times f\) of range
The maximum rated range is 600 V for the voltage input terminal and 20 A for the current input of WT310/WT332/WT333 and 40 A for the current input terminal of WT310HC and 2 V for option /EV2.

• 5mA, 10mA, 20mA, 50mA, 100mA and 200mA range of WT310

Within ± { (Maxmum rated range) × 0.0002 × f% of range} The Maximum rated range) = 0.0002 × f% of range The Maximum rated range is 20A.

• External current sensor input (/EX1 Option) ranges Within ± { (Maxmum rated range) × 0.01 × f% of range} The maximum rated range is 10 V

| | THE HIGHINGH FALCUTATION IS TO V |
|------------------|---|
| Line 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. 10us.

Voltage and Current Accuracy Temperature: 23±5°C, Humidity: 30 to 75%RH... Temperature: 25±3 v, Horniusy 3 ob 1734ms, Input waveform: Sine wave, Crest factor: 3, Common-mode voltage: 0 V Scaling function: OFF, Number of displayed digits: 5 digits Frequency filter: Turn ON to measure voltage or current of 200 Hz or less After warm-up time has passed After zero-level compensation or measurement range is changed

Accuracy (at 12 months) (The accuracy shown below is the sum of reading and range errors.)
* f in the read error equation is the input signal frequency in kHz

| | i ili ulc read error equali | on is the imput signal frequency i | II KIIZ. |
|-----------------------|-----------------------------|------------------------------------|------------------------|
| | WT310,WT330 | WT310HC | WT310HC |
| | (Voltage/Current) | (Voltage, Current EXT | (Current Direct input) |
| | | sensor input) | |
| DC | ±(0.1% of reading | ±(0.1% of reading | ±(0.2% of reading |
| | +0.2% of range) | +0.2% of range) | +0.2% of range) |
| $0.5Hz \le f < 45Hz$ | ±(0.1% of reading | ±(0.1% of reading | ±(0.1% of reading |
| | +0.2% of range) | +0.2% of range) | +0.2% of range) |
| $45Hz \le f \le 66Hz$ | ±(0.1% of reading | ±(0.1% of reading | ±(0.1% of reading |
| | +0.1 % of range) | +0.1 % of range) | +0.1 % of range) |
| $66Hz < f \le 1kHz$ | ±(0.1% of reading | ±(0.1% of reading | ±(0.1% of reading |
| | +0.2 % of range) | +0.2 % of range) | +0.2 % of range) |
| $1kHz < f \le 10kHz$ | ±{(0.07×f)% of reading | ±{(0.07×f)% of reading | ±((0.13*f)% of reading |
| | +0.3 % of range} | +0.3 % of range} | +0.3 % of range) |
| $10kHz < f \le 20kHz$ | | | ±((0.13*f)% of reading |
| | | | +0.5 % of range) |
| | ±(0.5 % of reading | ±(0.5 % of reading | |
| 10kHz < f ≤ 100kHz | +0.5 % of range) | +0.5 % of range) | |
| | ±[{0.04×(f-10)}% of reading | ±[{0.04×(f-10)}% of reading | |

Influence of temperature changes after zero-level compensation or range change
Add 0.02% of range/°C to the DC voltage accuracy. Add the following value to the DC current accuracies.
WT310 (SmA/10mA/20mA/50mA/100mA/20mA ranges): 5uA/°C
WT310 (0.5A/1A/2A/5A/10A/20A ranges) and WT330 direct current input: 500uA/°C

WT310 (0.5A/TA/2A/SA/10A/2OA ranges) and WT330 direct current input: 500uA/°C WT310HC direct current input: 1mA/°C External current sensor input (/EXI): 1mV/°C External current sensor input (/EXI): 50uV/°C • Accuracy of the waveform display data, Upk and Ipk Add the following value to the above accuracy (reference value). The effective input range is within ±300% of range (within ±500% for crest factor 6) Voltage input: 1.5 × √(15/range) % of range Direct current input range:

WT310 (5mA/10mA/20mA/50mA/100mA/200mA range): 3 × √(0.005/range) % of range WT310 (0.5A/1A/2A/5A/10A/20A range) and WT330 direct current input: 3 × √(0.5/range) % of range WT310HC direct current input: 3 × √(1/range) % of range External current sensor input range:

/EXI 0ption: 3 × √(2.5/range) % of range
/EXI 0ption: 3 × √(2.5/range) % of range
/EXI 0ption: 3 × √(0.05/range) % of range
/Influence of self-generated heat caused by voltage input
Add 0.0000001 xL⁰% of reading to the AC voltage accuracies.
Add 0.000001 xL⁰% of reading + 0.000001 xL⁰% of range to the DC current accuracies. U is the voltage reading (I).

voltage reading (V).

Influence of self-generated heat caused by voltage input lasts until falling the temperature of the input resistor even if voltage input decreases.

Influence of self-generated heat caused by current input

W1310: $Add \ 0.00013 \times l^2\% \ of \ reading \ to \ the \ AC \ current \ accuracies.$ $Add \ 0.00013 \times l^2\% \ of \ reading \ + 0.004 \times l^2 \ mA \ (0.5A/1A/2A/5A/10A/20A \ range) \ or \ 0.00013 \times l^2\% \ of \ reading \ + 0.00004 \times l^2 \ mA \ (5mA/10mA/20mA/20mA/20mA \ range), \ to \ the \ DC \ current \ accuracies.$ I is the current reading (A).

Add $0.00006 \times l^{2}\%$ of reading to the AC current accuracies. Add $0.0006 \times l^{2}\%$ of reading + 0.001 $\times l^{2}$ mA to the DC current accuracies. I is the current reading (A).

Add $0.00013 \times l^2\%$ of reading to the AC current accuracies.

Add 0.00013 × F% of reading to the AC current accuracies.

Add 0.00013 × F% of reading the 0.002 × F mA to the DC current accuracies. I is the current reading (A). Influence of self-generated heat caused by current input lasts until falling the temperature of the shunt resistor even if current input decreases.

Accuracy changes caused by data update interval

When the data update interval is 100 ms, add 0.05% of reading to the 0.5Hz to 1kHz accuracy.

**Guaranteed accuracy ranges for frequency, voltage, and current All accuracy figures for 0.5 to 10 Hz are reference values

The current accuracy figures for DC, 10 Hz to 45 Hz, and 400 Hz to 100 kHz when the current exceeds 20 A are reference values.

Active Power Accuracy

1 to 130% with respect to the rated range of voltage or current. (It displays up to140%) * W1310HC: 40ARange Only 1 to 100%(display is 110%) (Add the reading error \times 0.5 to above accuracies for the range of 110% to 130% of the Measurement Frequency Range Measurement

DC, $25Hz \le f \le 100kHz$ DC, $10Hz \le f \le 100kHz$ DC, $5Hz \le f \le 100kHz$ DC, $2.5Hz \le f \le 100kHz$ DC, $2.5Hz \le f \le 100kHz$ DC, $1.5Hz \le f \le 100kHz$ DC, $0.5Hz \le f \le 100kHz$ Only for direct current input of WT310HC, the maximum measurement range is 20kHz. 45 to 66 Hz: Add 0.2% of reading. When the line filter is 45 to 6 nz: Add 0.2% of reading.
Less than 45 Hz: Add 0.5% of reading.
Add: ±0.03% of reading/°C within the range 5 to 18°C or 28 to 40°C.
Accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 3. crest factor is set to 6

Same as the conditions for voltage and current Power factor: 1 Accuracy (at 12 months)
(The accuracy shown below is the sum of reading and range errors.)

* f in the read error equation is the input signal frequency in kHz.

| | WT310, WT332, WT333, WT310HC (Current EXT sensor input) | WT310HC (Current Direct input) |
|-----------------------|---|--|
| DC | ±(0.1% of reading+0.2% of range) | ±(0.3% of reading+0.2% of range) |
| 0.5Hz ≤ f < 45Hz | ±(0.3% of reading+0.2% of range) | ±(0.3% of reading+0.2% of range) |
| 45Hz ≤ f ≤ 66Hz | ±(0.1% of reading+0.1 % of range) | ±(0.1% of reading+0.1 % of range) |
| 66Hz < f ≤ 1kHz | ±(0.2% of reading+0.2 % of range) | ±(0.2% of reading+0.2 % of range) |
| $1kHz < f \le 10kHz$ | \pm (0.1% of reading+0.3 % of range) \pm [{0.067×(f-1)}% of reading] | ±((0.13*f)% of reading+0.3 % of range) |
| $10kHz < f \le 20kHz$ | | ±((0.13*f)% of reading+0.5 % of range) |
| 10kHz < f ≤ 100kHz | ±(0.5 % of reading+0.5 % of range) +[{0.09×(f-10)}% of reading] | |

Timer accuracy Remote control

| 5 | pec | ПС | auol |
|---|-----|----|------|
| | | | |

| Add the product of the vo DC voltage accuracy: 0.0 | changes after zero-level compensation or range change oltage influence and the current influence listed below to the DC power accuracies. 12% of range/°C |
|--|---|
| | nA/50mA/100mA/200mA ranges): 5uA/°C 10A/20A ranges) and WT330 direct current input: 500uA/°C input: 1mA/°C |
| External current sensor is | nput (/EX1): 1mV/°C |
| External current sensor in Influence of self-generate | nput (/EX2): 50uV/°C ed heat caused by voltage input |
| Add 0.0000001 ×U ² % of Add 0.0000001 ×U ² % of | f reading to the AC power accuracies. f reading to the AC power accuracies. f reading \pm 0.0000001 \times U ² % of range to the DC power accuracies. U is the voltage reading |
| (V). Influence of self-generat | ed heat caused by voltage input lasts until falling the temperature of the input resistor even |
| if voltage input decrease Influence of self-generate NT310: | is. ed heat caused by current input |
| Add $0.00013 \times l^2$ % of re $0.00004 \times l^2$ mA (5mA/1 | ading to the AC power accuracies. adding 4.004 \times PM \times |
| | ading to the AC power accuracies. ading \pm 0.001 \times $^{\circ}$ mA to the DC power accuracies. I is the current reading (A). |
| NT330: | ading to the AC power accuracies. |
| Add 0.00013 × I ² % of real Influence of self-generatif current input decrease | ading $+ 0.002 \times l^2$ mA to the DC power accuracies. I is the current reading (A). each heat caused by current input lasts until falling the temperature of the shunt resistor ever is. |
| Guaranteed accuracy ran | nterval is 100 ms, add 0.05% of reading to 0.5Hz to 1kHz accuracy. nges for frequency, voltage, and current |
| The power accuracy figureference values. | .5 to 10 Hz are reference values ures for DC, 10 Hz to 45 Hz, and 400 Hz to 100 kHz when the current exceeds 20 A are |
| nfluence of power factor | When power factor (λ) = 0(S: apparent power) • \pm 0.2% of S for 45 Hz \leq f \leq 66 Hz. |
| | ±{(0.2 + 0.2 × f)% of S} for up to 100 kHz as reference data. |
| | f is frequency of input signal in kHz. When $0 < \lambda < 1$ (Ø: phase angle of the voltage and current) |
| | (power reading) × [(power reading error %) + (power range error %) × (power range/indicated apparent power value) + |
| | $\{\tan\emptyset \times (\inf \ \lambda = 0)\%\}$ |
| When the line filter is turned ON | 45 to 66 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 | 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 | Accuracy of apparent power $+(\sqrt{-1.0004} - \lambda^2)(\sqrt{-1} - \lambda^2) \times 100 \%$ of range |
| reactive power Q Accuracy of power | $\pm [(\lambda - \lambda /1.0002) + \cos\emptyset - \cos\{\emptyset + \sin^{-1}(\inf \text{luence from the power factor when }\lambda]]$ |
| Factor λ | = 0%/100)}l] ± 1 digit |
| Accuracy of phase | when voltage and current are at the measurement range rated input $\pm [\emptyset - \cos^{-1}(\lambda/1.0002) + \sin^{-1}\{(\text{influence from the power factor when } \lambda = 0\%)/100\}]$ |
| difference Ø | deg ± 1 digit when voltage and current are at the measurement range rated input |
| Voltage Current and Act | |
| Voltage, Current, and Acti Item | Specifications |
| Measurement method Crest factor | Digital sampling method 3 or 6 |
| Wiring system | WT310, WT310HC (One element model) |
| | Single-phase, two-wire (1P2W) WT332 (Two element model) |
| | Select from single-phase, two-wire (1P2W); single-phase, |
| | three-wire (1P3W); or three-phase,three-wire (3P3W) |
| | WT333 (Three element model) |
| | Select from single-phase, two-wire (1P2W); single-phase, |
| Daniel adam | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). |
| A | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase,three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. Range increase |
| A | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. Range increase • The range is upped when any of the following conditions is met. |
| A | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. Range increase The range is upped when any of the following conditions is met. Urms or Irms exceeds 130% of the currently set measurement range. Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set |
| A | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. Range increase • The range is upped when any of the following conditions is met. • Urms or Irms exceeds 130% of the currently set measurement range. • Crest factor 3: Upk, Ipk value of the input signal exceeds 300% of the currently set measurement range. |
| A | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. Range increase The range is upped when any of the following conditions is met. Urms or Irms exceeds 130% of the currently set measurement range. Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range, On the WT330, when any of those input elements meets the above condition, the range is increased the next time the measured value is updated. |
| A | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. Ange increase • The range is upped when any of the following conditions is met. • Urms or Irms exceeds 130% of the currently set measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range, On the WT330, when any of those input elements meets the above condition, the |
| A | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. Range increase The range is upped when any of the following conditions is met. Urms or Irms exceeds 130% of the currently set measurement range. Crest factor 3: Upk, Ipk value of the input signal exceeds 300% of the currently set measurement range. Crest factor 6: Upk, Ipk value of the input signal exceeds 600% of the currently set measurement range, On the WT330, when any of those input elements meets the above condition, the range is increased the next time the measured value is updated. Range decrease The range is decreased when all of the following conditions are met. |
| A | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. Range increase • The range is upped when any of the following conditions is met. • Urms or Irms exceeds 130% of the currently set measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range is increased the next time the measured value is updated. Range decrease • The range is decreased when all of the following conditions are met. • Urms or Irms is less than or equal to 125% of the next lower measurement range. • Urms or Irms is less than or equal to 125% of the next lower measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set |
| A | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-phase, three-current (3V3A). Select manual or auto ranging. Ange increase • The range is upped when any of the following conditions is met. • Urms or Irms exceeds 130% of the currently set measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range, • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range, • On the WT330, when any of those input elements meets the above condition, the range is increased the next time the measured value is updated. Range decrease • The range is decreased when all of the following conditions are met. • Urms or Irms is less than or equal to 30% of the measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. |
| A | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. 8 The range is upped when any of the following conditions is met. 9 Urms or Irms exceeds 130% of the currently set measurement range. 9 Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. 10 Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range, 11 On the WT330, when any of those input elements meets the above condition, the range is increased the next time the measured value is updated. 12 Range decrease 13 The range is decreased when all of the following conditions are met. 14 Urms or Irms is less than or equal to 30% of the measurement range. 15 Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. 16 Crest factor 3: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. |
| A | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. Ange increase The range is upped when any of the following conditions is met. Urms or Irms exceeds 130% of the currently set measurement range. Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range, On the WT330, when any of those input elements meets the above condition, the range is increased the next time the measured value is updated. Range decrease The range is decreased when all of the following conditions are met. Urms or Irms is less than or equal to 30% of the measurement range. The range is upk, lpk value of the input signal exceeds 300% of the currently set measurement range. Crest factor 6: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. Or the WT330, when all of the input elements meet the above condition, the range |
| Range select Auto range Display mode Switching | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. Range increase • The range is upped when any of the following conditions is met. • Urms or Irms exceeds 130% of the currently set measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • In the W1330, when any of those input elements meets the above condition, the range is increased the next time the measured value is updated. Range decrease • The range is decreased when all of the following conditions are met. • Urms or Irms is less than or equal to 30% of the measurement range. • Urms or Irms is less than or equal to 125% of the next lower measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • On the W1330, when all of the input elements meet the above condition, the range is downed down the next time the measured value is updated. |
| Auto range Display mode Switching | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-phase, three-current (3V3A). Select manual or auto ranging. Ange increase • The range is upped when any of the following conditions is met. • Urms or Irms exceeds 130% of the currently set measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range, • The tange is creased the next time the measured value is updated. Range decrease • The range is decreased when all of the following conditions are met. • Urms or Irms is less than or equal to 30% of the measurement range. • Urms or Irms is less than or equal to 125% of the next lower measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • The MT330, when all of the input elements meet the above condition, the range is downed down the next time the measured value is updated. Select RMIS (the true RMIS value of voltage and current), VOLTAGE MEAN (the rectified mean value calibrated to the RMIS value of the voltage and the true RMIS value of the currently. OC (simple average of voltage and the true RMIS value of the currently. DC (simple average of voltage and the true RMIS value of the currently. |
| Auto range Display mode Switching Measurement synchronization source | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. Range increase • The range is upped when any of the following conditions is met. • Urms or Irms exceeds 130% of the currently set measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range, • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range is increased the next time the measured value is updated. Range decrease • The range is decreased when all of the following conditions are met. • Urms or Irms is less than or equal to 30% of the measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. On the WT330, when all of the input elements meet the above condition, the range is downed down the next time the measured value is updated. Select RMS (the true RMS value of voltage and current), VOLTAGE MEAN (the rectified mean value calibrated to the RMS value of the voltage and the true RMS value of the current), DC (simple average of voltage and current). |
| Display mode Switching Measurement synchronization source Line filter | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. Ange increase • The range is upped when any of the following conditions is met. • Urms or Irms exceeds 130% of the currently set measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range, On the WT330, when any of those input elements meets the above condition, the range is increased the next time the measured value is updated. Range decrease • The range is decreased when all of the following conditions are met. • Urms or Irms is less than or equal to 125% of the next lower measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the signal exceeds 600% of the currently set meas |
| Auto range Display mode Switching Measurement synchronization source | Select from single-phase, two-wire (1P2W); single-phase, three-wire (1P3W); three-phase, three-wire (3P3W); three-phase, four-wire (3P4W); or three-voltage, three-current (3V3A). Select manual or auto ranging. Range increase • The range is upped when any of the following conditions is met. • Urms or Irms exceeds 130% of the currently set measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range, • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range is increased the next time the measured value is updated. Range decrease • The range is decreased when all of the following conditions are met. • Urms or Irms is less than or equal to 30% of the measurement range. • Crest factor 3: Upk, lpk value of the input signal exceeds 300% of the currently set measurement range. • Crest factor 6: Upk, lpk value of the input signal exceeds 600% of the currently set measurement range. On the WT330, when all of the input elements meet the above condition, the range is downed down the next time the measured value is updated. Select RMS (the true RMS value of voltage and current), VOLTAGE MEAN (the rectified mean value calibrated to the RMS value of the voltage and the true RMS value of the current), DC (simple average of voltage and current). |

| ati (| DN | | | | | | |
|--|---|---|--|---|--|--|--|
| | | | | | | | |
| Frequence tem | cy Measurement | Specifications | | | | | |
| Measured item | | Voltage and current frequencies applied to one selected input element can be measured. WT332 (two element model) Select voltage (U1)/ current (11) of input element1 or voltage (U3)/ current (13) of input element3. WT333 (three element model) Select voltage (U1)/ current (11) of input element1, voltage (U2)/ current (12) of input element2 or voltage (U3)/ current (13) of input element3. | | | | | |
| Method Frequency measuring range | | Reciprocal method Varies depending on the data update interval (see description given later) as follows. Data Update Interval Measurement Range | | | | | |
| | | 0.1s 25Hz ≤ f ≤ 100kHz 0.25s 10Hz ≤ f ≤ 100kHz 0.5s 5Hz ≤ f ≤ 100kHz 1s 2.5Hz ≤ f ≤ 100kHz 1s 2.5Hz ≤ f ≤ 50kHz 2s 1.5Hz ≤ f ≤ 50kHz 0.5Hz ≤ f ≤ 50kHz Only for the direct current input of W1310HC, the maximum measurement range is | | | | | |
| Measurement range | | 20kHz. Auto switching among six types: 1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz, | | | | | |
| requenc | y filter | and 100 kHz. Select OFF or ON (cu | toff frequency of 500 | Hz). | | | |
| Accuracy | | crest factor is set t | nal level is 30% or mo to 3. (60% or more if the s ON when measuring of reading) | ne crest factor is set to | 6) | | |
| Computa tem | tion | Specifications | | | | | |
| Computin | g equation of app lement number | | ive power (Q), power f | actor (λ), and phase a | ngle (Ø) | | |
| υΣ[۷] | | Single-Phase, Three-Wire (1P3W) (U1+U3)/2 | Three-Phase, Three-Wire (3P3W) | Three-Voltage, Three-Current Method (3V3A) (U1+U2+U3)/3 | Three-Phase, Four-Wire (3P4W) | | |
| ΙΣ[A] ΡΣ[W] | | (l1+l3)/2 P1+P3 | | (11+12+13)/3 | P1+P2+P3 | | |
| SΣ[VA] | Si=Ui×Ii | S1+S3 | √3 (S1+S3) | √3 (S1+S2+S3) | S1+S2+S3 | | |
| QΣ[var] | $Qi = \sqrt{S_i^2 - P_i^2}$ | Q1+Q3 | | <u> </u> | Q1+Q2+Q3 | | |
| λΣ | λi=Pi/Si | <u>ΡΣ</u> <u>SΣ</u> | | | | | |
| Ø[°] | Øi=cos-1 (Pi Si) | $\frac{COS^{-1}}{S\Sigma}$ | | | | | |
| If the vo zero is of For Q[va the volta- from the D(LEAD)/O Lead and Phase an | Itage or current is displayed for S or Ir], when the curre age, the Q value is e Q of each eleme G(LAG)) lag detection igle Ø's | less than 0.5% (less to 10, and error is displayed to displayed as a positive that with the signs included to the correctly for the follows Sine waves | ne Q value is displayed e value. The value of Q ded. he voltage and curren wing: | ne crest factor is set to as a negative value; w Σ may be negative, be t inputs can be detected | 6) of the rated range, hen the current lags cause it is calculated | | |
| O (lead) and G (lag)) Scaling | | When the measured value is 50% or more (100% or more when the crest factor is 6) of the measurement range Frequency: 20 Hz to 2kHz(WT310HC: to 1kHz) Phase difference: ±(5° to 175°) 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 | | | | | |
| Averaging | | and current ranges. • Selectable range: 0.001 to 9999 Select the method from the following two types. • Exponential averaging method • Moving average method Select the attenuation constant for exponential averaging; select the sample number from 8, 16, 32, and 64 for moving average. Computation of efficiency is possible on the WT332/WT333. | | | | | |
| Crest fact | metic operation | Computation of eniciency is possible of the W1332/W1333. Computes the crest factor (peak value/RMS value) of voltage and current. Six types of four arithmetic operations possible (A+B, A=B, A*B, A/B, A/B, and A/B²) | | | | | |
| during int | egration | | ge active power within | | | | |
| Integration tem | JII | Specifications | | | | | |
| Timer | | Select manual integration mode, standard integration mode, or repetitive integration mode. Automatically stop 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 00 | | | | | |
| Count overflow | | seconds) WP: 99999MWh/-99999MWh, q: 999999MAh/-99999MAh Holds the elapsed integration time and integration value and stops integration when the elapsed time of integration reaches the maximum integration time of 10000 hours or when the integrated value reaches the maximum or minimum displayable integration value (999999M or –99999M). | | | | | |
| Accuracy | | ±(Power accuracy (c * In the case of auto The measurement is | or current accuracy) + range: not carried out during ent data after the range | a range change. | | | |
| Range se | tting | For details on range | ange for Integration is switching, see section | | nd Active Power | | |
| Valid Frequency Ranges for Integration | | For details on range switching, see section of Voltage, Current, and Active Power Measurements. Active power DC to 45 kHz Current When the measurement mode is RMS: DC, lower limit frequency determined by the data update interval to 45 kHz When the measurement mode is VOLTAGE MEAN: DC, lower limit frequency determined by the data update interval to 45 kHz When the measurement mode is DC: | | | | | |
| Timer aco | | DC to 45 kHz ±0.02% Start, stop and reset | operations are availab | ole using an external r | emote signal | | |
| ioniule 6 | ondUI | | with the /DA4 or /DA1 | | omoto signal. | | |

Specification

| | Specifications | | | |
|---|---|---|--|--|
| leasured item | All Installed elements. | | | |
| Method | PLL synchronization method | | | |
| requency range | Fundamental frequency of the PLL source is in the range of 10 Hz to 1.2k Hz. | | | |
| PLL source | Select voltage or current of | each input element. | | |
| | Input level | | | |
| | 50% or more of the rated | | | |
| | 100% or more of the rate | | | |
| | The frequency filter must | | undamental frequency is | |
| FT data length | less than or equal to 200h 1024 | 12. | | |
| Vindow function | Rectangular | | | |
| | n, and upper limit of analysis | | | |
| | | ME | Hannelinik oft Analysis and an | |
| Fundamental Frequency | Sample rate | Window Width | Upper Limit of* Analysis orders | |
| 10Hz ~ 75Hz 75Hz ~ 150Hz | f*1024 f*512 | 1 2 | 50 32 | |
| | | | | |
| 150Hz ~ 300Hz | f*256 | 4 | 16 | |
| 300Hz ~ 600Hz | f*128 | 8 | 8 | |
| 600Hz ~ 1200Hz | f*64 s orders can be decreased. | 16 | 4 | |
| The upper little of analysis Accuracy | s orders can be decreased. | | | |
| <wt310 wt332="" wt333=""> Frequency</wt310> | Voltage | Current | Power | |
| 10Hz < f < 45Hz | | | | |
| | | | | |
| 10⊓2 ≤ 1 < 40⊓2 | 0.15% of reading | 0.15% of reading | 0.15% of reading | |
| 10112 2 1 4 10112 | +0.35% of range | +0.35% of range | +0.50% of range | |
| 10Hz ≤ 1 < 45Hz 45Hz ≤ f ≤ 440Hz | +0.35% of range 0.15% of reading | +0.35% of range 0.15% of reading | +0.50% of range 0.25% of reading | |
| 45Hz ≤ f ≤ 440Hz | +0.35% of range 0.15% of reading +0.35% of range | +0.35% of range 0.15% of reading +0.35% of range | +0.50% of range 0.25% of reading +0.50% of range | |
| 10112 2 1 4 10112 | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading | +0.50% of range 0.25% of reading +0.50% of range 0.40% of reading | |
| $45Hz \le f \le 440Hz$ $440Hz < f \le 1kHz$ | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range | +0.50% of range 0.25% of reading +0.50% of range 0.40% of reading +0.50% of range | |
| 45Hz ≤ f ≤ 440Hz | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading | +0.50% of range 0.25% of reading +0.50% of range 0.40% of reading +0.50% of range 1.56% of reading | |
| $45Hz \le f \le 440Hz$ $440Hz < f \le 1kHz$ $1kHz < f \le 2.5kHz$ | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range | +0.50% of range 0.25% of reading +0.50% of range 0.40% of reading +0.50% of range 1.56% of reading +0.60% of range | |
| $45Hz \le f \le 440Hz$ $440Hz < f \le 1kHz$ | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of range | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of reading | +0.50% of range 0.25% of reading +0.50% of range 0.40% of reading +0.50% of range 1.56% of reading +0.60% of reading 5.77% of reading | |
| $45\text{Hz} \le f \le 440\text{Hz}$ $440\text{Hz} < f \le 1\text{kHz}$ $1\text{kHz} < f \le 2.5\text{kHz}$ $2.5\text{kHz} < f \le 5\text{kHz}$ | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range | +0.50% of range 0.25% of reading +0.50% of range 0.40% of reading +0.50% of range 1.56% of reading +0.60% of range | |
| $45\text{Hz} \le f \le 440\text{Hz}$ $45\text{Hz} < f \le 16\text{Hz}$ $16\text{Hz} < f \le 2.5\text{kHz}$ $2.5\text{kHz} < f \le 5\text{kHz}$ $2.5\text{kHz} < f \le 60$ | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of reading +0.45% of range | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of reading +0.45% of range | +0.50% of range 0.25% of reading +0.50% of range 0.40% of reading +0.50% of range 1.56% of reading +0.60% of range 5.77% of reading +0.60% of range | |
| $45\text{Hz} \le f \le 440\text{Hz}$ $440\text{Hz} < f \le 16\text{Hz}$ $16\text{Hz} < f \le 2.5\text{kHz}$ $2.5\text{kHz} < f \le 56\text{Hz}$ $2.5\text{kHz} < f \le 56\text{Hz}$ $440\text{Hz} < f \le 66\text{Hz}$ $460\text{Hz} < f \le 66\text{Hz}$ 460Hz $460\text{Hz} < f \le 66\text{Hz}$ 460Hz | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of reading +0.45% of range | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of range Current | +0.50% of range 0.25% of reading +0.50% of reading +0.50% of range 0.40% of reading +0.50% of range 1.56% of reading +0.60% of range 5.77% of reading +0.60% of range | |
| $45\text{Hz} \le f \le 440\text{Hz}$ $45\text{Hz} < f \le 16\text{Hz}$ $16\text{Hz} < f \le 2.5\text{kHz}$ $2.5\text{kHz} < f \le 5\text{kHz}$ $2.5\text{kHz} < f \le 60$ | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of reading +0.45% of range | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of reading +0.45% of range Current 0.15% of reading | +0.50% of range 0.25% of reading +0.50% of range 0.40% of reading +0.50% of reading +0.50% of range 1.56% of reading +0.60% of range 5.77% of reading +0.60% of range | |
| $45\text{Hz} \le f \le 440\text{Hz}$ $440\text{Hz} < f \le 16\text{Hz}$ $16\text{Hz} < f \le 2.56\text{Hz}$ $2.56\text{Hz} < f \le 56\text{Hz}$ | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+0 reading +0.45% of range 3.05% of reading +0.45% of range Voltage 0.15% of reading +0.35% of range | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+o f reading +0.45% of range 3.05% of range -0.45% of range Current 0.15% of reading +0.35% of reading | +0.50% of range 0.25% of reading +0.50% of range 0.40% of reading +0.50% of range 1.56% of reading +0.60% of range 5.77% of reading +0.60% of range Power 0.35% of reading +0.50% of range | |
| $45\text{Hz} \le f \le 440\text{Hz}$ $440\text{Hz} < f \le 16\text{Hz}$ $16\text{Hz} < f \le 2.5\text{kHz}$ $2.5\text{kHz} < f \le 5\text{kHz}$ $2.5\text{kHz} < f \le 5\text{kHz}$ $2.5\text{kHz} < f \le 5\text{kHz}$ | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of reading +0.45% of range Voltage 0.15% of reading +0.35% of reading -0.35% of reading -0.35% of reading | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of reading +0.35% of range 0.80%+ of reading +0.45% of range 1.05% of reading +0.45% of range 0.15% of reading +0.35% of reading +0.35% of reading +0.35% of reading | +0.50% of range 0.25% of reading +0.50% of range 0.40% of reading +0.50% of reading +0.50% of range 1.56% of reading +0.60% of range 5.77% of reading +0.60% of range | |
| $45\text{Hz} \le f \le 440\text{Hz}$ $440\text{Hz} < f \le 16\text{Hz}$ $16\text{Hz} < f \le 2.5\text{kHz}$ $2.5\text{kHz} < f \le 56\text{kHz}$ $2.5\text{kHz} < f \le 56\text{kHz}$ $2.5\text{kHz} < f \le 45\text{kHz}$ $45\text{Hz} \le f \le 440\text{Hz}$ | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80% + of reading +0.45% of range 3.05% of reading +0.45% of range Voltage Voltage 0.15% of reading +0.35% of range 0.15% of reading | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of reading +0.45% of range Current 0.15% of reading +0.35% of range | +0.50% of range 0.25% of reading +0.50% of range 0.40% of range 1.56% of reading +0.50% of range 1.56% of reading +0.60% of range 5.77% of reading +0.60% of range 0.35% of range 0.25% of reading +0.50% of range | |
| $45\text{Hz} \le f \le 440\text{Hz}$ $440\text{Hz} < f \le 16\text{Hz}$ $16\text{Hz} < f \le 2.56\text{Hz}$ $2.56\text{Hz} < f \le 56\text{Hz}$ | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+of reading +0.45% of range 3.05% of reading +0.45% of range 0.15% of reading +0.35% of range 0.15% of reading +0.35% of range 0.15% of reading -0.35% of range 0.35% of range | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of reading +0.45% of range Current 0.15% of reading +0.35% of reading +0.35% of reading +0.35% of range 0.15% of reading | +0.50% of range 0.25% of reading +0.50% of range 0.40% of range 0.40% of reading +0.50% of range 1.56% of reading +0.60% of range 5.77% of reading +0.60% of range Power 0.35% of reading +0.50% of range 0.25% of reading +0.50% of range 0.25% of reading +0.50% of range | |
| 45 Hz \leq f \leq 440Hz 440 Hz $<$ f \leq 1kHz 1 kHz $<$ f \leq 2.5kHz 2.5 kHz $<$ f \leq 5kHz 2.5 kHz $<$ f \leq 5kHz 2.5 kHz $<$ f \leq 5kHz 2.5 kHz $<$ f \leq 45kHz 2.5 kHz $<$ f \leq 440Hz 2.5 kHz \leq f \leq 440Hz 2.5 kHz \leq f \leq 440Hz 2.5kHz | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+of reading +0.45% of range 3.05% of reading +0.45% of range 0.15% of reading +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of reading +0.45% of range Current 0.15% of reading +0.35% of range 0.15% of reading +0.35% of range 0.20% of range | +0.50% of range 0.25% of reading +0.50% of range 0.40% of range 1.50% of reading +0.50% of range 1.56% of reading +0.60% of range 5.77% of reading +0.60% of range 0.25% of reading +0.50% of range 0.25% of reading +0.50% of range 0.40% of reading +0.50% of range | |
| $45\text{Hz} \le f \le 440\text{Hz}$ $440\text{Hz} < f \le 16\text{Hz}$ $16\text{Hz} < f \le 2.5\text{kHz}$ $2.5\text{kHz} < f \le 56\text{kHz}$ $2.5\text{kHz} < f \le 56\text{kHz}$ $2.5\text{kHz} < f \le 45\text{kHz}$ $45\text{Hz} \le f \le 440\text{Hz}$ | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80% + of reading +0.45% of range 3.05% of reading +0.45% of range 3.05% of reading +0.45% of range 0.15% of reading +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading 0.20% of reading 0.35% of range 0.35% of range | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of reading +0.45% of range Current 0.15% of reading +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.20% of reading +0.35% of range 0.20% of reading +0.35% of range | +0.50% of range 0.25% of reading +0.50% of range 0.40% of range 1.56% of reading +0.50% of range 1.56% of reading +0.60% of range 5.77% of reading +0.60% of range 0.35% of reading +0.50% of range 0.25% of reading +0.50% of range 0.25% of reading +0.50% of range 1.56% of reading +0.50% of range | |
| 45 Hz \leq f \leq 440Hz 440 Hz $<$ f \leq 1kHz 1 kHz $<$ f \leq 2.5kHz 2.5 kHz $<$ f \leq 5kHz <WT310HC> Frequency 10 Hz \leq f $<$ 45Hz 45 Hz \leq f \leq 440Hz 440 Hz $<$ f \leq 1kHz 1 kHz $<$ f \leq 2.5kHz | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of reading +0.45% of range Voltage 0.15% of reading +0.35% of range 0.15% of reading +0.35% of range 0.35% of range 0.35% of range 0.20% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80% of range 0.80% of range 0.80% of range 0.15% of reading +0.45% of range 0.15% of reading +0.35% of range 0.15% of reading +0.35% of range 0.25% of range 0.29% of range 0.29% of reading +0.35% of range | +0.50% of range 0.25% of reading +0.50% of range 0.40% of reading +0.50% of reading +0.50% of reading +0.60% of range 5.77% of reading +0.60% of range Power 0.35% of reading +0.50% of range 0.25% of reading +0.50% of range 0.40% of reading +0.50% of range 0.40% of reading +0.50% of range 0.40% of reading +0.50% of range | |
| 45 Hz \leq f \leq 440Hz 440 Hz $<$ f \leq 1kHz 1 kHz $<$ f \leq 2.5kHz 2.5 kHz $<$ f \leq 5kHz 2.5 kHz $<$ f \leq 5kHz 2.5 kHz $<$ f \leq 5kHz 2.5 kHz $<$ f \leq 45kHz 2.5 kHz $<$ f \leq 440Hz 2.5 kHz \leq f \leq 440Hz 2.5 kHz \leq f \leq 440Hz 2.5kHz | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80% + of reading +0.45% of range 3.05% of reading +0.45% of range 3.05% of reading +0.45% of range 0.15% of reading +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading 0.20% of reading 0.35% of range 0.35% of range | +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.80%+ of reading +0.45% of range 3.05% of reading +0.45% of range Current 0.15% of reading +0.35% of range 0.15% of reading +0.35% of range 0.20% of reading +0.35% of range 0.20% of reading +0.35% of range 0.20% of reading +0.35% of range | +0.50% of range 0.25% of reading +0.50% of range 0.40% of range 1.56% of reading +0.50% of range 1.56% of reading +0.60% of range 5.77% of reading +0.60% of range 0.35% of reading +0.50% of range 0.25% of reading +0.50% of range 0.25% of reading +0.50% of range 1.56% of reading +0.50% of range | |

The items listed below apply to all of the tables.

When the crest factor is set to 3.

When λ (the power factor) is 1.

Power figures that exceed 1.2kHz are reference values.

For the direct current range, add 10u4 to the current accuracy and (10u4/direct current range)×100% of range to the power accuracy.

For the external current sensor range, add 100 μV to the current accuracy and (10u4/direct current range)×100% of range to the power accuracy.

For nth harmonics component input, add ((n/(m + 1))/50)% of (the nth harmonics reading) to the n + mth harmonics of the voltage and current, and add ((n/(m + 1))/25)% of (the nth harmonics reading) to the n + mth harmonics and n - mth harmonics of the voltage and current, and add (n/(m + 1))/25)% of (the nth harmonics reading) to the n + mth harmonics and n - mth harmonics of the power.

Adul (1/300)76 of reading at a first section of the power.

The accuracy when the crest factor is 6 is the same as the accuracy when the crest factor is 3 after doubling the

measurement range.

The guaranteed accuracy ranges for frequency, voltage, and current, are the same as the guaranteed ranges for ordinary measurement.

If the amplitude of the high frequency component is large, influence of approximately 1% may appear in certain

harmonics.

Because the influence depends on the size of the frequency component, if the frequency component is small with respect to the range rating, the influence is also negligible.

| Displayed item | When the number of displayed digits is 5 | When the number of displayed digits is 4 |
|--|---|---|
| U, I, P, S*, Q* | 99999 | 9999 |
| λ* | 1.0000 to - 1.0000 | 1.000 to - 1.000 |
| Ø* | G180.0 to d180.0 | G180.0 to d180.0 |
| fU*, fI* | 99999 | 9999 |
| WP, WP±, q, q± | • | |
| When the unit is MWh or MAh | 999999 | 999999 |
| | (-99999 for negative wat | t hour and ampere hour.) |
| When the unit is other than MWh or MAh | 99999 | 99999 |
| TIME | | |
| Elapsed integration time | Display A indication | Display resolution |
| 0 to 99 hours 59 minutes 59 seconds | 0.00.00 to 99.59.59 | 1s |
| 100 hours to 9999 hours 59 minutes 59 seconds | 100.00 to 9999.59 | 1minute |
| 10000 hours | 10000 | 1 hour |
| Efficiency (WT330 only) | 100.00 ~ 999.99 (%) | 100.0 ~ 999.9 (%) |
| Crest factor | 99999 | 9999 |
| Four arithmetic operation | 99999 | 9999 |
| Average active power | 99999 | 9999 |
| Voltage peak | 99999 | 9999 |
| Current peak | 99999 | 9999 |
| Power Peak | 99999 | 9999 |

| Maximum display (display range) | During harmonic me | easurement | |
|--|-------------------------|--|--|
| Displayed item | | When the number of displayed digits is 5 | When the number of displayed digits is 4 |
| U, I, P | | 99999 | 9999 |
| λ | | 1.0000 to -1.0000 | 1.000 to -1.000 |
| Uhdf, Ihdf, Phdf | | 0.000 to 99.999 to | 0.00 to 99.99 to |
| | | 100.00 to 999.99% | 100.0 to 999.9% |
| Uthd, Ithd | | 0.000 to 99.999 to | 0.00 to 99.99 to |
| | | 100.00 to 999.99% | 100.0 to 999.9% |
| ØU, ØI | | | |
| Phase angle of the 1st | fundamental current | with respect to the 1st fundamer | ntal voltage. |
| | | G180.0 to d180.0 | G180.0 to d180.0 |
| | | r harmonic of voltage with respe | |
| 1st fundamental voltage | | -180.0 to 180.0 | -180.0 to 180.0 |
| | | r harmonics of current with resp | |
| 1st fundamental curre | nt | -180.0 to 180.0 | -180.0 to 180.0 |
| Jnit symbols | m. k. M. V. A. W. VA | , var, °, Hz, h±, TIME, % | |
| Number of displayed digits | Select 5 or 4 digits | ,, , , , , , | |
| Data update interval | | 0.5 s, 1 s, 2 s, or 5 s. | |
| Response time | | s the data update rate | |
| | | reach the accuracy of the final v | |
| | | 00% or 100 to 0% of the rated r | |
| Auto range monitor | | ates when the input signal meet | is the conditions for auto range |
| A | switching. | " :- d:!d f# f-IIi | |
| Overrange display | When the measured | " is displayed for the following of value exceeds 140% of the rate | onditions. |
| | *WT310HC: 40A ran | | u range |
| | | d value exceeds 110% of the rat | ed range |
| Hold | Holds the displayed | | cu range |
| Single update | Undates the displayed | ed value once each time the SIN | GLF key is pressed during Hold |
| MAX hold | Holds the maximum | displayed value of U, I, P, S, Q, | U±pk, I±pk and P±pk. |
| Internal memory | | | |
| tem | Specifications | | |
| Measured data | | easurement data by a communic | ation command. |
| | Store interval | | |
| | | or in the range of 1 s to 99 hrs | |
| | | function of stored measurement | data |
| Setup information | Saves/Loads four pa | tterns of setup information. | |
| External Current Sensor I | | otions) | |
| tem | Specifications | | |
| Allows input of voltage ou | tput type current senso | or signal. For detailed input spec | ifications, see "Input." |
| | Measurement range | of the /EX1 option: | |
| | Crest factor 3: 2.5 | | |
| | Crest factor 6: 1.2 | | |
| | Measurement range | | OV. |
| | Creet feeter 6: 25 | nV, 100mV, 200mV, 500mV, 1V, nV, 50mV, 100mV, 250mV, 500i | ZV mV 1V |
| | Grest ractor 6: 25f | 110, 501110, 1001110, 2501110, 5001 | IIV, IV |

| | Glest lactor 6. 20111, 301111, 1001111, 2001111, 3001111, 11 |
|---------------------------|--|
| D/A Output (/DA4, /DA12 0 | intions) |
| Item | Specifications |
| 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 | Set for each channel. |
| | U, I, P, S, Q, λ, Ø, fU, fl, Upk, Ipk, WP, WP±, q, q± and MATH |
| Accuracy | ±(accuracy of each measurement item + 0.2% of FS)(FS=5V) |
| D/A conversion resolution | 16 bits |
| Minimum load | 100 kΩ |
| Update Interval | Same as the data update interval. |
| Temperature coefficient | ±0.05%/°C of FS |
| | |

| Remote Control Input/Outp | ut Signal (/DA4, /DA12 Options) |
|------------------------------|--|
| Item | Specifications |
| Remote control input signal | EXT HOLD, EXT TRIG, EXT START, EXT STOP, EXT RESET |
| Remote control output signal | INTEG BUSY |
| I/O level | TTL |
| I/O logic format | Negative logic, falling edge |

| GP-IB Interface (Star | ndard on -C1) |
|-----------------------|--|
| Item | Specifications |
| Usable devices | National Instruments Corporation PCI-GPIB or PCI-GPIB+, PCIe-GPIB or PCIe-GPIB+ PCMCIA-GPIB or PCMCIA-GPIB+ (not support on Windows Vista or Windows 7) GPIB-USB-HS Use driver INI-488.2M Ver. 2.8.1 or later. |
| FI 11 1 1 1 | |

| Electrical and mechanical | Complies with IEEE St'd 488-1978 (JIS C 1901-1987) |
|-----------------------------|---|
| Serial (RS-232) Interface (| Standard on -C2) |
| Item | Specifications |
| Connector type | D-Sub 9-pin (plug) |
| Electrical specifications | Complies with EIA-574 (EIA-232 (RS-232) standard for 9-pin) |
| | |

| Baud rate | Select from 1200, 2400, 4800, 9600, 19200, 38400 or 57600bps. |
|---------------------------|--|
| USB PC Interface | |
| Item | Specifications |
| Number of ports | 1 |
| Connector | Type B connector (receptacle) |
| Electrical and Mechanical | Complies with USB Rev. 2.0 |
| specifications | |
| 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) |
| PC system requirements | A PC with a USB port, running the English or Japanese version of Windows 7 |
| | (32 bit/64bit), Windows Vista (32 bit), or Windows XP (32 bit, SP2 or later) |
| | Dedicated driver will supplied from Yokogawa home page |
| | |

| Ethernet Interface (/C7 Opt | tions) |
|-----------------------------|---------------------------------|
| Item | Specifications |
| Ports | 1 |
| Connector type | RJ-45 connector |
| Electrical and Mechanical | Complies with IEEE802.3 |
| specifications | |
| Transmission system | Ethernet (100BASE-TX, 10BASE-T) |
| Transmission rate | 100 Mbps max. |
| Communication protocol | TCP/IP |
| Supported services | DHCP, remote control (VXI-11) |

Specification

| 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) |
| | Elevation: 2000m or less |
| Installation location | Indoors |
| Storage environment | Temperature: -25°C to 60°C |
| | Humidity: 20%RH to 80%RH (No condensation) |
| Rated supply voltage | 100 VAC to 240 VAC |
| Permitted supply | 90 VAC to 264 VAC |
| range voltage | |
| Rated supply frequency | 50/60 Hz |
| Permitted supply voltage | 48 Hz to 63 Hz |
| frequency range | |
| Maximum power | WT310, WT310HC: 50VA, WT332/WT333: 70VA |
| Consumption | |
| External dimensions | WT310, WT310HC: Approx. 213 (W) × 88 (H) × 379 (D) mm |
| (excluding protrusions.) | WT332/WT333: Approx. 213 (W) × 132 (H) × 379 (D) mm |
| Weight | WT310, WT310HC: Approx. 3 kg |
| | WT332/WT333: Approx. 5 kg |
| Battery backup | Setup parameters are backed up with a lithium battery. |

■ Rack Mount

| Model/parts number | Product | Description | Order Q'ty |
|--------------------|-------------------|--|------------|
| 751533-E2 | Rack mounting kit | For WT310 series EIA standalone installation | 1 |
| 751533-J2 | Rack mounting kit | For WT310 series JIS standalone installation | 1 |
| 751534-E2 | Rack mounting kit | For WT310 series EIA connected installation | 1 |
| 751534-J2 | Rack mounting kit | For WT310 series JIS connected installation | 1 |
| 751533-E3 | Rack mounting kit | For WT330 series EIA standalone installation | 1 |
| 751533-J3 | Rack mounting kit | For WT330 series JIS standalone installation | 1 |
| 751534-E3 | Rack mounting kit | For WT330 series EIA connected installation | 1 |
| 751534-J3 | Rack mounting kit | For WT330 series JIS connected installation | 1 |

Accessory (sold separately)

| Model/parts number | Product | Description | Order Q'ty |
|--------------------|-------------------------|--|------------|
| 758917 | Test lead set | A set of 0.8 m long, red and black test leads | 1 |
| 758922 🛕 | Small alligator-clip | Rated at 300 V and used in a pair | 1 |
| 758929 🛕 | Large alligator-clip | Rated at 1000 V and used in a pair | 1 |
| 758923 | Safety terminal adapter | (spring-hold type) Two adapters to a set | 1 |
| 758931 | Safety terminal adapter | (screw-fastened type) Two adapters to a set 1.5 mm hex Wrench is attached | 1 |
| 758924 🛕 | Conversion adapter | BNC-banana-jack (female) adapter | 1 |
| 366924 ▲* | BNC-BNC cable | 1 m | 1 |
| 366925 △* | BNC-BNC cable | 2 m | 1 |
| 758921 🛕 | Fork terminal adapter | Banana-fork adapter, Two adapters to a set | 1 |
| B9284LK ▲ | External sensor cable | Current sensor input connector, Length 0.5 m | 1 |
| 705926 | Connection Cable | 1 m, For DA4, DA12 option | 1 |

A 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.

1 Use these products with two-voltage circuits (42 V or less).

■ AC/DC Current sensor /Clamp on Probe

| Model | Product Name | Description |
|--------|----------------------|---|
| CT1000 | AC/DC Current sensor | DC~300 kHz, ±(0.05% of reading +30uA), 1000 Apk |
| CT200 | AC/DC Current sensor | DC~500 kHz, ±(0.05% of reading +30uA), 200 Apk |
| CT60 | AC/DC Current sensor | DC~800 kHz, ±(0.05% of reading +30uA), 60 Apk |
| 751552 | Clamp-on probe | 30 Hz~5 kHz, 1400 Apeak(1000 Arms) |
| 96030 | Clamp-on probe | 20 Hz~20 kHz, ±0.5% reading, 200 Arms |
| 751574 | AC/DC Current sensor | DC~100 kHz, 600 Apeak(400 Arms) |

■ Model and Suffix Codes

| Model | SuppixCode | Description |
|-------------------------|-----------------|---|
| WT310 | | 1 Input element model |
| Power Cord | -D | UL, CSA standard, PSE |
| | -F | VDE standard |
| | -R | AS standard |
| | -0 | BS standard |
| | -Ĥ | GB standard |
| | -N | NBR standard (for Brazil) |
| Communication Interface | C1 | GP- IB |
| *USB is standard | -C1 select one | RS- 232 |
| Optional function | /C7 | Ethernet interface |
| Optional function | /EX1 | External sensor input 2.5V/5V/10V |
| | /EX1 select one | External sensor input 2.59/59/109 |
| | | External sensor input 50mV/100mV/200mV/500mV/1V/2V |
| | /G5 | Harmonics Measurement |
| | /DA4 | D/A- output(4CH) |
| Model | Suppix-Code | Describe |
| WT310HC | | 1 Input element /High current model |
| Power Cord | -D | UL, CSA standard, PSE |
| | -F | VDE standard |
| | -R | AS standard |
| | -Q | BS standard |
| | -H | GB standard |
| | -N | NBR standard (for Brazil) |
| Communication Interface | C1 | GP- IB |
| *USB is standard | -C1 select one | RS- 232 |
| Optional function | /C7 | Ethernet interface |
| Optional function | /EX1 | External sensor input 2.5V/5V/10V |
| | /EX2 select one | External sensor input 2.5v/5v/10v External sensor input 50mV/100mV/200mV/500mV/1V/2V |
| | | |
| | /G5 | Harmonics Measurement |
| | /DA4 | D/A- output(4CH) |
| Model | Suppix-Code | Describe |
| WT332 | | 2 Input elements model |
| WT333 | | 3 Input elements model |
| Power Cord | -D | UL, CSA standard, PSE |
| | -F | VDE standard |
| | -R | AS standard |
| | -Q | BS standard |
| | -H | GB standard |
| | -N | NBR standard (for Brazil) |
| Communication Interface | C1 | GP- IB |
| *USB is standard | -C1 select one | RS- 232 |
| Optional function | /C7 | Ethernet interface |
| ориона нинсион | | External sensor input 2.5V/5V/10V |
| | /EX1 select one | EXTERNAL SENSOR INDUL 2.5V/5V/1UV |
| | /EX2 | External sensor input 50mV/100mV/200mV/500mV/1V/2V |
| | /G5 | Harmonics Measurement |
| | /DA12 | D/A- output(12CH) |

Power cord(1 set), Rubber foot(1 set), Current input protective cover(each 1 set), Start up guide(1 set), Connector (provided only with /DA4 or /DA12, each 1 set), Safety terminal adapter 758931(provided two adapters in a set times input element number), CD (1 piece, included the startup guide, user guide, instruction manual and the communication manual by PDF data, and Viewer Software)



758917 Test lead set Two leads in a set. Use 758917 in combination with 758922 or 758929. Total length: 75 cm Rating: 1000 V, 32 A



758922 Small alligator adapters For connection to measurement leads (758917). Two in a set. Rating: 300 V



758929 Large alligator adapters For connection to measurement leads (758917). Two in a set. Rating: 1000 V



758923 *1 Safety terminal adapter set (spring-hold type) Two adapters in a set.



758931 *1 Safety terminal adapter set Screw-fastened adapters. Two adapters in a set. 1.5 mm Allen wrench included for tightening.

Notice





B9284LK ** 709526 External Sensor Cable 26-bin cable for options DA4 and For connection the external input DA12 of the WT500 to current sensor. Length: 50 cm.

Before operating the product, read the user's manual thoroughly for

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.

11 Maximum diameters of cables that can be connected to the adapters 758923 core diameter: 2.5 mm or less; sheath diameter: 4.8 mm or less 758923 core diameter: 2.5 mm or less; sheath diameter: 4.8 mm or less 20 mm or less 20 mm or less 20 mm or less 20 mm or less 3.9 mm or less 20 mm or less 3.9 mm

proper and safe operation.



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^{*} CT series do not conform CE Marking.
* For detailed information, see Power Meter Accessory Catalog Bulletin CT1000-00E