

## Digital Power Meter

### MODEL 66203/66204

#### Key Features :

- Voltage Ranges :  
15/30/60/150/300/600 Vrms,  
1200Vrms (optional kit)
- Current Ranges :  
0.005/0.02/0.05/0.2/0.5/2/5/20 Arms
- Frequency Range : DC, 15Hz~10kHz
- Embedded high speed DSP,  
16 bits Analog/Digital converters
- Half rack size, up to 4 input modules
- Supports various single and 3 phase  
wiring configurations (see diagram)
- Supports external shunt and CT for  
higher current applications
- 5 mA minimum current range &  
0.1mW power resolution
- Meets ENERGY STAR / EN 50564 /  
IEC 62301 / ErP
- Includes accumulated energy methods for  
unstable power measurement
- User-define criteria provides automatic  
PASS/FAIL indications
- Dual current shunt design provides high  
accuracy over a wide current range
- THD and user-specify order distortion  
measurement
- Inrush current and energy measurements
- Voltage / Current harmonics measurements  
up to 50 orders



## DIGITAL POWER METER MODEL 66203/66204

Chroma 66203/66204 Power Meters are designed for multiple phase power measurement applications. The wiring mode function allows the user to take accurate power measurements for various wiring modes 1P2W/1P3W/3P3W/3P4W as well as providing accurate standard power measurements common for most electrical devices. A unique feature of the 66203/66204 is its state-of-the-art DSP digitizing technology instead of less accurate and slower traditional analog circuits. The internal 16 bits analog/digital converters with sampling rates of up to 250kHz provide both high speed and high accuracy measurements which is unprecedented within the industry for this class of power meters.

The instruments include a four part display with 7-segment LED front panel readouts. Users can easily select desired parameters and readouts with a touch of a button. The 66203/66204 meters also include remote control using USB or GPIB interfaces via rear panel connections.

The 66203/66204 are packaged in a 3U high, half rack enclosure suitable for bench top or system integration. The power meters are capable of supporting external shunts and CT for higher current application. The 4 channel 66204 is suitable for input and output parameter measurement and efficiency of 3 phase PV inverters can be calculated with measurement of the DC voltage/current at the input side of the inverter.

The 66203/66204 power meters include a 2-shunt design to provide high accurate readings for both low and high current measurements. The power meters also support features such as Inrush current, Total Harmonic Distortion of V/I, and Energy measurements. With these practical functions, the 66203/66204 power meters are suitable for meeting the demanding tasks of R&D, production and quality control departments.



# Chroma

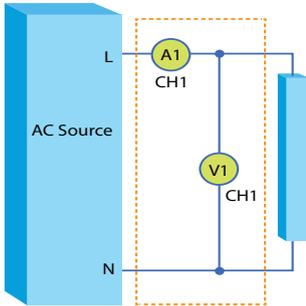


## FUNCTIONS AND APPLICATIONS

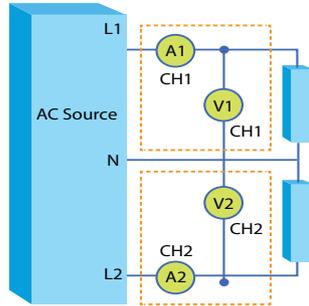
The multi-channel of 66203/66204 Power Meters are capable of supporting different wiring modes. As shown the instruments can be configured for single and 3 phase configurations by selection preset modes.



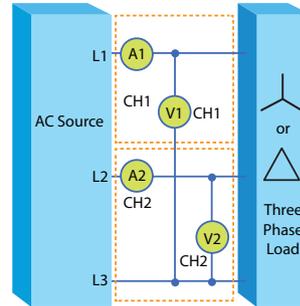
	Channel 1	Channel 2	Channel 3	Channel 4
1P2W (Single Phase Two Wire)	1P2W	1P2W	1P2W	1P2W
1P3W (Single Phase Three Wire)	1P3W		1P2W	1P2W
3P3W (Three Phase Three Wire – Two Watt meter Method)	3P3W		1P2W	1P2W
3P4W (Three Phase Four Wire)	3P4W			1P2W



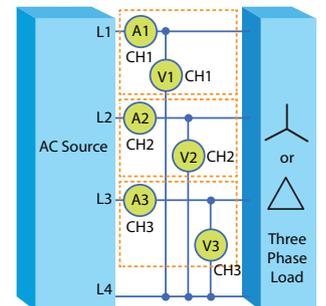
1P2W (Single Phase Two Wire)



1P3W (Single Phase Three Wire)

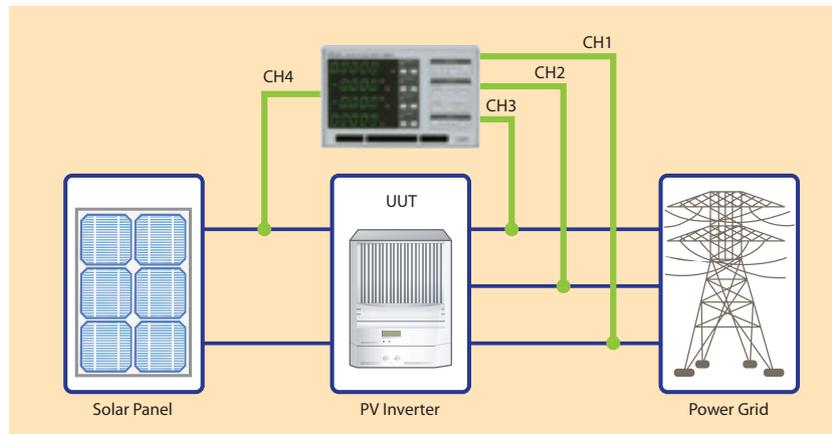


3P3W (Three Phase Three Wire)

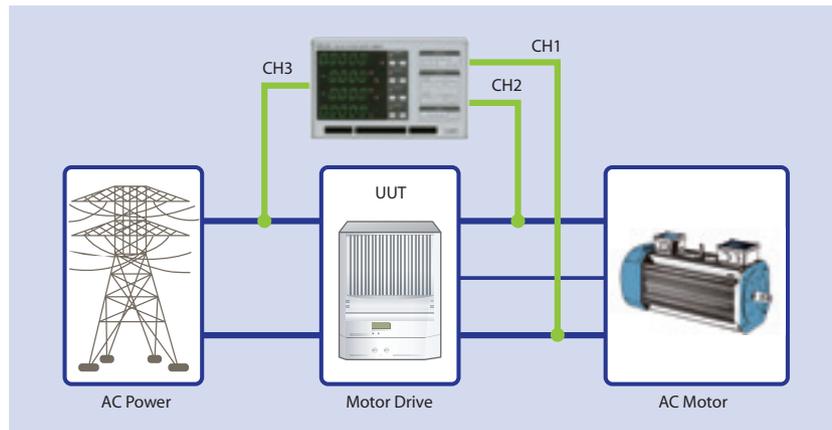


3P4W (Three Phase Four Wire)

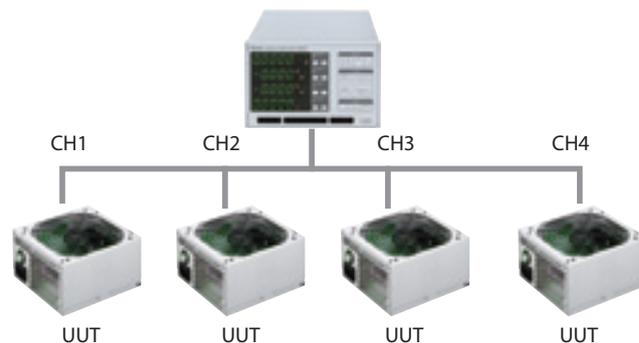
Each channel of 66203/66204 has the ability to provide independent measurements; hence the meters are suitable for multi-point measurement applications such as PV inverter testing. Instruments are designed for measuring DC input parameters as well as three phase AC readings on the output side. The overall efficiency for the PV inverter can easily be obtained by built-in functions. In order to meet high voltage applications (up to 1200Vrms) Chroma offers an HV option kit.



User could implement 3P3W (Three Phase Three Wire) wiring mode for three phase power measurement application. Such as AC motor inverter testing.

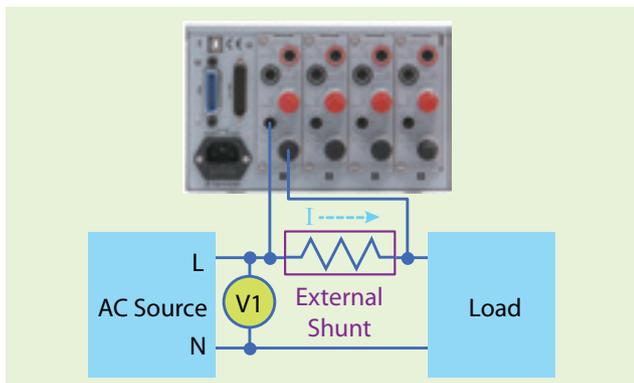


With the wiring mode set as 1P2W, the 66204 Power Meter has the capability of performing up to 4 simultaneous power measurements as shown. The meters are also designed to comply with power measurement requirements in accordance to many international standards such as Energy Star/EN 50564/IEC 62301/ErP.

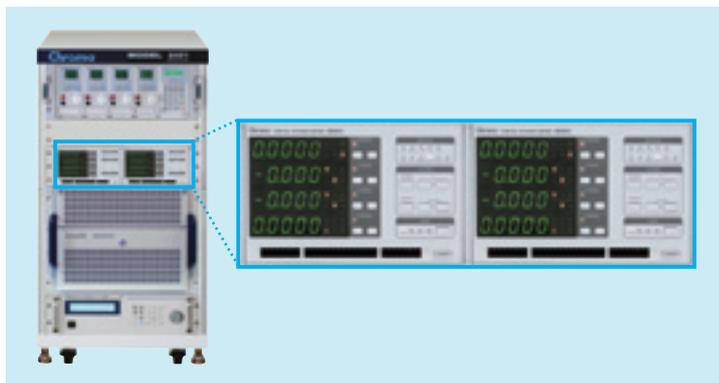


### User-defined Criteria for GO/NG Test

The Power Meters allow users to perform GO/NG functions by presetting pass/fail limits. If the measured values are within these limits, the Pass indicator illuminates green. Fail results in red illumination.



66203/66204 Power Meters support external shunt function for high current (>20A) measurement application.

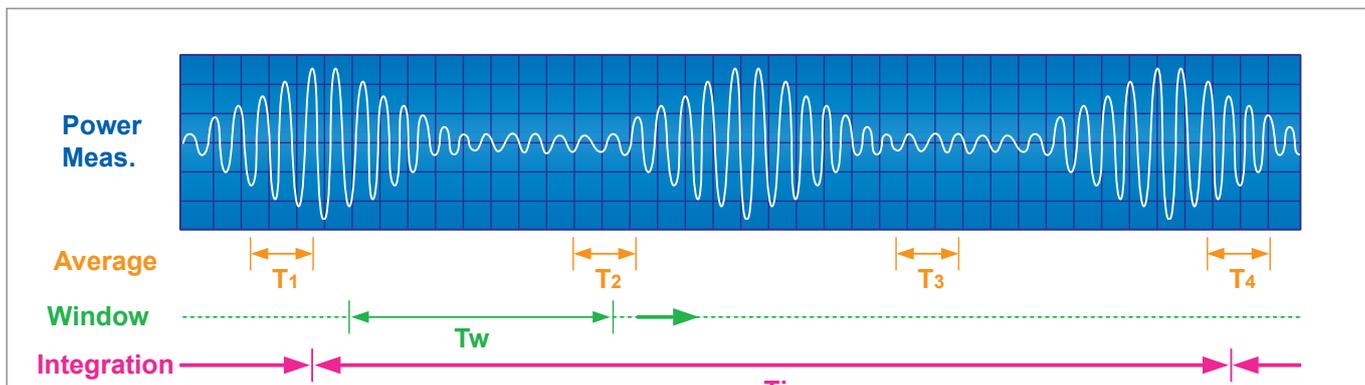


Compact size design allows two 66203/66204 Power Meters to be configured side-by-side in a standard 19" rack

### Average Mode and Integration Mode for Power Measurement

When using a traditional power meter, unstable measurements can occur if the UUT's power consumption are unstable or operating in non-linear modes (i.e. a power supply's hiccup mode). In these cases the load levels maybe different at different measurement aperture windows (T1, T2, T3 and T4 below). A simple averaging calculation can only provide a visual stable value but provides inaccurate power readings.

The 66203/66204 includes a Window Mode method which calculates all data within the user-defined time window (Tw). In this manner users can obtain a real average value without data lose. An accumulated energy approach method (i.e. integration mode) for power measurements is also provided. This integration mode calculates active power values by integrating energy from V and I in a user-defined time period (Ti). In this way, users can achieve accurate readings with guaranteed transient-free variations. The 66203/66204 meters provide a 5mA minimum current range with crest factor 4, and 0.1mW measurement resolution for low power application (<10W), and less than 2% uncertainty even for No-Load mode power measurements. These functions make 66200 an ideal choice for ENERGY STAR / IEC 62301 / ErP measurement.



### THD Measurement and User Define Level of Distortion

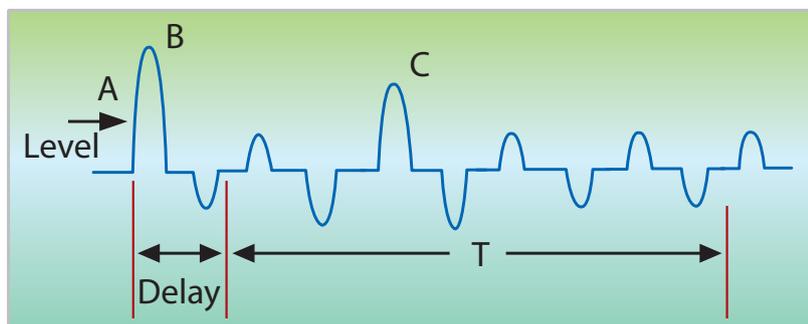
The 66203/66204 Power Meters can measure voltage and current Total Harmonic Distortion (THD) directly which can be displayed in percentage format. For some requirements (ENERGY STAR), users need to verify the THD of AC supply voltage when supplying the UUT in the specified mode not to exceed 2%, up to and including the 13th harmonic (as specified in IEC 62301). The 66203/66204 also provides a function to define a user-specify level of distortion n, (n is from 2 to 50) for measuring harmonic distortion. The calculation formula is listed below. Thus, the instrument can easily measure distortion values as required by the ENERGY STAR requirements.

$$\text{THD}_V = \frac{\sqrt{V_2^2 + V_3^2 + V_4^2 + V_5^2 + \dots + V_n^2}}{V_1}$$

Where  $V_n$  = rms value of nth harmonic of the voltage signal.

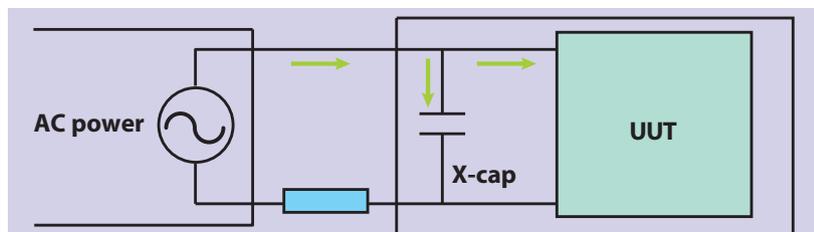
### Inrush Current Measurement

The 66203/66204 Power Meters include built-in inrush current ( $I_s$ ) measurement functions. Users can even set a current level for triggering the starting point of the measurement. Users also can use an external TTL signal to trigger inrush current measurements through the control I/O signal port located at the rear side. The delay parameter can help users to bypass the peak value B after the trigger point A. The parameter, T, allows a set time period to be established for measuring the peak value during a preset time (T). The main purpose is to avoid measuring the inrush current value that is generally caused by X-capacitor of a power supply.



### Low Pass Filter

The maximum measurement bandwidth of the 66203/66204 Power Meters is 50kHz. However, the high frequency component is not desirable in all applications. For example, the input switching noise of some power supplies may influence the power measurement. In order to achieve a proper value, a low pass filter is necessary to reject the switching component. Users can set the parameter filter ON in the system configuration setting. The bandwidth will be reduced to 5kHz to reject high frequency content but still meets the 3kHz requirement of ENERGY STAR test.



Filter Off : Bandwidth = 50kHz

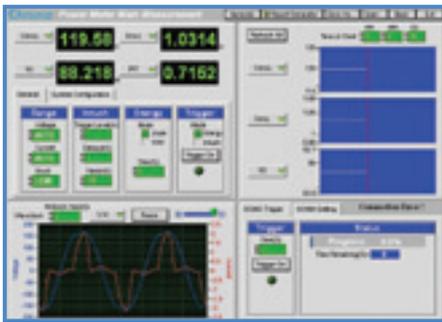


Filter On: Bandwidth = 5kHz  
(meets the 3kHz requirement of Energy Star)

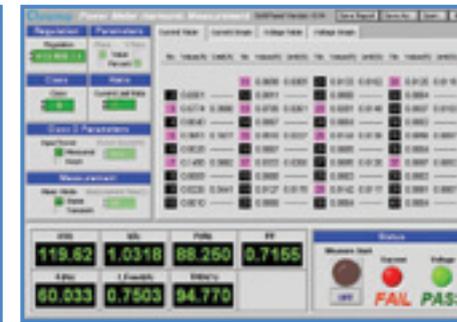
## POWER EFFICIENCY SOFTPANELS

The 66200 Power Meters provide graphical user interface software (Softpanels) which allow users to control and read measured parameters from a computer via USB or GPIB interface. Users can easily observe measured voltage and current waveforms and monitor the changes in parameter readings by using the chart function. Additional features include a recording function which can record selected parameters and write data to a file for further analysis. The 66200 Softpanels supports IEC 61000-3-2\* harmonic current limit test (pre-compliance) allowing users to examine whether the UUT has met the harmonic current requirement. The Power Efficiency Softpanel\* also integrates with Chroma's electronic loads and AC Sources to provide an easy method of power efficiency testing and recording of data using the test report function which automatically generates a report at the completion of testing.

(\*Only support by 1P2W with designated single channel)



66200 Softpanel

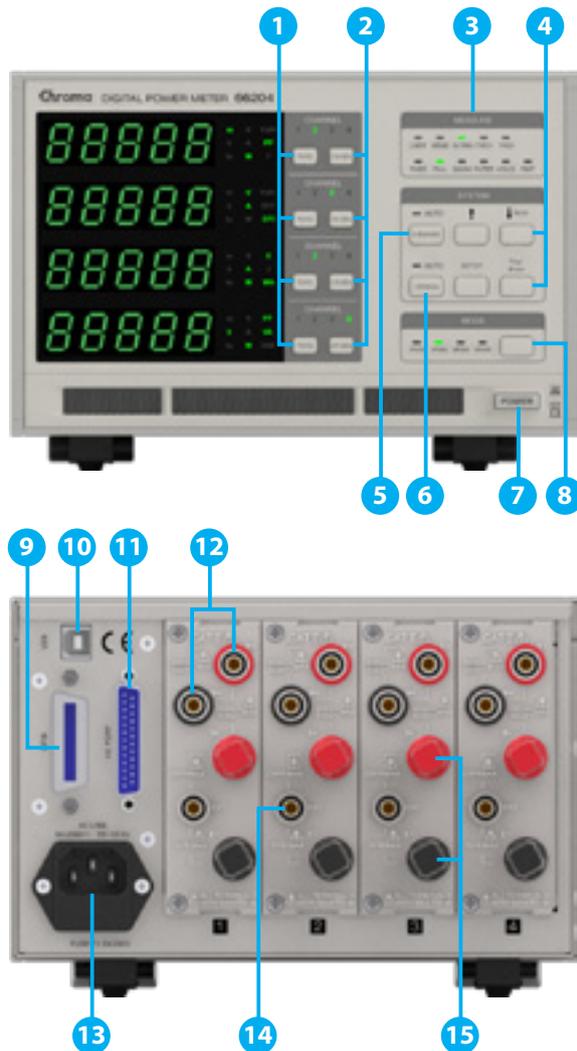


IEC 61000-3-2 Current Harmonics Test (Pre-compliance)



Power Efficiency Test Softpanel

## PANEL DESCRIPTION



1. Parameter selection key
2. Channel selection key
3. System setting and function indicator
4. System configuration setting
5. Voltage range selection key
6. Current range selection key
7. Power ON/OFF switch
8. Wiring mode selection key
9. GPIB remote interface
10. USB remote interface
11. Control I/O signals
12. Voltage measurement inputs
13. AC input power
14. External shunt input
15. Current measurement inputs

## SPECIFICATIONS

Model	66203	66204
Meas. Channel	3	4
Parameters	V, Vpk, I, Ipk, Is, W, VA, VAR, PF, CFI, F, THD V, THD I, E	
<b>AC/DC Voltage</b>		
Voltage Range (V)	15V/30V/60V/150V/300V/600Vrms (CF=2), 6 range HV option up to 1200Vrms	
Voltage Accuracy	15Hz to 1kHz: 0.1% RD + 0.08% RNG 1kHz to 10kHz: (0.1+0.05*kHz)% RD + 0.05% RNG	
Voltage Harmonics Accuracy	15Hz to 1kHz: 0.1% RD + 0.08% RNG 1kHz to 10kHz: (0.1+0.05*kHz)% RD + 0.05% RNG	
DC Voltage Accuracy	0.1% RD + 0.08% RNG	
<b>AC/DC Current</b>		
Current Range (I)	5mA/20mA/50mA/200mA/500mA/2A/5A/20Arms (CF=4)	
Current Accuracy	15Hz to 1kHz: 0.1% RD + 0.12% RNG 1kHz to 10kHz: (0.1+0.05*kHz)% RD + 0.1% RNG	
Current Harmonics Accuracy	15Hz to 1kHz: 0.1% RD + 0.12% RNG 1kHz to 10kHz: (0.1+0.05*kHz)% RD + 0.1% RNG	
DC Current Accuracy	0.1% RD + 0.1% RNG	
<b>Power</b>		
Power Range (W)	75mW ~ 12kW (48 ranges)	
Power Accuracy	47Hz to 63Hz: 0.1% RD + 0.1% RNG 1KHz to 10KHz: (0.1+0.1*kHz+0.3/PF*kHz)% RD + 0.18% RNG	
Power Factor accuracy	0.001+(15ppm/PF)*Hz	
<b>Frequency</b>		
Fundamental Frequency Range	DC, 15Hz ~ 10kHz	
THD Frequency Range	40Hz ~ 70Hz (100 order) 70Hz ~ 440Hz (50 order)	
Bandwidth	50kHz	
<b>Others</b>		
Display Resolution	5 Digits	
Display Update Rate	0.25sec/0.5sec/1sec/2sec	
Input Voltage	100~240V ± 10%, 50/60Hz	
Interface	USB+GPIB (Standard)	
Operation Temperature	0°C ~ 40°C	
Storage	-40°C ~ 85°C	
Safety & EMC	CE (include EMC & LVD)	
Dimension (H x W x D)	133 x 212 x 420 mm / 5.25 x 8.25 x 16.3 inch	
Weight	7.5 kg / 16.5 lbs	8.5 kg / 18.7 lbs

The specifications are valid only after the power meter is turned on more than one hour in a thermally stable environment.

## ORDERING INFORMATION

**66203** : Digital Power Meter (3 channels)

**66204** : Digital Power Meter (4 channels)

**A662008** : Power Efficiency Test Softpanel

**A662009** : Softpanel for 66200 Series

**A662010** : Rack Mount Kit for 1 unit

**A662011** : rack mount kit for 2 unit (side by side)

**A662012** : 1200V HV option kit

**A662013** : External CT 50Arms for 66203/66204

**A662014** : External CT 100Arms for 66203/66204

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