WT3000
Precision Power Analyzer

High-end Power Meter with top precision*
Basic Power Accuracy: 0.02% of reading

* As of February 2007, for power meter accuracy in three-phase power meter (as investigated by Yokogawa).

- Basic Accuracy 0.01% of reading
- Basic Power Accuracy 0.02% of reading
- Good Readability The Large, 8.4-inch LCD and the Range Indicator LEDs
- Simultaneous Measurement with 2 Units (8 Power Input Elements)
- Store Function 50 ms Data Storing Interval
- Interface GP-IB, Ethernet, RS-232 and USB
- Advanced Computation Function Waveform Computation, FFT Analysis, Waveform sampling Data Saving
- IEC61000-3-2 Harmonic Measurement
- IEC61000-3-3 Voltage Fluctuation/ Flicker Measurement
Yokogawa’s highest-precision power meter

The WT3000 has the highest precision of the Yokogawa power meters in the WT Series. This model in the WT Series is a high-performance series which is very popular in production line applications. The WT1600 allows measurement data to be viewed in a variety of ways, including numerical value display, waveform display, and trend display capabilities.

Better Efficiency in Power Measurements

In developing the WT3000, Yokogawa focused on improving efficiency in two basic areas. One goal was to obtain highly precise and simultaneous measurements of the power conversion efficiency of a piece of equipment. The other objective was to improve equipment evaluation efficiency by making simultaneous power evaluations and tests easier and faster.

New Innovations to Enhance the Reliable Measurement Technology

With the WT3000, we made further improvements to the basic performance specifications for even better functionality and reliability. We are confident users will appreciate these improvements to power and efficiency measurements thanks to the new power control technologies we have introduced.

A Variety of External Interface Choices

The WT3000 is the first model in the WT Series which is standard-equipped with a PC card slot (ATA flash card slot). The WT3000 is also standard-equipped with a GP-IB port. In addition, a serial (RS-232c) port, Ethernet port, USB port for peripheral, and USB port for connection to PC are available as options. The variety of interface choices allows customers to use the best interfaces for a wide variety of equipment, media, and network environments.

Select the model most suited to your measurement needs.

Standard Version

- 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 cosø=0
- 0.03% of ±0.10%
- Direct Input 5m/10m/20m/50m/100m/200m/500m/1/2/5/10/50 [A] *
- Voltage Range 15/30/60/100/150/300/600/1000 [V] *
- Current Range 0.5/1/2/5/10(100) [A] *
- Voltage range and current range are for crest factor 3
- Continuous Maximum Common Mode Voltage (50/60 Hz 1000 [Vrms])
- Data Update rate: 50 ms to 20 sec
- Effective input range: 1% to 130%
- Simultaneous measurement with 2 Units
- Standard PC Card Slot
- Storage Function (Approximately 30MB internal memory)

Motor Version

In addition to the functions of the standard version, the models offer powerful motor/inverter evaluation functions.

- Motor Efficiency and Total Efficiency Measurement
- Analog or pulse signal from rotating sensor and torque meter can be input, and allows calculation of torque, revolution speed, mechanical power, synchronous speed, slip, motor efficiency, and total efficiency in a single unit.


- The WT3000 is a truly innovative measurement solution, combining top-level measurement accuracy with special functions.
- The large, 8.4-inch liquid crystal display and the range indicator LEDs ensure good readability and make the system easy to use.
- Have you had problems or questions such as these?
  - When working with efficiency-improvement evaluation data for a high-efficiency motor, improvements cannot be seen unless measurements are taken with very high precision.
  - Measurement efficiency is poor during power measurements and power supply quality measurements.

The WT3000 is the answer to your measurement problems.

Yokogawa’s power measurement technology provides best-in-class precision and stability

Precision Power Analyzer WT3000

With basic power accuracy of ± 0.02% of reading, DC and 0.1 Hz–1 MHz measurement bandwidths, and up to four input elements, the WT3000 provides higher-accuracy measurement for inverter I/O efficiency.

Features

- Standard feature
- Option
- Software (sold separately)

1 As of February 2007. ±0.02% accuracy in a three-phase power meter (as investigated by Yokogawa).
2 As compared to Yokogawa’s products.
Functions

**WT3000 Controls:** Simple to Use, Easy to View

The WT3000 was designed with user-friendly functions and controls in response to user requests for a simpler range setting operation and more user-friendly parameter setting display process.

- **Simpler range settings**
  - Range settings using direct key input
  
  The range indicator on the WT3000 is a seven-segment green LED, so the set range can be monitored at all times. The range can easily be switched using the up and down arrows.

- **A wide range of standard functions**
  - Formats for viewing waveforms as well as numerical values
    - A Variety of display formats
      
      The WT3000 lets you display input signal waveforms in addition to numerical value data. This means you don’t need to connect a special waveform analyzer just to check signal waveforms.

      In addition, the optional advanced computation function lets you display vectors and bar graphs for enhanced visual presentation.

      - Waveforms up to approximately 10 kHz can be displayed accurately.
      - Excludes single phase model.

    - High-speed measurement to capture rapid data fluctuations
      
      Fast updating allows you to precisely capture rapidly changing transient states in the measurement subject.

      * The WT3000 switches between two different calculation systems depending on the data updating interval. See page 19 for details.

  - A way to add user-defined measurement parameters
    - User-defined function
      
      As many as twenty user-defined formulas can be set in the WT3000. These equations can be used to calculate various parameters, such as mean active power (see “A variety of integration functions” below).

    - Efficiency calculation function
      
      This function can be used to set up to four efficiency calculation formulas.

  - Compensates for the loss
    - Compensation functions
      
      This function compensates for the loss caused by the wiring of each element. The WT3000 has the following three types of correction functions to measure the power and efficiency.

      - **Wiring Compensation**
        
        This function compensates for the loss caused by the wiring of each element.

      - **Efficiency Compensation**
        
        The power measurement on the secondary side of a power transformer such as an inverter includes loss caused by the measurement instrument. This loss appears as error in the efficiency computation. This function compensates for this loss.

      - **Compensation for the Two-Wattmeter Method**
        
        In the two-power wattmeter method, an error results when current flows through the neutral line. This function computes the currents that flows through the neutral line for measurements using the two-wattmeter method with a three-phase, three wire (3V3A) system and adds the compensation value to the measured power. *Requires the delta computation option (/DT).

  - Storing measurement data
    - Store Function
      
      Voltage, current, power, and other measured data can be stored to the unit’s approximately thirty megabytes of internal memory. These data can be saved in binary or ASCII format on a PC card or USB memory. *Requires the /CS option.

*Waveforms up to approximately 10 kHz can be displayed accurately.

*Excludes single phase model.

**Using item pages to set display preferences**

- **Easily switch between multiple item pages**
  
  Easily switch between entire groups of displayed parameters.

- **Item pages make it easy to set the data you want to view for each experiment**
  
  The WT3000 has nine numeric item pages for displaying measurement values. Once you set the measurement parameters you want displayed on a particular item page, you can easily switch between entire groups of displayed parameters.

- **A variety of integration functions**
  
  • Active power, current, apparent power, reactive power
    
    In addition to the active power integration function (WP) and current integration function (q) included in earlier models, the WT3000 also has a new apparent power integration function (WS) and reactive power integration function (WQ).

  • A wide effective input range for high-precision integration
    
    The WT3000 has a wide effective input range, from 1% to 130% of the measurement range.

  • Average active power (using user-defined settings)
    
    Average active power can be calculated over an integration interval. This feature is useful for evaluating the power consumed by intermittent-control instruments in which the power value fluctuates.

  \[
  \text{Average active power} = \frac{\text{Integrated power (WP)}}{\text{Integrated elapsed time (H)}}
  \]

  *Requires the delta computation option (/DT).
A wide variety of optional functions make it easy to perform sophisticated power evaluations.

When you purchase a WT3000 from Yokogawa, you get to select just the options you need. This approach lets you maximize performance at a lower cost.

**Advanced Computation (/G6)**

The advanced calculation function (/G6 option) meets these measuring needs with advanced, powerful features for making power analysis measurements more efficient.

- **Harmonic Measurement in Normal Measurement Mode**
  You can measure harmonic data while in normal measurement mode. This is effective for observing values from normal measurements and harmonic data at the same time.

- **Wide Bandwidth Harmonic Measurement**
  This dedicated harmonic measurement function is distinct from the harmonic measurements that can be taken in normal measurement mode. The function is useful for ascertaining the distortion factor and harmonic components in strain measurements of fundamental frequencies from 0.1 Hz to 2.6 kHz. It allows wide bandwidth measurements of signals that include high frequency waves, such as from power supplies and acceleration of motor revolution.

- **Waveform Computation**
  You can perform computations on measured waveforms, and display power (instantaneous voltage × instantaneous current) and other waveforms on screen.

- **Waveform Sampling Data Saving**
  You can save sampling data of input waveforms, waveform computations, and FFT computations. The data is available for any kind of computation by PC software.

**Performing IEC harmonic standards tests**

**IEC harmonic measurement mode (/G6)**

Harmonic measurement software* can be used in this dedicated mode for harmonic measurement that supports international standards. This allows confirmation of whether or not home electronics, office automation electronics, or other devices conform with harmonic standards.

* IEC standard compliant harmonic measurement requires the model 761922 harmonic measurement software.

**Voltage Fluctuation and Flicker Measurement (/FL)**

Enables voltage fluctuation/flicker measurement conforming to IEC61000-3-3. The following values related to voltage fluctuation that are stipulated by the IEC61000-3-3 standard can be calculated from the measured data: dc (relative steady-state voltage change), dmax (maximum relative voltage change), dl (relative voltage change time), short-term flicker value Pt, long-term flicker value Fl, instantaneous flicker sensation, and others. In this mode, you can judge whether voltage fluctuations in the item under test relative to a specified minimum value are within the standard.

* The flicker test can also be performed with the WT3000 alone. Using the model 761922 harmonic/flicker measurement software (sold separately), you can display trend graphs, CPF graphs, or reports of the dc, dmax, and IFS (instantaneous flicker sensation) values in addition to the WT3000 judgment results.

**Checking phase voltage when you measure line voltage**

**Delta Calculation (/DT)**

This function allows you to calculate individual phase voltages from the line voltage measured in a three-phase, three-wire (3V3A) system. R-S line voltage can be calculated in systems measured from a three-phase, three-wire method (using two elements).

This is useful when you want to determine the phase voltage in motors and other items under test with no neutral lines.

Note: This function cannot be used for products with only one element.

**D/A Output (/DA)**

- **20 Channels**
  Measured values and calculated value by user-defined function can be output as ±5V FS DC voltages from the D/A output connector on the rear panel.

* **D/A zoom**
  This function allows the any input signal range to be scaled to between -5V and 5V* in the D/A output as Upper and Lower ranges. This makes it possible to enlarge input signal fluctuations for observation using a recorder or logger.

* The range is 0V to 5V for some functions, such as frequency measurement.

**Outputting measurement values as analog signals**

**Built-in printer (/B5)**

- **Output graphics at the touch of a button**
  The optional built-in printer is installed on the front side of the WT3000, so it is easy to use even if the WT3000 is mounted on a rack. The printer can be used to print data and waveform memos.

**Cycle by Cycle Measurement (CC)**

- **Capture cycle-by-cycle fluctuations**
  The function takes measurements of parameters such as voltage, current, and active power for each cycle, then lists the data on screen in a time series. Input frequencies from 0.1 Hz to 1000 Hz can be measured. Up to 3000 data can be saved in CSV format. Also, with the WTViewer software (model 760122, sold separately), data can be displayed in graphs by cycle.

**Checking the frequencies of all inputs**

**Added Frequency Measurement (/FQ)**

In addition to the standard two channels of frequency measurement, a six-channel frequency measurement option is also available. This option provides frequency measurement of voltage and current on all eight channels (with input elements 1 through 4 installed). This is necessary when you want to measure voltage and current frequency from the instrument’s I/O as well as voltage and current frequencies of multiple items under test at the same time.

**Video output for viewing on a larger screen**

**VGA output (/V1)**

The VGA port can be used to connect an external monitor in order to view numerical value data and waveforms on a larger screen. This capability is useful if you want to simultaneously check large amounts of data on a separate screen, or view data in a separate location.

**USB Port (Peripheral) Option (/C5)**

You can save voltage, current, power, and other kinds of data that are stored in the WT3000 to a USB Memory. The data can be saved in binary or ASCII format. You can also connect a keyboard for easy input of user-defined math expressions.

**Outputting measurement data display**

**Built-in printer**

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**USB Port (Peripheral) Option**

You can save voltage, current, power, and other kinds of data that are stored in the WT3000 to a USB Memory. The data can be saved in binary or ASCII format. You can also connect a keyboard for easy input of user-defined math expressions.

Note: When taking measurements that incorporate measuring instrument options, certain functions, displays, and measuring functions may be limited depending on the measurement mode. For example, waveform and FFT computations may not be used simultaneously.
Variety of Communication Functions (GP-IB Comes Standard)

USB Port (PC) Option (/IC12) * Select USBport (PC) or RS-232
The USB port (type B connector) on the rear panel of the WT3000 allows data communications with a PC.
1. USB driver required for USB communications. A USB driver is available from our Web site.

Serial (RS-232) (/IC2) * Select USBport (PC) or RS-232

Ethernet port (/IC7)
The optional Ethernet port (100BASE-TX/10BASE-T) allows you to connect the WT3000 to a LAN. Once connected, images and numerical value data saved on the WT3000 can be transferred to a PC using FTP server software or other utilities.

APPLICATIONS

Measurement Applications to Utilize WT3000’s Capabilities

Measurement of Inverter Efficiency

• Measuring Efficiency with High Precision: Simultaneous Measurement of Input and Output
The WT3000 offers up to four input elements capable of simultaneous measurement of single-phase input/three-phase output, or three-phase input/three-phase output.

• Accurate Measurement of Fundamental PWM Voltage
Motor drive technology has become more complex in recent years; pure sinewave-modulated PWM is less common, and cases in which the voltage mean differs greatly from the fundamental voltage waveform arise frequently. With the optional harmonic measurement function of the WT3000, accurate measurements of commonly measured values such as active power and the fundamental or harmonic components can be taken simultaneously without changing measuring modes.

• Phase Voltage Measurement without a Neutral Line (/DT option)
With the delta computation function, an object under test without a neutral line can be measured in a three-phase three-wire (3V3A) configuration, allowing calculation of each phase voltage.

• High Frequency and Harmonic Measurements (Requires the /G6 Option)
The fundamental frequencies of motors have become faster and faster. The WT3000 allows harmonic measurements of signals with fundamental frequencies as high as 2.6 kHz.

• Evaluation of Torque Speed Characteristics (Requires motor version, the /CC Option)
Torque speed can be evaluated based on the torque and revolution speed data measured with the motor version. Also, you can confirm the cycle-by-cycle voltage, current, and power fluctuations that occur such as when starting the motor.

• Related applications
Power conversion technologies such as those used in EVs and power conditioners
High-precision, simultaneous measurements are required in measuring conversion efficiency in the conversion of a converter’s three-phase input to a DC bus, and the conversion from an inverter’s DC bus to three-phase output.

You can take measurements in excess of 30 A by using a 2 A input element together with the model 751574 current transducer.
*See page 10 of the specifications.

When measuring three-phase input/three-phase output with a three-phase four-wire system, you can measure input and output simultaneously by synchronizing between two units.
Simultaneous Measurement of Voltage, Current, and THD (Total Harmonic distortion)

Testing of lighting devices often involves measurement of voltage, current, and THD, a parameter that indicates the quality of power. This is because distortion in voltage and current waveforms is becoming more prevalent due to the increasing complexity of control systems.

The WT3000 can simultaneously measure voltage and current with THD, eliminating these inconveniences and allowing for more accurate and rapid measurements of an instrument’s characteristics and fluctuations.

Lamp Current Measurement

Since lamp current flows inside of fluorescent tubes, normally it cannot be measured directly. However, lamp current can be displayed by measuring secondary current and cathode current and finding the difference in their instantaneous values using the delta computation function (/DT option).

Related applications
Evaluation of power quality in equipment designed to be connected in a system, such as UPSs and power conditioners

Measurement of Power Consumption in Mobile Phones

You can measure power consumption in mobile phones, batteries, and other equipment powered by dry cells. You can perform a variety of operation tests for reducing power consumption by using the current or power integration function. This offers a powerful means of evaluating instruments, such as for checking control modes for lengthening battery life.

Major Features
- 5mA range for very low current measurements
- Checking power consumption integration of mobile phones when switching modes (using integration functions)
- Visually observing trends in power consumption using trend display functions that allow checking of temporal fluctuations
- Checking the waveform of the consumed current
- Null function can be used to subtract the DC offset

Use the 2A input element for small current consumption.

High Accuracy Measurements of Transformers

High Accuracy Even at Low Power Factors
The WT3000 represents great improvement over previous models in terms of power factor error (it is approximately three times more accurate). With improved measurement accuracy in the lower power factors—such as with transformers, active power values can be measured with higher precision.

Simultaneous Measurement of RMS and MEAN of Voltage
Voltage RMS (the true RMS value) and voltage MEAN (rectified mean value calibrated to the rms value) can be measured at the same time, allowing for measurement of corrected power (Pc).

Phase Voltage Confirmation
The delta computation function (/DT option) allows both star-delta and delta-star conversion.

Measuring Conversion Efficiency of Power Conditioner

Conversion Efficiency Measurement
Renewable energy source of photovoltaic power generation and wind power is converted dc to ac using power conditioner. The WT3000 Precision Power Analyzer provides measurement with world-class DC and AC signal accuracies.

Reference equipment for power calibration
Basic power accuracy of ±0.02% of reading
The WT3000 can be used as a reference instrument for periodic in-house calibration of general-purpose power measurement instruments, such as the WT210 and WT230.
SOFTWARE

Utility Software

WTVviewer 760122
WTVviewer is an application software tool that reads numeric, waveform, and harmonic data measured with the WT3000 Precision Power Analyzer. Communications: GP-IB, Serial (RS-232, C2), USB (C12), or Ethernet (C7)

- Numeric Data
  WTVviewer can simultaneously display voltage, current, power and various other measured parameters for one to four elements individually, and for \( \Sigma_A \) and \( \Sigma_B \) calculations.

- Waveform
  Voltage and current waveforms can be monitored on the PC screen. You can confirm the voltage-current phase difference, waveform distortion, and other phenomena.

- Measuring Harmonics*
  WTVviewer can numerically or graphically display the results of measured harmonics up to the 100th order for such parameters as voltage, current, power and phase angle. * requires /G6 option

- Viewing Trends
  You can capture and view various data, measured with the WT3000 on your PC in a graphical trend format. This feature lets you monitor power supply voltage fluctuations, changes in current consumption and other time-based variations.

WTFileReader (free)
WT1600/WT3000 File Reader Software (off-line)
WTFileReader software can load and display data measured by the WT3000 Precision Power Analyzer or WT1600 Digital Powermeter that has been saved to a memory medium. That data can also be saved in CSV format.

Can be downloaded free from our Web site: http://www.yokogawa.com/tm/wtpz/wtfree/tm-wtfree_04.htm

You can download this software program from our web site
* LabVIEW is a registered trademark of National Instruments Corporation.

Harmonic Measurement / Voltage Fluctuation and Flicker Measurement Software (761922)

- Harmonic Measurement (G6 option)
The Harmonic Analysis Software (Model 761922) loads data measured by the WT3000 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. Communications: GP-IB, Ethernet (C7)

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.

- Flicker Measurement (FL option)
  This function enables voltage fluctuation and flicker measurements in compliance with EN61000-3-3 (Ed1:1995).

Measurement Mode
  Three modes are available for harmonic measurement.
  - Harmonic observation: Lets you view current, voltage, and phase angle for each order in a bar graph.
  - Waveform observation: Lets you view measured signals to confirm the suitability of the range and other factors.
  - Harmonic measurement (standards testing): For conducting standards tests and making the associated judgments. Efficiency is gained by performing tests after checking the waveform in Observation mode.

Note) This software cannot communicate with the WT using a serial (RS-232) interface (C2) or USB port (PC) (C12).
REAR PANEL

Rear Panel

Standard features
1. Voltage input terminals
2. Current external sensor input terminals
3. Current direct input terminals
4. GP-IB port
5. BNC connector for two-system synchronized measurement

Optional features
6. Serial (RS-232) port (option/C2)
or USB port (PC) (option/C12)
7. Ethernet port (100BASE-TX/10BASE-T) (option/C7)
8. VGA port (option/V1)
9. D/A output (option/DA)
10. Torque and speed input terminals (motor version)

CHARACTERISTICS

Example of basic characteristics showing the WT3000’s high precision and excellent stability

- Example of frequency versus power accuracy characteristic
- Total power error with rated range input for an arbitrary power factor (50/60Hz, 30A input element)
- Example of frequency characteristic
- Effect of common mode voltage on reading value
**ACCESSORIES**

**Related products**

- **Current Sensor Unit**
- **Current Transducer**
- **Current Clamp on Probe**

### 751521, 751523
**Current Sensor Unit**
- DC to 100 kHz/600 A peak
- Wide measurement range: -600 A to 0 A to +600 A (DC)/600 A peak (AC)
- Wide measurement frequency range: DC to 100 kHz (-3 dB)
- High-precision fundamental accuracy: ±0.5% of reading + 40 µA
- Superior noise withstanding ability and CMRR characteristic due to optimized casing design

*751521/751523 do not conform to CE Marking*

For detailed information, see Power Meter Accessory Catalog Bulletin 7515-52E.

### 751574
**Current Transducer**
- DC to 100 kHz/600 A peak
- Wide measurement range: DC and up to 100 kHz (-3 dB)
- High-precision fundamental accuracy: ±0.5% of reading + 40 µA
- Wide dynamic range: 0-600 A (DC)/900 A peak (AC)
- ±15 V DC power supply, connector, and load resistor required.

For detailed information, see Power Meter Accessory Catalog Bulletin 7515-52E.

### 751552
**Current Clamp on Probe**
- AC 1000 Arms (1400 A peak)
- Wide measurement range: 30 Hz to 5 kHz
- Basic accuracy: ±0.3% of reading
- Maximum allowed input: AC 1000 Arms, max 1400 A peak (AC)
- Current output type: 1 mA/A

A separately sold fork terminal adapter set (758921), measurement leads (758917), etc. are required for connection to WT3000. For detailed information, see Power Meter Accessory Catalog Bulletin 7515-52E.

### Adapters and Cables

- **758917**
  - Measurement leads
  - 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**
  - Safety terminal adapter set
  - (spring-hold type) Two adapters in a set.

- **758924**
  - Conversion adapter
  - For conversion between male BNC and female banana plug

- **366924/25**
  - BNC cable (BNC-BNC 1m/2m)
  - For connection to simultaneously measurement with 2 units, or for input external trigger signal.

- **758921**
  - Fork terminal adapter
  - Two adapters (red and black) to a set. Used when attaching banana plug to binding post.

**701959**
- Safety mini-clip set (hook Type)
  - Two pieces (red and black) in one set.
  - Rating: 1000 V

**758924**
- Conversion adapter
  - For conversion between male BNC and female banana plug

**B9284LK**
- External Sensor Cable
  - For connection the external input to current sensor.
  - Length: 50 cm

**751557**
- **Current Clamp on Probe**
  - AC 1000 Arms (1400 A peak)
  - Wide measurement range: 30 Hz to 5 kHz
  - Basic accuracy: ±0.3% of reading
  - Maximum allowed input: AC 1000 Arms, max 1400 A peak (AC)
  - Current output type: 1 mA/A

A separately sold fork terminal adapter set (758921), measurement leads (758917), etc. are required for connection to WT3000. For detailed information, see Power Meter Accessory Catalog Bulletin 7515-52E.

### Connecting Diagram

**Connecting the Measurement Cables and Adapters**

**Connecting Diagram for Current Transducer**

**Connecting Diagram for Clamp-on Probe**

- **751552**
  - Current Clamp on Probe
  - AC 1000 Arms (1400 A peak)
  - Wide measurement range: 30 Hz to 5 kHz
  - Basic accuracy: ±0.3% of reading
  - Maximum allowed input: AC 1000 Arms, max 1400 A peak (AC)
  - Current output type: 1 mA/A

A separately sold fork terminal adapter set (758921), measurement leads (758917), etc. are required for connection to WT3000. For detailed information, see Power Meter Accessory Catalog Bulletin 7515-52E.

*Don’t connect and use the current input terminal and EXT terminal simultaneously.*
The crest factor is the ratio of the waveform peak value and the RMS value.

\[
\text{Crest factor (CF, peak factor)} = \frac{\text{waveform peak}}{\text{RMS value}}
\]

When checking the measurable crest factor of our power measuring instruments, please refer to the following equation.

\[
\text{Crest factor (CF)} = \left(\frac{\text{measuring range} \times \text{CF setting (3 or 6)}}{\text{measured value (RMS)}}\right)
\]

* However, the peak value of the measured signal must be less than or equal to the continuous maximum allowed input value.

The crest factor on a power meter is specified by how many times peak input value is allowed relative to rated input value. Even if some measured signals exist whose crest factors are larger than the specifications of the instrument (the crest factor standard at the rated input), you can measure signals having crest factors larger than the specifications by setting a measurement range that is large relative to the measured signal. For example, even if you set CF = 3, CF5 or higher measurements are possible as long as the measured value (RMS) is 60% or less than the measuring range. Also, for a setting of CF = 3, measurements of CF = 300 are possible with the minimum effective input (1% of measuring range).
**WT3000 SPEC**

### WT3000 Specifications

#### Inputs

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input terminal type</strong></td>
<td>Voltage Plug-in terminal (safety terminal)</td>
</tr>
<tr>
<td></td>
<td>• External input: Large binding post</td>
</tr>
<tr>
<td></td>
<td>• External sensor input: Insulated BNC connector</td>
</tr>
<tr>
<td><strong>Input type</strong></td>
<td>Voltage Floating input, resistive potential method</td>
</tr>
<tr>
<td></td>
<td>• External sensor input: Floating input, shunt input method</td>
</tr>
<tr>
<td><strong>Measurement range</strong> (rated value)</td>
<td>15 V, 30 V, 60 V, 100 V, 150 V, 300 V, 600 V, 1000 V (for crest factor 3)</td>
</tr>
<tr>
<td></td>
<td>7.5 V, 15 V, 30 V, 50 V, 75 V, 150 V, 300 V, 500 V (for crest factor 6)</td>
</tr>
<tr>
<td></td>
<td>Current (2A input element)</td>
</tr>
<tr>
<td></td>
<td>• Direct input: 5mA, 10mA, 20mA, 50mA, 100mA, 200mA, 500mA, 1A, 2A (for crest factor 3)</td>
</tr>
<tr>
<td></td>
<td>• External sensor input: 50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V, 5 V, and 10 V (for crest factor 3)</td>
</tr>
<tr>
<td></td>
<td>25 mV, 50 mV, 100 mV, 250 mV, 500 mV, 1 V, 2.5 V, and 5 V (for crest factor 6)</td>
</tr>
<tr>
<td></td>
<td>Current (30A input element)</td>
</tr>
<tr>
<td></td>
<td>• Direct input: 500 mA, 1 A, 2 A, 5 A, 10 A, 20 A, and 30 A (for crest factor 3)</td>
</tr>
<tr>
<td></td>
<td>• External sensor input: 250 mA, 500 mA, 1 A, 2.5 A, 5 A, 10 A, and 15 A (for crest factor 6)</td>
</tr>
<tr>
<td><strong>Input impedance</strong></td>
<td>Floating input: Approx. 1 MΩ</td>
</tr>
<tr>
<td></td>
<td>• External sensor input: Approx. 10 MΩ, input capacitance: Approx. 5 pF</td>
</tr>
<tr>
<td><strong>Input resistance</strong></td>
<td>Current (2A input element)</td>
</tr>
<tr>
<td></td>
<td>• Direct input: Approx. 1 MΩ, input capacitance: Approx. 0.07 μH</td>
</tr>
<tr>
<td></td>
<td>• External sensor input: Input resistance: Approx. 1 MΩ, input capacitance: Approx. 40 pF</td>
</tr>
<tr>
<td><strong>Instantaneous maximum Voltage allowable input</strong> (10 s or less)</td>
<td>Peak value of 2500 V or RMS value of 1500 V, whichever is less.</td>
</tr>
<tr>
<td></td>
<td>Current (2A input element)</td>
</tr>
<tr>
<td></td>
<td>• Direct input: Peak value of 9 A or RMS value of 3.3 A, whichever is less.</td>
</tr>
<tr>
<td></td>
<td>• External sensor input: Peak value less than or equal to 10 times the measurement range.</td>
</tr>
<tr>
<td><strong>Continuous maximum Voltage allowable input</strong></td>
<td>Peak value of 1600 V or RMS value of 1100 V, whichever is less.</td>
</tr>
<tr>
<td></td>
<td>Current (2A input element)</td>
</tr>
<tr>
<td></td>
<td>• Direct input: Peak value of 6 A or RMS value of 2.2 A, whichever is less.</td>
</tr>
<tr>
<td></td>
<td>• External sensor input: Peak value less than or equal to 5 times the measurement range.</td>
</tr>
<tr>
<td><strong>Continuous maximum common mode voltage (ΔU/Δt=60 Hz) or 1000 Vrms</strong></td>
<td>Peak value less than or equal to 5 times the measurement range.</td>
</tr>
<tr>
<td><strong>Influence from common mode voltage</strong></td>
<td>Application 1000 Vrms with the voltage input terminals shorted and the current input terminals open.</td>
</tr>
<tr>
<td></td>
<td>• 50/60 Hz: ±0.1% of range or less</td>
</tr>
<tr>
<td></td>
<td>• Reference value up to 2000 V voltage: ±3% (max. range) or ±0.01% (±3% of range) or less.</td>
</tr>
</tbody>
</table>

### Display

- **Display**: 8.4-inch color TFT LCD monitor
- **Total number of pixels**: 640 (horiz.) x 480 (vert.) dots
- **Wavelength display resolution**: 501 (horiz.) x 432 (vert.) dots

Same as the data update rate. Exceptions are listed below:

- The display update interval of numeric display (4, 8, and 16 items) is 250 ms when the data update rate is 50 ms or 100 ms.
- The display update interval of numeric display (ALL, Single List, and Dual List) is 500 ms when the data update rate is 50 ms or 250 ms.
- The display update rate of the trend display, bar graph display, and vector display is 1 s when the data update rate is 50 ms or 500 ms.
- The display update interval of the waveform display is approximately 1 s when the data update rate is 50 ms to 1 s. However, it may be longer depending on the trigger setting.

Note: Up to 0.02% of the pixels on the LCD may be defective.

### Calculation Functions

- **V**: [V]  [-] [A] [Q] [W] [VAR] [VAh] [Ah] [Wh] [Ah] [Wh]
- **P**: [W]  [-] [kW] [MW] [kVAR] [kVAh] [kWh] [kVAh] [kWh]
- **Q**: [VAR]  [-] [kVAR] [MVAR] [VARh] [VARh] [VARh] [VARh]
- **S**: [VA]  [-] [kVA] [MVA] [VARh] [VARh] [VARh] [VARh]
- **f** [Hz]  [-] [kHz] [MHz]

### Note

1. The instrument’s apparent power (S), reactive power (Q), power factor (l), and phase angle (δ) are calculated using measured values of voltage, current, and active power. (However, reactive power is calculated directly from sampled data when TYPE3 is selected.) Therefore, when distorted waveforms are input, these values may be different from those of other measuring instruments based on different measuring principles.
2. The value of Q in the QL calculation is calculated with a preceding minus sign (-) when the current input leads the voltage input, and a plus sign when it lags the voltage input, so the value of QL may be negative.

### A/D converter

- **Simultaneous voltage and current conversion and 16-bit resolution**

### Range switching

- Can be set for each input element.

<table>
<thead>
<tr>
<th>Auto range functions</th>
<th>Increasing range value</th>
</tr>
</thead>
<tbody>
<tr>
<td>• When the measured values of U and I exceed 110% of the range rating</td>
<td></td>
</tr>
<tr>
<td>• When the peak value exceeds approximately 330% of the range rating (or approximately 660% for crest factor 6)</td>
<td></td>
</tr>
<tr>
<td>• When the measured values of U and I fall to 30% or less of the range rating, and Upk and Ipk are 300% or less of the lower range value (or 600% for crest factor 6)</td>
<td></td>
</tr>
</tbody>
</table>

### Using filter

- **Select OFF, 300 Hz, 5.5 kHz, or 50 kHz**

### Frequency filter

- **Simultaneous voltage and current conversion and 16-bit resolution**

### Line filter

- **Select OFF, 500 Hz, 5.5 kHz, or 50 kHz**

### Waveform Display (WAVE display)

**Waveform display items**: Voltage and current from elements 1 through 4, Motor version torque and waveform of resolution speed.
### Accuracy

**Conditions**: These conditions are all accuracy condition in this section.

**Temperature**: 23±3°C, Humidity: 30 to 75%RH, Input waveform: Sine wave, Common mode voltage: 0V, Crest factor: 3, Line filter: OFF, 3 (power factor): 1, After warm-up.

After zero level, compensation or range value change while wired: f is frequency (kHz), 6-month.

#### 30A input element, 2A input element (500mA, 1A, 2A range), Voltage input

<table>
<thead>
<tr>
<th>Voltage/current</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC</td>
<td>±0.05% of reading±0.05% of range (V, 30A, Sensor)</td>
</tr>
<tr>
<td>±0.05% of reading±0.05% of range of 2A [A(SP)]</td>
<td></td>
</tr>
<tr>
<td>±0.05% of reading±0.05% of range of 1A [A(SP)]</td>
<td></td>
</tr>
<tr>
<td>±0.05% of reading±0.05% of range of 5mA, 10mA, 20mA, 50mA, 100mA, 200mA range</td>
<td></td>
</tr>
</tbody>
</table>

#### 2A input element (5mA, 10mA, 20mA, 50mA, 100mA, 200mA range)

- **Accuracy of waveform display data, Upk and Ipk**
  - For temperature changes after zero-level compensation or range change, add 2uA/

#### Total power error with respect to the range for an arbitrary power factor

- **Accuracy of power factor**
  - Power factor readings measured under a load of 500mA to 30A range.

#### Influence of line filter

- **Influence of frequency**
  - When cutoff frequency is 50 Hz to 65kHz: Add 0.2% of reading (Under 45 Hz: Add 0.5% of reading)

#### Lead/Lag Detection (λ)

- **Accuracy of reactive power ($Q$)**
  - When cutoff frequency is 5.5 kHz to 1 MHz: Add 0.3% of reading

#### Measurement lower limit frequency

- **Measurement lower limit frequency**
  - Urm, umn, and Irmn are up to 2% (or 4% for crest factor 6).

#### Achieving power accuracy

- **Power accuracy**
  - The readout accuracy is ±0.03% in the frequency range.

#### Accuracy of apparent power $S$

- **Voltage accuracy + Current accuracy**
  - When current accuracy is ±0.03% in the frequency range.

#### Accuracy of reactive power $Q$

- **Accuracy of apparent power**
  - $\Rightarrow \text{Accuracy of power factor}$

#### Accuracy of phase difference $\delta$

- **Accuracy of phase difference**
  - $\Rightarrow \text{Accuracy of apparent power}$

<table>
<thead>
<tr>
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<tbody>
<tr>
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<tr>
<td>±0.05% of reading±0.05% of range of 2A [A(SP)]</td>
<td></td>
</tr>
<tr>
<td>±0.05% of reading±0.05% of range of 1A [A(SP)]</td>
<td></td>
</tr>
<tr>
<td>±0.05% of reading±0.05% of range of 5mA, 10mA, 20mA, 50mA, 100mA, 200mA range</td>
<td></td>
</tr>
</tbody>
</table>

### Temperature

- **Temperature**: ±0.05% of reading±0.05% of range (V, 30A, Sensor)
  - ±0.05% of reading±0.05% of range of 2A [A(SP)]
  - ±0.05% of reading±0.05% of range of 1A [A(SP)]
  - ±0.05% of reading±0.05% of range of 5mA, 10mA, 20mA, 50mA, 100mA, 200mA range

### Effective input range

- **Effective input range**
  - The readout accuracy is ±0.03% in the frequency range.

### Accuracy of apparent power S

- **Voltage accuracy + Current accuracy**
  - When current accuracy is ±0.03% in the frequency range.

### Accuracy of reactive power Q

- **Accuracy of apparent power**
  - $\Rightarrow \text{Accuracy of power factor}$

### Accuracy of apparent power $S$

- **Accuracy of reactive power $Q$**
  - $\Rightarrow \text{Accuracy of power factor}$

### Accuracy of phase difference $\delta$

- **Accuracy of phase difference**
  - $\Rightarrow \text{Accuracy of apparent power}$

### Accuracy of apparent power $S$

- **Accuracy of reactive power $Q$**
  - $\Rightarrow \text{Accuracy of power factor}$

### Accuracy of power factor ($\cos$)

- **Accuracy of power factor**
  - $\Rightarrow \text{Accuracy of apparent power}$

### Accuracy of phase difference $\delta$

- **Accuracy of phase difference**
  - $\Rightarrow \text{Accuracy of apparent power}$

### Accuracy of phase difference $\delta$

- **Accuracy of phase difference**
  - $\Rightarrow \text{Accuracy of apparent power}$

### Accuracy of phase difference $\delta$

- **Accuracy of phase difference**
  - $\Rightarrow \text{Accuracy of apparent power}$

### Accuracy of phase difference $\delta$

- **Accuracy of phase difference**
  - $\Rightarrow \text{Accuracy of apparent power}$
Functions

Measurement method
Digital multiplication method

Crest factor
3 or 6 (when inputting rated values of the measurement range), and 300 to the minimum valid input. However, 1.6 or 3.2 at the maximum range (when inputting rated values of the measurement range), and 160 to the minimum valid input.

Measurement period
Interval for determining the measurement function and performing calculations. Period used to determine and compute the measurement function.

• The measurement period is set by the zero crossing of the reference signal (synchronization source) when the data update interval is 50 ms, 100 ms, 5 s, 10 s, or 20 s (excluding watt hour WP as well as amper hour during DC mode).
• Measured through exponential averaging on the sampled data within the data update interval when the data update interval is 250 ms, 500 ms, 1 s, or 2 s.
• For harmonic measurement, the measurement period is from the beginning of the data update interval to 9000 points at the harmonic sampling frequency.

Wiring
You can select one of the following five wiring settings.
• 1P2W (single phase, two-wire), 1P3W (single phase, 3 wire), 3P2W (3 phase, 2 wire), 3P4W (3 phase, 4 wire), 3P3W (3 phase, 3 wire, 3 volt/3 amp measurement).

Compensation Functions
• Efficiency Compensation
• Wiring Compensation

Scalings
When inputting output from external current sensors, VT, or CT, set the sensor current conversion ratio, VT ratio, CT ratio, and power coefficient in the range from 0.0001 to 9999.9999.

Averaging
• The average calculations below are performed on the normal measurement parameters of voltage U, current I, power P, apparent power S, reactive power Q, and power factor l.
• Select an attenuation constant of 2, 4, 8, 16, 32, or 64.
• Exponential average
• Select exponential or moving averaging.
• Moving average
• Select an attenuation constant of 2, 4, 8, 16, 32, or 64.
• Moving average
• Select an average calculation constant of 4, 8, 16, 32, or 64.

Data update rate
Select 50 m, 100 m, 250 m, 500 m, 1 s, 2 s, 5 s, 10 s, or 20 s.

Response time
At maximum, two times the data update rate (only during numerical display)

Hold
Holds the data display.

Display
• Numerical display function
• Waveform display items

Display resolution
60000

Number of display items
Select 4, 8, 16, all, single list, or dual list.

Waveform display items
No. of display rasters
501
Display format
Peak-press compressed data
Time axis
Range from 0.5 ms–2 s/div. However, it must be 1/10th of the data update rate.

Saving and Loading Data
Settings, waveform display data, numerical data, and screen image data can be saved to media.*
Saved settings can be loaded from a medium.
* PC card, USB memory (C5 option)

Motor Evaluation Function (MW, Motor Version)

Measurement Function
Method of Determination, Equation

Rotating speed
When the input signal from the revolution sensor is DC voltage (analog signal)
Scaling factor: Number of revolutions per 1 V input voltage
Calibration: Value of the input signal from the revolution sensor

Torque
When the input signal from the torque meter is DC voltage (analog signal)
Input voltage from torque meter x scaling factor
Calibration: Value of the input signal from the torque meter

Motor output
Peak output

Wiring at maximum, two times the data update rate (only during numerical display)

Zoom function
No time axis zoom function

• Since the sampling frequency is approximately 200 kHz, waveforms that can be accurately reproduced are those of about 10 kHz.

• Vector Display/Bar Graph Display

Vector display
Vector display of the phase difference in the fundamental waves of voltage and current.

Bar graph display
Displays the size of each harmonic in a bar graph.

• Trend display
Number of measurement channels Up to 16 parameters
Displays trends (transitions) in numerical data of the measurement functions in a sequential line graph.

• Simultaneous display
Two windows can be selected from (numerical display, waveform display, bar graph display, or trend display) and displayed in the upper and lower parts of the screen.

Note: Depending on the user-defined math, integration, and other settings, the actual measurement time may be shorter than stated above.
Store function can’t use in combination with auto print function.

Integration
Mode
Select a mode of Manual, Standard, Continuous (repeat), Real Time Control Standard, or Real Time Control Continuous (Repeat).

Timer
Integration can be stopped automatically using the integration timer setting. 000000m00–1000000m00.

Count over
If the count over integration time reaches the maximum integration time (10000 hours), or if the integration value reaches maximum display integration value (99999999999), the elapsed time and value is saved and the operation is stopped.

Accuracy
± [power accuracy (or current accuracy) + time accuracy] + ±0.02% of reading.

Remote control
EXT START, EXT STOP, EXT RESET, EXT HOLD, EXT SINGLE and EXT PRINT (all input signal) / INTEG BUSY (output signal). Requires DA option.

Triggering
Trigger Type
Edge type

Trigger Mode
Select Auto or Normal. Triggers are turned OFF automatically during integration.

Trigger Source
Select voltage, current, or external clock for the input to each input element.

Trigger Slope
Select (Rising), (Falling), or (Rising + Falling).

Trigger Level
When the trigger source is the voltage or current input to the input elements. Set in the range from the center of the screen to ±100% (top/bottom edge of the screen). Setting resolution: 0.1%.

Format
ON/OFF
ON/OFF can be set for each voltage and current input to the input element.

Interpolation
Select dot or linear interpolation.

Graticule
Select graticule or cross-grid display.

Other display/ON/OFF
Upper/lower limit (scale value), and waveform label ON/OFF.

Curser measurements
When you place the cursor on the waveform, the value of that point is measured.
Revolution signal, torque signal
- When revolution and torque signals are DC voltage (analog input)
  Connector type: Insulated BNC connector
  Input range: 1 V/2 V/5 V/10 V/200 V
  Effective input range: 0%–110% of measurement range
  Input resistance: Approximately 1 MΩ
  Continuous maximum allowed input: ±22 V
  Continuous maximum common mode voltage: ±42 Vpeak or less
  Accuracy: ±(0.1% of reading+0.1% of range)
  Temperature coefficient: ±0.03% of range°/C
- When revolution and torque signals are pulse input
  Connector type: Insulated BNC connector
  Frequency range: 2 Hz~200 kHz
  Amplitude input range: ±12 Vpeak
  Effective amplitude: ±1 V (peak-to-peak) or less
  Input waveform duty ratio: 50%, square wave
  Input resistance: Approximately 1 MΩ
  Continuous maximum common mode voltage: ±42 Vpeak or less
  Accuracy: ±(0.05% of reading+1mHz)

**Added Frequency Measurement (FQ Optional)**
Device under measurement: Select up to two frequencies of the voltage or current input to the input elements for measurement. If the frequency option (/FQ) is installed, the frequencies of the voltages and currents being input to all input elements can be measured.

- **Measurement method**: Reciprocal method
- **Measurement range**:
  - Data Update Rate: Measuring Range
  - 50ms: 45Hz±5ns 1MHz
  - 100ms: 25Hz±5ns 1MHz
  - 250ms: 10Hz±5ns 500kHz
  - 500ms: 5Hz±5ns 200kHz
  - 1s: 2.5Hz±5ns 100kHz
  - 2s: 1Hz±5ns 50kHz
  - 5s: 0.5Hz±5ns 20kHz
  - 10s: 0.25Hz±5ns 10kHz
  - 20s: 0.125Hz±5ns 5kHz

  Accuracy: ±0.05% of reading
  When the input signal levels are greater than or equal to 25 mV (current external sensor input), 1.5mA (current direct input of 2A input element) and 150 mA (current direct input of 30A input element) respectively, and the signal is greater than or equal to 30% (0.1 Hz~440 Hz, frequency filter ON), 10% (440 Hz~500 kHz), or 30% (500 kHz~1 MHz) of the measurement range respectively. However, when the measurement frequency is smaller or equal to 2 times of above lower frequency, the input signal is greater than or equal to 50%. Add 0.05% of reading when current external input is smaller than or equal to 50 mV input signal level for each is double for crest factor 6.

**Delta Calculation Function (DT Optional)**
- **Voltage(V)**
  - ΔU: Differential voltage determined by computation u1 and u2
  - 3P3W→3V3A: u1: Line voltage that are not measured but can be computed for a three-phase, three-wire system
  - DELTA→STAR: u1, u2, u3: Line voltage that can be computed for a three-phase, three-wire (3Y3W) system
  - STAR→DELTA: u1, u2, u3: Neutral line voltage that can be computed for a three-phase, four-wire, three-system
- **Current(A)**
  - ΔI: Differential current determined by computation
  - 3P3W→3V3A: u1: Phase current that are not measured but can be computed
  - DELTA→STAR: Neutral line current
  - STAR→DELTA: Neutral line current

**D/A Output (D/A Optional)**
- **D/A conversion resolution**: 16 bits
- **Output voltage**: ±5 V FS (max. approximately ±7.5 V) for each rated value
- **Update rate**: Same as the data update rate on the main unit
- **Number of outputs**: 20 channels (each channel can be set separately)
- **Accuracy**: (accuracy of a given measurement function + 0.1% of FS)
  - FS = 5V
- **D/A zoom**: Setting maximum and minimum values.
  - Continuous maximum common mode voltage: ±42 Vpeak or less
- **Minimum load**: 100 kΩ
- **Temperature coefficient**: ±0.05% of FS/°C
- **Remote control**: EXT START, EXT STOP, EXT RESET, EXT HOLD, EXT SINGLE and EXT PRINT (all input signal) / INTEG BUSY (output signal) Requires /DA option

**Frequency (Simplified Figure Below)**
- **D/A output**: Approx. 7.5 V
  - Approx. 7.0 V
  - Approx. 4.5 V
  - Approx. 0.5 V
  - 0 V
  - –0.5 V

**Integrated Value**
- **Display Value**: Approx. 7.5 V
- **Output**: 140% Approx. 7.5 V
- **0%**: Approx. 7.5 V
- **–100%**: Approx. –7.5 V
- **~140%**: Approx. –7.5 V

**Built-in Printer (/B5 Optional)**
- **Printing method**: Thermal line-dot
- **Dot density**: 8 dots/mm
- **Paper width**: 112 mm
- **Effective recording width**: 104 mm
- **Recorded information**: Screenshots, list of measured values, harmonic bar graph
- **Auto print function**: Measured values are printed out automatically. However, auto print function can’t use in combination with store function.

**RGB Video Signal (VGA) Output Section (/V1 Optional)**
- **Connector type**: 15-pin D-Sub (receptacle)
- **Output format**: VGA compatible

**Advanced Calculation (/G6 optional)**
- **Wide Bandwidth Harmonic Measurement**
  - **Item**: Specifications
  - **Measured source**: All installed elements
  - **Format**: PLL synchronization method (when the PLL source is not set to Smp Clk) or external sampling clock method (when the PLL source is set to Smp Clk).
  - **Frequency range**: -PLL source 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 or current of each input element (external current sensor range is greater than or equal to 500 mV) or the external clock (Ext Clk or Smp Clk).
      - 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
      - Turn the frequency filter ON when the fundamental frequency is less than or equal to 440 Hz.
  - **FFT data length**: 9000
  - **FFT processing word length**: 32 bits
  - **Window function**: Rectangular
  - **Anti-aliasing filter**: Set using a line filter (OFF, 500 Hz, 5.5 kHz, or 50 kHz).
  - **Sample rate (sampling frequency)**, **window width**, and **upper limit of measured order**
    - **PLL source synchronization method**
      - **Fundamental Frequency of the PLL Source (Hz)**
      - **Sample Rate (S/S)**
      - **Window Width against the FFT Data Length (Frequency of the Fundamental Wave)**
      - **Upper Limit of the Measured Order**
        - 10 to 20: 1 x 3000
        - 20 to 40: 1 x 1500
        - 40 to 55: 1 x 900
        - 55 to 75: 1 x 550
        - 75 to 150: 1 x 450
        - 150 to 440: 1 x 360
        - 440 to 1100: 1 x 150
        - 1100 to 2600: 1 x 60
  - **External sampling clock method**
      - **Fundamental Frequency of the PLL Source (Hz)**
      - **Sample Rate (S/S)**
      - **Window Width against the FFT Data Length (Frequency of the Fundamental Wave)**
      - **Upper Limit of the Measured Order**
        - 0.1 to 68: 1 x 3000
        - 69 to 100:
When the line filter (5.5 kHz) is ON

- 10 Hz to 30 Hz: 0.3% of range to the power accuracy.
- 30 Hz to 66 Hz: up to 10%.
- 66 Hz to 440 Hz: 0.05% of range.
- 440 Hz to 900 Hz: 0.1% of range.
- 900 Hz to 2.5 kHz: 0.05% of range.
- 2.5 kHz to 5 kHz: 5% of range.
- 5 kHz to 25 Hz: 8% of range.

If the fundamental frequency is between 1 kHz and 2.6 kHz, add 1% of reading to the power accuracy for frequencies greater than 1 kHz.

When the line filter (5.5 kHz) is ON

- 0.1 Hz to 10 Hz: 0.3% of range.
- 10 Hz to 30 Hz: 0.3% of range.
- 30 Hz to 66 Hz: 0.5% of range.
- 66 Hz to 440 Hz: 0.1% of range.
- 440 Hz to 1 kHz: 0.05% of range.
- 1 kHz to 2.5 kHz: 0.05% of range.
- 2.5 kHz to 5 kHz: 5% of range.
- 5 kHz to 25 Hz: 8% of range.

If the fundamental frequency is between 1 kHz and 2.6 kHz, add 1% of reading to the power accuracy for frequencies greater than 1 kHz.

When the line filter is OFF

- 0.1 Hz to 10 Hz: 0.1% of reading + 0.3% of range.
- 10 Hz to 30 Hz: 0.3% of range.
- 30 Hz to 66 Hz: 0.1% of range.
- 66 Hz to 440 Hz: 0.05% of range.
- 440 Hz to 1 kHz: 0.05% of range.
- 1 kHz to 2.5 kHz: 0.05% of range.
- 2.5 kHz to 5 kHz: 5% of range.
- 5 kHz to 25 Hz: 8% of range.

However, all the items below apply to all tables.

- When the crest factor is set to 3
- When λ (power factor) = 1
- When the crest factor is set to 3
- When λ (power factor) = 1
- Power figures that exceed 440 Hz are reference values.
- For external current sensor range, add 0.2 mV to the current accuracy and add (0.2 mV / external current sensor range rating) x 100% of range to the power accuracy.
- For 30A direct current input range, add 0.2 mA to the current accuracy and add (2 mA / direct current input range rating) x 100% of range to the power accuracy.
- For 3A direct current input range, add 0.2 mA to the current accuracy and add (2 mA / direct current input range rating) x 100% of range to the power accuracy.
- For n' order component input, add (n'/m+1)/50% of the range to the power accuracy.
- For n' order component input, add (n'/m+1)/50% of the range to the power accuracy.
- For n' order component input, add (n'/m+1)/50% of the range to the power accuracy.
- For n' order component input, add (n'/m+1)/50% of the range to the power accuracy.
- 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.

Precision Power Analyzer WT3000
**FFT Function Specifications**

- **Item** Specifications
  - Input source Voltage, current, active power, and reactive power of each input element.
  - Active power and reactive power of an \( \Sigma \) wiring unit.
  - Torque and speed signals (analog input of motor input (option).
- **Type**: PS (power spectrum)
- **Number of computations**: Two computations (FFT1 and FFT2)
- **Maximum frequency**: 100 kHz
- **Analysis**
  - Number of points: 20,000 points or 200,000 points
  - Measurement period: 100 ms or 1 s
  - Frequency resolution: 10 Hz or 1 Hz
  - Window function: Rectangular, Hanning, or Flattop
  - Anti-aliasing filter: Set using a line filter (OFF, 500 Hz, 5.5 kHz, or 50 kHz).
  - Display update: Data update rate or (measurement period of the FFT + FFT computing time), whichever is longer

*The measurement period is 1 s when the number of FFT points is 200 k (when the frequency resolution is 1 Hz).
The measurement period is 100 ms when the number of FFT points is 20 k (when the frequency resolution is 10 Hz).*

**Harmonic Measurement in Normal Measurement**

- **Item** Specifications
  - Measured source: All installed elements
  - PLL source: Select the voltage or current of each input element (external)
  - Frequency range: Range in which the fundamental frequency of the PLL source is 10 Hz to 2600 Hz
  - PLL source:
    - Frequency filter ON when the fundamental frequency is
    - Greater than or equal to 440 Hz.
    - Greater than or equal to 100% of the measurement range rating.
    - Greater than or equal to 50% of the measurement range rating.
    - Current sensor range is greater than or equal to 500 mV or the
- **FFT data length**: 5000
- **FFT processing word length**: 30 bits
- **Window function**: Rectangular
- **Anti-aliasing filter**: Set using a line filter (5.5 kHz or 50 kHz).

**Note** To measure and display harmonic data requires a data update rate of 500 ms or more.

Sample rate (sampling frequency), window width, and upper limit of measured order during PLL synchronization on models with the advanced computation (5/6) option.

- **Fundamental the PLL Source (Hz)**: 10 to 20, 20 to 40, 40 to 55, 55 to 75, 75 to 150, 150 to 440, 440 to 1100, 1100 to 2600
- **Sample Rate (S/s)**: 1 x 3000, 1 x 1500, 1 x 900, 1 x 750, 1 x 450, 1 x 360, 1 x 150, 1 x 60
- **Upper Limit of the Measured Order**

**Accuracy**

- **When the line filter (5.5 kHz) is ON**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Voltage and Current</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \pm ) (reading error + measurement range error)</td>
<td>( \pm ) (reading error + measurement range error)</td>
</tr>
<tr>
<td>10 Hz</td>
<td>( \pm ) 0.15% of reading + 0.1% of range</td>
<td>( \pm ) 0.05% of reading + 0.02% of range</td>
</tr>
<tr>
<td>30 Hz</td>
<td>( \pm ) 0.4% of reading + 0.1% of range</td>
<td>( \pm ) 0.15% of reading + 0.05% of range</td>
</tr>
<tr>
<td>66 Hz</td>
<td>( \pm ) 0.05% of reading + 0.1% of range</td>
<td>( \pm ) 0.2% of reading + 0.05% of range</td>
</tr>
<tr>
<td>440 Hz</td>
<td>( \pm ) 0.4% of reading + 0.1% of range</td>
<td>( \pm ) 0.15% of reading + 0.05% of range</td>
</tr>
<tr>
<td>1 kHz</td>
<td>( \pm ) 0.25% of reading + 0.1% of range</td>
<td>( \pm ) 0.2% of reading + 0.05% of range</td>
</tr>
<tr>
<td>2.5 kHz</td>
<td>( \pm ) 0.6% of reading + 0.1% of range</td>
<td>( \pm ) 0.2% of reading + 0.05% of range</td>
</tr>
</tbody>
</table>

If the fundamental frequency is below 1 kHz and 2.6 kHz, add 0.5% of reading to the voltage and current accuracy and 1% of reading to the power accuracy when the frequency exceeds 1 kHz.

**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 (/C5 option)

*Waveform calculation function (MATH) cannot be used with FFT calculation at the same time.*
Voltage Fluctuation/Flicker Measurement (/FL optional)

- Normal Flicker Measurement Mode
  - Measurement items
    - Frequency
    - Voltage
    - Power
    - Current
  - Accuracy
    - U, I, P: Add \((0.3 + 2\times f)\)\% of reading + \((0.05 + 0.05\times f)\)\% of range
    - DC, dmax: 4\% (at \(d_{max} = 4\)\%)
  - Number of measurements
    - 10 to 3000
  - Display update
    - 2 s (do, dmax, and d(t))
  - Communication output
    - d, dmax, (U1, I1, U2, I2, U3, I3, U4, or I4).
- Items Common to Measurement Modes
  - Accuracy
    - U, I, P: Add \((0.3 + 2\times f)\)\% of reading + \((0.05 + 0.05\times f)\)\% of range
    - DC, dmax: 4\% (at \(d_{max} = 4\)\%)
  - Number of measurements
    - 10 to 3000
  - Display update
    - 2 s (do, dmax, and d(t))
  - Communication output
    - d, dmax, (U1, I1, U2, I2, U3, I3, U4, or I4).
- Serial (RS-232) Interface (/C2 Optional)
  - Connector type
    - 9-pin D-Sub (plug)
  - Electrical specifications
    - Conforms to EIA-574 (EIA-232 (RS-232) standard for 9-pin)
  - Transmission system
    - UART
  - Baud rate
    - Select from the following.
      - 1200, 2400, 4800, 9600, 19200 bps
- USB port(PC) (/C12 Optional)
  - Connector type
    - Type B connector (receptacle)
  - Electrical and Mechanical Specifications
    - Conforms to USB Rev.1.1
  - Speed
    - Max. 12 Mbps
  - Number of Ports
    - 1
  - Supported service
    - Remote control
  - Supported Systems
    - USB compatible with standard USB ports that run Windows 2000 or Windows XP with USB port as a standard. (A separate device driver is required for connecting to a PC.)
- USB port(Peripheral) (/C5 Optional)
  - Connector type
    - Type A connector (receptacle)
  - Electrical and Mechanical Specifications
    - Conforms to USB Rev.1.1
  - Speed
    - Max. 12 Mbps
  - Number of Ports
    - 2
  - Supported keyboards
    - 104 keyboard (US) and 109 keyboard (Japanese) conforming to USB HID Class Ver.1.1 devices
  - Supported USB memory devices
    - USB (USB memory) flash memory
  - Power supply
    - 5 V, 500 mA (per port)
    - However, device whose maximum current consumption exceeds 100 mA cannot be connected simultaneously to the two ports.

External I/O

I/O Section for Master/Slave Synchronization Signals

- External Clock Input Section
  - Connector type
    - BNC connector: Both slave and master
  - Input level
    - TTL
  - Inputting the synchronization source as the Ext Clk of normal measurement.
  - Frequency range
    - Same as the measurement range for frequency measurement.
  - Input waveform
    - 50\% duty ratio square wave
  - Input level of PLL source
    - Ext Clk of harmonic measurement.
  - Frequency range
    - 10 Hz to 2.5 kHz
  - Input waveform
    - 50\% duty ratio square wave
  - Inputting the external sampling clock (Smp Clk) of wideband harmonic measurement.
  - Frequency range
    - 3000 times the frequency of 0.1 Hz to 66 Hz
  - Input waveform
    - 50\% duty ratio square wave

For Triggers

- Minimum pulse width
  - 1 \(\mu\)s
- Trigger delay time
  - Within (1 \(\mu\)s + 1 sample rate)

PC Card Interface

- TYPE II (Flash ATA card)

General Specifications

- Warm-up time
  - Approximately thirty minutes.
- Operating temperature
  - 5–40\° C
- Operating humidity
  - 20–80\% (when printer not used), 35 to 80\% RH (when printer is used)
- Operating altitude
  - 2000 m or less
- Storage environment
  - -25-60\°C (no condensation may be present)
- Storage humidity
  - 20 to 80\% RH (no condensation)
- Rated supply voltage
  - 100–240 VAC
- Maximum power consumption
  - 150 VA (when using built-in printer)
- Weight
  - Approximately 15 kg (including main unit, 4 input elements, and options)
- Battery backup
  - Setup information and internal clock are backed up with the lithium battery
AC signals have waveforms that fluctuate repeatedly when viewed instantaneously. Therefore, measuring the power values of AC signals requires averaging for each period in a repeated interval, or averaging the data of several periods using a filtering process. The WT3000 automatically selects the appropriate calculation method (one of the above two methods) based on the data updating period. This approach ensures fast response and high stability as suitable for the particular measurement objective.

- When the data updating period is 50ms, 100ms, 5s, 10s, or 20s

Measurement values are determined by applying an Average for the Synchronous Source Period (ASSP) calculation to the sample data within the data updating period. (Note that this excludes power integrated values WP, as well as current integrated value qi in DC mode.) With ASSP, a frequency measurement circuit is used to detect the input signal period set as the synchronous source. Sample data corresponding to an interval which is an integer multiple of the input period are used to perform the calculation. Based on its fundamental principles, the ASSP method allows measurement values to be obtained simply by averaging an interval corresponding to a single period, so it is useful in cases where the data updating period is short or when measuring the efficiency of low-frequency signals.

- When the data updating period is 250ms, 500ms, 1s, or 2s

Measurement values are determined by applying an Exponential Average for Measuring Period (EAMP) calculation to the sample data within the data updating period. With EAMP, the sample data are averaged by applying a digital filtering process. This method does not require accurate detection of the input period. EAMP provides excellent measurement value stability.

* See page 12 of the specifications for information on the relationship between the data updating period and the lowest measurement frequency.

### Selecting formulas for calculating apparent power and reactive power

There are several types of power—active power, reactive power, and apparent power. Generally, the following equations are satisfied:

- Active power: \( P = \text{UI} \) (1)
- Reactive power: \( Q = \text{UI}\sin\phi \) (2)
- Apparent power: \( S = \sqrt{(\text{UI})^2 + (\text{I}^2\sin^2\phi)^2} \) (3)

Three-phase power is the sum of the power values in the individual phases.

The defining equations are only valid for sinewaves. In recent years, there has been an increase in measurements of distorted waveforms, and users are measuring sinewave signals less frequently. Distorted waveform measurements provide different measurement values for apparent power and reactive power depending on which of the above defining equations is selected. In addition, because there is no defining equation for power in a distorted wave, it is not necessarily clear which equation is correct. Therefore, three different formulas for calculating apparent power and reactive power for three-phase four-wire connection are provided with the WT3000.

#### TYPE1 (method used in normal mode with older WT Series models)

With this method, the apparent power for each phase is calculated from equation (3), and reactive power for each phase is calculated from equation (2). Next, the results are added to calculate the power.

- Active power: \( P_1+P_2+P_3 \)
- Apparent power: \( S_1+S_2+S_3 \)

Apparent power: \( S = \sqrt{(\text{UI})^2 + (\text{I}^2\sin^2\phi)^2} \)

* \( S1, S2, \) and \( S3 \) are calculated with a positive sign for the leading phase and a negative sign for the lagging phase.

#### TYPE2

The apparent power for each phase is calculated from equation (3), and the results are added together to calculate the three-phase apparent power (same as in TYPE1). Three-phase reactive power is calculated from three-phase apparent power and three-phase active power using equation (4).

- Active power: \( P_1+P_2+P_3 \)
- Reactive power: \( Q_1+Q_2+Q_3 \)

#### TYPE3 (method used in harmonic measurement mode with WT1600 and PZ2000)

This is the only method in which the reactive power for each phase is directly calculated using equation (2). Three-phase apparent power is calculated from equation (4).

- Active power: \( P_1+P_2+P_3 \)
- Reactive power: \( Q_1+Q_2+Q_3 \)

### Accessories

#### Instrument Carts.

**701960**
Compact Instrument Cart
500 × 560 × 785 mm (WDH)
- A: Keyboard and mouse mount

- Top shelf: Equipment not exceeding 467 (W) x 426 (D) x 213 (H) mm
- Middle shelf: Equipment not exceeding 467 (W) x 426 (D) x 213 (H) mm
- Bottom shelf: Equipment not exceeding 467 (W) x 426 (D) x 213 (H) mm

* W: Width; D: Depth; H: Height

Maximum load: 30 kg on each shelf

**701962**
All-purpose Instrument Cart
467 × 693 × 713 mm (WDH)

- Top shelf: Equipment not exceeding 467 (W) x 426 (D) x 213 (H) mm
- Middle shelf: Equipment not exceeding 467 (W) x 426 (D) x 213 (H) mm
- Bottom shelf: Equipment not exceeding 467 (W) x 426 (D) x 213 (H) mm

* W: Width; D: Depth

Maximum load: 30 kg on each shelf

**701961**
Deluxe Instrument Cart
570 × 580 × 839 mm (WDH)
- A: Keyboard and mouse mount

- Top shelf: Equipment not exceeding 467 (W) x 426 (D) x 213 (H) mm
- Middle shelf: Equipment not exceeding 467 (W) x 426 (D) x 213 (H) mm
- Bottom shelf: Equipment not exceeding 467 (W) x 426 (D) x 213 (H) mm

* W: Width; D: Depth; H: Height

Maximum load: 50 kg on each shelf

* The photo shows the mount holding a DL7400.

### External dimensions of Yokogawa power meters (excluding protrusions)

<table>
<thead>
<tr>
<th>Model</th>
<th>Width (mm)</th>
<th>Height (mm)</th>
<th>Depth (mm)</th>
<th>Compact mount (mm)</th>
<th>Deluxe mount (mm)</th>
<th>External-mount (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT2000</td>
<td>406</td>
<td>137</td>
<td>450</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>WT3000</td>
<td>406</td>
<td>137</td>
<td>450</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>WT1700</td>
<td>213</td>
<td>88</td>
<td>379</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>WT2200</td>
<td>213</td>
<td>120</td>
<td>379</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>PZ4000</td>
<td>406</td>
<td>137</td>
<td>450</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

* The back-side may protrude beyond the back shelves of the mounts.
Table: Model and Suffix Codes

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT3000</td>
<td>/A</td>
<td>Single-phase</td>
</tr>
<tr>
<td></td>
<td>/B</td>
<td>Three-phase U, V, W</td>
</tr>
<tr>
<td></td>
<td>/C</td>
<td>Three-phase U, V, W</td>
</tr>
<tr>
<td></td>
<td>/D</td>
<td>Three-phase U, V, W</td>
</tr>
</tbody>
</table>

Table: Current Sensor Unit

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>751521</td>
<td>-D</td>
<td>UL/CSA standard</td>
</tr>
<tr>
<td></td>
<td>-F</td>
<td>BS standard</td>
</tr>
<tr>
<td></td>
<td>-H</td>
<td>UL/CSA standard</td>
</tr>
<tr>
<td></td>
<td>-I</td>
<td>BS standard</td>
</tr>
</tbody>
</table>

Table: Clamp on Probe / Current transducer

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>751512</td>
<td>-D</td>
<td>UL/CSA standard</td>
</tr>
<tr>
<td></td>
<td>-F</td>
<td>BS standard</td>
</tr>
<tr>
<td></td>
<td>-H</td>
<td>UL/CSA standard</td>
</tr>
<tr>
<td></td>
<td>-I</td>
<td>BS standard</td>
</tr>
</tbody>
</table>

Table: Accessories (sold separately)

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>759917</td>
<td>-A</td>
<td>Not for lied set</td>
</tr>
<tr>
<td>759917</td>
<td>-B</td>
<td>Not for lied set</td>
</tr>
<tr>
<td>759917</td>
<td>-C</td>
<td>Not for lied set</td>
</tr>
</tbody>
</table>

Table: Mounts

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>701951</td>
<td>/A</td>
<td>Compact mount</td>
</tr>
<tr>
<td>701951</td>
<td>/B</td>
<td>Deluxe mount</td>
</tr>
</tbody>
</table>

Table: Other accessories

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>758931</td>
<td>-A</td>
<td>Safety terminal adapter (screw-fastened type) Two adapters to a set.</td>
</tr>
<tr>
<td>758931</td>
<td>-B</td>
<td>Safety terminal adapter (spring-hold type) Two adapters to a set.</td>
</tr>
</tbody>
</table>

Table: Model and Suffix Codes

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<thead>
<tr>
<th>Model</th>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>700301</td>
<td>-A</td>
<td>USB port (Peripheral)</td>
</tr>
<tr>
<td>700301</td>
<td>-B</td>
<td>USB port (PC)</td>
</tr>
<tr>
<td>700301</td>
<td>-C</td>
<td>Serial (RS-232) Interface</td>
</tr>
<tr>
<td>700301</td>
<td>-D</td>
<td>VGA Output</td>
</tr>
<tr>
<td>700301</td>
<td>/E</td>
<td>Built-in Printer</td>
</tr>
<tr>
<td>700301</td>
<td>/F</td>
<td>Delta Calculation</td>
</tr>
<tr>
<td>700301</td>
<td>/G</td>
<td>Add-in Frequency Measurement</td>
</tr>
<tr>
<td>700301</td>
<td>/H</td>
<td>Efficiency function</td>
</tr>
<tr>
<td>700301</td>
<td>/I</td>
<td>Voltage Fluctuation, Flicker</td>
</tr>
<tr>
<td>700301</td>
<td>/J</td>
<td>Cycle by Cycle</td>
</tr>
<tr>
<td>700301</td>
<td>/K</td>
<td>External sensor cable</td>
</tr>
<tr>
<td>700301</td>
<td>/L</td>
<td>Built-in Printer</td>
</tr>
</tbody>
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<tr>
<td>701950</td>
<td>/A</td>
<td>Compact mount</td>
</tr>
<tr>
<td>701950</td>
<td>/B</td>
<td>Deluxe mount</td>
</tr>
</tbody>
</table>

Table: Current Sensor Unit

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</thead>
<tbody>
<tr>
<td>751521</td>
<td>-B</td>
<td>Three-phase U, V</td>
</tr>
<tr>
<td>751521</td>
<td>-C</td>
<td>Three-phase U, W</td>
</tr>
</tbody>
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Table: Clamp on Probe / Current transducer

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<thead>
<tr>
<th>Model</th>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>701950</td>
<td>/A</td>
<td>Compact mount</td>
</tr>
<tr>
<td>701950</td>
<td>/B</td>
<td>Deluxe mount</td>
</tr>
</tbody>
</table>

Table: Current Sensor Unit

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>751521</td>
<td>-B</td>
<td>Three-phase U, V</td>
</tr>
<tr>
<td>751521</td>
<td>-C</td>
<td>Three-phase U, W</td>
</tr>
</tbody>
</table>

Table: Clamp on Probe / Current transducer

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>751512</td>
<td>-D</td>
<td>UL/CSA standard</td>
</tr>
<tr>
<td>751512</td>
<td>-E</td>
<td>BS standard</td>
</tr>
<tr>
<td>751512</td>
<td>-F</td>
<td>UL/CSA standard</td>
</tr>
<tr>
<td>751512</td>
<td>-G</td>
<td>BS standard</td>
</tr>
</tbody>
</table>

Table: Accessories (sold separately)

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>759917</td>
<td>-A</td>
<td>Not for lied set</td>
</tr>
<tr>
<td>759917</td>
<td>-B</td>
<td>Not for lied set</td>
</tr>
<tr>
<td>759917</td>
<td>-C</td>
<td>Not for lied set</td>
</tr>
</tbody>
</table>

Table: Mounts

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>701951</td>
<td>/A</td>
<td>Compact mount</td>
</tr>
<tr>
<td>701951</td>
<td>/B</td>
<td>Deluxe mount</td>
</tr>
</tbody>
</table>

Table: Other accessories

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>758931</td>
<td>-A</td>
<td>Safety terminal adapter (screw-fastened type) Two adapters to a set.</td>
</tr>
<tr>
<td>758931</td>
<td>-B</td>
<td>Safety terminal adapter (spring-hold type) Two adapters to a set.</td>
</tr>
</tbody>
</table>