

Technical specification

# GWL/M-YR1035P

Battery Tester and Resistance Meter



PRODUCT WEBPAGE



## Overview

YR1035+ battery internal resistance tester is a true four-wire internal resistance tester, which can measure the internal resistance and voltage at the same time. It can also be used to measure the resistance. The measurement results are displayed on the same screen. This product is suitable for battery configuration, battery performance testing, battery screening and other aspects.

The machine structure exquisite, easy to carry, is your ideal electrician, electronic testing machine.

## Safety instructions

The machine shall not input DC voltage greater than 100V. No AC voltage can be input under any conditions. Micro USB port is used for charging and 4.5V – 5.5V voltage is input.

## Part names and functions

Button function:

Název	
<b>[POWER] key</b> (Power /Set/Cancel)	<ol style="list-style-type: none"> <li>1. Short press to start up in shutdown state.</li> <li>2. From the menu options, click the [POWER] key to unset and return to the menu list.</li> <li>3. In normal mode and sorting mode, click [POWER] to enter the menu list.</li> <li>4. Under the menu list, click [POWER] to enter the selected menu options.</li> <li>5. In normal mode and sorting mode, long press [POWER] key to enter the shutdown interface, and use [HOLD] key and [RANGE R] key to determine whether shutdown is required.</li> </ol>
<b>[HOLD] key</b> (Save/confirm)	<ol style="list-style-type: none"> <li>1. Under the „Power Off?“ interface, click [HOLD] to confirm shutdown.</li> <li>2. In normal mode and sorting mode, short press [HOLD] on the left side of the screen will display HOLD, indicating that the screen is locked. Click to unlock again.</li> <li>3. Under the menu list, short press [HOLD] to exit directly from the menu list.</li> <li>4. From the menu options, click [HOLD] to save the Settings and return to the menu list. Click [HOLD] again to save the Settings and return to the measurement interface.</li> <li>5. In parameter setting, click [HOLD] to switch [RANGE R] and [RANGE U].</li> </ol>
<b>[RANGE R] key</b> (Move up/add)	<ol style="list-style-type: none"> <li>1. Under the „Power Off?“ interface, click [RANGE R] key to cancel the shutdown.</li> <li>2. In normal mode and sorting mode, click [RANGE R] key to switch the RANGE of internal resistance.</li> <li>3. Under the menu list, click the [RANGE R] key to move up menu options. Long press ultra-3s.</li> <li>4. From the menu options, click the [RANGE R] key to move up to select the parameter, or change the parameter value. Long press more than 3S will continuous motion.</li> </ol>
<b>[RANGE U] key</b> (Move down/reduce )	<ol style="list-style-type: none"> <li>1. In normal mode and sorting mode, click [RANGE U] key to switch the voltage range.</li> <li>2. Under the menu list, click the [RANGE U] key to move down menu options. Long press ultra-3s.</li> <li>3. From the menu options, click the [RANGE U] key to move down to select the parameter, or change the parameter value. Long press more than 3S will continuous motion.</li> </ol>

## Parameter setting

Click the [POWER] Key in the measurement interface to enter the menu list, switch the selected menu through the [RANGE R] Key and the [RANGE U] Key, and press the [POWER] key to enter the setting after selecting, press the [HOLD] Key to exit the setting and return to the measurement interface.

Parameter											
1	<p>General mode: General Test common mode, the display interface is the measurement interface.</p> <p>① The upper part on the left side is the internal resistance range (AUTO is the automatic range, 20mR is the 20 mΩ range, 200mR is the 200 mΩ range, 2R is the 2 OHM range, 20R is the 20 OHM range, 200R is 200 OHM range),</p> <p>② the following part is the voltage range (AUTO is the automatic range, 1V is the 1V range, 10V is the 10V range, 100V is the 100V range).</p>										
2	<p>Sorting mode: used for battery screening. Before using the sorting mode, you need to set it in the menu [5. Setting of grading]. After the setting is completed, enter the sorting mode to measure and sort. The battery to be tested shows stable read-out value, and the battery that meets the sorting setting parameters will show whether it passes through YES or NO and which parameter is unqualified.</p>										
3	<p>Backlight Settings: Backlight parameter Settings. Brightness (10% – 99%); Trigger (close, operate, always on); Delay time (5S – 60S)</p>										
4	<p>Energy saving setting: Automatic shutdown function setting. Automatic shutdown (on, off); Time delay (5min – 60min); Low power consumption (on, off). When entering the low-power mode, the position displaying the measured value displays the „-“ symbol. You can exit the low-power mode by pressing any button on the panel.</p>										
5	<p>Classification setting:</p> <p>① Press the [POWER] Key in the measurement interface to enter the setting</p> <p>② Select [5. Grading settings] by pressing [RANGE R] or [RANGE U], and then press [POWER] to enter the grading settings interface</p> <p>③ Press the [RANGE U] button to select the parameter to be set</p> <p>④ After selecting the parameters to be set, Press [RANGE R] button to start setting (note: [RANGE R] Key to set the value, and [RANGE U] Key to select the setting position)</p> <p>⑤ After setting, Press [HOLD] Key twice to save and exit, and then return to the measurement interface</p> <p>⑥ Then press the [POWER] key to enter the Menu Settings, select [2. Sorting mode], then press the [POWER] key to enter the sorting mode interface, and then directly test it. (Note: LO is the lowest value and UP is the highest value. Those in this range are qualified.)</p>										
6	<p>Serial port settings: expansion options, consult the manufacturer for details.</p>										
7	<p>Calibration: the internal resistance is calibrated, the voltage is set to zero, and each gear can be calibrated separately.</p> <p>① Internal resistance calibration</p> <p>Calibration resistance of the corresponding gear of the test line connection during the calibration of the internal resistance gear:</p> <table border="0"> <tr> <td>20mΩGear</td> <td>10mΩ--20mΩ</td> </tr> <tr> <td>200mΩGear</td> <td>100mΩ--200mΩ</td> </tr> <tr> <td>2ΩGear</td> <td>1Ω--2Ω</td> </tr> <tr> <td>20ΩGear</td> <td>10Ω--20Ω</td> </tr> <tr> <td>200ΩGear</td> <td>100Ω--200Ω</td> </tr> </table> <p>Select the gear and press the [RANGE R] or [RANGE U] key to adjust the measurement display value to the value closest to the external resistance. Save Settings to exit.</p> <p>Note: unconnected resistance cannot be calibrated. The displayed value is random.</p> <p>② The voltage is set to zero</p> <p>When the display value of the short-connection voltage of the watch pen cannot return to zero, it needs to be adjusted to zero. Short the stylus, select the tap position, then select the voltage display value, and press [RANGE R] key to zero. Save exit.</p>	20mΩGear	10mΩ--20mΩ	200mΩGear	100mΩ--200mΩ	2ΩGear	1Ω--2Ω	20ΩGear	10Ω--20Ω	200ΩGear	100Ω--200Ω
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Parameter	
8	Restore calibration: restore the factory calibration settings of internal resistance gear without opening the lid to adjust potentiometer.
9	Setting: Press the [RANGE R] key to switch the language version. EN is the English version and CNS is the Chinese version. After selection, press the [HOLD] Key twice to save and exit the built-in battery charging current setting; Buffer function, when measuring voltage above 30V, in order to prevent or reduce the spark in contact, the machine will automatically turn on the buffer BU (For this function, you need to set the buffer status to enabled in [9. Settings]). The default value is "disabled". At this time, the test will show a delay display, which needs to be turned off manually (press the [POWER] Key in the measurement interface to enter the setting, and press the [RANGE U] Key to select [9. Settings], press the [POWER] Key again to enter the settings, press the [RANGE U] Key to select the buffered „open“, and press [RANGE R] again, „Open“ changes to „close“, press the middle [HOLD] Key twice again, save and return to the measurement interface); The contrast ratio can be set to 0 ~ 9, the larger the value, the deeper the display.

## Precision specifications

Format of precision specification:  $\pm$  ([degree percentage]+[minimum significant digit])

Range*	Maximum resolution	Precision	Display mode
20m $\Omega$	0.01m $\Omega$	0.7%+7	22.00m $\Omega$
200m $\Omega$	0.1m $\Omega$	0.5%+5	220.0 m $\Omega$
2 $\Omega$	1m $\Omega$	0.5%+5	2.200 $\Omega$
20 $\Omega$	10m $\Omega$	0.5%+5	22.00 $\Omega$
200 $\Omega$	0.1 $\Omega$	0.6%+5	220.0 $\Omega$

\* The range of gear range is 5% – 95%, and the error may be greater than the above precision if the range is not within this range (less than 5% range, or greater than 95% range).

Voltage measurement:  $\pm$  (% reading +% range)

Range	Maximum resolution	Precision	Display mode
1V	0.00001V	0.15+0.015	.99999V
10V	0.0001V	0.15+0.010	9.9999V
100V	0.001V	0.15+0.015	99.999V

Positive and negative symmetry error  $\pm$  (0.012% +5 words).

Temperature Drift 100ppm/ $^{\circ}$ C within normal service temperature (10 $^{\circ}$ C – 40 $^{\circ}$ C).

## Maintenance

### HOST MAINTENANCE:

1. Avoid high temperature and humidity environment. Prevent interface and circuit from moisture oxidation.
2. Avoid direct sunlight to the LCD screen for a long time to avoid aging.
3. If not used for a long time, please keep the battery at 50% power (or between 3.7V – 3.9V battery voltage) to extend the life.

### EXTERNAL TEST LINE:

1. Check the on-off condition of each signal line of the test line frequently to avoid the test error caused by the broken line.
2. Avoid high temperature and humid environment. Prevent the interface and probe from moisture oxidation.

## General technical indicators

Technical indicators	
Maximum voltage between any terminals:	100V
Display:	Internal resistance number: 2,000 count voltage number: 99,999 count updated 4 times per second
Temperature:	Working: 10°C – 40°C, storage: -20°C – 60°C internal resistance temperature coefficient: 0.1 * (specified accuracy)/°C(<18°C or >28°C)
Battery type:	3.7V 2000mAh 18650
Power consumption:	<60mA (200mΩ and above range, when the power supply is 3.7V, the backlight is off) < 120 ma (20 m Ω range, the power supply of 3.7 V, the backlight off) <10mA (enter low power mode) 0mA (Power off)

## Matters needing attention in the test

1. The machine has been calibrated before delivery, and there is no need to calibrate or reset the machine.
2. After starting up, check the internal resistance and voltage range. For example, connect the test line to test directly on the automatic range AUTO.
3. The twined test wire should not be disassembled, but should be wound in red and black when received, and should be wound in vain. Double stranded can enhance anti-interference and improve measurement accuracy.
4. Each test line of the indicator pen shall be in good contact with the battery under test, and there shall be no connection between each test line.
5. Use of Kelvin plus test wire: the clamp must be open when measuring the battery. There should be no direct contact between the two metal pieces of each clamp and the battery electrode.
6. Use of 18650 battery stand: align the back edge of the movable stand with the length scale according to the length of the battery, and compress the negative contact with the battery before putting it in. So that the positive and negative poles can not expose the middle of the yellow needle, otherwise it can not be stable and accurate measurement.
7. Use of probe test line: the positive and negative poles of the vertical battery press down the probe to shrink part of the probe and make both probes touch the battery independently. Make sure that the positive and negative surfaces of the battery are clean, otherwise poor contact can not be stable and accurate measurement.

## Summary and classification of common problems

- 1. Voltage value jitter when not measured after starting up**  
A: Under the condition of no test after starting up, it is normal that the voltage has a numerical jitter. The value is a random value, meaningless and has no influence on the measurement results.
- 2. Could you tell me how to adjust YR1035+ to zero? There is also a 0.0X mΩ resistance between the two Kelvin clips**  
A: There is a wiring sequence for the direct short circuit of the Test line. The clamping sequence is red line, black line, white line, white line. Only when the probe test line contacts the same metal surface can it be the minimum value. The minimum value is generally not zero, but does not affect the measurement accuracy. No processing is required. (The machines are all calibrated before shipment, and no zero adjustment is required normally.)
- 3. Can YR1035+ measure large single lithium iron phosphate battery?**  
A: Lithium iron phosphate is generally recommended to measure batteries within 100 ampere hours. The internal resistance of the battery above 100 ampere hours is generally lower than the recommended measurement of 0.3 mΩ or more. This battery can be measured with internal resistance below 100V and above 0.3~0.5 mΩ.

**4. The internal resistance below 0.3 mΩ cannot be measured, can it?**

A: It is not impossible to measure, and the reading error is large. For example, 1 mΩ error plus or minus 0.03 mΩ, if it is 0.2 mΩ error plus or minus 0.05 mΩ, so more than 0.3 mΩ is recommended. The measured value of 0.05 mΩ is sometimes very accurate, but the uncertainty will make the reference of little significance.

**5. To measure the internal resistance of the 18650 battery, should it be fully charged or not?**

A: If you want to get a general idea, you can test directly. To be precise, if it's a new battery, test it on a full charge. Old batteries are tested after they have been drained. But under normal conditions, the change in internal resistance is very small. The better the battery's internal resistance, the less it is affected by the amount of charge.

**6. Is the instrument measuring time positive and negative? Will the connection be damaged?**

A: connect opposite have no influence, divide positive and negative pole. As long as it doesn't exceed 28V.

**7. The figures change quickly and cannot be measured.**

A: The test line is not in good contact with the battery, there is strong interference around or the battery is charging and discharging. Normal use will not appear jump.

**8. Is it necessary to take off the battery line to test one of the multiple connections of electric cars? Or can you just measure it?**

A: As long as it is not in startup, or charging, you can directly test one section.

**9. Is it OK to measure the battery pack?**

A: As long as the total measured voltage is less than 28V. However, the resistance of the connecting line between the batteries is often greater than the internal resistance of the battery, so the series measurement cannot accurately measure the internal resistance. It is best to measure the battery poles directly.

**10. Can I measure the internal resistance of capacitance?**

A: The internal resistance value of approximate capacitance.

**11. What are the advantages of YR1035+?**

A: The most important thing is that the YR1035+ is a 4-wire measurement, which avoids the resistance of the test wire and contact resistance with the battery. This enables YR1035+ to be stable in the range of 0.48mΩ~0.52 mΩ when measuring resistance as small as 0.5 mΩ (this measurement accuracy is actually higher than the nominal accuracy). In addition, the measured speed can be stable at 2~3 seconds in the automatic range and 1~2 seconds in the fixed range. Others have other auxiliary functions. Up to 100V can be measured, which is convenient to measure some battery packs.

## Correlation between internal resistance and other parameters

### LITHIUM ION BATTERIES:

1. The same 18650 battery will gradually lose capacity during use, resulting in smaller capacity and higher internal resistance.
2. After the same 18650 battery is fully charged, the internal resistance reaches the most stable and near the minimum at 4.2V. During the use, the voltage drops and the internal resistance rises slightly.
3. For a battery with the same volume of 18650, the larger the capacity, the greater the internal resistance may be. Because of the volume limitation, increasing the capacity parameter requires sacrificing the internal resistance parameter.
4. The same capacity of the battery, the general internal resistance is smaller the better, the more able to withstand a larger discharge current.
5. The same type of battery does not limit other factors, the larger the capacity is the smaller the internal resistance, because the plate area thickness electrolytic quality will be greater, so the internal resistance is smaller.
6. With the same voltage, capacity and volume, the greater the Number of C, the smaller the internal resistance. Less internal resistance to greater discharge capacity.
7. The internal resistance of the same battery is affected by temperature. The higher the temperature is, the smaller the internal resistance is. The older the battery is, the more sensitive it is.

### THE CONDITIONS OF LEAD-ACID BATTERIES ARE SIMILAR TO THOSE OF LITHIUM BATTERIES ABOVE:

1. The larger the capacity size under the same voltage, the smaller the internal resistance will be.
2. The same volume, capacity of the battery, the lower the internal resistance of the high C number lower the power discharge capacity, the higher the high C number discharge capacity.
3. The internal resistance of the same capacity battery will be different under different discharge rates. For example, a 12Ah battery at a 2-hour rate has less resistance than a 12Ah battery at a 5-hour rate.

### CASE OF CHEAP DRY BATTERIES:

1. The internal resistance is generally relatively high, for example, the better AA no. 5 battery has internal resistance of more than 100 m $\Omega$ , and the better 9V square battery has internal resistance of more than 8  $\Omega$ . The lower the quality, the higher the internal resistance.
2. The internal resistance is obviously positively related to the remaining power. For example, the internal resistance of AA No. 5 battery at full charge is 100 m $\Omega$ , and the internal resistance may be as high as 500 m $\Omega$  after the power is used up.
3. Alkaline batteries are similar to dry batteries in that the internal resistance is much lower. Button batteries are similar to dry batteries.



## Internal resistance parameters of some batteries

- ① The following is the list of common battery resistance of 10-hour rate, for reference only.  
The 2-hour rate battery is about 62%~70% of the table value, and the 20-hour rate battery is about 1.4~1.5 times of the table value

### Standard reference for internal resistance of ordinary battery: (unit: mΩ)

For specific parameters, refer to the table section of instruction book

- ② No.5 dry battery 0.1~0.5 Ω. No. 7 dry battery 0.3 – 0.8 Ω.
- ③ the quality of 9V battery is good 8~15 Ω, the quality of the second 20~40 Ω.
- ④ LR44 button battery 1.5~2.2 Ω.
- ⑤ The good internal resistance of 18650 lithium battery is within 10 mΩ or even milliohms.  
The relatively good one is within 30 mΩ, the general one is within 60 mΩ, and the worse one is over 100 mΩ.
- ⑥ No. 5 nickel hydrogen battery 0.01~0.05 mΩ. Power nickel cadmium battery 1~5 mΩ.
- ⑦ Electric car 12V12Ah day battery internal resistance 8~10 mΩ.



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