Clamp-on Power Meters

Models CW120, CW121  Model CW240  AP240E Data Analysis Program

Yokogawa Meters & Instruments Corporation
Realization of Power & Power Quality Management using a CW240

CASE 1
Get a view of energy consumption!
It is essential to measure energy and manage consumption of each sector such as facility and production line for your energy saving activities and to minimize loss.

CASE 2
Contribute for improving productivity!
Constantly analyze productivity by managing unit consumption. Managing voltage, current, electric power and power factor makes for good maintenance of production facility. Moreover, you can check operation management loss and enhance productivity.

CASE 3
Discover of electric power waste!
Measure and collect data of electric power consumption by short period. The CW240 can figure out load of production process, and has the ability to check wasteful time and current flow of standby load current.

CASE 4
Detect voltage fluctuation!
When trouble occurs on supply side of electric power, instantaneous voltage drop can affect quality of produced goods at the factory. The CW240 is useful for collecting data such as voltage fluctuation to prevent such problems.

Characteristics of CW240

- Simultaneous measurement of instantaneous value, electric energy, demand, harmonics and voltage fluctuation.
- Simultaneous measurement of loads in 4 systems of up to 1P2W
  Simultaneous measurement of loads in 2 systems of up to 1P/3P3W
- Data saving interval can be set from 1 waveform (for instantaneous measurement) to 1 hour.
- Measure up to 50th order harmonics
- 4ch leakage current measurement using newly released clamp probe 96036
- Long time data logging by using compact flash memory.
- Multi language for the display (English, German, French, Italian, Spanish, Korean and Chinese)
- 2ch analog input (Optional)
  Equipped with 4ch analog output (recorder output)
- AC adaptor for power supply. NiMH rechargeable battery and alkaline battery for backup
System Configuration Block Diagram

CW240: Simultaneous measurement using two or more CW240 units

External contact signal

PC

Printer

RS-232

MV series: Recorder

510 series Illuminance meter

JUXTA Temperature converter

PC card

Alkaline battery

NiMH battery pack

AC adaptor

510 series Illuminance meter

MV series: Recorder and JUXTA

Product of Yokogawa Meters & Instruments Corporation

Product of Yokogawa Electric Corporation
Convenient functions

Use of the 3-wattmeter method enables display of instantaneous value of each measurement element.

Measurement of Instantaneous Value: For investigation of power consumption, maximum load factor and peak current

The CW240 can be used to carry out investigation regarding renewal of electric equipment such as transformers in building, check load factors and demand factors, and to check current/voltage fluctuation at motor start-up.

Measurement elements: Voltage/current/electric power (active, reactive, apparent)/power factor/phase angle of each phase, average/minimum/maximum values of each measurement element.

Data collection time: 1/2/5/10/15/30 seconds, 1/2/5/10/15/30/60 minutes
One cycle (waveform), 100/200/500 ms (short time interval)

Investigation into Energy Saving at Factories and Buildings

Food processing plant Facility investigated: Pumps

Purpose: To review the current power equipment, and replace it if necessary but with low investment cost

Solution 1: Calculation of the amount of used water based on power consumption since flow meters are expensive

Solution 2: Introduction of invert pump control

Energy saving & Reduce electricity bill
Power Quantity Measurement: For Power-Saving Diagnosis and Data Collection for ISO14001

The CW240 can measure and display the power quantity consumed up to the specified time (from the start of integration until the end).

- **Measurement elements**: Active power quantity, regenerative power quantity, reactive power quantity (leading/lagging)
- **Data collection time**: 1/2/5/10/15/30 seconds, 1/2/5/10/15/30/60 minutes

**Convenient functions**
The number of display digits and display units can be selected.

- Standard (Voltage/current range is selected according to the phase)
- Arbitrary (Decimal point position and display unit can be specified)
- Auto (Decimal point position and display unit are selected automatically according to the integration result)

**Demand Measurement**: For Review and Investigation on Contract Demand

- **Measurement elements**: Maximum power demand required since the start of logging measurement and the time it occurs
  - Active power, reactive power (lag), power factor
  - Active power quantity (consumption, regeneration), reactive power quantity (lagging/leading)

**Convenient functions**
Normally, the demand time limit is set to 30 minutes in the contract with a power company. However, the CW240 allows you to set the desired demand time limit in units of seconds/minutes.

- **Demand time limit**: Length of time set to obtain the average power (normally 30 minutes)
- **Demand power**: Average power during the demand time limit

**Energy Saving and Maintenance for Electric Equipment at Factories and Buildings**

**CW240 solution (building)**
1. For energy investigation/control for each application and floor
2. For simple investigation for each shop and tenant
3. Diagnosis of operational status of equipment such as elevator and air conditioner
4. Diagnosis regarding renewal of electrical equipment

**CW240 solution (factory)**
1. Diagnosis of operational status of equipment such as production equipment and air conditioner
2. For investigation of electric power consumption rate for each production line
3. For energy investigation/control for privately-owned electrical power facilities
4. For control of monthly target energy consumption
Harmonic Measurement

In many cases, inverter power supplies are used to drive air-conditioners and compressors. These power supplies cause distortions in voltages and currents, leading to malfunctions and power loss. Therefore, investigation and control of influences on the main power supplies by harmonics is necessary.

- **Harmonics for analysis**: 1st to 50th
- **Display data**: List, bar graph (linear/log), vector (inflow/outflow judgment)
- **Measurement elements**: Level, content, phase angle (voltage/current/electric power of each harmonic), aggregate value (voltage, current, electric power, power factor), aggregate harmonic distortion factors (THD-F or THD-R) of voltage/current
- **THD-F**: Distortion factor for the fundamental wave
- **THD-R**: Distortion factor for all rms values voltage/current
- **Data collection time**: 1/2/5/10/15/30/60 minutes

Convenient functions

The harmonic whose data is required to be saved can be selected. Inflow/outflow of harmonics can be checked.

**THD-F**

Distortion factor for the fundamental wave, THD-R: Distortion factor for all rms values voltage/current

(Influences by harmonics)

<table>
<thead>
<tr>
<th>Category</th>
<th>Device</th>
<th>Influence type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power devices</td>
<td>Capacitor, reactor</td>
<td>Overheat, burn, vibration, noise due to excessive current</td>
</tr>
<tr>
<td></td>
<td>Transformer</td>
<td>Overheat, noise, increase in core/copper loss</td>
</tr>
<tr>
<td></td>
<td>Fuse, breaker</td>
<td>Blow-out, malfunction due to excessive current</td>
</tr>
<tr>
<td></td>
<td>Induction motor</td>
<td>Periodic fluctuation of revolution speed, overheat, increase in loss</td>
</tr>
<tr>
<td>Electronic/electrical household appliances</td>
<td>Protective relay</td>
<td>Malfunction</td>
</tr>
<tr>
<td></td>
<td>Electrical household appliances</td>
<td>PLL malfunction, noise, malfunction, breakdown</td>
</tr>
<tr>
<td></td>
<td>Fluorescent lamp, mercury-arc lamp</td>
<td>Burn of stabilizer/capacitor, flickering</td>
</tr>
<tr>
<td></td>
<td>Computer</td>
<td>Malfunction, out of, breakdown</td>
</tr>
<tr>
<td></td>
<td>Electronics device</td>
<td>Malfunction of automatic control part</td>
</tr>
</tbody>
</table>

Explanation of vector diagram

- Vector length indicates the apparent power of each harmonic in proportion to that of the fundamental harmonic.
- The horizontal axis shows active power and the vertical axis indicates reactive power. They are shown in a logarithm.
- Proportions shown are those of the measurement element actually measured.

Improvement of Harmonic Measurement and Diagnosis

**Printing plant**

**Purpose**: To investigate the cause for periodic breakdown of printing machine

**Measurement**: Advantages obtained by using the CW240

- Compact and easy to carry
- Measurement of up to the 50th harmonic
- Long-term data collection
- Vector diagram display

**Result**: Occurrence of harmonics in 5th and 7th was discovered!

In addition, it became clear that harmonics are generated due to loads inside the factory. In particular, the 5th harmonic causes adverse effects such as burn-out of the serial reactor in the capacitor used to improve the power factor.

Before solution

- Time series for each harmonic for current 1
- Control for each harmonic for current 1
- Total harmonic distortion for current 1

Countermeasure: Installation of transformer filter for 5th and 7th harmonics

After solution

- Time series for each harmonic for current 1
- Control for each harmonic for current 1
- Total harmonic distortion for current 1

Effects of countermeasure: The contents of 5th and subsequent harmonics decreased drastically and the distortion ratio also dropped below 30%, resulting in elimination of breakdowns.
Waveform Measurement

- **Measurement elements:**
  - Voltage of each phase, current of each phase
  - Voltage and current of each phase

- **Data saving format:**
  - Binary (can be converted to CSV format using a standard application program)

  The scale of the vertical axis can be changed from x1/3 to x20.

![Waveform distortion]

Easy to understand waveform distortion.

Voltage Fluctuation Measurement

The CW240 detects dates/times of when fluctuations occur, fluctuation type, channels where they occur, rms values, and periods between start and end. The voltage threshold is set, and fluctuations exceeding the threshold are detected.

- **Measurement element:**
  - Voltage dip (voltage drop), voltage swell (voltage rise), instantaneous power failure

- **Data saving:**
  - Detected based on the voltage rms value of one waveform.
  - Up to 100 data sets can be saved.

Convenient functions

It is possible to provide a voltage difference between start and end by setting a hysteresis.

<table>
<thead>
<tr>
<th>Item</th>
<th>Phenomenon</th>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage dip (Sag, voltage drop)</td>
<td>A voltage drop occurs for a short time due to the occurrence of a large inrush current, for example, when a motor is started.</td>
<td>Decrease of power supply voltage may cause devices to stop or reset operations.</td>
</tr>
<tr>
<td>Voltage swell (Voltage rise)</td>
<td>Voltage increases instantaneously, for example, when lightning occurs or when a power line with a heavy load is turned ON/OFF.</td>
<td>Increase of power supply voltage may cause devices to drop or reset operations.</td>
</tr>
<tr>
<td>Instantaneous power failure</td>
<td>Power supply is stopped instantaneously or for a short time, for example, when a problem occurs in the power supply (excessive power supply due to lightning, etc.) or due to the trip of a breaker caused by short circuits in the power supply, etc.</td>
<td>Instantaneous power failure may cause devices to drop or reset operations. Recently, various preventive measures have been taken for computers, thanks to widespread use of UPS (uninterruptible power source).</td>
</tr>
</tbody>
</table>

Voltage fluctuation image

Measurement result

Convenient functions

It is possible to provide a voltage difference between start and end by setting a hysteresis.

Power Supply Quality Check at Various Places

Quality check for power supplies used in semiconductor manufacturing equipment in accordance with the SEMI guidelines

Measure stability of the voltage of supplied power according to SEMI S2-0302 (Environmental, Health, and Safety Guideline for Semiconductor Manufacturing Equipment). If a sag (default: within 2%) occurs, the wafer is removed from the line for inspection so daily quality check for power supplies is necessary.

Example:

- **Voltage level:**
  - 120% as reference

- **Result:**
  - Occurrence date/time of the sag can be reported so that semiconductor quality can be improved.

Other:

- Verification of instantaneous power failure preventive measures implemented in semiconductor manufacturing equipment

Advanced obtained by using the CW240

- Compact and easy to carry
  - Detects voltage fluctuations in each cycle, instantaneous power failures and voltage fluctuations are monitored continuously, and the occurrence and recovery times are reported.
The CW240 enables simultaneous measurement of loads in four systems in the case of the single-phase 2-wire system, and in two systems in the case of the single/three-phase 3-wire system (common to voltage). Current clamp probe/range can be set for each system.

Measures Loads in Four Systems Simultaneously.

This allows measurement according to the current flowing in each load.

Reduces Operation Errors at Work Site.

Setting check function

Settings made for data saving can be checked in the screen. This prevents data acquisition errors that may occur due to mistakes in voltage range setting, current clamp selection or data save item selection.
Saving a Large Amount of Data

Use of an external memory card (compact flash) makes it possible to save a large amount of data. A memory card (*1) of up to 2GB can be used, and the data is saved in CSV format. (*2)

In addition, the CW240 has a 1MB internal memory.

*1: Memory cards purchased from Yokogawa should be used.
*2: Data shorter than one second is saved in binary format. Screen copies can be made in bitmap format. Voltage fluctuation data is saved in text format.

Storage period when PC card (512MB) and internal memory (1MB) are used

<table>
<thead>
<tr>
<th>Wiring</th>
<th>1P2W</th>
<th>1P3W</th>
<th>2P1W</th>
<th>2P2W</th>
<th>2P3W</th>
<th>2P4W</th>
<th>3P2W</th>
<th>3P3W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of storable data items</td>
<td>114</td>
<td>146</td>
<td>208</td>
<td>254</td>
<td>300</td>
<td>378</td>
<td>505</td>
<td>564</td>
</tr>
<tr>
<td>Recording period</td>
<td>1 min</td>
<td>1 min</td>
<td>1 min</td>
<td>1 min</td>
<td>1 min</td>
<td>1 min</td>
<td>1 min</td>
<td>1 min</td>
</tr>
<tr>
<td>Interval time</td>
<td>1 min</td>
<td>1 min</td>
<td>1 min</td>
<td>1 min</td>
<td>1 min</td>
<td>1 min</td>
<td>1 min</td>
<td>1 min</td>
</tr>
<tr>
<td>Power supply backup</td>
<td>18 hrs</td>
<td>24 days</td>
<td>37 days</td>
<td>44 days</td>
<td>56 days</td>
<td>65 days</td>
<td>67 days</td>
<td>74 days</td>
</tr>
<tr>
<td>Voltage, current, etc.</td>
<td>±1 VDC</td>
<td>±1 VDC</td>
<td>±1 VDC</td>
<td>±1 VDC</td>
<td>±1 VDC</td>
<td>±1 VDC</td>
<td>±1 VDC</td>
<td>±1 VDC</td>
</tr>
</tbody>
</table>

Leakage Current Measurement

- External magnetic field effect is 0.002A or less, at 400A/m - Yokogawa’s proprietary technology has achieved a magnetic field impact amount of 30 ppm even in adjacent power lines. (At 100A)

Use of the 2A current clamp probe (96036) enables measurements with 200.0 mA range.

Analog Input/Output

- Besides power data - Analog data such as temperature and illuminance data can be saved simultaneously with power data by using the analog input function (2 channels). The available input ranges are 100 mV/1 V/5 V. In addition, the analog output function (4 channels) acquires data to an external recorder, allowing data duplexing. Output is ±1 VDC. (The analog input/output function is optional.)

Other Convenient Functions

- Power supply backup
- Multi-lingual support
- Manual data saving
- Screen hard copy
- Zoom function

Besides the AC adapter, it is possible to use a NiMH battery pack (94004) or alkaline batteries (six AA batteries). The CW240 will continue to operate even if supply of power is interrupted.

The CW240 supports Japanese, English, German, French, Spanish and Italian (available in the near future).

The data for the selected items can be saved or printed using the SAVE key. However, it cannot be saved during integrating measurement (and during standby).

The currently displayed screen can be saved or printed using the DISP COPY key. Files are saved in bitmap format.

The measured data for the selected five items can be zoomed in. The items to be displayed can be selected from instantaneous value and measured power quantity data.
### Specifications

#### Inputs

<table>
<thead>
<tr>
<th>Item</th>
<th>Voltage</th>
<th>Current</th>
<th>Current (reactive power meter method in use)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input type</td>
<td>Resistive potential division</td>
<td>Clamp-detection</td>
<td></td>
</tr>
<tr>
<td>Rated value</td>
<td>Clamp range</td>
<td>Clamp range</td>
<td></td>
</tr>
<tr>
<td>450 V</td>
<td>0.0000 V to 50.000 V</td>
<td>0.0000 V to 50.000 V</td>
<td></td>
</tr>
<tr>
<td>300 V</td>
<td>0.0000 V to 25.000 V</td>
<td>0.0000 V to 25.000 V</td>
<td></td>
</tr>
<tr>
<td>1000 V</td>
<td>0.0000 V to 50.000 V</td>
<td>0.0000 V to 50.000 V</td>
<td></td>
</tr>
</tbody>
</table>

#### Measurements

<table>
<thead>
<tr>
<th>Item</th>
<th>Voltage</th>
<th>Current</th>
<th>Power factor</th>
<th>Phase angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>Digital sampling</td>
<td>Digital sampling</td>
<td>Digital sampling</td>
<td>Digital sampling</td>
</tr>
<tr>
<td>Propagation range</td>
<td>0 to 2000 Hz</td>
<td>0 to 2000 Hz</td>
<td>0 to 2000 Hz</td>
<td>0 to 2000 Hz</td>
</tr>
<tr>
<td>Power factor</td>
<td>0 to 90°</td>
<td>0 to 90°</td>
<td>0 to 90°</td>
<td>0 to 90°</td>
</tr>
<tr>
<td>Phase angle</td>
<td>0 to 360°</td>
<td>0 to 360°</td>
<td>0 to 360°</td>
<td>0 to 360°</td>
</tr>
</tbody>
</table>

#### Range Configuration for Active Power

For single-phase 2-wire system (X2 for single-phase 3-wire system, X3 for three-phase 4-wire system):

- **When 96030 / 96031 / 96032 / 96033 / 96036 is used:**
  - Voltage range
    - 200 V: 0.010 A to 20.000 A
    - 500 V: 0.010 A to 50.000 A
    - 1000 V: 0.010 A to 100.000 A
    - 2.000 V: 0.010 A to 200.000 A
  - Current range
    - 96032 (100A)
    - 96033 (300A)
    - 96036 (1000A)

- **When 96031 / 96032 / 96033 / 96036 is used:**
  - Voltage range
    - 200 V: 0.010 A to 20.000 A
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  - Current range
    - 96032 (100A)
    - 96033 (300A)
    - 96036 (1000A)

### Equations

#### Active power, reactive power, apparent power, power factor and phase angle are measured for each phase.

- **The average, maximum and minimum values of those obtained during integrating measurement are calculated.**

#### Equations for Each Phase

- **Wiring Single-phase**

- **Input range**
  - Approx. 0.5 seconds

- **Current measurement**
  - Voltage input (continuous) 1000 V rms

- **Maximum allowed measured (range)**
  - Approx. 0.5 seconds

- **Frequency**
  - 40 to 70 Hz

- **Harmonic level**
  - 0 to 130% of each range

- **16-bit resolution**
  - Voltage/current input simultaneous conversion, PLL synchronized 128 samples/period

- **Single-phase 2-wire: 4 systems, single-phase 3-wire: 2 systems, three-phase 3-wire 2-current: 2 systems**

- **A/D converter**
  - Voltage/current input simultaneous conversion, PLL synchronized 128 samples/period 10-bit resolution

- **Range Configuration for Active Power**
  - Voltage range
    - 200 V: 0.010 A to 20.000 A
    - 500 V: 0.010 A to 50.000 A
    - 1000 V: 0.010 A to 100.000 A
    - 2.000 V: 0.010 A to 200.000 A
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    - 2.000 V: 0.010 A to 200.000 A
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    - 96036 (1000A)

- **When 96031 / 96032 / 96033 / 96036 is used:**
  - Voltage range
    - 200 V: 0.010 A to 20.000 A
    - 500 V: 0.010 A to 50.000 A
    - 1000 V: 0.010 A to 100.000 A
    - 2.000 V: 0.010 A to 200.000 A
  - Current range
    - 96032 (100A)
    - 96033 (300A)
    - 96036 (1000A)
Specifications of Each Function

- **Frequency Measurement Function**
  - Measurement input: Voltage input. Selectable from U1, U2 and U3.
  - Frequency range: 45 to 65 Hz.
  - Display range: ±200 Digits ±14.4dB.
  - Accuracy: For 10% to 180% sine wave input of voltage range.
  - Cutoff frequency: Approx. 300 Hz. OFF/ON selectable.
  - Low-pass filter function.

- **Power Quantity Measurement Function**
  - Measurement elements: Active power quantity, reactive power quantity, active power power (lag/lead).
  - Measurement accuracy: ±1.5% (When STANDARD is selected for display digits).
  - Measurement range:
    - Active power quantity: 0.00000 mWh to 999999 GWh.
    - Reactive power quantity: ±0.00000 mWh to ±999999 GWh.
    - Power factor: ±0.00000.
  - Display digits setting function: Selectable from automatic setting by rated power, minimum resolution setting, and minimum resolution shift by integrated value.

- **Demand Measurement Function**
  - Measurement elements:
    - Active power (consumption), reactive power (lagging), power factor.
    - Demand value within the interval time.
  - Active power quantity (consumption, generation), reactive power quantity (lagging, leading), Power quantity within the interval time.

- **Accuracy**
  - Measurement accuracy: ±1.5dB (When STANDARD is selected as the standard number of display digits).

- **Harmonic Measurement Function**
  - Measurement range:
    - Fundamental wave frequency: 45 to 65 Hz.
    - Synchronization frequency: 1st to 50th.
    - Power factor: Power factor between harmonic and fundamental wave.
    - Phase angle: Phase angle of harmonic and fundamental wave.

- **Display digit**
  - Level of each harmonic of voltage, current and power.

- **Measurement accuracy**
  - Level: ±1.0%.
  - Power factor: ±0.5%.
  - Phase angle: ±1°.

- **Accuracy guarantee conditions**
  - Voltage: ±0.3% rms.
  - Current: ±1% rms.
  - Frequency: ±0.02%.

- **Decimation**
  - 57 inch STN monochrome LCD display (320 x 240 pixels) with backlight.
  - OFF/ON and auto OFF selectable.
  - Contrast:
    - Automatically adjusted according to the ambient temperature / humidity.
    - Settable in 10 steps.

- **Input range**
  - Items other than power quantity: ±4 digits.
  - Power quantity: ±4 digits.

- **Function**
  - Moving average (Averaging from selectable to 2, 5, 10 and 20).
  - Hold / cancel.

- **Save/Print Function**
  - Data can be savored in manually or automatically.
  - Storage media:
    - Internal memory: 1MB or PC card.
  - Printing:
    - Dedicated printer (via RS-232).

- **Measurement data**:
  - Measured data, waveform data, data, screen data, setting data.
  - Setting format:
    - Measured data: CSV format.
    - Display format:
      - Waveform data: BMP format.
      - Setting data: BMP format.

- **Save/Print interval**
  - Standard: 1/25/10/5/1/0.005 seconds.

- **Data storage time display**
  - Displays only instantaneous values that can be input.

- **File operation**
  - Save/print interval:
    - Measurement data can be saved in the internal memory and PC card.
    - File names in the internal memory and PC card can be changed.
    - Files in the internal memory and PC card can be deleted.

- **File format**
  - Folders in the internal memory can be copied to the PC card.
  - Files can be read, written, deleted and renamed.

- **Communication Function**
  - Electronic specifications:
    - EU: RS-232.
  - Synchronization system:
    - Asynchronous communication.

- **Connector**
  - Baud rate: 1200/2400/9600/38400 bps.

- **External control I/O terminals**
  - Used to control start/end of integration measurement.
  - Control input:
    - TRL level or contact.
  - Control output:
    - TTL level.

- **Analog Input and DA Output Functions (Optional)**
  - DA output:
    - Output voltage: ±100% of the rated voltage.
      - Voltage, current, voltage/current, active power, reactive power, power factor, phase angle, frequency.
    - Resolution: ±0.1%.
    - Frequency: ±0.02%
  - Power quantity output range:
    - ±100% of the rated voltage.
  - Analog input:
    - Input range:
      - 0.00000 mWh to 999999 GWh.
    - Number of inputs: 2 channels.
    - Accuracy: ±0.5%.
    - Polarity: ±11 bits.
  - Sampling rate:
    - Approx. 20 ms.
  - Input resistance:
    - Approx. 100Ω.

- **Clock Function**
  - Automatic calendar, automatic leap-year setting, 24-hour system.
  - Real-time accuracy: ±20 ppm (±2°C).

- **Wiring Control Function**
  - Verification of validity of measurement of voltage/current input value, voltage/current phase difference, voltage-to-voltage phase difference, current-to-current phase difference and frequency.
  - Verification of single-phase load (in the case of Scott connection).

- **Setting Check Window**
  - Used to check data saved and start/end for integrating measurement.

- **Other functions**
  - VT ratio/CT ratio setting, ID number setting, NIMII (nickel hydrate battery) charge, remaining battery voltage display, beep sound (key operation), key lock, system reset.

- **General specifications**
  - Location for use:
    - Indoor, at an altitude of 2500 meters or less.
  - Operating temperature and humidity range:
    - 5° to 40°C, 5 to 90%RH (no condensation).
  - Insulating resistance:
    - 500 VAC, 50ΩM or greater.
  - Insulating withstand voltage:
    - 500 VAC, 500Vrms for one minute.
    - 3.5kVDC for one minute.
  - Power supply:
    - AC24V, 500mA.
  - Maximum rated powder consumption:
    - Main unit: Approx. 10W (normal operation), approx. 20W (when changing of NiMH battery pack).
  - Weight:
    - Approx. 1.2 kg (without batteries).

- **Accuracy guarantee conditions**
  - Warm-up time:
    - 30 minutes or more (within active input range, sine wave input, etc.).
  - Accuracy guarantee frequency:
    - 45 to 65Hz.
  - Accuracy warranty period:
    - 1 year.
Model CW120 Clamp-on Power Meter

Maintenance and long term monitoring of electrical equipment and electrical system.

- Voltage input
- Current input (clamp)
- Power switch
- 100-240VAC Power connection
- RS-232 connector (8-pin)
- External I/O controller port (plug-in module slots: expansion functions to start/stop multiple units simultaneously)
- PC card slot (flash ATA memory)
- Easy-to-recognize function icons

Model CW121-□-1
Low-cost tools to support your energy conservation efforts

As energy conservation becomes increasingly important, we are pleased to present low-cost clamp-on power meters designed to meet user needs for simple tools capable of measuring power values and instantaneous values.

Useful features for energy conservation and power measurement

● Periodically save data as often as once a second
  Data can be saved as low as 1-second interval. This capability allows the CW120 Series to respond quickly to load fluctuations and measure transient responses in equipment.

● Check equipment operating conditions
  The CW120 Series has an instantaneous value filing function (enabling multiple data records to be saved in a single file when multiple measurements are taken) which is useful for determining equipment operating conditions.

● Wiring error check function
  This function helps ensure that measurement operations are correct.

● Simultaneous measurement of multiple facilities
  Multiple CW120 Series units can start and stop integration simultaneously through externally controlled I/O.

● Works even with small electric energy values
  Easily change the decimal position (the number of digits following the decimal point) and display unit (Wh, kWh, MWh, GWh) on the electric energy display.

Details for Models CW120/CW121

<table>
<thead>
<tr>
<th>Items</th>
<th>CW120/CW121</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement Mode</td>
<td>Input system</td>
</tr>
<tr>
<td>Instant mode</td>
<td>Single-phase 2-wire to 3-phase 4-wire</td>
</tr>
<tr>
<td></td>
<td>(Up to 3 phase 3 wire for CW120)</td>
</tr>
<tr>
<td>Electric Energy mode</td>
<td>Available</td>
</tr>
<tr>
<td>Screen</td>
<td>Segmented LCD with backlight</td>
</tr>
<tr>
<td>Communication</td>
<td>Interface</td>
</tr>
<tr>
<td></td>
<td>RS232 or RS485</td>
</tr>
<tr>
<td>Protocol</td>
<td>MODBUS, PC-link, Power-Monitor, Proprietary</td>
</tr>
<tr>
<td>Monitoring by AP240E</td>
<td>Available</td>
</tr>
<tr>
<td>Power supply</td>
<td>100 to 240V AC, Supply the power from input.</td>
</tr>
<tr>
<td>Size (W×H×D)</td>
<td>117×161×51mm</td>
</tr>
<tr>
<td>Weight</td>
<td>600g</td>
</tr>
</tbody>
</table>

Load measurements on multiple systems

● In addition to support for a variety of connection types, the CW120 Series can simultaneously measure the loads* (facilities, equipment) on multiple systems sharing a common power supply.
  CW120 (three-phase 3-wire model): 1ø2W×2
  CW121 (three-phase 4-wire model): 1ø2W×2, ×3

1ø2W Three current systems (example)
Low-cost tools to support your energy conservation efforts

Compact design

● The CW120 Series is compact in size (117×161×51mm (W×H×D)), making it ideal for installation in cubicles and inside distribution panels. Installation is even easier with the magnetic case (93023).
● Although the CW120 Series is small, it has a large backlit LCD.
● A new addition to the clamp lineup is a small-diameter current clamp (model 96033, capable of measurements in the range of 5–50 A) for measurements in tight spots and locations where many wires are jumbled together.

Measurements

● The CW120 Series can be used for voltage measurements up to 495 V.
● A variety of connection types are supported, from single-phase 2-wire to three-phase 4-wire (CW120: three-phase 3-wire model; CW121: three-phase 4-wire model).
● Continuous measurement integration (accurate measurements can be obtained even if there are large load fluctuations)
● Plus/minus signs are shown for reactive power and power factor.
● The data saving interval can be set in the range of one second to one hour.

Parameters setting tool (name: Toolbox)

The setting software allows you to set CW120 Series measurement conditions through a PC and save measurement data on a PC when the unit is connected to the PC through RS-232 or RS-485 port.

● Measurement conditions setting function
This function makes it easy to set basic functions needed for measurement, such as start/stop time and date, wiring method, clamp type, voltage, and current range etc.

● File transfer function
The data file stored in CF pack can be transferred to PC. Microsoft Excel can read transferred data file.

* Toolbox is included as a standard feature (on two floppy disks).
Advanced data management and communication

Data management and communication

1. You can connect CW120 to a PC through dedicated RS-232 cable.
2. A printer (sold separately) can be connected through RS-232 cable to print measurement data.
3. If you have a media reader connected to your PC or card slot in notebook PC, measurement data and settings can be uploaded directly to a PC from CF* pack.

<table>
<thead>
<tr>
<th>Memory Card</th>
<th>Memory capacity</th>
<th>Interval Time 1sec</th>
<th>Interval Time 1sec</th>
<th>Wiring Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>97034</td>
<td>256MB</td>
<td>Approx. 103days</td>
<td>Approx. 71hours</td>
<td>System 1ø2W</td>
</tr>
<tr>
<td>97035</td>
<td>512MB</td>
<td>Approx. 206days</td>
<td>Approx. 140hours</td>
<td>System 1ø2W</td>
</tr>
<tr>
<td>97037</td>
<td>2GB</td>
<td>Approx. 2years</td>
<td>Approx. 50hours</td>
<td>System 1ø2W</td>
</tr>
</tbody>
</table>

* Compact Flash cards with memory capacity up to 2 GB may be used.

Network Communication

CW120 In addition to proprietary communication also supports, MODBUS, PC-link and Power Monitor protocols. PC-link is a protocol for Yokogawa’s Temperature controllers and PLCs. Power Monitor protocol is a protocol for Yokogawa’s Power Monitors. (PR201)

Remote monitoring

The RS-485 allows multiple use to be connected for remote monitoring.

* RS-485/RS-232 converter is required to connect the CW120/CW121-m-2 (RS-485 communication spec) to the RS-232 port on your PC.

Specifications

### Inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Voltage (V)</th>
<th>Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated value (range)</td>
<td>150/300/450 V</td>
<td>Clamp 96033: 5/10/20/50 A Clamp 96030: 20/30/50/100 A Clamp 96021: 50/100/200/500 A Clamp 96022: 200/500/1000 A</td>
</tr>
</tbody>
</table>

### Measurement Input Functions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Voltage</th>
<th>Current/active power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>Digital sampling</td>
<td></td>
</tr>
<tr>
<td>Frequency range</td>
<td>45–65 Hz (reciprocal system), detected from VI</td>
<td></td>
</tr>
<tr>
<td>Crest factor</td>
<td>150/300 V range Rated input: 2 Rated input: 3</td>
<td></td>
</tr>
<tr>
<td>Active input range</td>
<td>±15% ±30% of each range</td>
<td></td>
</tr>
<tr>
<td>Display range</td>
<td>All ranges 1.5 V ± 0.5% of each range</td>
<td></td>
</tr>
<tr>
<td>Temperature coefficient</td>
<td>±0.05% ±0.05%/°C (including clamp)</td>
<td></td>
</tr>
<tr>
<td>Display updating interval</td>
<td>Approximately one second</td>
<td></td>
</tr>
</tbody>
</table>

### Instantaneous Value Measurement

- Measurement parameters: Voltage rms (V), current rms (A), active power (W), frequency (Hz)
- Measurement accuracy (at power factor 1, including clamp) ±1.0% rdg ±0.4% rng ±0.8% of full range when using clamps 96030, 96031, and 96033 ±1.2% rdg ±0.8% when using clamp 96032
- Frequency: ±0.1% rdg ±0.1% of full range
- Computation parameters: Reactive power (Var), power factor
- Power factor influence: ±1.0% rdg ±0.5% (relative to reactive factor 1) when using clamp 96030 ±2.0% rdg ±1.0% (relative to power factor 1) when using clamp 96030
- Reactive factor influence: ±1.0% rdg ±0.5% (relative to reactive factor 1) when using clamp 96030 ±2.0% rdg ±1.0% (relative to power factor 1) when using clamp 96030

### Electric Energy Measurement

- Measured parameters: Active electric energy, regenerative electric energy (regenerative electric energy is not displayed on the screen; it is merely saved)
- Measurement accuracy: Active power measurement accuracy ±1.0% (with standard settings)
- Integration function settings: Start/stop settings: Manual, timer, external trigger (control)
- Output intervals: 1/2/5/10/15/30 seconds; 1/2/5/10/15/30 minutes; 1 hour
- Displayed digits: 1 T: One period for input signal 0 T
- 0 t=0
- P = P1 + P2 + P3
- Single-phase 3-wire: P = P1 + P2
- Three-phase 3-wire (Y型): P = P1 + P2
- Three-phase 4-wire: P = P1 + P2 + P3
- Power factor influence: ±1.0% rdg ±0.5% (relative to reactive factor 1) when using clamp 96030 ±2.0% rdg ±1.0% (relative to power factor 1) when using clamp 96030

### Equations

- Voltage rms: 
  \[ V = \sqrt{\frac{1}{T} \int_{t=0}^{T} V(t)^2 \, dt} \]
- Current rms: 
  \[ I = \sqrt{\frac{1}{T} \int_{t=0}^{T} I(t)^2 \, dt} \]
- Active power: 
  \[ P = \frac{1}{T} \int_{t=0}^{T} V(t)I(t) \, dt \]
- Reactive power and power factor: 
  \[ Q = \frac{1}{T} \int_{t=0}^{T} V(t) \angle \phi(t) I(t) \, dt \]

### Display Functions

- Display screens: Backlight segmented LCD
- Maximum number of displayed digits: 6 digits
- Other parameters: 4 digits
- Range makeup: (rated values)

### Table

**Input Specifications**

<table>
<thead>
<tr>
<th>Clamp 96032</th>
<th>Clamp 96030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>Wiring</td>
</tr>
<tr>
<td>150.0V</td>
<td>1aW</td>
</tr>
<tr>
<td>2aW</td>
<td>1.00 kW</td>
</tr>
<tr>
<td>3aW</td>
<td>1.50 kW</td>
</tr>
<tr>
<td>300.0V</td>
<td>1aW</td>
</tr>
<tr>
<td>2aW</td>
<td>4.00 kW</td>
</tr>
<tr>
<td>3aW</td>
<td>4.50 kW</td>
</tr>
<tr>
<td>450.0V</td>
<td>1aW</td>
</tr>
</tbody>
</table>
Communication Functions

- **Electrical specifications:** Conforms to EIA RS-232 or EIA RS-485.
- **Protocols:** CW120/121 proprietary protocol, Power Monitor protocol (Standard protocol used for YOKOGAWA M&C’s Power Monitor).
- **PC link communication:** (Standard protocol used for YOKOGAWA M&C’s Temperature Controllers).
- **MODEM communication:** (ASCII or RTU).
- **Synchronization system:** Start stop synchronization.
- **Baud rates:** 1200, 2400, 4800, 9600, 19200, 38400 bps.
- **Synchronization system:** Start stop synchronization.

PC card Interface

- **Slot:** PC card slot TYPE II.
- **Compatible card:** ATA flash memory card.
- **Function specifications:** Saving measurement data, saving and reading settings data.

Faulty Wiring Checking Functions

- **Check details:** Presence/absence of power input, check for frequency measurement range, voltage phase sequence, presence/absence of power input, whether current clamp is reverse-connected.

Scaling Function

- **Settings ranges:** VT ratio: 1–10,000.
- **CT ratio:** 1–10,000 (in increments of 0.01).

External Control I/O (for RS-232 only; not provided for RS-485)

- **Control input:** TTL level or contact.
- **Control output:** TTL level.

Other Functions

- **Clock:** (typical precision ±100 ppm), key lock, system reset.

General Specifications

- **Environmental requirements:** Indoor usage at an altitude of 2000 meters or less.
- **Usage temperature and humidity ranges:** 0–50°C, 5–85% RH (no condensation).
- **Storage temperature and humidity ranges:** -20–60°C, 5% RH (no condensation).
- **Insulating resistance:** 500 V DC, 50 MΩ or greater between voltage input terminals and case.
- **Insulating withstand voltage:** 2300 V AC for one minute between power line and case.
- **Insulating withstand voltage:** 2300 V AC for one minute between power line and current input terminals, communication terminals, and control I/O terminals.
- **Insulating withstand voltage:** 3320 V AC for one minute between voltage input terminals and current input terminals, communication terminals, and control I/O terminals.
- **Insulating withstand voltage:** 5550 V AC for one minute between voltage input terminals and case.
- **Insulating withstand voltage:** 5550 V AC for one minute between voltage input terminals and case.
- **Power supply:** 100–240 V AC ±10%, 50/60 Hz.
- **Consumed power:** 8 VA maximum.
- **External dimensions:** Approximately 117 x 115 x 51 mm (W x H x D).
- **Weight:** Approximately 0.6 kg.

Terminals

- **Voltage input:** CW120: 3 terminals, Banana terminals (safety terminals).
- **Current terminals:** CW120: 2 pairs, Banana terminals (safety terminals).
- **External control I/O terminals:** RS-485: 4 terminals (+/-/SG/TM) M3 screw terminals.
- **Connectors:** RS-232: Mini DIN 8-pin.
- **Accessories:** Voltage input probes: 3 for CW120, 4 for CW121.

Safety standards:

- **Compliant with EN61010-1, EN61010-2-031, UL61111-1, CAN C22.2 No. 1010.1-02**
- **Pollution degree II (Max. input voltage: 600 Vrms)**
- **Protection degree 2**

EMC (radiation):

- **Compliant with EN55011, Group I, Class A, EN61326, EN61000-3-2, EN61000-3-3**

EMC (immunity):

- **Compliant with EN55011**.
### CW420 Model and Suffix Code

#### Model name and suffix code

<table>
<thead>
<tr>
<th>Model (Part No.)</th>
<th>Suffix code</th>
<th>Option code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW240</td>
<td>D</td>
<td>H</td>
<td>Power Cord (UL/CSA Standard)</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>H</td>
<td>Power Cord (VDE Standard)</td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>B</td>
<td>Power Cord (GB Standard)</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>B</td>
<td>Power Cord (SAA Standard)</td>
</tr>
</tbody>
</table>

#### CW420 selection list for clamps

<table>
<thead>
<tr>
<th>Aim wiring to measure</th>
<th>Number of clamps</th>
<th>Notes for selecting type of clamp probes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-phase 2wire/3load</td>
<td>1</td>
<td>Different clamps are selectable.</td>
</tr>
<tr>
<td>1-phase 3wire/4load</td>
<td>2</td>
<td>Same clamps must be selected.</td>
</tr>
<tr>
<td>3-phase 4wire/5load</td>
<td>3</td>
<td>Same clamps must be selected for each load</td>
</tr>
<tr>
<td>3-phase 3wire/4load</td>
<td>4</td>
<td>Same clamps must be selected for each load</td>
</tr>
<tr>
<td>3-phase 3wire/5load</td>
<td>5</td>
<td>Same clamps must be selected for each load</td>
</tr>
<tr>
<td>3-phase 3wire/6load</td>
<td>6</td>
<td>Same clamps must be selected for each load</td>
</tr>
</tbody>
</table>

Standard accessories comes with main unit
91007 Voltage probes, AC adapter x 1, AA size alkaline battery x 6, ToolBox240(CD-ROM)x1, User's Manual x1CD-ROM version x1, Quick Manual x1CD-ROM version x1, Communication function manual/CD-ROM x1

### CW120 Models and Suffix code

#### Model name and suffix code

<table>
<thead>
<tr>
<th>Model (Part No.)</th>
<th>Suffix code</th>
<th>Option code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW120</td>
<td></td>
<td></td>
<td>Three-phase 3-wire</td>
</tr>
<tr>
<td>CW121</td>
<td>D</td>
<td>H</td>
<td>AC power cord (UL/CSA Standard)</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>H</td>
<td>AC power cord (VDE Standard)</td>
</tr>
<tr>
<td>Power cord</td>
<td>H</td>
<td>B</td>
<td>AC power cord (GB Standard)</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>B</td>
<td>AC power cord (SAA Standard)</td>
</tr>
<tr>
<td>Communication</td>
<td></td>
<td>1</td>
<td>RS-232 communication interface</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>RS-485 communication interface</td>
</tr>
</tbody>
</table>

#### CW120/CW121 selection list for clamps

<table>
<thead>
<tr>
<th>Aim wiring to measure</th>
<th>Number of clamps</th>
<th>Notes for selecting type of clamp probes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-phase 2wire/3load</td>
<td>1</td>
<td>Same clamps must be selected.</td>
</tr>
<tr>
<td>1-phase 2wire/4load</td>
<td>2</td>
<td>Same clamps must be selected.</td>
</tr>
<tr>
<td>1-phase 2wire/5load</td>
<td>3</td>
<td>Same clamps must be selected for CW121.</td>
</tr>
<tr>
<td>1-phase 3wire/4load</td>
<td>4</td>
<td>Same clamps must be selected for CW121.</td>
</tr>
<tr>
<td>1-phase 4wire/5load</td>
<td>5</td>
<td>Same clamps must be selected for CW121.</td>
</tr>
</tbody>
</table>

#### Accessories supplied at no extra cost

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Part No.</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Power cord</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Voltage probes (for CW120)</td>
<td>H018</td>
<td>3</td>
</tr>
<tr>
<td>4. Operation Guide</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CW120 Accessories

#### Accessories

<table>
<thead>
<tr>
<th>Carrying case</th>
<th>Main unit case</th>
<th>Portable case</th>
</tr>
</thead>
<tbody>
<tr>
<td>93022</td>
<td>93023</td>
<td>93024</td>
</tr>
</tbody>
</table>

This cable supplies power from a measurement circuit. length 1.5m
Not applied to CE and UL.

#### Power cable

<table>
<thead>
<tr>
<th>Name</th>
<th>Model No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage probe</td>
<td>91007</td>
<td>Four per set</td>
</tr>
<tr>
<td>Voltage probe</td>
<td>91013</td>
<td>Wire per set</td>
</tr>
<tr>
<td>Communication cable</td>
<td>91011</td>
<td>RS232 communication cable for PC (9-pin)</td>
</tr>
<tr>
<td>Printer cable</td>
<td>91010</td>
<td>RS232 printer cable, 1.5 m</td>
</tr>
<tr>
<td>Memory Card (2GB)</td>
<td>91004</td>
<td>2GB CF with PC Card Adapter</td>
</tr>
<tr>
<td>Memory Card (4GB)</td>
<td>91005</td>
<td>4GB CF with PC Card Adapter</td>
</tr>
<tr>
<td>Printer</td>
<td>91010</td>
<td>Includes one roll of thermal paper and one battery pack</td>
</tr>
<tr>
<td>AC adapter (for printer, Europe)</td>
<td>94006</td>
<td>Power Supply 200-240 VAC</td>
</tr>
<tr>
<td>AC adapter (for printer, USA)</td>
<td>94009</td>
<td>Power Supply 100-120 VAC</td>
</tr>
<tr>
<td>Thermal paper for printer</td>
<td>97009</td>
<td>10 rolls</td>
</tr>
<tr>
<td>AC adapter for 96035</td>
<td>94010</td>
<td>For AC 220-240 V</td>
</tr>
</tbody>
</table>

#### CW viewer

<table>
<thead>
<tr>
<th>Name</th>
<th>Model No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC adapter</td>
<td>94010</td>
<td>For AC 220-240 V</td>
</tr>
</tbody>
</table>
Effective power supply quality and power saving management for PCs

CWViewer AP240E
Data Analysis Program for CW240/CW12x

AP240E report creation in line with your objectives.

Powerful & Accurate measurement with the CW240.

Increased quality and effectiveness of report creation
CW Viewer AP240E is data analyzing software for the CW240 Clamp-on Power Meter. Making full use of the rich measuring functions of the CW240, this efficiently manages the large amounts of measurement data that are required in order to implement power quality management, energy management, and power saving measures. Furthermore, the quality and efficiency of report creation has been improved in order that reports to meet certain purposes can be easily created.

Report creation in line with objectives
- Graph Display
- Harmonics Instant Value Display
- Waveform Data Display
- Voltage Change Display
- Harmonic Graph Display
Effective power supply quality and power saving management for PCs.

**Power quality and power saving management data measured with the CW240**

**AP240E report creation in line with your objectives**

**Increased quality and effectiveness of report creation**

### Bulk Data Management

In order to edit measurement data to create reports that meet objectives, it is necessary to sort the required elements from a broad range of measurement data, and to set both the parameters for display, and items to display. CW Viewer AP240E carries out bulk management of data by registering measurement data and display parameters. Easy data registration, deletion, reference, and analysis means that the program is easy to use immediately, even for beginners.

#### Bulk Management of Large Quantities of Measurement Data

Using the AP240E, it is easy to register a large amount of data measured with CW240 in the database, for integrated handling.

1. At the time of data registration, only the target files are displayed, and detailed information can be confirmed by selecting these files.
2. Measurement data can be searched by measurement date or group name.
3. Automatically links to measurement data such as that for waveforms and voltage changes.
4. Group names and comments can be added and registered.

#### Fast Reproduction of Past Reports

CW Viewer AP240E links display parameters for graphs and records with measurement data, and saves this in the database, which means that reports that have been created in the past can be swiftly recreated in the same format.

### Simple Report Creation

Select measurement data, and click the Data Display button to edit reports. Settings of display items is easy, and items such as graphs and daily reports are easy to create.

#### Pick out target elements from large amounts of data.

Items that can be selected when setting display items are displayed in a list, which means that measurement data items that are required for carrying out power management and power quality management can be efficiently selected to meet objectives.

1. Up to a maximum of 8 items can be set for both the left and right axes.
2. Display items, units, and scale, etc. can be selected from the list.
3. Desired maximum and minimum values for the graph scale can be set. Additionally, the Automatic Settings button can be used to set optimal values.
4. This is also convenient for comparisons with power reduction targets, by setting standard values.

#### Easy Setting of Focus Times

Setting the start and period of the focus times enables setting of a range of part (or all) of the measurement data.

1. The display start time can be specified from the range of existing measurement data.
2. The specified display range can be moved easily using these buttons.
3. The graph display period (the whole period or a desired period) can be specified.
4. A desired range (more than the measurement cycle) can be specified.
Variety of Presentations in Line with Objectives

Report formats that can be selected as a result of the types of measurement data are displayed on tabs. Report formats in line with objectives can be easily selected with tabs from a variety of report presentations.

● Selection of Report Formats with Tabs
Report formats such as graph display, daily report display, harmonics graph and voltage change can be easily switched by selection with tabs.

Superimposed Display of Multiple Waveforms
A channel, system, and type can be selected for each measurement item such as power, voltage, and current, and up to 8 items can be simultaneously displayed on the graph for each of the left and right vertical axes (a total of 16 items). This enables the comparative display per channel and system of multiple data items.

● Easy-to-see Graph Display
Graph display can be changed (line type, line thickness, and line color, markers, etc.) in line with objectives, and multiple measurement data can be displayed on the report in an easy to see manner.

● Harmonics Data Analysis
Harmonics graphs are displayed by selecting the desired degree from amongst 50. Harmonics trend graphs and harmonics instant value graphs can be selected with tabs, and in the harmonics instant value tab, all harmonics levels, harmonics content ratios, and phase differences can be displayed. Vector display of power phase differences is also possible.

● Waveform Data Display
Displays as a graph waveform data (maximum of 7 for each of four systems) measured with the CW240. Irregularities in voltage and current waveforms for each phase can be viewed at a glance, making for effective management of electrical power quality (current situation and confirmation of measures taken).

One-Touch Selection of Daily and Weekly Reports

● Daily Report Display
Demand measurement values for power consumption are displayed in time units (30 minutes or 1 hour) as daily reports, simply by selecting the desired demand measurement items. Furthermore, load and demand ratio calculations are carried out automatically by setting capacitance values for facilities.

● Weekly and Monthly Report Display
Demand measurement values for power consumption in 1 day units are displayed as weekly and monthly reports. Load and demand ratio calculations are carried out automatically in the same way as with daily reports.

● Voltage Change Display
Displays in a list voltage drops, rises, and momentary power interruption detection data and detection time. This enables confirmation of the start, end, and period of voltage changes.

● Record Display
When the graph display, harmonics trend display, and harmonics instant value display tabs have been selected, numerical data for the displayed graph range can be displayed as a record.
Report Creation Customization Functions

\**Graph and Record Printing**
Print graphs and records by using the Print buttons on the graph display screen and records screen. Additionally, when printing, the preview screen will allow confirmation of output.

\**Selectnable Printer Type**
Printer configuration is possible in order that either color or monochrome are printed correctly.

AP240E Analysis Data can be Further Edited in MS Excel and Word

\**Graph Copy**
The portion of the graph on the displayed screen can be copied to the clipboard by using the Graph Copy button on the graph screen. This enables graph images that are created in CW Viewer AP240E to be pasted into Excel or Word documents. Power phase difference vector diagrams and waveform data are also handled in the same way.

\**Record Copy**
By using the Record Copy button in the same way as with graphs, record data can be copied to the clipboard. Record data is copied as text data.

\**Saving Record Data as CSV Format Files**
The range of data displayed on the daily report, monthly report, and record screens can be saved as CSV format files. CSV files can be used in spreadsheet software; this is convenient for secondary analysis of measurement data, and creation of original reports.

Useful Functions

\**Analog Input Data**
Scaling for analog input data settings, and unit settings can be carried out. This enables comparison of measurement data such as temperature and lighting density with data such as used energy.

\**Voltage Unbalance Ratio Display**
Automatically measures voltage unbalance ratios when CH1 ~ CH3 voltage is measured, and can display as a graph in the same way as with other measurement data items.

\**Default Settings**
Frequently used unit settings, graph display parameter settings, and group name settings, etc. can be registered as defaults in advance.

\**Display Settings / Measurement Parameter Display**
Settings parameters and measurement intervals, etc. at the time of measurement are displayed on the top of the tabs on the data display screen, enabling constant confirmation by selecting tabs even if the report format is changed.
**AP240E Specifications**

**Data Management**
- Display of measurement parameters when measurement data is registered.
- Registration in the database of measurement date, measurement parameters, group names, and comments added to measurement data possible.
- Bulk management of data such as harmonics data, waveform data, and voltage change data.
- Editing of data names, comments, and group names possible.
- Searching by measurement dates / periods, and group names possible.
- Saving of settings information at the time the report was displayed, and that corresponds to data.
- Setting of defaults for a range of settings data possible.

**Data Display Selection**
- Always display measurement parameters on the data display screen.
- Selection by the use of tabs to select report displays (graph display, daily report display, weekly / monthly report display, harmonic graph display, harmonics instant value display, waveform data display, voltage change display) possible.

**Graph Display**
- Graph display of up to 8 items on each of the left and right axes possible.
- Selection of display items an ordered list possible.
- Settings of units, decimal points, minimum values, and maximum values, as well as automatic adjustment for each of the left and right axes possible.
- Graph customization (line type, line thickness marker, color) possible.
- Setting of the graph display period (focused time, period, measurement cycle) possible.
- Movement of the graph display period possible.
- Graph interpolation of non-measured segments possible.

**Daily Report Display, Weekly / Monthly Report Display**
- Displays the daily report, and weekly / monthly report tabs where there is demand measurement data.
- Displays selected demand measurement values per time (or date).
- Selection of display intervals for daily report display (1 hour / 30 minutes) possible.
- Can set the equipment capacity, and automatically calculate load ratios and demand ratios.

**Harmonic Graph Display**
- Displays the harmonics graph tab where there is harmonics measurement data.
- Selection of degree data up to a maximum of 50 degrees possible.

**Harmonics Instant Value Display**
- Displays the harmonics graph tab when there is harmonics measurement data.
- Selection of degrees of up to 50 possible.
- Display of power phase difference vector diagrams possible.

**Waveform Data Display**
- Displays the waveform data tab when there is waveform data.
- Display of selected waveform data.

**Voltage Change Display**
- Displays the voltage change data tab when there is voltage change detection data.
- Displays voltage change data per detection time.
- Selection of display items (voltage dip, voltage swell, detected momentary power interruptions) possible.

**Package contents**

<table>
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<tr>
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<tbody>
<tr>
<td>AP240E installation CD</td>
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<tr>
<td>User registration card</td>
<td>1</td>
</tr>
</tbody>
</table>
### Common Accessories for CW120/121 and CW240

#### Measuring range

<table>
<thead>
<tr>
<th>Item</th>
<th>Measuring range</th>
<th>Output voltage</th>
<th>Output impedance</th>
<th>Output amplifier</th>
<th>Operating circuit</th>
<th>Measured range</th>
<th>Measuring range</th>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>96030,31</td>
<td>0–20 A Max. AC</td>
<td>0–5 V rms AC (1 mA)</td>
<td>100 mm, five 125 × 5 mm bus bars, or three 100 × 15 mm bus bars</td>
<td>Not specified</td>
<td>±0.5˚ (20 Hz to 1 kHz)</td>
<td>±0.5% rdg (100 A, 10 Hz to 10 kHz)</td>
<td>±2% (5–3000 A, 45 Hz to 66 Hz)</td>
<td>±4˚ (200 A, 40 Hz to 1 kHz)</td>
</tr>
<tr>
<td>96033</td>
<td>0–3000 A Max. AC</td>
<td>0–5 V rms AC (1 mA)</td>
<td>100 mm, five 125 × 5 mm bus bars, or three 100 × 15 mm bus bars</td>
<td>Not specified</td>
<td>±0.5˚ (20 Hz to 1 kHz)</td>
<td>±0.5% rdg (100 A, 10 Hz to 10 kHz)</td>
<td>±2% (5–3000 A, 45 Hz to 66 Hz)</td>
<td>±4˚ (200 A, 40 Hz to 1 kHz)</td>
</tr>
</tbody>
</table>

#### Phase

- ±1.5% rdg (20 Hz to 45 Hz)
- ±0.5% rdg (45 Hz to 66 Hz)
- ±1.5% rdg (45 Hz to 66 Hz)
- ±1.5% rdg (100 A, 10 Hz to 10 kHz)
- ±0.5% rdg (100 A, 10 Hz to 10 kHz)
- ±2% (5–3000 A, 45 Hz to 66 Hz)
- ±4˚ (200 A, 40 Hz to 1 kHz)

#### Measured range

- ±0.1% of full scale (at 400 A/m, 50/60 Hz)
- ±0.5% of full scale (at 400 A/m, 50/60 Hz)
- ±1% +0.2 A or less
- ±1˚ (5–3000 A, 45 Hz to 66 Hz)
- ±2% (200 A, 40 Hz to 1 kHz)
- ±2% (200 A, 40 Hz to 1 kHz)

#### Output cable length

- Approx. 2.4 m 
- Approx. 1000 Arms (1414 Apk) for 5 minutes
- Approx. 2.4 m 
- Approx. 1000 Arms (1414 Apk) for 5 minutes

#### Power supply

- Continuous measurement: 150 hours
- International measurement: 10,000 times
## Clamp-On Power Meters

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW121-D/SP1</td>
<td>CW121-D Clamp Meter with standard accessories and 93037 Carrying case and 94009 Lithium ion battery</td>
</tr>
<tr>
<td>CW240-D/SP1</td>
<td>CW240-D Clamp Meter with standard accessories and 93037 Carrying case and 94009 Lithium ion battery</td>
</tr>
</tbody>
</table>

Contact Information:

www.Farnell.co.uk

www.Newark.com