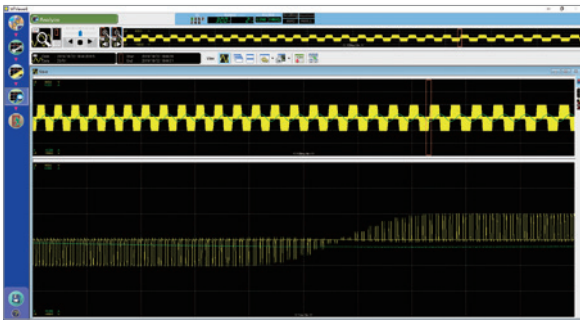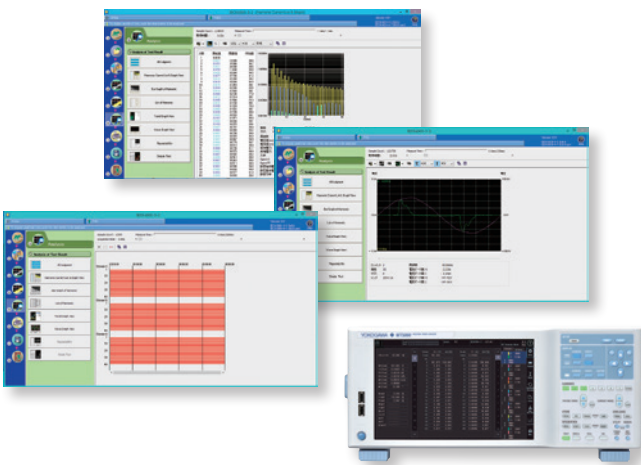# Test&Measurement

Next generation in precision

WT5000
Precision Power Analyzers
New Features

Data streaming

WT5000 /DS option

IEC Harmonic/Voltage Fluctuation and Flicker

WT5000 /G7 option

Precision Making

WT5000 /DS option

Waveform data streaming[1]

In addition to benefitting from the highly accurate numerical data measured by the WT5000, one can stream to a PC the waveform data with a sample speed of up to 2 MS/s. Voltage and current waveforms as well as the motor signals can be streamed to a PC.
This allows engineers to study the transient behavior simultaneously when measuring efficiency or energy consumption.

Display examples of WTViewerE

Synchronized data

The waveform data is streamed without any gaps, can be combined, and is synchronized with the numerical data. Abnormal findings in numerical data can be directly linked and be evaluated in the waveform data. For example, one can find numeric parameters variation caused by the influence of imposed high frequency noise.

Simple operation and analysis, supported WTViewerE[2]

WTViewerE offers control of the WT5000 and makes it simple to record and analyze measurement data.
When the waveform data is recorded by the WTViewerE, it shows the relationship between the numerical data and the corresponding waveform data. When evaluating numerical data in analysis mode, the corresponding part of the streamed waveform data is indicated.

*1: To stream the waveform data to a PC, it is possible to make use of WTViewerE 761941. This can also be done by making use of dedicated communication commands for programming.

*2: Previous WTViewerE software versions will be upgraded to support the Data streaming function soon. Trial version of WTViewerE is available until then.
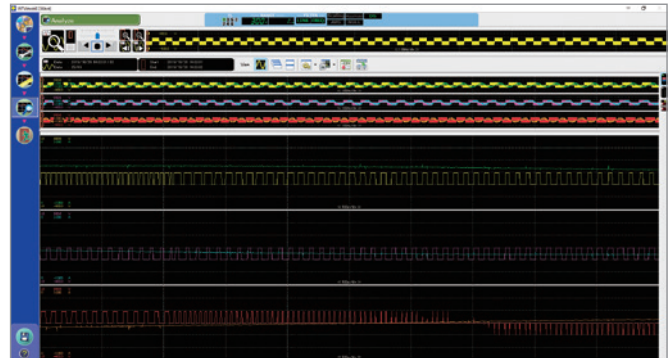
Display examples of WTViewerE
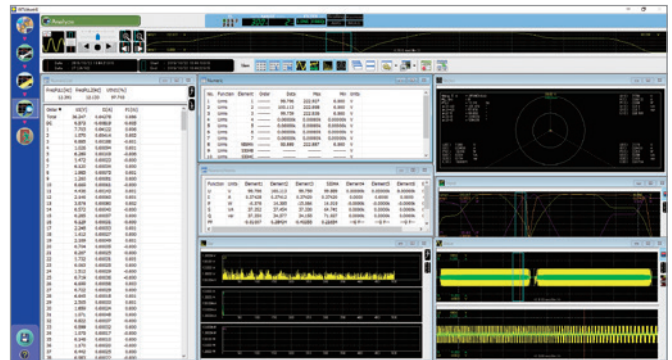
Main specifications

Data Streaming	
Waveform sample rate	10, 20, 50, 100, 200 and 500 kS/s, 1 and 2 MS/s
Waveform data that can be streamed	
	All inputs (U, I, Motor and AUX)
Numeric data that can be saved	
	All numeric data (normal data/harmonic data)
Update rate	1 s (fixed)
Acquisition interval	1 s

Acquisition time	Acquisition time is determined by the amount of empty space of the drive. *When sample rate is set at 2 MS/s, data size of one waveform is as follows:	Time	Data Size
		1 s	8.0 MB
		1 minute	480 MB
		1 hour	28.8 GB

Acquired waveform data	Streamed waveform data 1-second displayed waveform data
Data format	Streamed waveform data/displayed waveform data: 32-bit single-precision floating-point Numeric data: 32-bit single-precision floating-point

Maximum waveform trace count

Case of USB 3.0		Case of Gigabit Ethernet (VXI-11)	
Sample rate (S/s)	Maximum waveform trace count	Sample rate (S/s)	Maximum waveform trace count
2 MS	2	2 M	2
1 M	6	1 M	4
500 k	14	500 k	6
10 k to 200 k	22	10 k to 200 k	22

Communication interface	USB 3.0, Ethernet 1000 Base-T

*PC System requirements:
Equivalent to Intel Core i5-8250U or higher with 4 GB RAM or more and 1 TB free space on SDD
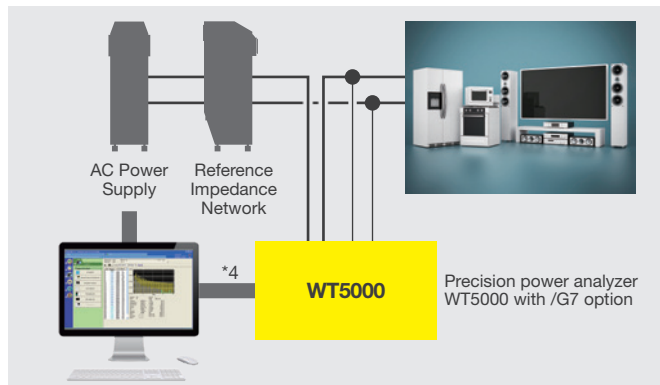
WT5000 /G7 option

Harmonics regulation test[1] [2]

Combined with the /G7 option and the Harmonic /Flicker measurement software[3], the WT5000 measured harmonic data can be saved into a PC and judge the level according to IEC regulations. To support large equipment over 16 A/phase (IEC61000-3-12), the CT200 current sensor model can be used.

Voltage fluctuation and Flicker regulation test[1] [2]

The WT5000 with the /G7 option can measure voltage fluctuation and can conduct a Flicker test, according to IEC61000-3-3 regulations. This option shows a trend of parameters such as dc, dmax and Pinst (instantaneous flicker sensation). In order to capture test results, this option generates a comprehensive test report.

AC Power Supply / Reference Impedance Network / *4 / WT5000 / Precision power analyzer WT5000 with /G7 option

*1: Supported standards:
- Harmonics
  EN61000-3-2, IEC61000-3-2, EN61000-3-12, IEC61000-3-12, JIS C 61000-3-2
- Voltage fluctuation/flicker
  EN61000-3-3, IEC61000-3-3, EN61000-3-11, IEC61000-3-11

*2: 30 A/ 5 A High Accuracy Element (760901/760902) are available.

*3: In order to improve service for users, the Harmonic/Flicker measurement software will be supplied as subscription model in the near future. It can be sold after the preparation is ready. A free trial software will be given until then.

*4: GP-IB, Ethernet and USB communications are available.

Main specifications

IEC Harmonic measurement
(The /G7 option and the Harmonic/Flicker Measurement Software for WT5000 is required)

Input element	30 A and 5 A High Accuracy Input Element (760901* and 760902) *Current input is compliant up to 23 Arms for the 1st order.
Measured source	Select an input element or an Σ wiring unit
Format	PLL synchronization method
Frequency range	Fundamental frequency of the PLL source is in the range of 45 Hz to 66 Hz.
PLL source	• Select the voltage or current of each input element (external current sensor range is greater than or equal to 500 mV) or the external clock (fundamental frequency). • Input level Greater than or equal to 50% of the measurement range rating when the crest factor is 3 Greater than or equal to 100% of the measurement range rating when the crest factor is 6 • Be sure to turn the frequency filter ON.
PLL point	32768
Window function	Rectangular

Period of the window	No gap and No overlap
Anti-aliasing filter	Set using a line filter (Butterworth, cutoff 30 kHz: Ed2.0/E2.0A1, 20kHz: Ed1.0)

Inter-harmonic measurement
- Grouping function Enable/disable (IEC61000-4-7 Ed. 2.0)
- No grouping function (IEC61000-4-7 Ed. 1.0)

Sample rate (sampling frequency), window width, and upper limit of measured order*

Fundamental frequency of the PLL source (Hz)	Sample rate (S/s)	Sample rate (S/s)	Window Width against the FFT Data Length (Frequency of the Fundamental Wave)	Upper limit of the Measured order
IEC61000-4-7 Ed. 2.0/2.0-amd 1	45 to 55	f × 3276.8	10	200
	55 to 66	f × 2730.67	12	170
IEC61000-4-7 Ed. 1.0	45 to 66	f × 2048	16	120

*IEC defines the maximum harmonic order that is measured to be 40.
The Harmonic/Flicker Measurement Software for WT5000 can measure the harmonics up to order 40.

Data update interval	Depends on the PLL source

Accuracy: ±(% of reading + % of range)

Frequency	Voltage and current	Power
45 Hz ≤ f ≤ 66 Hz	±(0.2% of reading + 0.04% of range)	±(0.4% of reading + 0.05% of range)
66 Hz < f ≤ 440 Hz	±(0.2% of reading + 0.05% of range)	±(0.4% of reading + 0.1% of range)
440 Hz < f ≤ 1 kHz	±(0.2% of reading + 0.05% of range)	±(0.4% of reading + 0.1% of range)
1 kHz < f ≤ 2.5 kHz	±(0.3% of reading + 0.05% of range)	±(0.6% of reading + 0.1% of range)
2.5 kHz < f ≤ 3.3 kHz	±(0.4% of reading + 0.05% of range)	±(0.8% of reading + 0.1% of range)
3.3 kHz < f ≤ 10 kHz	±(1% of reading + 0.05% of range)	±(2% of reading + 0.1% of range)

However, all the items below apply
- Line filter: Butterworth, cutoff frequency is 30 kHz ON
- When lambda is 1
- When crest factor is set to CF3
- When grouping function is OFF
- For n^{th} order component input, add ({n/(m + 1)}/50)% of (the nth order reading) to the n + m^{th} order and n − m^{th} order of the voltage and current, and add ({n/(m + 1)}/25)% of (the nth order reading) to the n + m^{th} order and n − m^{th} order of the power (only when applying a single frequency).
- Accuracy when the crest factor is 6: The same as when the range is doubled for crest factor 3.
- The accuracy guaranteed range by frequency and voltage/current is the same as the guaranteed range of normal measurement.
- Measured frequency is reference value

Display update	Depends on PLL source

IEC Voltage fluctuation and Flicker
(The /G7 option and the Harmonic/Flicker Measurement Software for WT5000 is required)

Flickermeter class		F2
Supported Standards		IEC61000-4-15 Ed. 1.1/Ed. 2.0
Normal Flicker Measurement Mode		
Measurement items	dc	Relative steady-state voltage change
	dmax	Maximum relative voltage change
	Tmax	The time during which the relative voltage change during a voltage fluctuation period exceeds the threshold level
	Pst	Short-term flicker value
	Plt	Long-term flicker value
One observation period		30 s to 15 min
Observation period count		1 to 99
Measurement of dmax Caused by Manual Switching Mode		
Measurement Items		dmax: Maximum relative voltage change
One observation period		1 minute
Observation period count		24
Items Common to Measurement Modes		
Target voltage/frequency		230 V/50 Hz, 230 V/60 Hz, 120 V/50 Hz and 120 V/60 Hz
Measured source input		Voltage (current measurement function not available)
Target element		30 A and 5 A High Accuracy Input Element (760901 and 760902)
Measurement element number		
		Maximum 3 element
Voltage input level		Greater than or equal 50% of the measurement range rating
Flicker scale		0.01 to 6400 P.U. (20%) divided logarithmically into 1024 levels
Display update		2 s (dc, dmax, and Tmax) For every completion of a observation period (Pst)
Communication output		dc, dmax, Tmax, Pst, Plt, instantaneous flicker sensation (Pinst), and cumulative probability function (CPF)
External storage output		Screen image
Accuracy		dc, dmax: ±4% (at dmax = 4%) Pst: ±5% (at Pst = 1 to 3), ±0.05 (at Pst = 0.2 to 1)
		*Conditions for the accuracy above • Ambient temperature: 23±1°C • Line filter: ON (Cutoff 10 kHz) • Frequency filter: ON (Cutoff 1 kHz) *Frequency measurement figures are reference values.

Model and Suffix code

Model	Suffix Code	Descriptions
WT5000		Precision Power Analyzer
Language Menu	-HC	Chinese/English Menu
	-HE	English Menu
	-HG	German/English Menu
	-HJ	Japanese/English Menu
Power Cord	-B	Indian Standard
	-D	UL/CSA Standard, PSE Compliant
	-F	VDE/Korean Standard
	-H	Chinese Standard
	-N	Brazilian Standard
	-Q	BS Standard
	-R	Australian Standard
	-T	Taiwanese Standard
	-U	IEC Plug Type B
Option	/M1	32 GB Built-in Memory
	/MTR1	Motor Evaluation 1
	/DA20*	20 CH D/A Output
	/MTR2*	Motor Evaluation 2
	/DS	Data Streaming
	/G7	IEC Harmonic/Flicker Measurement

*When select from these options, please select only one. /MTR2 option requires installation of /MTR1 option.

Model	Suffix Code	Descriptions
760901		30 A High Accuracy Element
760902		5 A High Accuracy Element

Standard accessories

WT5000
Power cord, Rubber feet, Cover panel B8216JA 7 sets, User's manual, expanded user's manual, communication interface user's manual, connector (provided only with/DA20)

760901/760902
Safety terminal adapter B9317WB/B9317WC (provided two adapters in a set times input element number) Safety terminal adapter A1650JZ/A1651JZ (provided black/red two adapters in a set, times of 30 A input element number), Safety terminal adapter B8213YA/B8213YB (provided black/red two adapters in a set, times of 5 A input element number)

User's manuals: Start guide (booklet), function/operation, communication manuals (electric file)

Clamp probes and AC/DC current sensors

Model	Product name	Descriptions
720930	Current Clamp Probe	40 Hz to 3.5 kHz, AC50 A
720931	Current Clamp Probe	40 Hz to 3.5 kHz, AC200 A
CT2000A	AC/DC Current Sensor	DC to 40 kHz, ±(0.05% of reading + 30 µA), 3000 Apeak (2000 Arms)
CT1000A	AC/DC Current Sensor	DC to 300 kHz, ±(0.04% of reading + 30 µA), 1500 Apeak (1000 Arms)
CT1000	AC/DC Current Sensor	DC to 300 kHz, ±(0.05% of reading + 30 µA), 1000 Apeak
CT200	AC/DC Current Sensor	DC to 500 kHz, ±(0.05% of reading + 30 µA), 200 Apeak
CT60	AC/DC Current Sensor	DC to 800 kHz, ±(0.05% of reading + 30 µA), 60 Apeak

Accessory (sold separately)

Model	Product name	Descriptions
366924 ⚠ *1	BNC-BNC Cable	1 m
366925 ⚠ *1	BNC-BNC Cable	2 m
701901	1:1 Safety BNC Adapter Lead	1000 V CAT II for /MTR1, /MTR2
701902	Safety BNC-BNC Cable	1000 V CAT II, 1 m for /MTR1, /MTR2
701903	Safety BNC-BNC Cable	1000 V CAT II, 2 m for /MTR1, /MTR2
758917	Test Lead Set	A set of 0.75 m long, red and black test leads
758922 ⚠	Small Alligator-clip	Rated at 300 V CAT II two in a set
758923	Safety Terminal Adapter	Two adapters to a set (spring-hold type)
758924	Conversion Adapter	BNC-banana-Jack (female) adapter
758929 ⚠	Large Alligator-clip	Rated at 1000 V CAT II and used in a pair
758931	Safety Terminal Adapter Set	Two adapters to a set (Screw-fastened type), 1.5 mm hex Wrench is attached.

*1: Use these products with low-voltage circuits (42 V or less).

Rack mounting kits

Model	Product name	Descriptions
751542-E4	Rack Mounting Kit	For EIA
751542-J4	Rack Mounting Kit	For JIS

Application software

Model	Product name	Descriptions
761941	WTViewerE	Application Software for WT Series

Additional Option License*

Model	Suffix Code	Descriptions
760991	-DS	Data Streaming
	-G7	IEC Harmonic/Flicker Measurement

*Separately sold license product (customer-installable).

Yokogawa's Approach to Preserving the Global Environment

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

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

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