

How to Test The Efficiency of Household Appliance

Abstract: The harmonic and power consumption measurements of household appliances are important test items in research, development and production. The paper focuses on analysis of the role of ITECH IT9121 power meter in two aspects. When the ITECH IT9121 power meter is used with the IT-E185 measuring fixture box, measurement can be done more efficiently.

Text

Household appliances have become an indispensable part of our daily life. The energy consumption and safety issues are considered at first during selection. To obtain more market shares on the fierce market, electrical appliance manufacturers increase the efforts and investment in research and development of products for energy conservation and safety. However, to continuously improve the product quality, the accurate measuring instruments should be used to measure product parameters. Therefore, a high-precision power meter is indispensable for research, development and testing of household appliances.

The ITECH IT9121 power meter can provide the rated input of 600Vrms and 20Arms, with the voltage and current accuracy of 0.1%. It can be used for accurately measuring the voltage, current, power, frequency, harmonic and other parameters and is applicable to related tests of the household appliance industry. The role of the power meter in analysis of the harmonic and power consumption measurement of household appliances is described below.

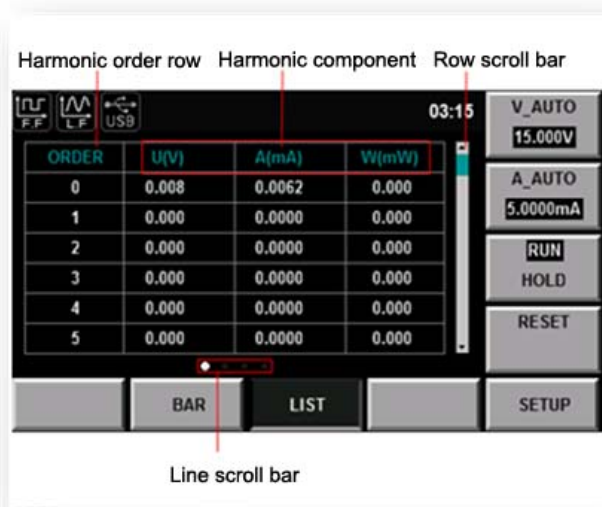


I. Harmonic Measurement

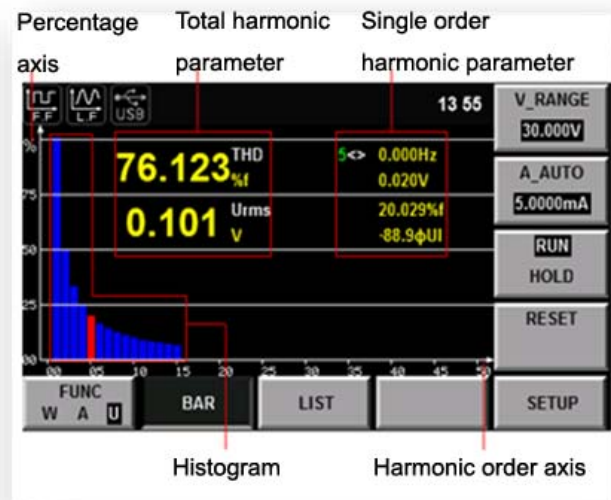
The electrical and electronic line is used instead of the traditional circuit of the household appliance to greatly improve the performance. However, for the controlled or uncontrolled rectifier circuit, large-capacity filter capacitor and other nonlinear elements of household appliances, the conduction angle of the diode is small during rectification, the input AC current will not be the sine wave, but will be the sharp pulse. The fundamental component of the waveform current is small, and a number of high-order harmonic waves are mixed into the power grid, causing the voltage and current waveform distortion, the decrease of the power factor, the overheating of the power supply line and transformer, the decrease of the rating of the electrical appliance and the equipment accident. From the safety perspective, the harmonic suppression of electrical products, i.e. power factor correction, is critical to household appliance manufacturers. The accurate harmonic measurement of household appliances is the premise for efficient harmonic suppression.



As for the harmonic measurement, the measurement results of the ordinary power meter are generally different from the real value, as the sampling rate and bandwidth are limited and high-frequency components cannot be measured accurately. This defect can be made up by the ITECH IT9121 power meter with the bandwidth of 100KHZ. The high-speed harmonic measurement with a wider dynamic range can be done. In the harmonic test, the voltage, the current, the active power, reactive power and phase of each harmonic wave and the total harmonic distortion (THD) factor can be tested. In addition, the multi-harmonic measurement can be done, and 50 harmonic waves of fundamental frequency can be measured at most. The IT9121 power meter can also display harmonic parameters in the histogram and list form (see Fig. 1), so that test results can be displayed more clearly, the work of testers can be facilitated, and the efficiency can be increased.



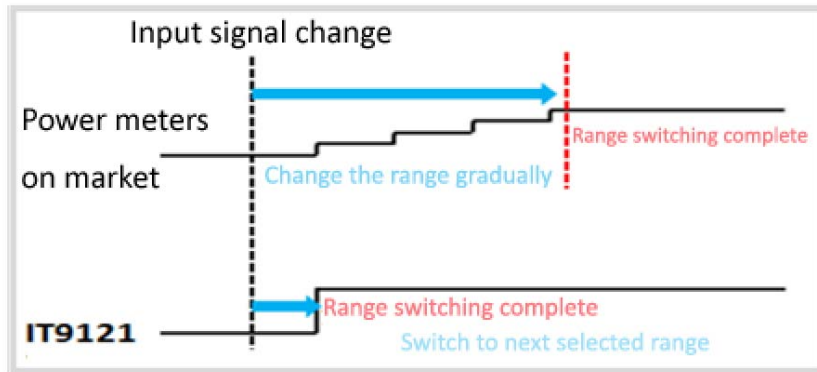
IT9121 Harmonic List Display



IT9121 Histogram Display of Harmonic List

II. Power Consumption Measurement

When the operating states of the electrical appliances change, the power consumption will change accordingly. When the operating power consumption is measured, the ordinary power meter can only be used for integral measurement within one range. If the measured value is beyond the current maximum range, the range should be switched manually before integration, which may cause measurement errors and nonconforming measurement accuracy. For the ITECH IT9121 has unique integral mode, the technology of automatic range switching is applied, thereby saving the range switching time, solving the problem of integral measurement errors caused by manual range switching and improving the accuracy and efficiency of the power consumption measurement of household appliances.



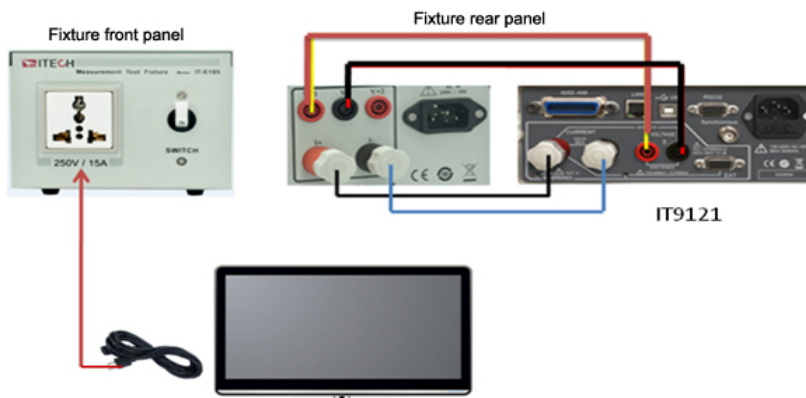
IT9121 automatic range switching

With increasingly severe global resources, the energy problem is more important, the standby power consumption problem of household appliances has attracted more and more attention, and the testing accuracy of the ordinary power meter is not applicable to such tests. For the ITECH IT9121 power meter, the micro current of 50μA at least can be measured with the minimum current accuracy of 5mA, and the lower standby power consumption can be measured in the future with the power measurement accuracy of 0.01W.

In addition, the ITECH IT9121 power meter can be used for accurately testing household appliances with the power higher than 1200W. The direct current input range is up to 20Arms. Under the rated voltage of 220Vrms, the power consumption of 4400W at most can be measured. Therefore, IT9121 is a perfect test solution for the power test of the high-power electrical appliance.

Wiring Aid of Measurement: ITECH IT-E185 Measuring Fixture Box

The wiring problem often occurs to the power meter used for testing household appliances. The plug for connection to the mains power should be cut off to lead the internal L, N and GND wires, and the voltage and current terminal of the power meter should be connected into the circuit according to the voltage and current parallel circuit principle, as shown in the below figure. ITECH solves this problem from the perspective of user demands. When the IT9121 power meter is used, you can select the measuring fixture box IT-E185 of ITECH, which can simplify wiring (see the figure).



Schematic Diagram of Connection of Measuring Fixture Box IT-E185



Conclusion

ITECH Electronics has been dedicated to study on test solutions of related industries with “power electronic” products as the core. The IT9121 power meter is one of star products of ITECH and has high quality and performance, which are the advantages of ITECH products. When it is used with the IT-E185 measuring fixture box, test demands can be realized quickly and easily in the field of household appliances, motors, UPS, etc.



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