

Precision Power Analyzer

# WT3000

Advanced Calculation Function(/G6 Option)

Yokogawa's power measurement technology provides Best-in-Class precision and stability. 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 WT3000 provides a high-accuracy measurement solution for power electronics product testing. The Advanced Calculation Function (/G6 option) is now being released to support customer requirements for more advanced and complex power analysis capabilities.



The Advanced Calculation Function (/G6 option) provides for wide bandwidth harmonic measurement, IEC compliant harmonic measurement (requires harmonic measurement software), FFT calculation, waveform calculation functions, and saving of waveform sampling data.

## ▶ Wide Bandwidth Harmonic Measurement Mode

**Harmonic measurement for a frequency range of 0.1 Hz – 2.6 kHz**  
Enables harmonic measurement over wide bandwidths. Supports measurement of harmonic signals beyond those of the harmonic measurement function in normal measurement mode(/G5 option). This option allows for harmonic analysis on waveforms with a fundamental frequency range of 0.1 Hz–2.6 kHz (\*1). You can measure up to the 50th order harmonic at 1 kHz fundamental.(\*2).

\*1 0.1–10 Hz using an external sampling clock

\*2 Harmonic measurement of up to the 20th order possible in the 1 kHz to 2.6 kHz range.

## ▶ IEC Harmonic Measurement Mode

**Can perform tests conforming to international standards**

The IEC harmonic measurement mode meets the window width requirement of the latest IEC harmonic standard (10 cycles of 50 Hz and 12 cycles of 60 Hz). Also, this mode allows users to use the 761921 harmonic measurement software to perform tests conforming to IEC 61000-3-2 rev. 2.2.

\* These modes cannot be used at the same time.

## ▶ FFT Calculation Mode

**More detailed frequency analysis than with the harmonic measurement mode**

Two FFT calculations can be performed simultaneously on waveform data of measured voltage and current. You can select a resolution for FFT of 1 Hz or 10 Hz. FFT analysis of up to 100 kHz can be performed.

## ▶ Waveform Calculation Mode

**Monitoring of instantaneous power waveforms**

Up to two waveform calculations and other Waveform Calculation functions can be used at once. If you create a formula that multiplies voltage and current waveforms, you can confirm an instantaneous power waveform on screen. Waveform Calculation data can be saved in CSV or WVF format.

## ▶ Waveform Sampling Data Saving Function

**Saving of detailed waveform data for confirmation**

All captured voltage and current waveform data (200 kS/s), calculated waveforms, and FFT calculated waveforms can be saved. You can choose to save in CSV or WVF format, and to save to PC card or USB memory (/C5 option).

## ▶ WT3000 Feature

### ■ High Accuracy and Wide Frequency Range

Basic Power Accuracy  
±(0.02% of reading + 0.04% of range)  
Frequency Range  
DC, 0.1 Hz to 1 MHz

### ■ Low Power Factor Error

Power factor influence when  $\cos\phi=0$   
0.03% of S  
\*S is reading value of apparent power  
 $\phi$  is phase angle between voltage and current

### ■ Current Range

Direct Input  
0.5/1/2/5/10/20/30 [A]  
External Input  
50m/100m/200m/500m/1/2/5/10 [V]

### ■ Voltage Range

15/30/60/100/150/300/600/1000 [V]

### ■ Continuous Maximum Common Mode Voltage (50/60 Hz)

1000 [Vrms]

- Data Update rate: 50 ms to 20 sec
- Effective input range: 1% to 130%
- Simultaneously measurement with 2 Units

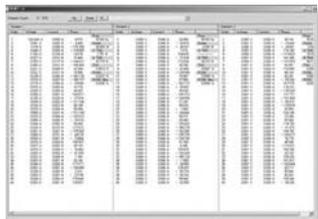
# 761922 Harmonic Measurement Software (WT3000)

The Harmonic Analysis Software (Model 761922) loads data measured by the WT3000/WT2000/WT1600 Power Analyzer and performs harmonic analysis that complies with IEC61000-3-2 edition 2.2. You can

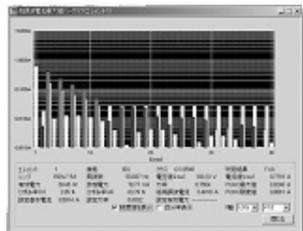
use the model 761922 harmonic measurement software to perform harmonic measurement tests conforming to IEC 61000-4-7 edition 2 (window width is 10 cycles of 50 Hz and 12 cycles of 60 Hz) with WT3000.

## ▶ Harmonic Current Measurement Value List and Bar Graph

Enables PASS/FAIL evaluations of harmonic measurement results in line with standard class divisions (A, B, C, D). Displays lists of measurement values, as well as bar graphs that let you compare the measured value and standard limit value for each harmonic component.



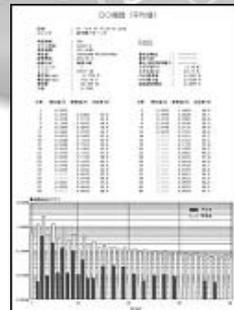
Measurement Value List



Bar Graph

## ▶ Automatic Report Generation

You can print harmonic measurement results as value lists and graphs, and save image data



Note: The screenshot is a display example from the WT2000.

## ▶ WT3000 /G6 option specification

### Wide Bandwidth Harmonic Measurement Mode

Measured item All elements  
 Method PLL synchronization method or external sampling clock method  
 Frequency range PLL synchronization method:  
 Fundamental frequency of the PLL source is in the range of 10 Hz to 2.6 kHz.  
 External sampling clock method  
 Input a sampling clock signal having a frequency that is 3000 times the fundamental frequency between 0.1 Hz and 66 Hz of the waveform on which to perform harmonic measurement.  
 The input level is TTL. The input waveform is a rectangular wave with a duty ratio of 50%.  
 PLL source Select the voltage, current, or external clock of each input element  
 However, External input range is equal or more than 500mV  
 FFT processing word length 32 bits  
 Window function Rectangular  
 Anti-aliasing Filter Set using a line filter (OFF, 500 Hz, 5.5 kHz, 50 kHz)

#### Sample rate (sampling frequency), window width, and upper limit of harmonic order under analysis during PLL synchronization

Fundamental Freq.	Sample Rate	Window Width	Upper limit of Harmonic Order under Analysis
10Hzsf<20Hz	fx3000	3	100
20Hzsf<40Hz	fx1500	6	100
40Hzsf<55Hz	fx900	10	100
55Hzsf<75Hz	fx750	12	100
75Hzsf<150Hz	fx450	20	50
150Hzsf<440Hz	fx360	25	50
440Hzsf<1.1kHz	fx150	60	50
1.1kHzsf<2.6kHz	fx60	150	20

#### Sample rate, window width, and upper limit of harmonic order under analysis when using external sampling clock

Fundamental Freq.	Sample Rate	Window Width	Upper limit of Harmonic Order under Analysis
0.1Hzsf<66Hz	fx3000	3	100

### Harmonic measurement on normal measurement Mode

Measured item All elements  
 Method PLL synchronization method  
 Frequency range Fundamental frequency of the PLL source is in the range of 10 Hz to 2.6 kHz.  
 PLL source Select the voltage, current, or external clock of each input element  
 However, external input range is equal or more than 500mV  
 FFT processing word length 32 bits  
 Window function Rectangular  
 Anti-aliasing Filter Set using a line filter (OFF, 5.5 kHz, 50 kHz)

#### Sample rate (sampling frequency), window width, and upper limit of harmonic order under analysis during PLL synchronization

Fundamental Freq.	Sample Rate	Window Width	Upper limit of Harmonic Order under Analysis
10Hzsf<20Hz	fx3000	3	100
20Hzsf<40Hz	fx1500	6	100
40Hzsf<55Hz	fx900	10	100
55Hzsf<75Hz	fx750	12	100
75Hzsf<150Hz	fx450	20	50
150Hzsf<440Hz	fx360	25	15
440Hzsf<1.1kHz	fx150	60	7
1.1kHzsf<2.6kHz	fx60	150	3

### IEC Harmonic Measurement Mode

Measured item Select a single wiring unit (up to 3 elements)  
 Method PLL synchronization method or external sampling clock method  
 Frequency range Fundamental frequency of the PLL source is in the range of 45 Hz to 66 Hz.  
 PLL source Select the voltage, current, or external clock of each input element  
 However, External input range is equal or more than 500mV  
 FFT processing word length 32 bits  
 Window function Rectangular  
 Anti-aliasing Filter Set using a line filter (5.5 kHz)  
 Interharmonics Grouping On/Off

#### Sample rate (sampling frequency), window width, and upper limit of harmonic order

Fundamental Freq.	Sample Rate	Window Width	Upper limit of Harmonic Order under Analysis
45Hzsf<55Hz	fx900	10	50
55Hzsf<66Hz	fx750	12	50

### FFT Calculation Function

Parameters Voltage, current, active power and reactive of any element.  
 Sigma calculation of active power and reactive power.  
 Analog input of torque and speed on motor input (-MV)  
 PS (power spectrum)  
 2(FFT1, FFT2)  
 Type Number of analysis 20,000 points or 200,000 points  
 Number of points 100 kHz  
 Maximum frequency analysis 1 Hz or 10 Hz  
 Frequency resolution Rectangular, Hanning, Flattop  
 Window functions Set using a line filter (OFF, 500 Hz, 5.5 kHz, 50 kHz)  
 Anti-aliasing Filter

### Waveform Calculation Function

Parameters Voltage, current and active power of any element.  
 Analog input of torque and speed on motor input (-MV) Motor output(mechanical power)  
 Waveform calculations 2 types (MATH1, MATH2)  
 Arithmetic calculations +, -, \*, and /  
 Other functions ABS,SQR,SQRT,LOG,LOG10,EXP,NEG,AVG2,AVG4,AVG8,AVG16,AVG32,AVG64

### Waveform Sampling Data Saving Function

Parameters Voltage waveform, current waveform, analog input waveform of torque and speed waveform calculation, FFT performing data  
 Data type CSV format, WVF format  
 Storage PCMCIA, USB memory (VCS option)

\* Waveform calculation function (MATH) cannot be used with FFT calculation at the same time.  
 \* See the power analyzer catalog (Bulletin 7603-00E) for other specifications

### 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	Select when you selected 760301 model
	-02	Select when you selected 760302 model
	-03	Select when you selected 760303 model
	-04	Select when you selected 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
Options	/G5	select one Harmonic Measurement
	/G6	select one Advanced Calculation Measurement
	/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	select one USB port (Peripheral)
/C7	Ethernet function	



### YOKOGAWA ELECTRIC CORPORATION

Communication & Measurement Business Headquarters /Phone: (81)-422-52-6768, Fax: (81)-422-52-6624

E-mail: tm@cs.jp.yokogawa.com

YOKOGAWA CORPORATION OF AMERICA

Phone: (1)-770-253-7000, Fax: (1)-770-251-6427

YOKOGAWA EUROPE B.V.

Phone: (31)-33-4641858, Fax: (31)-33-4641859

YOKOGAWA ENGINEERING ASIA PTE. LTD.

Phone: (65)-62419933, Fax: (65)-62412606

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Printed in Japan, 512(KP)