Digital Power Analyzers

Selection Guide

Digital Power Analyzer

Yokogawa's PX8000 and WT Series Power Meters and Power Analyzer:
Advanced Technology and High Reliability for a Wide Range of Power Measurement Solutions

WT Series

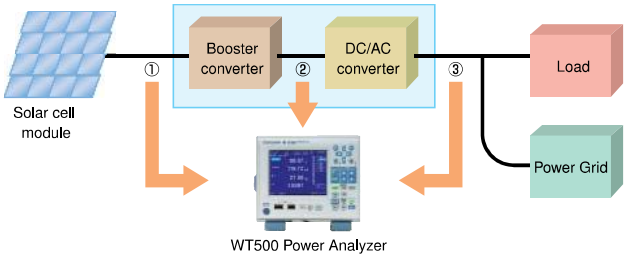
Models / Items	WT310/WT330 ...P28	WT500 ...P23	WT3000 ...P24	WT1800 ...P26	PX8000 ...P30
Features	New Entry Class Digital Power Analyzers 4 models line up, equipping 5 mA range (WT310), 40 A range (WT310HC), and 2 or 3 CH inputs (WT332/WT333) Standard Communication I/F and auto-ranging under integration mode	Low-Middle Class Power Analyzer Compact half rack size and easy use Max. 1000V and 40A input Simultaneous measurement U, I, P and those harmonics components External USB memory for direct data saving	Top model of Digital Power Analyzer With basic power accuracy of ±0.02% of reading, DC and 0.1 Hz-1 MHz measurement bandwidth, and up to four input elements, the model provides higher-accuracy measurement of inverter Input/Output efficiency.	Middole Class Digital Power Analyzer Up to six Input elements in one instrument (3 phase power input from two systems in one unit) 8.4-Inch XGA TFT Color LCD Wide voltage and current input range	A power analyzer with capabilities of transient power measurement and waveform parameter measurement Fast sampling up to 100 MS/s, Broad bandwidth up to 20 MHz (-3 dB), Trend measurement of each cycle, Specified period measurement by cursor
Input elements	1(WT310.WT310HC), 2 (WT332), 3(WT333)	1 to 3	1 to 4	1 to 6	Module structure, 1 to 4 power measurement element
Basic power accuracy (50/60 Hz)	0.1% of rdg + 0.1% of rng	0.1% of rdg + 0.1% of rng	0.02% of rdg + 0.04% of rng	0.1% of rdg + 0.05% of rng	0.1% of reading + 0.1% of range
Power measurement frequency range	DC, 0.5 Hz to 100 kHz (WT310HC is up to 20 kHz)	DC, 0.5Hz to 100 kHz	DC, 0.1 Hz to 1 MHz	DC, 0.1 Hz to 1 MHz	DC, 0.1Hz to 1MHz
Input voltage range (for crest factor 3)	15/30/60/150/300/600/ V	15/30/60/100/150/300/600/1000 V	15/30/60/100/ 150/300/600/1000 V	1.5/3/6/10/15/30/60/ 100/150/300/600/1000 V	1.5/3/6/10/15/30/60/100/150/300/600/ 1000 V
Input current range (for crest factor 3)	Direct input: 5 m/10 m/20 m/50 m/100 m/ 200 m/500 m/1/2/5/10/20 A (WT310) Direct input: 1/2/5/10/20/40 A (WT310HC) Direct Input: 500m/1/2/5/10/20 A (WT332.WT333) External input(option): 2.5/5/10 V, or 50 m/100 m/200 m/500 m/1/2 V	Direct input: 500 m/1/2/5/10/20/40 A External sensor input (option): 50m/ 100 m/250 m/500 m/1/2/5/10 V	Direct input: 0.5/1/2/5/10/20/30 A or 5 m/10 m/20 m/50 m/100 m/200 m/ 500 m/1/2 A External input: 50 m/100 m/200 m/500 m/1/2/5/10 V	Direct input: 10 m/20 m/50 m/100 m/200 m/ 500 m/1/2/5 A or 1/2/5/10/20/50 A External input (option): 50 m/100 m/250 m/500 m/ 1/2.5/5/10 V	Direct input: 10 m/20 m/50 m/100 m/ 200 m/500 m/1/2/5 A External sensor input: 50 m/100 m/ 250 m/500 m/1/2.5/5/10 V
Measurement parameters	Voltage, Current, Active power, Reactive power, Apparent power, Power factor, Phase angle. Peak voltage, Peak current, Frequency, Crest factor, Integration (power and current), Harmonic distortion, Harmonic components	Voltage, Current, Active power, Reactive power, Apparent power, Power factor, Phase angle, Peak voltage, Peak current, Voltage frequency, Current frequency Active power integration and Current integration for both charge/ discharge and sold/bought, crest factor, Efficiency, harmonic analysis	Voltage, Current, Active power, Reactive power, Apparent power, Power factor, Phase angle, Peak voltage, Peak current, Voltage Frequency, Current Frequency, Active power integration, Apparent power integration, Reative power integration, Current integration, Corrected power, Crest factor, Efficiency, Harmonic analysis	Voltage, Current, Active power, Apparent power, Reactive power, Power factor, Phase angle, Peak voltage, Peak current, Voltage Frequency, Current Frequency, Active power integration, Current integration, Crest factor, Form factor, Impedance, Resistance, Reactance, Corrected Power, Harmonic analysis	Voltage, Current, Active power, Reactive power, Power factor, Phase angle, Peak voltage, Peak current, Voltage frequency, Current frequency Transient voltage/current/power(Trend of waveform by cycle), Averaged voltage/ current/power by cursor(waveform parameters calculation)
Display	7 Segment LED, 4 displays	5.7-inch TFT color LCD	8.4-inch TFT color LCD	8.4-inch XGA TFT color LCD	10.4 inch TFT color LCD (XGA)
External dimensions (mm) (W × H × D)	213 × 88 × 379 (WT310 and WT310HC) 213 × 132 × 379 (WT332 and WT333)	213 × 177 × 408.5	426 × 177 × 459	426 × 177 × 459	355 × 259 × 180
Weight (kg)	3 (WT310), 5 (WT330)	6.5	15	15	6.5 (without any options and paper)

***About CW series Clamp-on Power Meters, please refer to the page 65.**

Power Analyzer **WT500**

Compact and easy to use. The Power Analyzer for the renewable energy generation

Overview of a Photovoltaic Power Conditioner



Basic Specifications

- Measurement voltage range: (for crest factor 3)
  15/30/60/100/150/300/600/1000V
- Measurement current range: (for crest factor 3)
  Direct input 500 m/1/2/5/10/20/40A
  External sensor input (option)
  50 m/100 m/200 m/500 m/1/2/5/10V
- Frequency range:
  DC, 0.5Hz to 100kHz
- Measurement Accuracy:
  Basic Accuracy (45Hz ≤ f ≤ 66Hz and DC)
  Voltage/Current/Power
  ± (0.1% of rdg + 0.1% of rng)
- USB interface to PC is standard feature
- Ethernet communication function is available (optional)
- GP-IB communication function is available (optional)
- Effective of power factor (at cos ϕ =0)
  ± 0.2% of S (apparent power)
- External dimensions:
  Approx. 213(W) × 177(H) × 408.5(D) mm
- Weight: Approx. 6.5kg (with 3-input element)

Overview

The WT500 is a low-middle class power analyzer and it features a 5.7-inch color TFT and half width racking compact body that enable s single-phase and three-phase power measurement, achieving ±0.1% of reading basic and DC accuracy, maximum input of 1000Vrms, 40Arms and a measurement bandwidth up to 100kHz.

Features

- Accurate efficiency measurement of DC and AC signals
- RMS, MEAN, DC, AC and RMEAN of voltages and currents simultaneous measurement.
- Simultaneous measurement of normal U/I/P data and those harmonic data
- As fast as 100ms data capturing and store data with all channels
- Separate integration functions for charge/discharge or bought/sold power
- Integration of power, reactive power, apparent power, and current enables you to determine a device's average power consumption
- Harmonics (DC-50th order) and Total harmonic distortion (THD) can be measured
- Saving measured data directly to external USB memory
- Measurement values can be saved as images or numerical data, and can be pasted into reports, analyzed in spreadsheet software, or used in a variety of other ways
- Easy setup with cursor keys
- GP-IB, USB and Ethernet communication are available

Model Number and Suffix Codes

Model	Suffix Codes	Description
760201		WT500 1 input element model
760202		WT500 2 input elements model
760203		WT500 3 input elements model
Power cord	-D	UL/CSA standard
	-F	VDE standard
	-R	SAA standard
	-Q	BS standard
	-H	GB standard
Options	/C1	GP-IB interface
	/C7	Ethernet interface
	/EX1	External sensor input for 760201
	/EX2	External sensor input for 760202
	/EX3	External sensor input for 760203
	/G5	Harmonic Measurement
	/DT	Delta computation (760202/03 only)
	/FQ	Add-on Frequency Measurement (760202/03 only)
	/V1	VGA Output

Note: Adding input modules after initial product delivery will require rework at the factory. Please choose your models and configurations carefully, and inquire with your sales representative if you have any questions.

Digital Power Analyzers

Precision Power Analyzer **WT3000**

Best-in-class*1 Precision and Stability with Basic Power Accuracy: ±0.06% of Total More Precise, More Bandwidth, and Simultaneous Measurement

(*1: As of March 2014, for power accuracy in a three-phase power meter as investigated by Yokogawa)

WT3000

Features

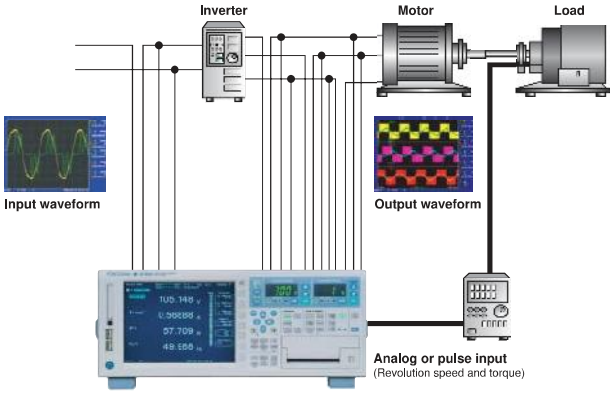
The WT3000 has the highest precision of all the Yokogawa power analyzers in the WT series. The WT3000 can be used as a reference instrument for calibration and to measure the power and conversion efficiency of power transformers such as an inverter. It helps increase efficiency in evaluation and testing.

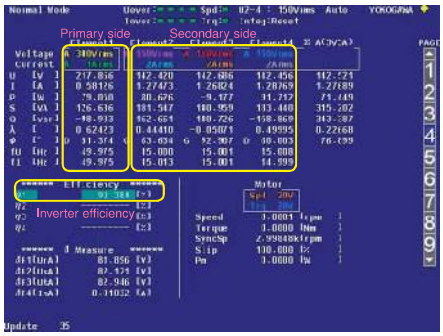
- Basic power accuracy ±0.06% of total, the highest precision of all power analyzers in the WT series
- Up to four input elements to achieve accurate measurement of input and output conversion efficiency
- Motor efficiency and total efficiency measurement of the motor version
- Simultaneous harmonic measurement without changing measuring modes (option)
- Wide bandwidth harmonic measurement between 0.1 Hz and 2.6 kHz of the fundamental waveform (option)
- USB (media, keyboard, PC connection) (option)
- Ethernet interface (option)
- Harmonic measurement compliant with IEC61000-3-2/12 and (option)
- Voltage fluctuation/flicker measurement compliant with IEC61000-3-3/11 (option)

Applications to Utilize WT3000 Precision Power Analyzer's Capabilities

High-precision measurement of motor/inverter efficiency

Growing interest in energy conservation of late increases the need to evaluate motor/inverter efficiency with high precision. The WT3000 offers up to four voltage and four current inputs and is capable of high-precision measurement of single-phase input and three-phase output to evaluate the inverter efficiency.
A motor evaluation function (option) allows you to observe changes in voltage, current, and power while at the same time observing changes in revolution speed and torque, and calculate and display mechanical power and total efficiency.
Also, you can synchronize two units and take measurements, and WTViewer software for data acquisition allows you to compare the power of the two units and calculate the efficiency.

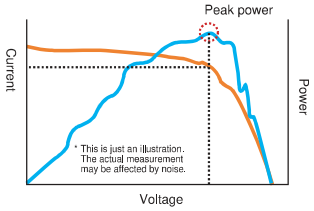




Example of measurement data display on the primary and secondary sides

Measuring instantaneous peak power in photovoltaic power generation

In photovoltaic power generation, MPPT control varies the voltage to maximize energy harvested from the solar panel. The WT3000 allows you to measure voltage, current, and power, as well as peak voltage and peak current (on the plus and minus sides, respectively). Also, the user-defined MATH allows you to measure the instantaneous peak power (on the plus and minus sides).

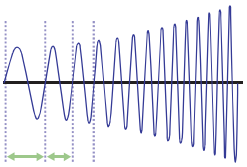


MPPT: Maximum Power Point Tracker
Example of measurement results of voltage, current, and power under control

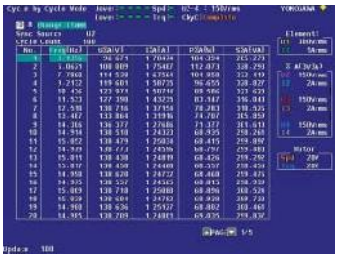
Example of power (P1) and instantaneous peak power on the plus (F1) and minus (F2) sides

Cycle-by-cycle function allows measuring voltage, current, and power for each cycle

To observe the rising characteristic of a starting motor or the like, you may want to acquire data for each cycle instead of at specified time intervals. The cycle-by-cycle measurement (/CC option) of the WT3000 allows you to measure the following parameters: voltage, current, active power, apparent power, reactive power, power factor, speed, torque, and mechanical power. Up to 3,000 periods of measurements can be taken.



Cycle-by-cycle data computation



Example of cycle-by-cycle measurement of three-phase voltage, current, active power, and apparent power

Example of LED driving circuit and measurement

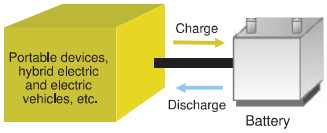
Lighting equipment is shifting from incandescent to fluorescent lamps. Furthermore, in recent years, long-life, low power consumption LEDs are attracting attention. To increase the power conversion efficiency of an LED driving circuit (drive module), it is necessary to measure the voltage, current, and power of input and output with high precision. The WT3000 provides the best-in class accuracy to measure the power conversion efficiency of input and output.

Example of DC voltage, current, and power at three points and conversion efficiency measurement.

Rear panel (4 input elements and options)

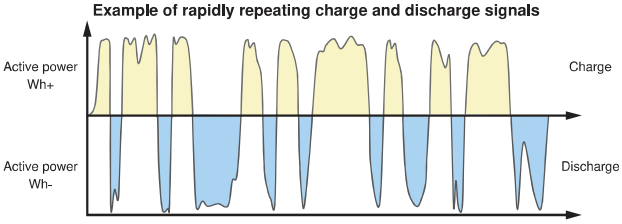
Measuring battery charge and discharge (Ah/Wh)

For battery-powered equipment such as portable devices and electric-powered bicycles, engineers must often perform short-duration charge/discharge tests under actual operating conditions. Since the WT3000 employs a digital sampling system, each rapidly changing charge/discharge current and power can be integrated without gaps. This is effective in the evaluation of ampere-hours and watt-hours for calculating battery life.



Example of display of total watt hours (on the plus and minus sides)

Example of rapidly repeating charge and discharge signals



Charge and discharge current Ah (power Wh) can be integrated respectively.

Specifications

Voltage direct input range	: 15/30/60/100/150/300/600/1000 V
Current direct input range	: 0.5/1/2/5/10/20/30 A or 5 m/10 m/20 m/ 50 m/100 m/200 m/500 m/1/2 A
Current sensor input range	: 50 m/100 m/200 m/500 m/1/2/5/10 V
Frequency bandwidth	: DC, 0.1 Hz to 1 MHz
Basic accuracy (45 Hz to 66 Hz)	(30 A input element)
Voltage/current	0.01% of rdg*1 + 0.03% of rng*2
Power	0.02% of rdg*1 + 0.04% of rng*2
Data update period	: Select from 50 ms, 100 ms, 250 ms, 500 ms, 1 s, 2 s, 10 s, and 20 s
Power factor influence:	0.03% of S (apparent power) when cos ϕ =0
A/D converter	Simultaneous voltage and current conversion, 16-bit resolution Conversion speed approx. 5 µs
Display	8.4-inch color TFT LCD monitor
Built-in printer (option)	Thermal line-dot, paper width 112 mm
PC card port, USB port (option)	
External dimensions	: Approx. 426 (W) × 177 (H) × 459 (D) mm (excluding protrusions)
Weight	: Approx. 15 kg (main unit, four input elements, options)

*1: 1 rdg: reading *2: 1 rng: range

Model Number and Suffix Code

■Precision Power Analyzer WT3000

Model	Suffix Codes	Description	
760301		WT3000 1 input element model	
760302		WT3000 2 input elements model	
760303		WT3000 3 input elements model	
760304		WT3000 4 input elements model	
Element number	-01	30A input element	for 760301 model
	-02		for 760302 model
	-03		for 760303 model
	-04		for 760304 model
	-10	2A input element	for 760301 model
	-20		for 760302 model
	-30		for 760303 model
	-40		for 760304 model
Version	-SV	Standard Version	
	-MV	Motor Version	
Power cord	-D	UL/CSA standard	
	-F	VDE standard	
	-R	AS standard	
	-Q	BS standard	
	-H	GB standard	
	-N	NBR standard	
Options	/G6	Advanced Computation (IEC standard testing*, harmonic, FFT, Waveform computation)	
	/B5	Built-in Printer	
	/DT	Delta Calculation	
	/FQ	Add-on Frequency Measurement	
	/DA	20ch D/A output	
	/V1	VGA Output	
	/C2 (Select one)	Serial (RS-232) Interface	
	/C12 (Select one)	USB port (PC)	
	/C5	USB port (Peripheral)	
	/C7	Ethernet function	
	/CC	Cycle by Cycle	
	/FL	Voltage Fluctuation, Flicker	

* requires 761922 software

Note: Adding input modules after initial product delivery will require rework at the factory. Please choose your models and configurations carefully, and inquire with your sales representative if you have any questions.

* For common optional accessories, please see page 35

Digital Power Analyzers

High Performance Power Analyzer **WT1800**

Broad Ranges Power Measurement with One Unit

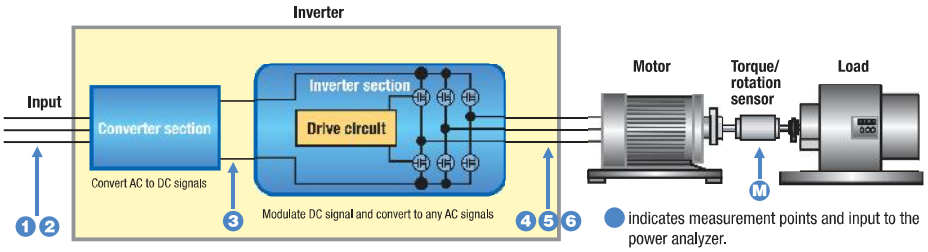
WT1800
Bulletin WT1800-00EN

Overview

The WT1800 High performance power analyzer can measure both the small currents called for by energy saving designs as well as the large currents involved in large-sized loads. As it handles voltages ranging from 1.5 V to 1000 V, it has a wide variety of uses. Since 3 phase power can be input from two separate systems (6 inputs), you only need one WT1800 to simultaneously measure Input/Output signals from inverters with normal/harmonics data as fast as 50ms.

- Basic Power Accuracy +/-0.1% of reading
- DC Power Accuracy +/-0.05% of reading
- Voltage/Current Bandwidth 5 MHz (-3 dB, typical)
  Voltage, 5A direct input, external sensor input
- Sampling Rate 2 MS/s (16-bit resolution)
- Input Element number Max. 6
- Current Measurement 100 µA to 55 Arms direct

Input/Output Efficiency Measurements of Inverters, Matrix converters, Motors, Fans, and Pumps



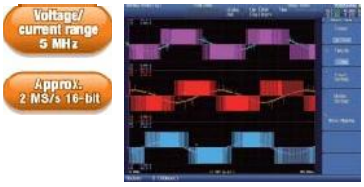
● indicates measurement points and input to the power analyzer.
M indicates connecting the motor output to the motor signal input (/MTR) of the power analyzer

Overview The WT1800 is capable of performing up to 6 power input measurements to make it possible to perform an inverter efficiency test between the input and output in inverter evaluation. In addition, a motor evaluation function (option) makes it possible to simultaneously monitor voltage, current, and power changes, as well as rotation speed and torque changes.

Advantages of WT1800

• 5 MHz range and 2 MS/s high-speed sampling

The vertical resolution in power measurements is one of the important elements for high-precision measurements.
The WT1800 is capable of 16-bit high resolution and approximately 2 MHz sampling to make it possible to measure faster signals with higher precision.



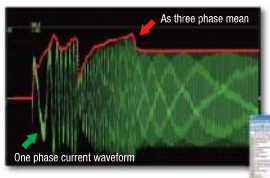
• Dual harmonic measurement (/G6 option)

The WT1800 is capable of performing two-line simultaneous harmonic measurements with one unit for the first time in the industry.
The ability to simultaneously measure harmonics for the input and output signals not only reduces the switching time but also makes it possible to perform simultaneous data analysis for the input and output, which has not been possible with the previous models.

The following measurements can be performed for up to the 500th order
Single harmonic measurement (/G5 option)
Dual harmonic measurement (/G6 option)

• ms response capability (/HS Option)

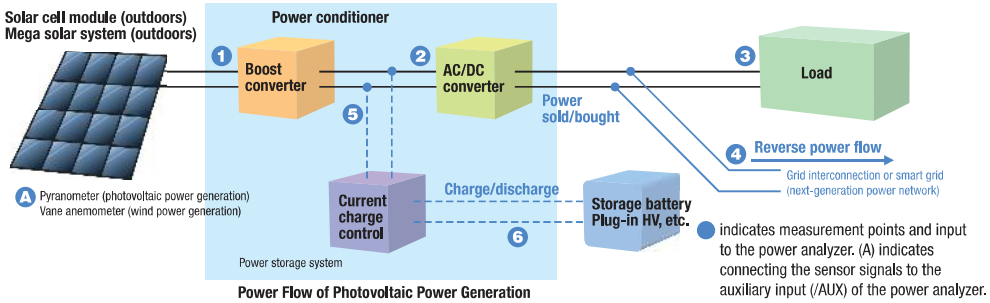
The High Speed data capturing /HS option can measure ΣUrms, ΣIrms and ΣP from single phase (DC signal) and three phase devices every 5 ms (When External Synchronization is OFF) or, 1 ms to 100 ms when External Synchronization is ON (depending on the frequency of the clock signal). It outputs data in 1 s blocks to internal/external memory or to a PC through a communications interface.
The average characteristic is set using the cutoff frequency of the HS filter for measured data during 5 ms or 1 ms to 100 ms period. The cutoff frequency can be varied from 1 Hz to 1,000 Hz in 1 Hz steps.



Comparison between a phase current waveform and three phase current values of every 5ms

Data analysis and graph drawing by data calculation software

Power Generation and Conversion Efficiency Measurements in New Energy Markets, including Photovoltaic and Wind Power Generation



Power Flow of Photovoltaic Power Generation

Overview

Energy generated by photovoltaic cell modules and wind turbines is converted from DC to AC by a power conditioner. Furthermore, the voltage is converted by a charge control unit for the storage battery. Minimizing losses in these conversions improves efficiency in the overall energy system. The WT1800 is capable of providing up to 6 channels of power inputs per unit to make it possible to measure the voltage, current, power, and frequency (for AC) before and after each converter, as well as converter efficiency and charging efficiency.

Advantages of WT1800

• Max. 1000 V/50 A x 6-line direct measurement

Wide voltage/current range

Efficiency measurement

Synchronized operation

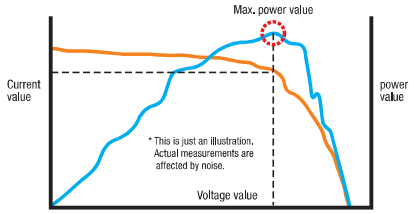
Direct input terminals in a voltage range from 1.5 V to 1000 V and current range from 10 mA to 5 A or 1 A to 50 A make it possible to perform high-precision measurements without using a current sensor. Furthermore, power conditioner evaluation requires multiple-channel power measurements, such as inputs/outputs from a boost converter, inverter, and storage battery. The WT1800 is capable of providing up to 6 channels of power inputs to make it possible to simultaneously perform power measurements at multiple points with one unit. In addition, two units can be operated in synchronization for multi-channel power evaluation.

• Maximum Power Peak Tracking (MPPT) measurement

MPPT

Maximum power peak value

In photovoltaic power generation, an MPPT control is performed to effectively utilize voltage generated by photovoltaic cells in an attempt to maximize the harvested power.
The WT1800 is capable of measuring not only the voltage, current, and power but also the voltage, current, and power peak values (plus (+) and minus (-) sides, respectively). Also, the maximum power peak value (plus (+) and minus (-) sides) can be measured.



Typical voltage, current, and power measurements in MPPT control

Basic Specifications

- Measurement Voltage range: (for Crest factor 3)
  1.5/3/6/10/15/30/60/100/150/300/600/1000 V
- Measurement Direct Current range: (for Crest factor 3)
  5 A input element
  10 m/20 m/50 m/100 m/200 m/500 m/1/2/5 A
  50 A input element
  1/2/5/10/20/50 A
- Measurement External Current Sensor range: (for Crest Factor 3)
  50 m/100 m/200 m/500 m/1/2/5/10 V
- Band width: DC, 0.1 Hz to 1 MHz
  (5A direct Current input, External Current Sensor input)
  DC, 0.1 Hz to 200 kHz (50 A direct Current input)
- Basic Accuracy: (45 Hz ≤ f ≤ 66 Hz)
  0.1% of reading + 0.05% of range
- DC Accuracy: 0.05% of reading + 0.1% of range
- A/D converter: Sampling frequency 2 MS/s
  Resolution 16 bit
- External dimensions: Approx. 426 (W) × 177 (H) × 459 (D) mm
- Weight: Approx. 15 kg (with 6-input element)

Model Number and Suffix Code

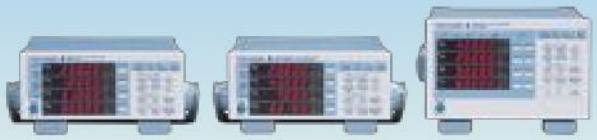
Model	Suffix codes	Description					
WT1800 Single input element							
WT1801	-01	50 A					
	-10	5 A					
WT1800 2 input elements							
WT1802	-02	50 A	50 A				
	-11	5 A	50 A				
	-20	5 A	5 A				
WT1800 3 input elements							
WT1803	-03	50 A	50 A	50 A			
	-12	5 A	50 A	50 A			
	-21	5 A	5 A	50 A			
	-30	5 A	5 A	5 A			
WT1800 4 input elements							
WT1804	-04	50 A	50 A	50 A	50 A		
	-13	5 A	50 A	50 A	50 A		
	-22	5 A	5 A	50 A	50 A		
	-31	5 A	5 A	5 A	50 A		
	-40	5 A	5 A	5 A	5 A		
WT1800 5 input elements							
WT1805	-05	50 A	50 A	50 A	50 A	50 A	
	-14	5 A	50 A	50 A	50 A	50 A	
	-23	5 A	5 A	50 A	50 A	50 A	
	-32	5 A	5 A	5 A	50 A	50 A	
	-41	5 A	5 A	5 A	5 A	50 A	
	-50	5 A	5 A	5 A	5 A	5 A	
WT1800 6 input elements							
WT1806	-06	50 A	50 A	50 A	50 A	50 A	50 A
	-15	5 A	50 A	50 A	50 A	50 A	50 A
	-24	5 A	5 A	50 A	50 A	50 A	50 A
	-33	5 A	5 A	5 A	50 A	50 A	50 A
	-42	5 A	5 A	5 A	5 A	50 A	50 A
	-51	5 A	5 A	5 A	5 A	5 A	50 A
	-60	5 A	5 A	5 A	5 A	5 A	5 A
Standard option							
Power cord	-D	UL/CSA standard					
	-F	VDE standard					
	-R	AS standard					
	-Q	BS standard					
	-H	GB standard					
	-N	NBR standard					
Languages	-HE	Default setting English menu					
	-HG	Default setting German menu					
	-HC	Default setting Chinese menu					
	-HR	Default setting Russian menu					
Additional option							
Options	/EX1	External current sensor input for WT1801					
	/EX2	External current sensor input for WT1802					
	/EX3	External current sensor input for WT1803					
	/EX4	External current sensor input for WT1804					
	/EX5	External current sensor input for WT1805					
	/EX6	External current sensor input for WT1806					
	/B5	Built-in printer					
	/G5	Harmonic Measurement	Select one				
	/G6	Simltaneous Dual Harmonic Measurement					
	/DT	Delta Computation					
	/FQ	Add-on Frequency Measurement					
	/V1	RGB output					
	/DA	20-channel DA Outputs					
	/MTR	Motor Evaluation Function	Select one				
	/AUX	Auxiliary Sensor Inputs					
	/HS	High Speed Data Capturing					

* The numbers in the "Description" column have the following meanings.
50 A: 50 A input element, 5 A: 5 A input element
Elements are inserted in the order shown starting on the left side on the back.
* GPIB, Ethernet and USB communication come standard.

Note: Adding input elements after initial product delivery will require rework at the factory. Please choose your models and configurations carefully, and inquire with your sales representative if you have any questions

New compact WT300 series for reliable power measurement

Useful in the development of home appliances and office equipment as well as in the measurement of power consumption and standby power on production line



WT310 (1ch) | WT310HC (1ch, MAX40A) | WT332 (2ch)/ WT333 (3ch)

The WT300 series is the 5th generation of Yokogawa's compact power meter portfolio.

Specifications

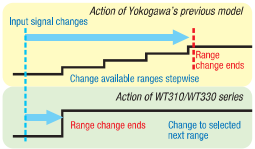
- Direct voltage input range
  15/30/60/150/300/600 V
- Direct current input range
  5/10/20/50/100/200 mA (WT310 only)
  0.5/1/2/5/10/20 A (Common for WT300 series)
  1/2/5/10/20/40 A (WT310 HC only)
- External current input range (optional)
  2.5/5/10 V or 50 m/100 m/200 m/500 m/1/2V
- Frequency range: DC, 0.5 Hz to 100 kHz
  (up to 20 kHz for WT310HC)
- Basic accuracy (45 Hz to 66 Hz)
  Voltage/current ±(0.1% of rdg*1 + 0.1% of rng*2)
  Power ±(0.1% of rdg*1 + 0.1% of rng*2)
- Influence of power factor (when cos Ø =0)
  Add ±0.2% of VA
- Data update rate: 100 m/250 m/500 m/1/2/5 s
- External dimensions
  · WT310 series: Approx. 213(W) × 88(H) × 379(D) mm (excluding protrusions)
  · WT330 series: Approx. 213(W) × 132(H) × 379(D) mm (excluding protrusions)
- Weight: Approx. 3.0 kg (WT210), approx. 5.0 kg (WT230)

*1 rdg: reading, *2 rng: range

New Functions to Improve Measurement Efficiency

● 3 First-in-class range skip (range configuration) function

The WT300 series is equipped with the range skip (range configuration) function of the high-end models, which reduces the range-change time in auto-ranging mode that is long due to the wide voltage and current ranges. This function skips the ranges other than the pre-selected range to speed up the change to the selected range in auto-ranging mode. (The included WTViewerFreePlus software is required for the setting)



● First-in-industry integration measurement auto-ranging function

This is the industry's first function to automatically change the range in response to changes of the consumption power and current values in integration mode. This function continues integration even if the level of the input exceeds the maximum of the selected range and the range is changed to a higher level as a result of a rapid change in the conditions. This function eliminates the need for repeating the test even if a range is exceeded, thus reducing the evaluation time. Furthermore, separate power integration for each polarity (±Wh), current integration (Ah), and DC integration (charge/discharge) are also available.
(The measurement accuracy depends on the input level and variation. It is recommended to set a fast data update rate.)

Features

- **Basic power accuracy: ±0.1% of reading**
- **Measurement frequency range: DC, 0.5 Hz to 100 kHz (to 20 kHz for WT310HC)**
- **Fast data update rate: 100 ms**
- **Small current measurement: 5 mA range available (WT310)**
- **40 A large current available (WT310HC)**

Integration power measurement auto ranging function
- Simultaneous measurement of harmonics with voltage, current, and power (mode switching is not required, but the included WTViewerFreePlus software is required)
- Multiple communication interfaces: USB, GP-IB or RS-232 and Ethernet (option)
- Compact half-rack mount size
- The included standard PC software allows you to display values, harmonic bar graph, and waveforms

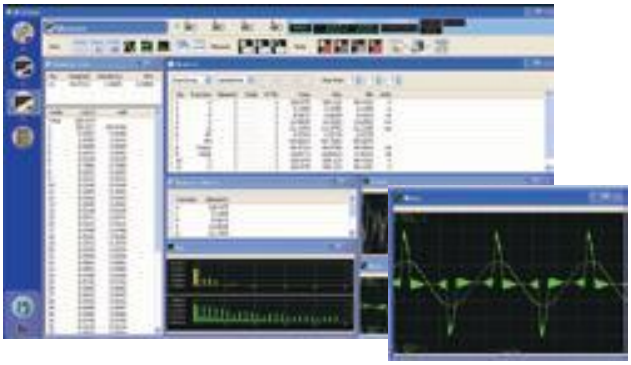
Models and Suffix Codes

Model	Suffix Code		Description
WT310			1 Input element model
Power Cord	-D		UL, CSA standard, PSE
	-F		VDE standard
	-R		AS standard
	-Q		BS standard
	-H		GB standard
	-N		NBR standard
Communication Interface *USB is standard	-C1	select one	GP- IB
	-C2		RS- 232
Optional function	/C7		Ethernet interface
	/EX1	select one	External sensor input 2.5V/5V/10V
	/EX2		External sensor input 50mV/100mV/200mV/500mV/1V/2V
	/G5		Harmonics Measurement
	/DA4		D/A- output(4CH)
Model	**Suffix 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
Communication Interface *USB is standard	-C1	select one	GP- IB
	-C2		RS- 232
Optional function	/C7		Ethernet interface
	/EX1	select one	External sensor input 2.5V/5V/10V
	/EX2		External sensor input 50mV/100mV/200mV/500mV/1V/2V
	/G5		Harmonics Measurement
	/DA4		D/A- output(4CH)
Model	**Suffix 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
Communication Interface *USB is standard	-C1	select one	GP- IB
	-C2		RS- 232
Optional function	/C7		Ethernet interface
	/EX1	select one	External sensor input 2.5V/5V/10V
	/EX2		External sensor input 50mV/100mV/200mV/500mV/1V/2V
	/G5		Harmonics Measurement
	/DA12		D/A- output(12CH)

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

WTViewerFreePlus For WT300 Series (included)

Setting Window



Measurement Window

The WTViewerFreePlus software installed on a PC uses a USB, GP-IB/RS-232, or Ethernet (optional) interface to capture, transfer, and display* five or more numeric values, bar graph of harmonic order components, trend graph of measurement data, or voltage/current waveforms that cannot be displayed on the LED display of the WT300 series. The use of this software extends the application range of the WT300 series.
With the aim of simplifying the connection and setup, the details were redesigned so that the communication function is recognized automatically, a dedicated setting window was added, and all measurement data can be displayed simultaneously.

* Waveform display requires the /G5 harmonic measurement option.

WT300 Series Can Be Used for a Variety of Applications

Production line or QA testing of electric Devices

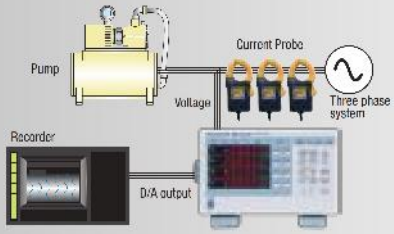
- Compact half rack mount size helps customers build smaller test systems with a better Return on Investment (ROI).
- D/A output function for data recording
- Multiple communication interfaces. USB, RS-232 or GP-IB and Ethernet capability.

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 flexibly captured.

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.



Comparison between WT210/230 series and WT300 series

		WT310/WT332/WT333	WT310HC	WT210/WT230
DC power measurement accuracy		0.1% of reading±0.2% of range	0.3% of reading±0.2% of range	0.3% of reading±0.2% of range
Current range (Crest factor=3)	Direct input	5m/10m/20m/50m/100m/200m/ 0.5/1/2/5 /10/20[A] (WT310) 0.5/1/2/5/10/20[A] (WT332/WT333)	1/2/5/10/20/40[A]	5m/10m/20m/50m/100m/200m/ 0.5/1/2/5 /10/20[A] (WT210) 0.5/1/2/5/10/20[A] (WT230)
	External current input	EX1: 2.5/5/10[V] EX2: 50m/100m/200m/500m/1/2[V] (OP.)	EX1: 2.5/5/10[V] EX2: 50m/100m/200m/500m/1/2[V] (OP.)	EX1: 2.5/5/10[V] EX2: 50m/100m/200m[V] (OP.)
Effective input range for voltage & current (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%
	0<PF<1	Power reading x {power reading error ÷ (power range / apparent power reading) + tanØ x (influence when PF = 0)} %	Power reading x {power reading error ÷ (power range / apparent power reading) + tanØ x (influence when PF = 0)} %	Add the power reading x {tanØ x (influence when PF = 0)}%.
Simultaneous measurement of RMS, VotageMEAN & DC		Yes *1	Yes *1	No
Frequency 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
Harmonic 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 integration		Yes	Yes	No
Communication interface	USB	Yes	Yes	No
	GP-IB	Yes GP-IB or RS-232	Yes GP-IB or RS-232	Yes (OP) GP-IB or RS-232C
	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 standard for GP-IB		IEEE488.2	IEEE488.2	IEEE488.1 and IEEE488.2
Comparator function		No	No	Yes
Viewer software (setting & 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
Changed points

Precision Power Scope **PX8000**

Power Analyzer Capable of Measuring Waveform Parameters and Transient Power

PX8000
Detailed catalog: Bulletin PX8000-01EN/PX8000-02EN

The PX8000 is a compact sophisticated power analyzer that can incorporate up to four measurement power elements. It can calculate the transient voltage, current, and power for each cycle, the average voltage, current, and power between cursors, and measure waveform parameters.

Features

- High-speed sampling and wide range measurement
  The power of devices driven at a high frequency can be measured at a 100 MS/s sampling rate, at a 12-bit resolution, and in the 20 MHz range*1.
- Waveform measurement function
  Instantaneous power waveforms can be displayed as standard in addition to voltage and current waveforms, and power changes can be observed directly.
  Voltage, current, and power waveforms for each cycle can be calculated and numerical values can be displayed by cursor.
  The average voltage, current, and power values in a specified period by the cursor can be calculated.
  Acquisition memory is up to 100 M points per channel (when equipping the /M2 option), allowing for capturing and displaying detailed waveforms.
- Waveform analysis function
  Up to the 500th order harmonic components can be measured simultaneously (when installing the /G5 option).
  2-channel FFT function is available as standard.
- De-skew (phase compensation) function when using an external power sensor, etc. is available.
- Motor characteristics can be evaluated (mechanical output calculation with torque and rotation speed input, as well as analog and pulse input).

*1: Direct current input at 10 MHz (-3 dB typical)

Various functions to measure transient power*2

● Simultaneous calculation and display of instantaneous power waveforms

The PX8000 calculates the instantaneous power waveform simultaneously with the voltage and current waveforms. The instantaneous waveform can be obtained as the product of the voltage and current waveforms that are sampled at the same time. This function is a standard function so no special setting is required. This instantaneous power value can be displayed using the cursor.

Waveform data in the displayed entire range can be displayed on the numerical display screen.

The instantaneous power waveform indicates the trend of power change. The value at any point in time can be displayed using the cursor.

● Trend power calculation for each cycle

Power trend waveform for each cycle can be calculated using the User Defined Computation (waveform calculation, MATH) at up to 4 M points. The captured waveforms can be used to obtain the value for a particular cycle and calculate the difference between cycles using the cursor function.

Settings of the trend calculation using the User Defined Computation (MATH) function.

The cursor (horizontal, vertical, and marker) allows you to display the numerical data of trend waveform for each cycle calculated using the User Defined Calculation (MATH).

● Power calculation in a range specified by the cursor

The average numerical values in a range specified by the cursor can be calculated. Values in the entire range of waveforms displayed on the screen can be displayed on the upper numerical display screen. The MEASURE function cursor can be used for the measurement in the specified range.

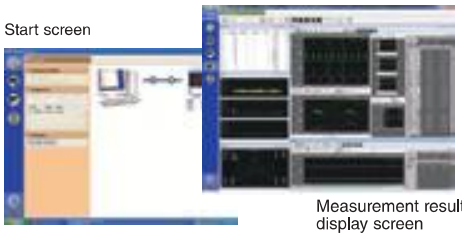
Waveform parameters to be calculated can be set in detail.

Measured values of waveforms displayed in the entire range can be displayed on the numerical display screen.

The measured value between cursors indicating the start and stop positions can be set independently from the measured value displayed on the upper numerical display screen.

● Viewer software PowerViewerPlus (coming soon)

Start screen

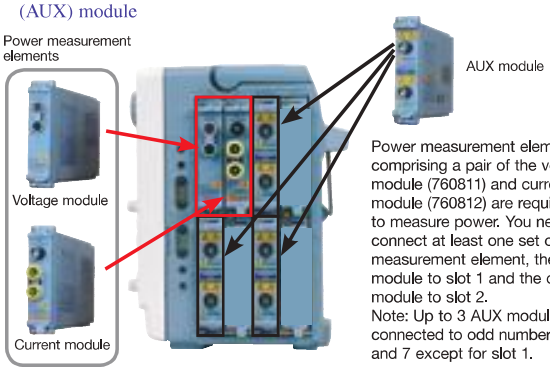


Measurement results display screen

PC application software for the PX8000 will be released soon. The 760881 PowerViewerPlus allows you to transfer measurement data of the PX8000 to a PC to display and analyze a large amount of waveform data on the PC.

*2: Accuracy is not specified for the numerical data of the measured transient power.

Power measurement elements (voltage and current modules) and Auxiliary (AUX) module



Power measurement elements comprising a pair of the voltage module (760811) and current module (760812) are required to measure power. You need to connect at least one set of power measurement element, the voltage module to slot 1 and the current module to slot 2.
Note: Up to 3 AUX modules can be connected to odd number slots 3, 5, and 7 except for slot 1.

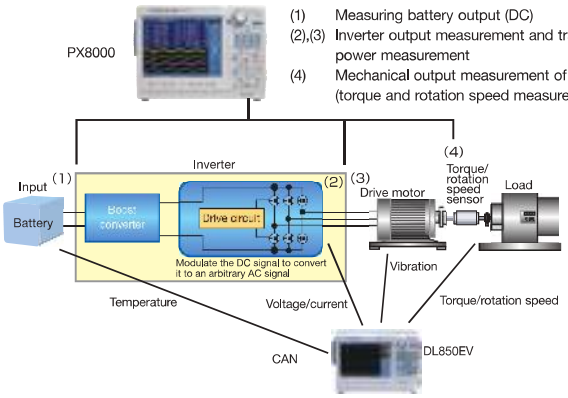
Functions to prevent mismatch between the voltage and current modules

- Warning message
- Check on the overview screen '(you can check paired modules)

Safety design

Different types of voltage input terminal and current input terminal are used to keep the user from confusing one from the other.

Application example: Inverter evaluation using the PX8000 and DL850EV



Overview of the evaluation with the PX8000 and DL850EV

Electric vehicles (EVs) and hybrid electric vehicles (HEV) are made of a large number of electrical and mechanical parts. To evaluate their efficiency, electrical parts and mechanical parts must be measurement simultaneously. The DL850EV is a data acquisition instrument that can measure many types of physical quantities at multiple points simultaneously. On the other hand, the PX8000 measures the efficiency of the inverter and the motor, as well as transient changes at every moment based on the electrical signals of voltage and current and the mechanical output calculated from the torque and rotation speed.

Specifications

- Voltage direct input range: 1.5/3/6/10/15/30/60/100/150/300/600/1000 Vrms
- Current direct input range: 10 m/20 m/50 m/100 m/200 m/500 m/1/2/5 Arms
- Current sensor input range: 50 m/100 m/200 m/500 m/1/2/5/10 Vrms
- Frequency range: DC to 20 MHz (-3 dB, voltage and current sensor input)
  DC to 10 MHz (-3 dB, current direct input)
- Power basic accuracy (45 Hz to 66 Hz)
  ±(0.1% of reading + 0.1% of range)
- Influence of power factor error (cos Φ = 0):
  0.15% of S (apparent power)
- A/D converter: Maximum sampling rate 100 MS/s
  Resolution 12-bit
- Acquisition memory: Standard: 10 M points per channel
  Max: 100 M points per channel (/M2 option)
- Maximum waveform viewing time:
  20 minutes (not dependent on the memory size)
- History memory: This function can save up 1,000 records of waveform data and display and calculate them as needed(when the /M2 option installed)
- Waveform display: Up to 16 waveforms can be displayed.
  Voltage and current waveforms and simultaneous power waveform can be displayed.
- Snapshot: Waveform at an arbitrary moment on the screen can be saved.
- De-skew (phase compensation) function:
  Phase difference between the voltage and current modules is compensated.
- Trend measurement (waveform measurement, MATH):
  Voltage, current, and power waveform calculation for each cycle
- Calculation in the specified period (waveform parameter calculation, MEASURE):
  Average value between cursors can be measured.
- Simultaneous harmonic measurement:
  Up to the 500th order harmonic measurement (/G5 option)
- 2-channel FFT function available as standard
- Printer: Screens can be copied (/B5 option)
- External storage: USB port (×2), SD card
- Video output: RGB analog, video output
- Display unit: 10.4-inch color TFT XGA display
- GP-IB, Ethernet, and USB communication available as standard
- IRIG function: Data measured with multiple PX8000 units can be synchronized (/C20 option)
- External dimensions: 355 (W) × 259 (H) × 180 (D) mm (excluding protrusions)
- Weight: Approximately 6.5 kg
  (main unit only, excluding paper and options)

* For common options and accessories, see Page 37.

PX8000 Model and Suffix Codes

Product name	Model	Suffix code	Description
Precision Power Scope	PX8000		Precision Power Scope main unit
		-D	UL and CSA standards (PSE compliant, 3-pole type)
		-F	VDE standard
		-R	AS standard
		-Q	BS standard
		-H	GB standard
		-N	NBR standard
		-HE	English menu language
		/B5	In-built printer
		/C20	IRIG function
		/G5	Simultaneous harmonic measurement
		/M1*1	50 M point/CH memory extension
		/M2*1	100 M point/CH memory extension
		/P4	4CH probe power output

Product name	Model	Suffix code	Description
Voltage Module	760811 *2		Necessary to order the same number as that of the 760812 Current Modules at the same time
Current Module	760812 *2		Necessary to order the same number of that of the 760811 Voltage Modules at the same time
Auxiliary (AUX) Module	760851		Can measure the sensor signals of torque and rotation speed on 2 channels

*1 Selection of both /M1 and /M2 is not available for one main frame. The standard memory length is 10 M points/CH.
*2 The power value will be calibrated using a pair of Voltage (760811) and Current (760812) modules, therefore an equal quantity of these must be ordered together.

- A test Certificate of the Voltage Module includes the test results of the voltage and power values which are calibrated with one paired Current Module. Also the test Certificate of the Current Module includes the test results of the current and power values which are calibrated with one paired Voltage Module.

<Cautions regarding the installation of modules and their location>
- The PX8000 has a maximum of 8 slots for installing modules.
- It is required to equip the PX8000 main frame with at least one Voltage Module and one Current Module in slots 1 and 2 to create one Power Measurement Element. The PX8000 can be equipped with a maximum of three additional Power Measurement Elements.
- When modules are ordered with the PX8000 main frame, the modules are factory installed in the main frame up to a combined maximum of 4 power measurement elements and auxiliary modules. Priority is given to the installation of power measurement elements.
- The location of modules can be changed by the customer. However, slot 1 must be always containing a Voltage Module and slot 2 must always contain a Current Module.
- Power values are calibrated using one Voltage Module and one Current Module, so the same number of these modules must be ordered together. In the case of service, repair or re-calibration, both modules must be sent together to the service department.
- Up to 3 Auxiliary (AUX) Modules can be installed in odd numbered slot only (3, 5 and 7). Odd numbered slots (3, 5 and 7) are also used to install additional Voltage Modules, and even numbered slots (4, 6 and 8) for additional Current Modules.

AC/DC Current Sensor CT60/CT200/CT1000

Wide Variety of precision Current Sensors for broad applications

CT60/CT200/CT1000

AC/DC Current Sensors DC, up to 800 kHz, up to 1000 A peak

- Rated Current
  - CT60 DC: 0 to 60 A, AC 60 A peak
  - CT200 DC: 0 to 200 A, AC 200 A peak
  - CT1000 DC: 0 to 1000 A, AC 1000 A peak
- Frequency band width
  - CT60 DC to 800 kHz (-3 dB)
  - CT200 DC to 500 kHz (-3 dB)
  - CT1000 DC to 300 kHz (-3 dB)
- Measurement Accuracy
  DC, 50/60 Hz: ± (0.05% of reading + 30 μA)
- Power Supply Voltage ± (15 V + 5%)

Current Probe 751552

Accessory for Digital Power Meters and Power Analyzer

758917

758921

751552

Current Clamp-on Probe AC 1000 Arms (1400 A Peak)

- Measurement bandwidth: 30 Hz to 5 kHz
- Basic accuracy: ± 0.3% of reading
- Maximum allowable input: AC 1000 Arms
  1400 Apk (AC)
- Current output type: 1 mA/A

To connect this probe to the WT series, you need the Model 758921 (Fork terminal adapter) and Model 758917 (Measurement lead set) accessories sold separately. For details, please see the Power Meter Accessories Catalog (Bulletin CT1000-00E).

WT Series Accessory Software

760122 and Power Consumption Measurement Software

PC-based Control and Data Acquisition

WTViewer

760122

Main Features of WTViewer

- Numeric, waveform, harmonic, and trend displays
- Manual save function: With one click you can save only desired data at the right timing.
- Data conversion to CSV: You can save waveforms, numeric data, and screen images to a PC.
- You can control multiple WT series units of the same specifications from a PC.
  Note: The functionality differs slightly depending on the model. For details, please refer to the specifications of your desired model.

4 units synchronization

File conversion function

FTP function

Command monitor

WTViewer is a software application that allows you to load numeric and waveform data measured with the WT3000 Precision Power Analyzer, WT1800 High performance Power Analyzer, or WT500 Power Analyzer to a PC via GP-IB, serial (RS-232 for WT3000), or USB (for WT3000/WT1800/WT500) communications. It also lets you view the waveform data, and analyze and save the numeric data.

Communication functions supported by WTViewer 760122

Model number	GP-IB	Serial (RS-232)	Ethernet	USB
WT3000	○	● *1	●	● *1
WT1800	○	×	○	○
WT500	●	×	●	○
WT310	○ *2	○ *2	●	○
WT330	○ *2	○ *2	●	○

○ : Supported (by WT as standard) ● : Supported (by WT as an option) × : Not supported (by WT)
*1: With the WT, RS232 and USB port (PC) cannot be used at the same time.
*2: With the WT, RS232 and GP-IB cannot be used at the same time.

WT3000

	Maximum connections	FTP server/client function
GP-IB connection	1 to 4 units	Not available
Serial (RS-323) communication	1 unit	Not available
Ethernet communication	1 to 4 units	Available*
USB communication	1 to 4 units	Not available

WT1800

	Maximum connections	FTP server/client function
GP-IB connection	1 to 4 units	Not available
USB communication	1 to 4 units	Not available
Ethernet communication	1 to 4 units	Available

WT500

	Maximum connections	FTP server function
GP-IB connection	1 to 4 units	Not available
Ethernet communication	1 to 4 units	Available
USB communication	1 to 4 units	Not available

* A PC card or USB memory is required.

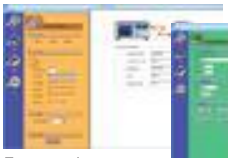
Power Consumption Measurement Software

Power Consumption Measurement Software

Free Software

- Support for the measurement of standby power compliant with the ErP Directive Lot 6, IEC62301 standard
- Allows you to acquire the necessary data such as a power value with simple operations such as just pressing the Start button.
- Allows you to print out a report on the measurement results.

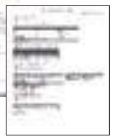
(The free software can be downloaded from Yokogawa's website)



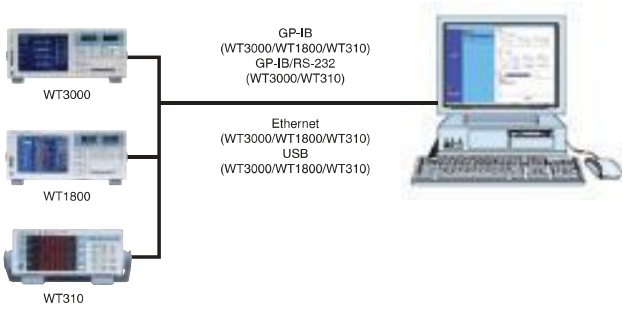
Example of an initial setup screen

Example of a screen to set the measurement conditions

Example of a measurement screen



Example of a printed report



WT Series Accessory Software

761922 IEC regulation software

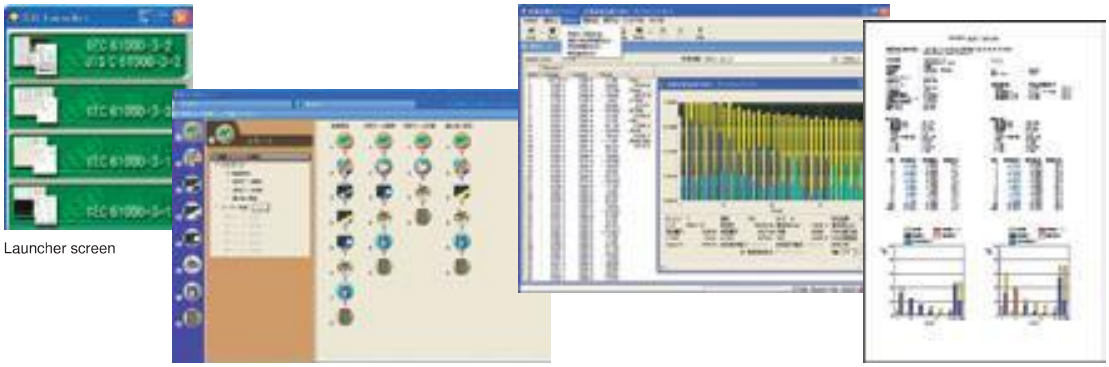
Support for IEC Standards Testing

Harmonic/Flicker Measurement Software

761922

- Allows you to judge high current equipment with input current of 16 A or more per phase (IEC61000-3-11/-3-12)
- Support for the method that does not consider interharmonics in the window of 16 cycles specified in IEC61000-4-7 1991
- Best-in-class high-precision current and voltage measurements (also allows you to calculate the limits of the standard)
- All Judgment graph display shows a list of all the measurement results in a time series by order.
- Allows you to measure harmonics for up to 24 hours, so capable of measuring equipment that needs more than one hour for one cycle.
- Continuous data acquisition at a measurement interval of 200 ms ensures continuous measurement over a long period of time with no missing data
- Support for the standard tests of single- and three-phase equipment

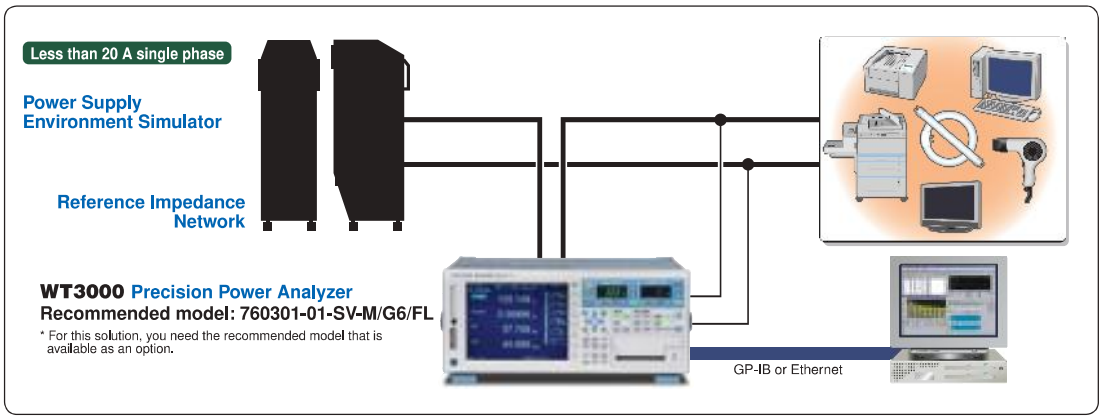
Example of a measurement screen

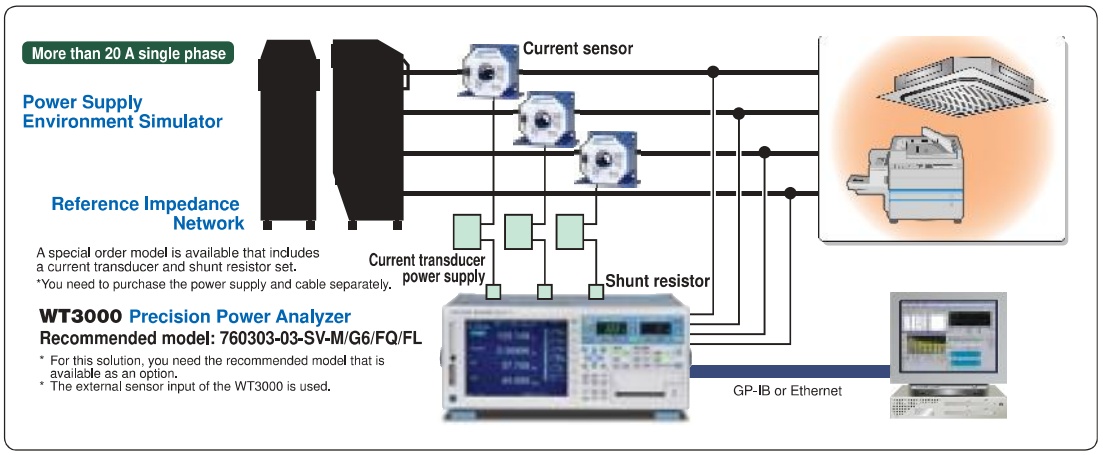


Launcher screen

Example of an initial setup screen

Example of a printed report





	Applicable standards
Harmonic current standard	IEC61000-3-2 Ed3.2 2009 (less than 16 A per phase) / 3-12 Ed 1.0 2004 (more than 16 A per phase)
Harmonic analyzer	IEC61000-4-7 Ed 1.0 1991/ Ed 2.0 2002 / Ed 2.0-Am1 2008
Voltage fluctuations and flicker standard	IEC61000-3-3 Ed 2.0 2008 (less than 16 A per phase /-3-11 Ed 1.0 2000 (more than 16 A per phase)
Flicker analyzer	IEC61000-4-15 Ed 1.1 2003

Digital Analyzers Accessories List

Accessories List

Product	Part No.	Description		WT3000	WT1800	WT500	WT310/WT330	PX8000
1:1 BNC safety adapter lead	701901	1000 Vrms-CAT II, 1.8 m long Safety BNC (male) to safety banana (female) use in combination with 701959, 701954, 758921, 758922 or 758929		●	●	●	●	
Measurement leads	758917	Two leads in a set. Use 758917 in combination with 758922 or 758929. Total length: 75 cm Rating: 1000 V, 32 A		●	●	●	●	●
Small alligator adapters	758922	For connection to measurement leads (758917). Two in a set. Rating: 300 V		●	●	●	●	●
Large alligator adapters	758929	For connection to measurement leads (758917). Two in a set. Rating: 1000 V		●	●	●	●	●
Safety terminal adapter set	758923	(spring-hold type) Two adapters in a set.		●	●	●	●	●
Safety terminal adapter set	B8213ZD	Screw-fastened adapters for voltage input. Two adapters in a set. 1.5 mm Allen wrench for tightening is required.		●	●	●	●	●
Safety terminal adapter set	B8213ZA	Screw-fastened adapters for current input of PX8000. Two adapters in a set. Allen wrench for tightening is required.						●
Fork terminal adapter	758921	Two adapters (red and black) to a set. Used when attaching banana plug to binding post.		●	●	●	●	
Conversion adapter	758924	For conversion between BNC and female banana plug		●	●	●	●	
Conversion adapter	366971	9-pin/25-pin conversion adapter		●				
External sensor cable	B9284LK	For the external input of the WT series. Length: 50 cm		●	●	●	●	●
BNC cable	366924	BNC cable BNC–BNC, 1 m		●	●	●		●
BNC cable	366925	BNC cable BNC–BNC, 2 m		●	●	●		●
26 pin cable	705926	For/DA4 and/DA12 option					●	
Compact instrument cart	701960	500 (W) × 560 (D) × 705 (H) mm /A: keyboard, mouse table /B: 3-prong power strip		●	●	●	●	●
Deluxe instrument cart	701961	570 (W) × 580 (D) × 893 (H) mm /A: keyboard, mouse table /B: 3-prong power strip		●	●	●	●	●
All-Purpose instrument cart	701962	467 (W) × 693 (D) × 713 (H) mm		●	●	●	●	●
Rack mounting kit	751535-E4	For EIA		●	●	●		
Rack mounting kit	751535-J4	For JIS		●	●	●		
Rack mounting kit	751533-E2	For WT310 EIA standalone installation					●	
Rack mounting kit	751533-J2	For WT310 JIS standalone installation					●	
Rack mounting kit	751534-E2	For WT310 EIA connected installation					●	
Rack mounting kit	751534-J2	For WT310 JIS connected installation					●	
Rack mounting kit	751533-E3	For WT330 EIA standalone installation					●	
Rack mounting kit	751533-J3	For WT330 JIS standalone installation					●	
Rack mounting kit	751534-E3	For WT330 EIA connected installation					●	
Rack mounting kit	751534-J3	For WT330 JIS connected installation					●	