

GPM-8310

Digital Power Meter

FEATURES

5"TFT LCD

- DC, 0.1Hz ~ 100kHz Voltage/Current Test Bandwidth
- Two Numerical Display Modes
 - General Mode: Displays 2 Main Test Items + 8 Secondary Test Items
 - Simple Mode: Displays the Test Values of 4 Main Test Items
- Waveform Display: V (voltage), I (current), P (power)
- The Current/Voltage can be Measured to a Deformed Wave with CF of 3, and the Half-range CF can Reach 6 or 6A
- Meeting the IEC 61000-4-7 Harmonics Measurement Requirements (50/60Hz)
- 50th Order of Harmonic Measurement and Analysis (value and bar graph)
- Integration Function Supports Automatic Level-changing
- External Current Sensor Input Terminals (EXT1/EXT2)
- Standard Interfaces: RS-232C, USB Device/Host, LAN, GPIB
- Optional Interface: Digital I/O (DA4) (must be installed before leaving the factory)
- Optional Accessory: GPM-001



GW Instek GPM-8310 is a digital power meter for single-phase (1P/2W) AC power measurement. Features include DC, 0.1Hz~100kHz test bandwidth, 16bits A/D, and 300 kHz sampling rate. It adopts 5" TFT LCD screen with a five-digit measurement display and provides 25 power measurement related parameters, and has a high-precision measurement capability. It also features the ability to display waveform (voltage/current/power), the integration measurement function, harmonic measurement and analysis of each order (meeting the IEC 61000-4-7 harmonics measurement requirements at 50/60Hz), external sensor input terminals, and various communication interfaces, etc., to help users achieve clear, convenient and accurate power measurements. This power meter is a most cost-effective power meter with most complete functionalities among the products of the same category.

The rated direct input voltage of GPM-8310 is 600V and the input current is 20A. The minimum current level is 5mA (resolution up to 0.1uA) and the power measurement resolution is 0.1uW. The crest factor can reach 3 (half measurement range can reach 6 or 6A), and the voltage/current/power measurement capability can reach (\pm 0.05% reading \pm 0.1% level). Different measurement modes can be selected according to (AC+DC/AC/DC/V-MEAN), providing up to 25 relevant parameters for power measurement, including voltage (Vrms/Vac/Vdc/Vmn/V+pk/V-pk), current (Irms/Iac/Idc/I+pk/I-pk), frequency (VHz/IHz), power (P/P+pk/P-pk), crest factor (CFV/CFI), apparent power (VA), reactive power (VAR), power factor (PF), phase angle (DEG), total harmonic distortion rate (THDV/THDI), maximum current ratio (MCR), and the MATH calculation function. Hence, for the measurement of low current/low power such as standby power consumption, or the measurement of power consumption of general products, this power meter provides the best range and accuracy support.

GPM-8310 also makes good use of the advantages of the TFT LCD to display the results of parameter measurement by using numerical and graphical methods. In terms of numerical values, the general mode and the simple mode are provided. The general mode can display 10 measurement parameters (2 main measurements + 8 monitoring measurements), and the simple mode can display four measurement parameters. These displayed parameters can be arbitrarily selected from 25 power parameters according to the needs of users. In terms of graphic display, a simple oscilloscope mode is provided to display waveforms for three parameters including voltage, current and power. In addition, the measurement and analysis of each harmonic order of the measurement signal can be completely displayed by numerical values or bar graphs. This power meter not only meets the needs of accuracy and legibility in process testing, but also meets the needs of diverse measurement applications in R&D design and quality verification.

In addition, the performance of GPM-8310 in auxiliary measurement mechanism/function is also comprehensive. For the application of measuring large voltage, the VT rate setting can be used with an external voltage Potential Transformer. For the measurement of large current, the type of current transformer ~ voltage output type or current output type will determine the applied method. If it is a current output type, it can be directly locked to the rear panel of the instrument and collocated with the CT rate setting to conduct measurement. If it is a voltage output type, measurement can be conducted through the external current sensor input terminals (EXT1/EXT2) provided by GPM-8310. Automatic level-changing can self-define the required level to save level-changing time. 10,000 lots of internal memories can be used to store measurement data according to the update rate set by GPM-8310 or a user-defined time interval for subsequent analysis.

In terms of data retrieval and storage, GPM-8310 provides a variety of communication interfaces including RS-232C/ USB device (virtual COM)/ LAN/ GPIB. Users can write programs to read the measurement results according to their habits or with existing system interfaces and there is no need to procure interfaces. USB host supports GPM-8310 screen capture, internal record data access, and firmware update. For the needs of external signal control or the use of data recorder to record data, GPM-8310 also provides an optional Digital I/O (DA4) interface (must be installed before leaving the factory), which can be connected to an external controller such as PLC or a data recorder to meet the application of automatic measurement or long recording.

VARIOUS DISPLAY MODES



Numerical (General) Mode Numerical (Simple) Mode

Waveform Mode Harmonic (Bar Graph) Measurement Harmonic (Table Column) Measurement

GPM-8310 provides the numerical value display mode and the waveform display mode, which help users to maximize the benefit of their measurement. Under the numerical mode, there are the general mode and the simple mode. The general mode has related measurement settings and can simultaneously display 10 measurement parameters (2 main measurements and 8 secondary measurements). The simple mode displays only 4 measurement parameter results. The parameters in each mode can be arranged and combined as required. Under the graphic mode, a simple oscilloscope function is provided to display the waveforms of three parameters including voltage, current and power. The horizontal scale can be adjusted (from 25us/div ~ 1s/div according to the set data update rate), and 3 magnification rates for waveform observation are also provided for users to select. In the harmonic measurement, the measurement results of each order of harmonics can be displayed by bar graphs, and a specific observation order can be specified. The relevant values of each order of harmonics (voltage/current/power/voltage distortion ratio/current distortion ratio/power distortion ratio/voltage phase angle/current phase angle) can be completely recorded and displayed.

Measurement Items	Symbols
Voltage	Vrms, V+pk, V-pk, Vac*, Vdc*, Vmn*
Current	Irms, I+pk, I-pk, Iac*, Idc*
Power	P, P+pk, P-pk, VA, VAR
Power Factor	PF
Crest Factor	CFV, CFI
Phase Angle	DEG
Frequency	VHz, IHz
Total Harmonic Distortion	THDV, THDI
Maximum Current Ratio	MCR
Integration	WP, WP+, WP-, q, q+, q-, Vac, lac

Note : "*" Only applicable to specific measurement modes for selection

GPM-8310 provides a variety of measurement items and functions, including voltage, current, frequency, effective power, apparent power, reactive power, power factor, crest factor, total harmonic distortion, and can also measure the maximum current ratio. GPM-8310 is also equipped with the measurement function of power or current time integration for the DUT. Users set a period of time to perform instantaneous power



integration at the set time period, and then divide by the time to obtain the average power of the DUT. In addition, when performing integration measurement, GPM-8310 supports automatic level-changing function for the power change of the DUT at different times in order to obtain the most complete integration result within the set time.

SUPERB MEASUREMENT ASSISTANCE

Ratio VT Ratio State	Off	Measure
Ratio	0001.000	
CT Ratio State	Off	
Ratio	0001.000	
Power Ratio State	Off	
Ratio	0001.000	

Ratio Configuration

With respect to the support of measurement assistance, the performance of GPM-8310 is outstanding. First of all, for the measurement of high voltage/high power, the setting of voltage ratio/power ratio is provided to restore the attenuated ratio to a true value. For the measurement of large current, other than the setting of current ratio, external current sensor terminals (EXT1/EXT2) can be utilized to connect with a voltage output type current transformer, making large current measurement more



External Current Sensor Input

convenient. In addition, GPM-8310 provides 4 sets of panel settings for storage/recall and memory for storing 10,000 lots of measurement values. The measurement storage can log the measurement results based upon the update rate or a self-defined time interval to facilitate the subsequent analysis. The USB host on the front panel supports screen capture, measurement value storage, and GPM-8310 firmware update.

D. FLEXIBLE LEVEL-CHANGING MECHANISM



Automatic level-changing under the integration function



Self-defined automatic level-changing mechanism

GPM-8310 provides the measurement of the integration function under the automatic level-changing mode to allow users to fully calculate the total value of the power consumption of the DUT from the beginning to the end of the integration function. In addition, GPM-8310 also supports self-defined setting mechanism for level-changing. Users can select the required level to be changed to save time on level-changing and expedite the test.

E. CONVENIENT AND PRACTICAL INTERFACE



Practical Interface

GPM-8310 provides comprehensive and diverse communications interfaces including RS-232 / USB / LAN / GPIB, which are suitable for customers to write computer software for remote control and the collection of measurement results through commands. The optional Digital I/O (DA4) interface provides 3 different modes: the external control mode, the DA4 output mode and the self-defined output mode based on user settings. When the setting is in the external control mode, it allows users to activate, stop, trigger or reset the integration measurement



DA4 Interface Mechanism

function through external signals. When the setting is in the DA4 output mode, users can define 4 measurement parameter values from the 25 measurement parameters provided (even with the result of integration measurement) to produce outputs by a fixed level (full scale \pm 5V) or a manual level (full scale \pm 5V) and receive results by collocating with a data recorder. When the setting is in the self-defined output mode, a communications interface is required to control the action of each defined pin through commands.





GTL-213 Test Lead



GTL-210 Test Lead







GPM-001(EU) Test Fixture

UNIVE University Specifications Imput Type Control Finding input through results wolking dwidthrough shurt Massare Range Volage 133, X00, K00, K00, K00, K00, K00, K00, K00	SPECIFICATIONS				
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Temperature CoefficientAdd $\pm 0.03\%$ of reading/°C within the range 5 to 18°C or 28 to 40°C.When the Line Flter is Turned ON $45 - 66$ Hz 45 HzAdd 0.2 % of readingAccuracy When the Crest Factor is Set to 6 or 6Aaccuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set Update IntervalAccuracy Changes Caused by Data Update IntervalWhen the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy Add the following value to the DC current accuracies. S mA/10 mA/20 mA/50 mA/100 mA/200 mA ranges $5 \ \mu A/°C$ $0.5 \ A/1 \ A/2 \ A/5 \ A/10 \ A/20 \ ArangesAccuracy When the Crest Factor is Setto 6 or 6Aaccuracy obtained by doubling the measurement range error for the accuracy when the crest factor is setS \ mA/10 \ mA/20 \$	Accuracy	$\begin{array}{c} 0.1 \ \text{Hz} \leq f < 45 \\ 45 \ \text{Hz} \leq f \leq 66 \\ 66 \ \text{Hz} < f \leq 1 \ \text{kl} \\ 1 \ \text{kHz} < f \leq 10 \ \text{l} \end{array}$	Hz ± ((Hz ± ((Hz ± ((KHz ± ((0.1 % of reading + 0.2 % 0.1 % of reading + 0.05 0.1 % of reading + 0.2 % 0.07 *f) % of reading + 1	6 of range) % of range) 6 of range) 0.3% of range)
When the Line Filter is Turned ON $45 - 66$ Hz < 45 HzAdd 0.2 % of reading Add 0.5 % of readingAccuracy When the Crest Factor is Seet to 6 or 6Aaccuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set cacuracy Changes Caused by Data Update IntervalWhen the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy Add the following value to the DC current accuracy. Add the following value to the DC current accuracies. 5 mA/10 mA/20 mA/50 mA/100 mA/200 mA ranges5 μ A/°C 0.5 A/1 A/2 A/5 A/10 A/20 A rangesAccuracy When the Crest Factor is Set to 6 or 6Aaccuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set 5 mA/10 mA/20 mA/50 mA/100 mA/200 mA ranges5 μ A/°C 0.5 A/1 A/2 A/5 A/10 A/20 A rangesCacuracy When the Crest Factor is Set to 6 or 6Aaccuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 6 or 6AAccuracy Changes Caused by Data Update IntervalWhen the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracyAccuracy Changes Caused by Data Update IntervalWhen the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracyAccuracy Changes Caused by Data Update IntervalSpecificationsAccuracy Changes Caused by Data Update IntervalSpecificationsAccuracy Changes Caused by Data Update IntervalDC 0.1 % of reading + 0.2 % of range) 0.1 Hz to 1 kHz accuracyActive POWER ACCURACY ItemSpecificationsAccuracyIDC 0.1 % of reading + 0.2 % of range) 0.1 Hz	Temperature Coefficient				
Accuracy When the Crest Factor is Set to 6 or 6Aaccuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set when the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy Add 0.02% of range/°C to the DC voltage accuracy. Add the following value to the DC current accuracies. S mA/10 mA/20 mA/50 mA/100 mA/200 mA ranges S mA/10 mA/20 mA/50 mA/100 mA/200 mA ranges S 00 μ /°C External current sensor input (/EXT1) External current sensor input (/EXT2) S 0 μ /°CAccuracy When the Crest Factor is Set to 6 or 6Aaccuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 6 or 6AAccuracy When the Crest Factor is Set to 6 or 6Aaccuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 6 or 6AAccuracy Changes Caused by Data Update IntervalWhen the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy $0 0 \mu/°C$ Accuracy Changes Caused by Data Update IntervalWhen the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy $0 0 \mu/°C$ Accuracy Changes Caused by Data Update IntervalSpecifications same as the conditions for voltage and current. Power factorPower factor1AccuracyDC $0.1 Hz \leq f < 45$ Hz $\pm (0.3 % of reading + 0.2 % of range)0.1 Hz \leq f < 45 Hz \pm (0.3 % of reading + 0.2 % of range)0.1 Hz \leq f < 10 kHz \pm (0.1 % of reading + 0.2 % of range)1 kHz < f \le 10 kHz \pm (0.1 % of reading + 0.3 % of range) \pm [(0.067x(f-1)]% of reading]1 0 kHz $	When the Line Flter is Turned ON		Add	d 0.2 % of reading	
Accuracy Changes Caused by Data Update IntervalWhen the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy Add 0.02% of range/°C to the DC voltage accuracy. Add the following value to the DC current accuracies. 5 mA/10 mA/20 mA/20 mA/20 mA ranges 5 mA/10 mA/20 mA/20 mA/20 mA ranges 5 mA/10 mA/20 mA/20 mA/20 mA/20 mA/°C External current sensor input (/EXT1) External current sensor input (/EXT2) 50 μ V/°CAccuracy When the Crest Factor is Set to 6 of 6A Accuracy Changes Caused by Data Update IntervalWhen the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy by ν V°CAccuracy Changes Caused by Data Update IntervalSpecificationsRequirementsSpecificationsRequirementsSpecificationsRequirementsSame as the conditions for voltage and current. Power factor 45 Hz ≤ f ≤ 66 Hz 45 Hz ≤ f ≤ 10 kHz 45 Hz ≤ f ≤ 10 kHz 40.1 % of reading + 0.2 % of range) 10 kHz < f ≤ 100 kHz 40.1 % of reading + 0.2 % of range) 10 kHz < f ≤ 100 kHz 40.1 % of reading + 0.5 % of range) 10 kHz < f ≤ 100 kHz 40.1 % of reading + 0.5 % of range) ± [[0.067x(f-1)]% of reading] 10 kHz < f ≤ 100 kHz 10 kHz < (0.1 % of reading + 0.5 % of range) ± [[0.09x(f-10)]% of reading] 10 kHz < f ≤ 100 kHz 10 kHz < (0.5 % of reading + 0.5 % of range) ± [[0.09x(f-10)]% of reading]	Accuracy When the Crest Factor is			0	e error for the accuracy when the crest factor is set to
Update IntervalInfluence of Temperature Changes After Zero-level Compensation or Range ChangeAdd 0.02% of range/°C to the DC voltage accuracy. Add the following value to the DC current accuracies. 5 mA/10 mA/20 mA/50 mA/100 mA/200 mA ranges5 μ A/°C 0.5 A/1 A/2 A/5 A/10 A/20 A rangesSonge ChangeSonge A/°C 0.5 A/1 A/2 A/5 A/10 A/20 A ranges500 μ A/°C 0.5 A/1 A/2 A/5 A/10 A/20 A rangesAccuracy When the Crest Factor is Set to 6 or 6Aaccuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 6 or 6AAccuracy Changes Caused by Data Update IntervalWhen the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracyActive POWER ACCURACYItemItemSpecifications same as the conditions for voltage and current. Power factorPower factor1Accuracy0.1 Hz $\leq f < 45$ Hz $\leq 1 \leq 66$ Hz $\leq 1 \leq 10$ kHz0.1 Hz $\leq f < 45$ Hz $\leq 1 \leq 66$ Hz $\leq 1 \leq 10$ kHz(0.1 % of reading + 0.2 % of range) ≤ 1 kHz $\leq f \leq 10$ kHz $\leq 1 \leq 10$ kHz0.1 Hz $\leq f < 10$ kHz $(0.1 \% of reading + 0.2 \% of range)$ $\leq 1 \leq 1 \leq 10$ kHz0.1 Hz $\leq f < 10$ kHz $(0.1 \% of reading + 0.2 \% of range)$ $\leq 1 \leq 1$		When the data	undate interval	is 100 ms, and Auto, ad	d 0.05% of reading to the 0.1 Hz to 1 kHz accuracy
After Zero-level Compensation or Range ChangeAdd the following value to the DC current accuracies. 5 mA/10 mA/20 mA/50 mA/100 mA/200 mA ranges5 μ A/°C 0.5 A/1 A/2 A/5 A/10 A/20 A ranges500 μ A/°C External current sensor input (/EXT1)1 mV/°C External current sensor input (/EXT2)50 μ V/°CAccuracy When the Crest Factor is Set to 6 or 6Aaccuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 6 or 6Aaccuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set update intervalACTIVE POWER ACCURACY ItemSpecificationssame as the conditions for voltage and current. Power factorPower factor1AccuracyDC 0.1 Hz ≤ f < 45 Hz 45 Hz ≤ f ≤ 66 Hz 45 Hz < f ≤ 10 kHz	Update Interval				
to 6 or 6AWhen the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracyAccuracy Changes Caused by Data Update IntervalWhen the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracyActive POWER ACCURACY ItemSpecificationsRequirementsSpecificationsRequirementsDC 0.1 Hz ≤ f < 45 Hz 45 Hz ≤ f ≤ 66 Hz 66 Hz < t ≤ 10 kHzDC 66 Hz < f ≤ 10 kHz(0.1 % of reading + 0.2 % of range) 66 Hz < f ≤ 10 kHz t (0.1 % of reading + 0.2 % of range) 1 kHz < f ≤ 10 kHzHz < f ≤ 10 kHzt (0.2 % of reading + 0.2 % of range) 1 kHz < f ≤ 10 kHzItemt (0.1 % of reading + 0.2 % of range) t (0.067x(f-1))% of reading] 1 kHz < f ≤ 10 kHz	After Zero-level Compensation or	Add the following value to the DC current accuracies.5 mA/10 mA/20 mA/50 mA/100 mA/200 mA ranges5 μA/°C0.5 A/1 A/2 A/5 A/10 A/20 A ranges500 μA/°CExternal current sensor input (/EXT1)1 mV/°C			
	•	accuracy obtair	ned by doubling	the measurement range	e error for the accuracy when the crest factor is set to
$\begin{tabular}{ c c c c } \hline I & Specifications \\ \hline Requirements & same as the conditions for voltage and current. Power factor 1 \\ \hline Accuracy & DC & (0.1\% of reading + 0.2\% of range) \\ 0.1Hz \le f < 45 Hz & \pm (0.3\% of reading + 0.2\% of range) \\ 45 Hz \le f \le 66 Hz & \pm (0.1\% of reading + 0.05\% of range) \\ 66 Hz < f \le 11 Hz & \pm (0.2\% of reading + 0.2\% of range) \\ 1 Hz < f \le 10 Hz & \pm (0.1\% of reading + 0.2\% of range) \\ 1 Hz < f \le 10 Hz & \pm (0.1\% of reading + 0.3\% of range) \\ 1 Hz < f \le 100 Hz & \pm (0.1\% of reading + 0.3\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.1\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of reading + 0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of range) \\ \hline I Hz < f \le 100 Hz & \pm (0.5\% of range) \\ \hline I Hz & = (0.5\% of range) \\ \hline I$		When the data	update interval	is 100 ms, and Auto, ad	d 0.05% of reading to the 0.1 Hz to 1 kHz accuracy.
Requirementssame as the conditions for voltage and current. Power factorAccuracyDC $(0.1\% \text{ of reading } + 0.2\% \text{ of range})$ $0.1Hz \le f < 45 \text{ Hz}$ $\pm (0.3\% \text{ of reading } + 0.2\% \text{ of range})$ $45 \text{ Hz} \le f \le 66 \text{ Hz}$ $\pm (0.1\% \text{ of reading } + 0.2\% \text{ of range})$ $66 \text{ Hz} < f \le 11 \text{ Hz}$ $\pm (0.2\% \text{ of reading } + 0.2\% \text{ of range})$ $1 \text{ Hz} < f \le 10 \text{ Hz}$ $\pm (0.1\% \text{ of reading } + 0.2\% \text{ of range})$ $1 \text{ Hz} < f \le 10 \text{ Hz}$ $\pm (0.2\% \text{ of reading } + 0.2\% \text{ of range})$ $1 \text{ Hz} < f \le 10 \text{ Hz}$ $\pm (0.1\% \text{ of reading } + 0.3\% \text{ of range}) \pm [[0.067x(f-1)]\% \text{ of reading}]$ $10 \text{ Hz} < f \le 100 \text{ Hz}$ $\pm (0.5\% \text{ of reading } + 0.5\% \text{ of range}) \pm [[0.09x(f-10)]\% \text{ of reading}]$		Specifications			
$ \begin{array}{ll} 0.1 \text{Hz} \leq f < 45 \text{ Hz} & \pm (0.3 \ \% \ \text{of reading} + 0.2 \ \% \ \text{of range}) \\ 45 \text{ Hz} \leq f \leq 66 \text{ Hz} & \pm (0.1 \ \% \ \text{of reading} + 0.05 \ \% \ \text{of range}) \\ 66 \text{ Hz} < f \leq 1 \text{ HHz} & \pm (0.2 \ \% \ \text{of reading} + 0.2 \ \% \ \text{of range}) \\ 1 \ \text{ Hz} < f \leq 10 \ \text{ Hz} & \pm (0.1 \ \% \ \text{of reading} + 0.3 \ \% \ \text{of range}) \\ 10 \ \text{ Hz} < f \leq 100 \ \text{ Hz} & \pm (0.5 \ \% \ \text{of range}) \\ \pm (0.5 \ \% \ \text{of range}) \\ \pm [\{0.09x(f-10)\}\% \ \text{of reading}] \\ \end{array} $		same as the co		tage and current.	
Influence of Power Factor when power factor (λ) = 0.(5: apparent power)	Accuracy	$\begin{array}{c} 0.1 \mbox{Hz} \leq f < 45 \\ 45 \mbox{ Hz} \leq f \leq 66 \\ 66 \mbox{ Hz} < f \leq 1 \mbox{Hz} \\ 1 \mbox{ kHz} < f \leq 10 \end{array}$	Hz ± (' Hz ± (' Hz ± (' kHz ± ('	0.3 % of reading + 0.2 % 0.1 % of reading + 0.05 0.2 % of reading + 0.2 % 0.1 % of reading + 0.3 %	6 of range) % of range) 6 of range) 6 of range) ± [{0.067x(f-1)}% of reading]
$\pm 0.1\% \text{ of S for 45 Hz} \le f \le 66 \text{ Hz}$	Influence of Power Factor				

SPECIFICATIONS				
	± {(0.1 + 0.15 × f) % of S } for up to 100 kHz as reference data			
	•f is frequency of input signal in kHz when $0 < \lambda < 1$ (Φ : phase angle of the Voltage and current)			
	(power reading) × [(power reading error%) + (power range %) × (power range / indicated apparent power value) + {tan Φ × (influence when λ =0)%]			
When The Line Filter is Turned ON	45 ~ 66 Hz Add 0.3 % of reading			
Temperature Coefficient	< 45 Hz Add 1 % of reading same as the temperature coefficient for voltage and current			
Accuracy When The Crest Factor is Set to 6 or 6A	accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 3			
Accuracy of Apparent Power S	voltage accuracy + current accuracy			
Accuracy of Reactive Power Q	accuracy of apparent power + ($\sqrt{1.0004}$ - λ 2) - ($\sqrt{1}$ - λ 2) ×100 %			
Accuracy of Power Factor Λ	$\pm [(\lambda - \lambda/1.0002) + [\lambda \cos \varphi - \cos \{\varphi + \sin -1 \text{ (influence from the power factor when } \lambda = 0\%/100)\}] \pm 1 \text{ digit}$ when voltage and current are at the measurement range rated input			
Accuracy of Phase Difference Φ	$\pm [ø-\cos^{-1}(\lambda/1.0002) + \sin^{-1} (influence from the power factor when \lambda = 0 \% / 100)] \pm 1 digit when voltage and current are at the measurement range rated input$			
Accuracy When The Crest Factor is Set to 6 or 6A	accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 3			
Accuracy Changes Caused by Data Update Interval	When the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy.			
VOLTAGE, CURRENT AND ACTIVE PO				
Item Measurement Method	Specifications Digital sampling method			
Crest Factor	3 or 6 (6A)			
Wiring System	Single-phase, two-wire (1 P2 W)			
Range Select	Select manual or auto ranging			
Auto Range	Auto-range increase The range is upped when any of the following conditions is met.			
	Crest factor 3 Urms or Irms exceeds 130% of the currently set measurement range. Upk, lpk value of the input signal exceeds 300% of the currently set measurement range.			
	Crest factor 6 Urms or Irms exceeds 130% of the currently set measurement range. Upk, Ipk value of the input signal exceeds 600% of the currently set measurement range.			
	Crest factor 6A Urms or Irms exceeds 260% of the currently set measurement range. Upk, Ipk value of the input signal exceeds 600% of the currently set measurement range.			
	Auto-range decline The range is downed when all of the following conditions are met. Crest factor 3 Urms or Irms is less than or equal to 30% of the measurement range. Urms or Irms is less than or equal to 125% of the next lower measurement range. Upk, Ipk value of the input signal exceeds 300% of the currently set measurement range. Crest factor 6 or 6A Urms or Irms is less than or equal to 30% of the measurement range. Urms or Irms is less than or equal to 30% of the measurement range. Urms or Irms is less than or equal to 125% of the next lower measurement range. Urms or Irms is less than or equal to 125% of the next lower measurement range. Upk, Ipk value of the input signal exceeds 600% of the currently set measurement range.			
Display Mode Switching	Vrms (the true RMS value of voltage and current) VOLTAGE MEAN (the rectified mean value calibrated to the RMS value of the voltage and the true RMS value of the current) AC DC			
Measurement Synchronization Source	Select voltage, current, or off In the case of Auto Update Rate, select the voltage or current from the equipped element.			
Line Filter	Select OFF or ON (cutoff frequency at 500 Hz).			
Peak Measurement	Measures the peak (max, min) value of voltage, current or power from the instantaneous voltage, instantaneous current or instantaneous power that is sampled.			
Zero-level Compensation	Removes the internal offset of the measure unit (After measurement range is changed)			
Measurement Parametersl	VoltageVrms , Vmn, Vdc , VacCurrentIrms , Idc , IacActive PowerPApparent PowerVAReactive powerVARPower FactorPFCrest FactorCFI, CFVPhase AngleDEGFrequencyIHz and VHz			
	Voltage PeakV+pk and V-pkCurrent PeakI+pk and I-pkActive Power PeakP+pk and P-pkTotal Harmonic DistortionTHDI and THDVMaximum Current RatioMCR			

SPECIFICATIONS						
FREQUENCY MEASUREMENT Item	Specifications					
Measurement Item	Voltage and current					
Measurement Frequency Range	Data update interval 0.1 s 0.25 s 0.5 s 1 s 2 s 5 s 10 s 20 s Auto (*) (*) Limit of the measure Timeout 1 s 5 s 10 s 20 s	$\label{eq:measurement Freque} \\ \begin{tabular}{lllllllllllllllllllllllllllllllllll$	uency by the Timeou	t setting		
Measurement Range	Auto switching among si	x types: 100mHz, 1 H	z, 10 Hz, 100 Hz, 1 k	Hz, 10 kHz, and 100 kHz.		
Frequency Filter	Select OFF or ON (cut of	ff frequency of 500 Hz)			
Accuracy	Requirements	the crest factor is set (60% or more if the o	to 3. crest factor is set to 6	re of the measurement range If or 6A) voltage or current of 200 Hz or less.		
INTEGRATION	± (0.06% of reading)					
Item	Specifications					
Mode	Select manual integration	n mode, standard inte	gration mode, or rep	etitive integration mode.		
Timer	Automatically stop integr	Automatically stop integration by setting a timer. Selectable range: 0 hours 00 minutes 00 seconds to 9999 hours 59 minutes 59 seconds				
Accuracy		±(Power accuracy (or current accuracy) + 0.1% of reading) (fixed range)				
Range Setting	Auto range or fixed range	e is available for Integ	ration			
Timer Accuracy Remote Control	±0.02%					
HARMONIC MEASUREMENT	start, stop and reset open	Start, stop and reset operations are available using an external remote signal. (option)				
Item	Specifications					
Measured Item	Voltage, Current, Power					
Measured Method	Zero-cross simultaneous	calculation method				
Frequency Range	10 Hz to 1.2 kHz.					
FFT Data Length	1024 4096 (Auto switch when	both 50Hz/60Hz and	update rate > 0.1s cc	onditions are met)		
Sample Rate, Window Width, and Upper Limit of Analysis Orders*	Fundamental Frequency 10 Hz to 44 Hz 45 Hz to 55 Hz 54 Hz to 66Hz 67 Hz to 150 Hz 150 Hz to 300 Hz 300 Hz to 600 Hz 600 Hz to 1200 Hz		Window Width 1 10 12 2 4 8 16	upper limit of Analysis orders 50 50 32 16 8 4		
Accuracy	Frequency $10 \text{ Hz} \le f < 45 \text{ Hz}$ $45 \text{ Hz} \le f < 440 \text{ Hz}$ $440 \text{ Hz} \le f < 1.2 \text{kHz}$	Voltage 0.15% of reading + 0.35% of range 0.15% of reading + 0.35% of range 0.20% of reading + 0.35% of range	Current 0.15% of reading + 0.35% of range 0.15% of reading + 0.35% of range 0.20% of reading + 0.35% of range	Power 0.35% of reading + 0.50% of range 0.25% of reading + 0.50% of range 0.40% of reading + 0.50% of range		
* 50Hz/60Hz Compliant IEC61000-4-7						
D/A OUTPUT (OPTIONS)	Caracifica II					
D/A OUTPUT (OPTIONS)	Specifications	(maximum) against	ach rated value			
D/A OUTPUT (OPTIONS) Item Output Voltage	±5 V FS (approach ±7.5 V	/ maximum) against e	each rated value.			
D/A OUTPUT (OPTIONS) Item Output Voltage Number Of Output Channels	±5 V FS (approach ±7.5 V	, 0		WP, WP±, a, a±. Off		
D/A OUTPUT (OPTIONS) Item Output Voltage Number Of Output Channels Output Items Accuracy	±5 V FS (approach ±7.5 V	, P, VA, VAR, PF, DEG	, VHZ, IHZ, Vpk, Ipk,	WP, WP±, q, q±, Off		
D/A OUTPUT (OPTIONS) Item Output Voltage Number Of Output Channels Output Items Accuracy D/A Conversion Resolution	±5 V FS (approach ±7.5 V 4 Set for each channel: V, I ±(accuracy of each meas	, P, VA, VAR, PF, DEG	, VHZ, IHZ, Vpk, Ipk,	WP, WP±, q, q±, Off		
D/A OUTPUT (OPTIONS) Item Output Voltage Number Of Output Channels Output Items Accuracy D/A Conversion Resolution Minimum Load	±5 V FS (approach ±7.5 V 4 Set for each channel: V, I ±(accuracy of each meas 16 bits 100 kΩ Same as the data update	, P, VA, VAR, PF, DEG, urement item + 0.2% interval.	, VHZ, IHZ, Vpk, Ipk, of FS) (FS = 5 V)	WP, WP±, q, q±, Off nterval. More than 100ms.		
D/A OUTPUT (OPTIONS) Item Output Voltage Number Of Output Channels Output Items Accuracy D/A Conversion Resolution Minimum Load Update Interval Temperature Coefficient	\pm 5 V FS (approach \pm 7.5 V 4 Set for each channel: V, I \pm (accuracy of each meas 16 bits 100 kΩ Same as the data update In the case of Auto Upda \pm 0.05%/°C of FS	, P, VA, VAR, PF, DEG, urement item + 0.2% interval.	, VHZ, IHZ, Vpk, Ipk, of FS) (FS = 5 V)			
D/A OUTPUT (OPTIONS) Item Output Voltage Number Of Output Channels Output Items Accuracy D/A Conversion Resolution Minimum Load Update Interval Temperature Coefficient REMOTE CONTROL INPUT/OUTPUT	±5 V FS (approach ±7.5 V 4 Set for each channel: V, I ±(accuracy of each meas 16 bits 100 kΩ Same as the data update In the case of Auto Upda ±0.05%/°C of FS SIGNAL (OPTIONS)	, P, VA, VAR, PF, DEG, urement item + 0.2% interval.	, VHZ, IHZ, Vpk, Ipk, of FS) (FS = 5 V)			
D/A OUTPUT (OPTIONS) Item Output Voltage Number Of Output Channels Output Items Accuracy D/A Conversion Resolution Minimum Load Update Interval Temperature Coefficient REMOTE CONTROL INPUT/OUTPUT Item	$\begin{array}{c} \pm 5 \mbox{ V FS (approach \pm 7.5 \mbox{ V} \\ 4 \\ \mbox{Set for each channel: V, I} \\ \pm (accuracy of each meas \\ 16 \mbox{bits} \\ 100 \mbox{ k}\Omega \\ \mbox{Same as the data update} \\ \mbox{In the case of Auto Upda} \\ \pm 0.05\%/^{\circ} C \mbox{ of FS} \\ \hline \mbox{SiGNAL (OPTIONS)} \\ \mbox{Specifications} \\ \end{array}$, P, VA, VAR, PF, DEG urement item + 0.2% interval. te Rate, update interv	, VHZ, IHZ, Vpk, Ipk, of FS) (FS = 5 V) al is equal to signal in			
D/A OUTPUT (OPTIONS) Item Output Voltage Number Of Output Channels Output Items Accuracy D/A Conversion Resolution Minimum Load Update Interval Temperature Coefficient REMOTE CONTROL INPUT/OUTPUT Item Remote Control Input Signal	\pm 5 V FS (approach \pm 7.5 V 4 Set for each channel: V, I \pm (accuracy of each meas 16 bits 100 kΩ Same as the data update In the case of Auto Upda \pm 0.05%/°C of FS SIGNAL (OPTIONS) Specifications EXT HOLD, EXT TRIG, E	, P, VA, VAR, PF, DEG urement item + 0.2% interval. te Rate, update interv	, VHZ, IHZ, Vpk, Ipk, of FS) (FS = 5 V) al is equal to signal in			
D/A OUTPUT (OPTIONS) Item Output Voltage Number Of Output Channels Output Items Accuracy D/A Conversion Resolution Minimum Load Update Interval Temperature Coefficient REMOTE CONTROL INPUT/OUTPUT Item	$\begin{array}{c} \pm 5 \mbox{ V FS (approach \pm 7.5 \mbox{ V} \\ 4 \\ \mbox{Set for each channel: V, I} \\ \pm (accuracy of each meas \\ 16 \mbox{bits} \\ 100 \mbox{ k}\Omega \\ \mbox{Same as the data update} \\ \mbox{In the case of Auto Upda} \\ \pm 0.05\%/^{\circ} C \mbox{ of FS} \\ \hline \mbox{SiGNAL (OPTIONS)} \\ \mbox{Specifications} \\ \end{array}$, P, VA, VAR, PF, DEG urement item + 0.2% interval. te Rate, update interv	, VHZ, IHZ, Vpk, Ipk, of FS) (FS = 5 V) al is equal to signal in			

DIGITAL IO SIGNAL (OPT	
Item	Specifications
I/O Control Output Signal	OUT1, OUT2, OUT3, OUT4
I/O Level	TTL
I/O Sink Current	Max 100mA (per/ch)
process. In respect to di acquired from GPM-8310	or Q and "" will be displayed for λ and Φ when either current or voltage is less than 0.5% of the rated range (less than or
GENERAL	st lactor is set oj.
GENERAL	
Note	 The below are the basic conditions required to operate the GPM-8310 within specifications: 1-year Calibration: Yearly Operating Environment: 18-28 °C (64.4-82.4 °F) Humidity: <80%RH, Accuracy: ± (% of reading + % of range) The specifications apply when it warmed up for at least 30 minutes and operates in the slow rate. The power supply cable must be grounded to ensure accuracy. Input voltage and current must be standard sine wave. The power factor must be 1. The crest factor must be 3. The common-mode voltage must be zero.
Specification Condition	Temperature: 23°C±5°C Humidity: <80%RH(non-condensing)
Operation Condition	Temperature 0°C ~ 40°C, • 30 ~ 40°C, Relative Humidity < 70%RH (non-condensing) • >40°C, Relative Humidity < 50%RH (non-condensing) Indoor use only Altitude: < 2000 meters Pollution degree 2
Storage Condition	Temperature -40°C ~ 70°C Humidity: < 90%RH (non-condensing)
Power Source	AC 100-240V, 50–60Hz ; Consumption Max. 30VA
Dimensions	268(W) x 107(H) x 379(D) mm (w/t bumpers)
Weight	Approx. 2.9kg

ORDERING INFORMATION

GPM-8310	Digital Power Meter with RS-232C/USB device & host/LAN/GPIB
GPM-8310 with DA4	Digital Power Meter with RS-232C/USB device & host/LAN/GPIB and opt. DA4

ACCESSORIES

Safety Instruction Sheet x 1, Power cord x 1 Test lead GTL-209 x 1, Test lead GTL-212 x 1 CD x 1 (including complete user manual and USB driver) DA4 cable GTL-214 (available for GPM-8310 with DA4 only)

PM-8213CD	TBH Specifications subject to change without notice.
OPTION	
Opt.01	DA4 Interface (including cable, GTL-214)
Note : Optior	nal DA4 interface must be installed in factory.
OPTION A	CCESSORIES
GPM-001 GPM-001(EU GTL-209 GTL-210 GTL-212 GTL-213 GTL-214 GTL-232	Test Fixture (including GTL-210 x 2, GTL-213 x 1)) Test Fixture (including GTL-210 x 2, GTL-213 x 1) Test Lead, Banana to Bane-wire, Approx. 1000mm Test Lead, O-Type to Bane-wire, Approx. 1000mm Test Lead, O-Type to Bane-wire, Approx. 1000mm DA4 Cable, Approx. 1000mm RS-232C cable, 9-pin Female to 9-pin, null modem for computer, Approx. 2000mm
GTL-246	USB Cable, A-B type, Approx. 1200mm
GTL-248	GPIB Cable, Approx. 2000mm
GRA-422	Rack Mount Kit, 19" 2U size

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