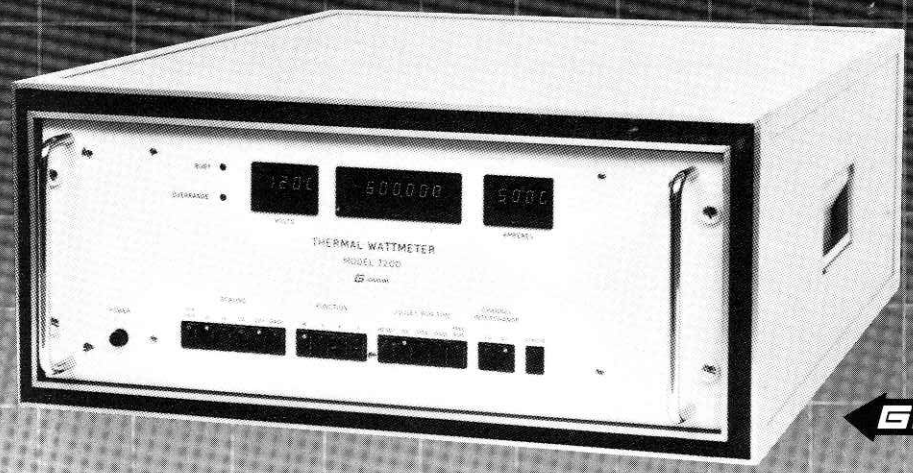
# Precision Digital Wattmeter




GP-IB

**Features**

- **Direct digital measurement of:**
  - **Power**
  - **Voltage**
  - **Current**
  - **Joules**
- **70 ppm accuracy at all power factors**
- **Uses Differential Multi Junction Thermal Converter to derive true power**
- **6½ digit resolution**
- **Microprocessor controlled auto balance**
- **IEEE-488 interface**
- **High power capability using external CT's and PT's**

The Guildline 7200 Precision Digital Wattmeter brings a new dimension to precision power measurement. Through the utilization of a differential multi-junction thermal convertor (DMJTC) true power is derived from an ac-dc transfer. The DMJTC together with a unique circuit design has eliminated the errors and difficulties usually associated with power measurements.

Most other wattmeters exhibit large errors or are unable to operate at non-unity power factors; the severest limitations being at very low power factors. The 7200 operates at ALL power factors, in ALL quadrants, without degradation in performance.

Besides the ability to measure power, the 7200 can measure voltage, current or joules and digitally display the results to 6½ digit resolution. Voltage and current are displayed during power measurements. Joules are displayed by the accumulation of watt-seconds determined by an internally selectable clock. Answers can be displayed in Systems International (SI) units or scaled in "per unit" from zero to unity.

### Accuracy

Precision power measurement has been limited in the past essentially to measurements at unity power factor with pure sine wave inputs. The 7200 achieves better than 70 ppm accuracy for power measurements at all power factors for distorted waveforms up to a crest factor of 2.4:1.

### Ergonomic Design

The 7200 is physically designed to interact simply and efficiently with the operator. All buttons are logically spaced and grouped and digital displays preclude ambiguous readings. The main display resolves to a full 6½ digits giving a resolution of 100μW, 100μV and 1μA for watts, voltage and current respectively. Two auxiliary displays monitor voltage and current simultaneously to a 3½ digit resolution. The scaling controls allow selection of two voltage and current ranges in either SI units or as a percentage of full scale range.

Four different functions (Watts, Volts, Amps or Joules) can be selected from the front panel. Energy measurements can be made by selection of one of the 4 run time controls; 10 Sec, 100 Sec, 1000 Sec and free run. Voltage & current channel interchange controls are provided to reduce phase shift errors when working at or close to zero power factor. All controls on the front panel have integrated indicator lamps for easy identification of the measurement and control status.

### Systems Use

Built in as standard is an IEEE-488 GP-IB interface. All functions are fully programmable over the Bus with the exception of line power on/off.

## Applications

The 7200 Digital Wattmeter can be used for metering inter-ties between utilities, calibrating watt hour meters, short circuit losses in large transformers, shunt reactor losses, precision voltage and current measurement at power frequencies, measurement of power in thyristor controlled circuits, calibration of rotating standards and other standard wattmeters.

The range of the 7200 can be further extended by use of external CT's and PT's. When external potential and current sensing equipment produces other than the standard ranges of voltage and current, i.e., 120/240V and 1A/5A, auxiliary 1mA full scale inputs have been provided to retain maximum accuracy and resolution under these conditions.

The conventional two Wattmeter method and three Wattmeter method for the measurement of three phase power can be easily carried out with two or three 7200's connected in a three phase system. Via the IEEE-488 Bus, Wattmeter synchronization can easily be achieved to measure all phases simultaneously.

## SPECIFICATIONS & PERFORMANCE

**Wattage**
Frequency: 47Hz to 63Hz

**Power Factor Range:** 0 to ±1 pf.
Specifications apply up to 110% of Selected Range

| Nominal Applied Input | | Input Range | | Resolution | (% Reading + Digits) @ All Power Factors | | Displayed Watts pf = 1 |
|---|---|---|---|---|---|---|---|
| Volts | Amps | Volts | Amps | | 90 days 23°C ± 5°C | 1 Year 23°C ± 5°C | |
| 120 | 0.1 | 120 | 1 | 100μW | 0.007 + 2 | 0.008 + 2 | 12W |
| 120 | 1 | 120 | 1 | 100μW | 0.007 + 2 | 0.008 + 2 | 120W |
| 120 | 0.5 | 120 | 5 | 1mW | 0.007 + 2 | 0.008 + 2 | 60W |
| 120 | 5 | 120 | 5 | 1mW | 0.007 + 2 | 0.008 + 2 | 600W |
| 240 | 0.1 | 240 | 1 | 100μW | 0.007 + 2 | 0.008 + 2 | 24W |
| 240 | 1 | 240 | 1 | 100μW | 0.007 + 2 | 0.008 + 2 | 240W |
| 240 | 0.5 | 240 | 5 | 1mW | 0.008 + 2 | 0.01 + 2 | 120W |
| 240 | 5 | 240 | 5 | 1mW | 0.008 + 2 | 0.01 + 2 | 1200W |

Joules: Accuracy Specification same as Wattage

**Frequency:** 40Hz to 440Hz

| Nominal Applied Input | | Input Range | | Resolution | (% Reading + Digits) @ All Power Factors | | Displayed Watts pf = 1 |
|---|---|---|---|---|---|---|---|
| Volts | Amps | Volts | Amps | | 90 days 23°C ± 5°C | 1 Year 23°C ± 5°C | |
| 120 | 0.1 | 120 | 1 | 100μW | 0.03 + 4 | 0.04 + 4 | 12W |
| 120 | 1 | 120 | 1 | 100μW | 0.015 + 4 | 0.025 + 4 | 120W |
| 120 | 0.5 | 120 | 5 | 1mW | 0.03 + 4 | 0.04 + 4 | 60W |
| 120 | 5 | 120 | 5 | 1mW | 0.02 + 4 | 0.03 + 4 | 600W |
| 240 | 0.1 | 240 | 1 | 100μW | 0.03 + 4 | 0.04 + 4 | 24W |
| 240 | 1 | 240 | 1 | 100μW | 0.015 + 4 | 0.025 + 4 | 240W |
| 240 | 0.5 | 240 | 5 | 1mW | 0.03 + 4 | 0.04 + 4 | 120W |
| 240 | 5 | 240 | 5 | 1mW | 0.02 + 4 | 0.03 + 4 | 1200W |

Joules: Accuracy Specification same as Wattage

**Frequency:** 440Hz to 1000Hz

| Nominal Applied Input | | Input Range | | Resolution | (% Reading + Digits) @ All Power Factors | | Displayed Watts pf = 1 |
|---|---|---|---|---|---|---|---|
| Volts | Amps | Volts | Amps | | 90 days 23°C ± 5°C | 1 Year 23°C ± 5°C | |
| 120 | 0.1 | 120 | 1 | 100μW | 0.04 + 10 | 0.05 + 10 | 12W |
| 120 | 1 | 120 | 1 | 100μW | 0.03 + 10 | 0.04 + 10 | 120W |
| 120 | 0.5 | 120 | 5 | 1mW | 0.04 + 10 | 0.05 + 10 | 60W |
| 120 | 5 | 120 | 5 | 1mW | 0.03 + 10 | 0.04 + 10 | 600W |
| 240 | 0.1 | 240 | 1 | 100μW | 0.08 + 10 | 0.09 + 10 | 24W |
| 240 | 1 | 240 | 1 | 100μW | 0.04 + 10 | 0.05 + 10 | 240W |
| 240 | 0.5 | 240 | 5 | 1mW | 0.08 + 10 | 0.09 + 10 | 120W |
| 240 | 5 | 240 | 5 | 1mW | 0.04 + 10 | 0.05 + 10 | 1200W |

Joules: Accuracy Specification same as Wattage

## SPECIFICATIONS

**VOLTAGE:** (6½ Digits)

**Range:** 0 to 120V and 0 to 240V
**Accuracy:** ±0.01% of full scale volts
**Resolution:** 100μV

**AMPERAGE:** (6½ Digits)

**Range:** 0 to 1A and 0 to 5A
**Accuracy:** ±0.01% of full scale amps
**Resolution:** 1μA on 1A range
10μA on 5A range

**TEMPERATURE COEFFICIENT:** ±0.0002% /°C
T.C. need only be applied outside the range +18 to 28°C

**CREST FACTOR:** 2.4:1 for voltage and current with full accuracy

**DISPLAY TIME UPDATE:** 1 second

**SETTLING TIME:** 20 seconds to full accuracy

**WARM UP TIME:** 30 minutes to specified accuracy

**INPUT CHARACTERISTICS (Floating)**

**Overload:** AC voltage (fuse protected): 2 times range Max. DC 4mV
AC current: 20A Max. DC 1mA

**Impedance:** Voltage inputs —

| Range | Input Terminals | Sense Terminals | Max. external lead resistance input/sense |
|---|---|---|---|
| 120V | 900kΩ, 2kH, 1200pf | 2600pf | 40Ω/20Ω |
| 240V | 3.6MΩ, 8kH, 600pf | 1300pf | 100Ω/50Ω |

**Impedance:** Current inputs — 0.002Ω

**Leakage:** Potential transformer
Screen leakage impedance
$10^9\Omega$//1000pf
Current transformer
Shield leakage impedance
$10^9\Omega$//400pf

**Maximum Common Mode Voltage:** 1000V rms

**Common Mode Rejection:** >120 dB

**Direct Inputs:** 1mA full scale for both voltage and current. Overload protected to 50mA, 0.2Ω input impedance.

**INTERFACE:** IEEE-488 (1978) interface. Subset: SH1, AH1, T5, L4, SR1, RL1, PP0, DC0, DC1, DT0, C0, E1

**GENERAL SPECIFICATIONS**

**Line Voltage:** 110V ± 10% 220V ± 10%
120V ± 10% 240V ± 10%

**Line Frequency:** 50/60Hz ± 5%

**Power Consumption:** 70VA Max.

**Operating Temperature Range:** 15°C to 30°C

**Relative Humidity:** 20% to 80% non-condensing

**Mounting:** 19" Rack

**Dimensions:** Width 483mm (19")
Height 178mm (7")
Depth 447mm (17⅝")

**Weight:** 36.4 kg (80 lbs.)

## HOW TO ORDER

**7200:** Precision Digital Wattmeter

**Accessories:** OM 7200-A-00 Operating Manual (included)
TM 7200-A-01 Technical Manual (included)

***For Services and/or Calibration Contact:***

**Guildline Calibration Services**
***A Prime Standards Laboratory***

**Guildline**

***"Blending Craft and Technology"™***

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