ONMEAS®

Rev.A5

AT2811

LCR Meter



User's Guide

Scan QR code for operation video

Safety Precautions

Warning:If you find any of the following abnormal conditions, stop operation immediately and disconnect the power cord. Contact the Onmeas Precision Instruments sales department for repair immediately; otherwise a fire or potential electric shock hazard to the operator may result.

- The instrument operates abnormally.
- The instrument produces abnormal noise, odor, smoke, or flashes during operation.
- The instrument generates high temperature or electric shock during operation.
- The power cord, power switch, or power socket is damaged.
- Foreign matter or liquid entering the instrument

Safety Information

Warning Danger: To avoid possible electric shock and ensure personal safety, follow the guidelines below during operation.

Disclaimer	Please read the following safety information carefully before using the instrument. Onmeas Precision Instruments shall not be liable for any personal injury or property loss caused by the user’s failure to comply with the following terms.
Instrument Grounding	To prevent electric shock hazard, connect the power ground wire properly.
Do Not Using the Instrument in an Explosive Gas Environment	Do not use the instrument in an environment containing flammable or explosive gases, vapors, or excessive dust. Using any electronic equipment in such an environment poses a risk to personal safety.
Do Not Opening the Instrument Enclosure	Non-professional maintenance personnel must not open the instrument enclosure in an attempt to repair the instrument. Charge that has not been fully discharged may remain inside the instrument for some time after it is switched off, which may cause an electric shock hazard to persons.
Do Not Using a Damaged Instrument	If the instrument has been damaged, the hazard is unpredictable. Disconnect the power cord; do not continue to use it and do not attempt to repair it yourself.
Do Not Using an Instrument Operating Abnormally	If the instrument is not operating normally, the hazards are unpredictable. Disconnect the power cord, do not use the instrument again, and do not attempt to repair it yourself.
Do not use the instrument beyond the methods specified in this manual	Beyond the specified scope, the protective measures provided by the instrument will become ineffective.

Limited Warranty and Limitation of Liability

Onmeas Ltd. (hereinafter referred to as Onmeas) warrants that every instrument you purchase is fully compliant in terms of quality and metrology. This warranty does not cover the fuse, nor damage caused by negligence, misuse, contamination, accident, or abnormal conditions of use. This warranty applies only to the original purchaser and is not transferable.

From the date of shipment, Onmeas provides one year of free warranty; this warranty also covers VFD or LCD. During the warranty period, damage to the instrument caused by improper operation of the user shall be repaired at the user's expense. After one year and for the lifetime of the instrument, Onmeas provides repair services on a charged basis. For the replacement of VFD or LCD, the fee is charged at the current cost price.

If product damage is found, please contact Onmeas to obtain the information required for an approved return or replacement. Afterwards, please send this product to the dealer for return or replacement. Be sure to state the reason for the product damage, and prepay the postage and the insurance to the destination. For the repair or replacement of products within the warranty period, Onmeas will cover the return shipping cost. For the repair of non-warranty products, Onmeas will make an estimate of the repair cost and will only carry out the repair with your consent; all costs arising from the repair shall be borne by the user, including the return shipping cost.

This warranty is the only warranty provided by Onmeas and is your sole and exclusive remedy. Apart from this, there are no other express or implied warranties (including the implied warranty of fitness for a particular purpose), and all other warranties are expressly disclaimed. Neither Onmeas nor its other dealers have made any oral or written representation to establish a warranty or to expand the scope of this warranty in any way. In no event shall Onmeas be liable for any special, indirect, incidental or consequential damages or losses (including loss of data) arising from any cause beyond the specifications. If any of the terms hereof conflicts with local regulations, local regulations shall prevail; therefore such a term may not apply to you. However, the ruling of such a term does not affect the validity and enforceability of the other terms.

People's Republic of China
Jiangsu Province
Onmeas Ltd.
May 2014
Rev.C0

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1. Installation and Setup Guide

Thank you for purchasing our product! Please read this chapter carefully before use.
In this chapter, you will learn about the following:

- Main Functions Packing List
- Power Requirements
- Replacing the Fuse
- Operating Environment
- Cleaning

1.1 Packing List

Before formally using the instrument, please first:
1. Inspect the appearance of the product for defects such as damage or scratches;
2. Check the instrument accessories against the table below for anything missing;

Table 1- 1 Instrument Accessories

Name	Quantity	Remarks
Instruction Manual	1 copy	
Power cord	1 piece	220V/50Hz
Fuses	2 pieces	0.5A slow-blow
ATL501 Kelvin test cable	1 set	Four pieces
Warranty card (with quality certificate)	1 copy	

If there is any damage or missing accessories, contact the Onmeas Precision Instruments sales department or your dealer immediately.

1.2 Power Requirements

The AT2811 can only be used under the following power conditions:
Voltage: 198-252VAC
Frequency: 47.5-52.5Hz
Power: max. 10VA



To prevent electric shock hazard, connect the power ground wire properly
If the user replaces the power cord, make sure that the ground of the power cord is reliably connected.

1.3 Replacing the Fuse

There is 1 spare fuse among the supplied accessories.
The fuse is located on the rear panel of the instrument; refer to *Chapter 3 Operation Guide Rear Panel* section.



Please use 250V, 0.5A slow-blowFuses

1.4 Operating Environment

The AT2811 must be used under the following environmental conditions:

Temperature: 0°C~55°C,
Humidity: below 95%RH at 40°C
Spec temperature: 23°C ±5°C
Spec humidity: <70%RH

1.5 Cleaning

To prevent electric shock, unplug the power cord before cleaning.
Use a clean cloth dampened with a little clean water to clean the enclosure and panel.
Do not clean the inside of the instrument.



Do not use solvents (alcohol or gasoline, etc.) to clean the instrument.

2. Overview

In this chapter you will learn the following:

- Introduction
- Model Description
- Main Specifications
- Main Features

2.1 Introduction

The AT2811 is a general-purpose LCR meter, a micro bench-top instrument controlled by a high-performance microprocessor. It offers four test frequencies from 100Hz to 10kHz, selectable 0.1V, 0.3V and 1V test levels, and selectable 30Ω/100Ω source resistance. The instrument can measure inductance L, capacitance C, resistance R, impedance Z, quality factor Q and dissipation factor D.

The newly designed AT2811 offers the highest cost-effectiveness with a foolproof operation interface, easily meeting the requirements of component manufacturers, schools, research institutes and metrology/quality inspection departments for accurate testing and mass production.

The instrument has a built-in sorting function with 5-bin sorting display and sorting beeper settings.

2.2 Main Specifications

The AT2811 technical specifications cover the basic technical indicators of the instrument and the ranges allowed for testing. These specifications are what the instrument can achieve when it leaves the factory.

For complete technical specifications, refer to Chapter 4.

- Measurement parameters: L-Q, C-D, R-Q, Z-Q.
- Test frequency: 100Hz, 120Hz, 1kHz, 10kHz
- Frequency accuracy: ±0.02%
- Test level: 0.1Vrms, 0.3V and 1.0V.
- Level accuracy: ±10%
- Test speed: slow 3 readings/second, fast 10 readings/second.
- Test impedance: 30Ω and 100Ω.
- Test range: 6-range automatic or manual testing.
- Equivalent circuit: series and parallel equivalence.
- Test terminal type: 5-terminal measurement.
- Basic accuracy: 0.25%

2.3 Main Features

- Display:
- Primary parameter on 0.8-inch LED display, secondary parameter on 0.5-inch LED display

  Primary and secondary parameters can be displayed simultaneously, both with 5 digits.

  Display A: L, C, R, Z

  Display B: Q, D

- Correction function:
- Short-circuit and open-circuit zeroing at all frequencies.

- Comparator (sorting) function:
- 5-bin sorting results: 3 percentage pass bins, 1 auxiliary bin and 1 fail bin.
- Comparator function display: displayed directly with LED indicators.
- Beep: the beeper can be set for all comparator results.

3. Operation Guide

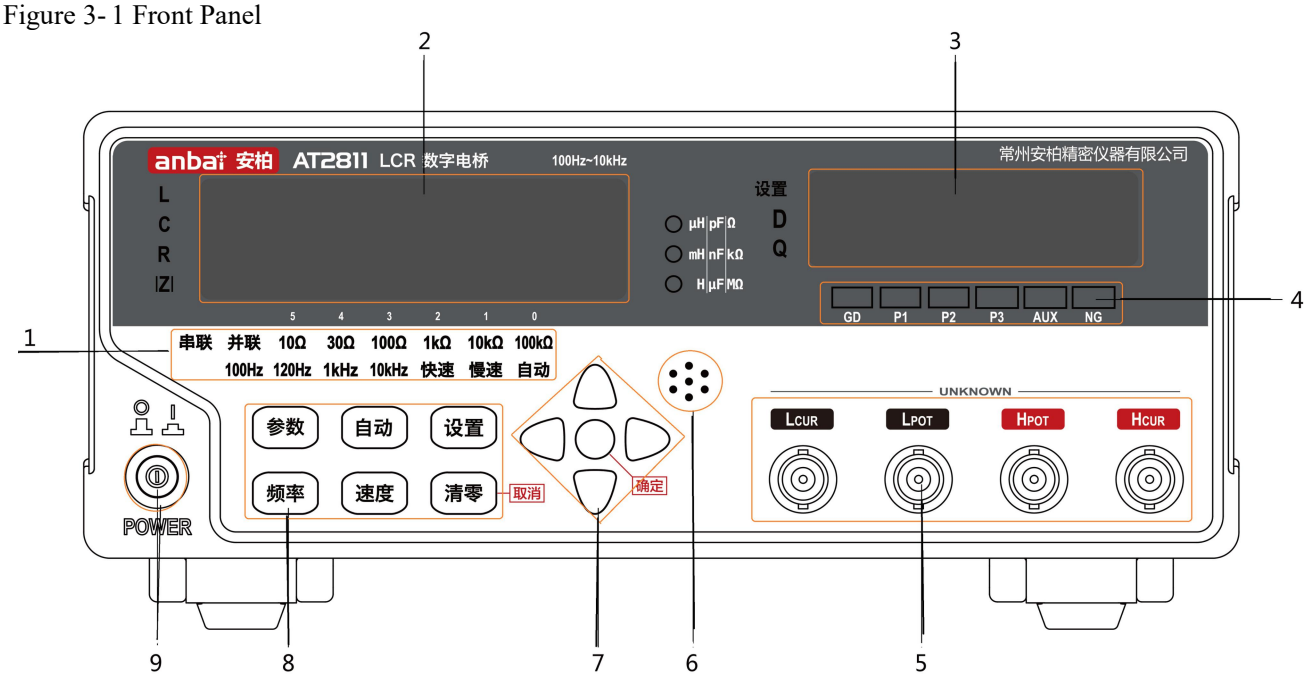
In this chapter you will learn the following:

- Getting to know the front panel — introduction to the keys, LEDs and test terminals.
- Rear panel — introduces the power supply and interface information.
- Power-on startup — includes the power-on self-test process, instrument defaults, and instrument warm-up time.
- Display information — prompt messages encountered during instrument startup and use.
- Starting a test — how to connect to the test terminals, signal source, test functions, range settings, display modes and the sorting system.

3.1 Getting to Know the Front Panel

3.1.1 Front Panel Description

Figure 3- 1 Front Panel



1	Status indicators: range number, speed, range, equivalent-circuit and frequency indicators
2	Primary parameter display window: 0.8-inch digital LED display
3	Secondary parameter display window: 0.5-inch digital LED display
4	Sorting indicators
5	Test Terminals
6	Beeper indicator
7	Direction keys
8	Main function keys
9	Power switch

3.2 Keypad

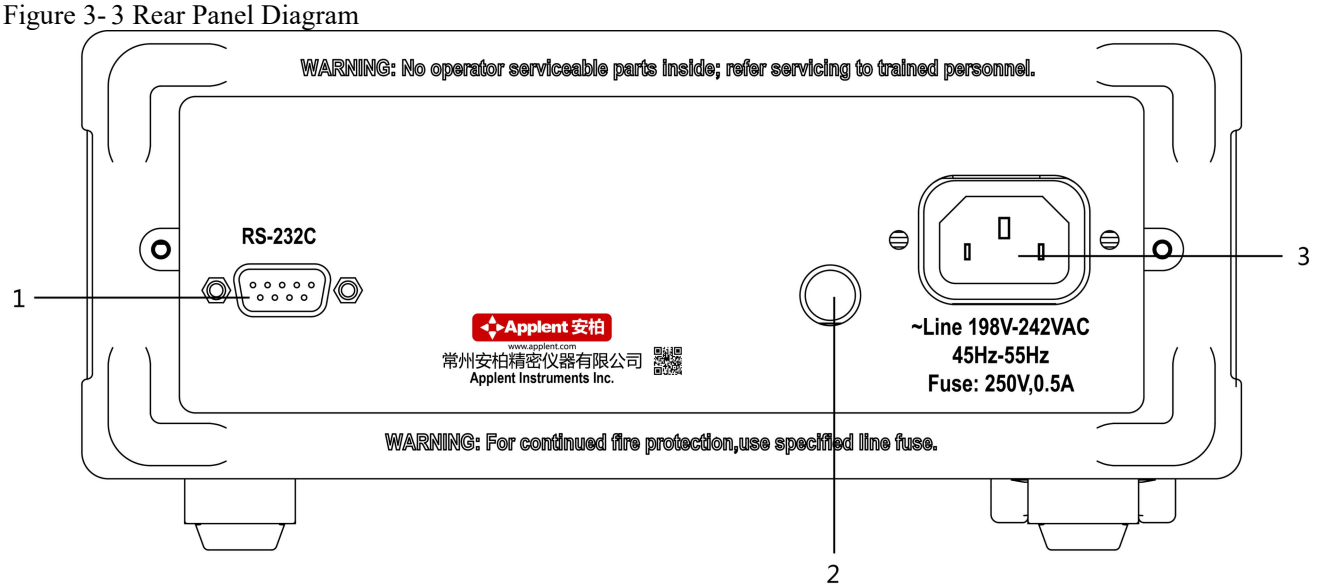
Figure 3- 2
Keypad



Param	Parameter selection. Select L-Q, C-D, R-Q, |Z|-Q
Freq	Test frequency selection. Select 100Hz, 120Hz, 1kHz or 10kHz
Auto	Auto/manual ranging selection.
Speed	Test speed selection. Select slow or fast
Setup	Enter sorting and other function settings.
Zeroing	Enter the zeroing screen.
◀▶	Select the range.
Cancel	Returns from the setup screen to the testing state
Enter	Confirms an option or an entry.

3.3 Rear Panel

Figure 3- 3 Rear Panel Diagram



1	RS232C. Reserved port; not used in this version.
2	Fuse holder. Use a 250V, 0.5A fuse.
3	Power socket. Use mains 198V~242VAC, 45Hz~55Hz

3.4 Power-On Startup

3.4.1 Powering On

The key marked "+" at the lower left of the panel is the power switch.



Power on.

Power off.

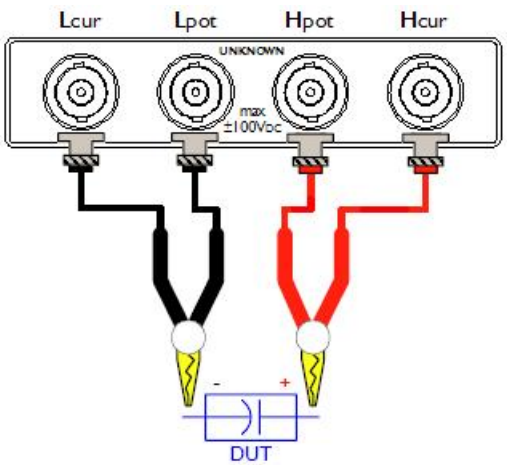
3.4.2 Warm-up Time

To achieve the specified accuracy, the instrument needs to warm up for at least 15 minutes.

3.5 Connecting the Test Terminals

If you use the supplied "Kelvin" test clips for testing, connect them to the instrument test terminals as follows.

Figure 3-4 *Test Terminals*



Warning: Do not apply DC voltage or current to the test terminals, otherwise the instrument will be damaged.
Warning: For charged devices, make sure the charge is fully discharged before measurement.

3.6 Selecting the Primary and Secondary Parameters

参数

Operation: In the testing state, press Param key to cyclically select the parameters on the first and second display rows.

Four parameter combinations are available:

L-Q, C-D, R-Q, Z-Q

Units used for the corresponding parameters:

L	μH (microhenry)	mH (millihenry)	H (henry)
C	pF (picofarad)	nF (nanofarad)	μF (microfarad)
R/Z	Ω (ohm)	kΩ (kiloohm)	MΩ (megaohm)

Note: Z is the absolute value; L/C/R can be positive or negative.In C-D measurement, if the primary parameter is displayed as a negative value, the device under test is actually inductive; in L-Q measurement, a negative display means the device under test is actually capacitive. In theory, R is always positive; in some cases R may appear negative, which is caused by excessive zeroing — perform the zeroing calibration correctly.

The instrument displays up to 5 digits, but not always 5 — sometimes 4. The conversion relationship is shown in the table below:

Previous display digits	First two digits of the new measurement	New display digits
4	<33	5
5	>30	4

3.7 Setting the Test Frequency



Frequency accuracy: ±0.02%
Operation: press Freq to cycle the frequency indicators through:
100Hz, 120Hz, 1kHz, 10kHz

3.8 Auto and Manual Ranging



Operation: press Auto switches between auto ranging and range hold.
Indicator: Auto shows the current state — lit means auto ranging, off means manual ranging.

3.9 Selecting the Test Speed



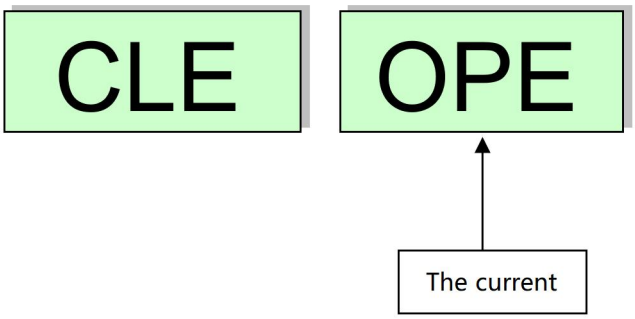
Operation: press Speed switches between the 2 test speeds:
Slow 3 readings/second
Fast 10 readings/second

3.10 Zeroing

Zeroing is a necessary operation to guarantee the accuracy of the instrument; it effectively cancels the influence of the stray capacitance and inductance of the test fixture and test leads, and the lead resistance and inductance, on the test. When the test leads are replaced or the ambient temperature/humidity changes significantly, zeroing calibration must be performed.



Press Zeroing to enter the zeroing screen; the instrument offers open (OPEN) or short (SHORT) zeroing according to the current test terminal state:



Exit: press Cancel key returns to the testing state.

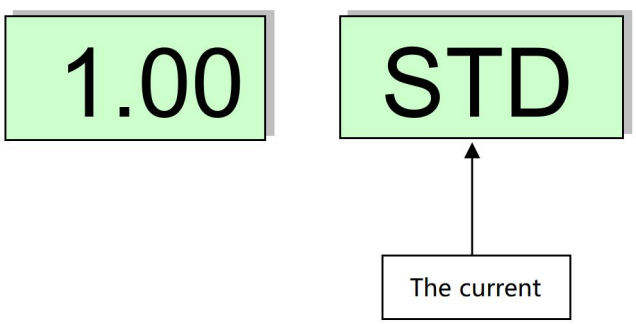
Execute:
Open or short the test terminals; the instrument detects the test terminal state automatically and prompts the corresponding open/short option.
Press Enter to start zeroing. Zeroing finishes in about 20 seconds; then open or short the test terminals (if the previous state was short zeroing, open the test terminals; if it was open zeroing, short the test terminals), and press Enter again and wait about 20 seconds for zeroing to complete and return to the test screen.)

Interrupt: press Cancel terminates zeroing.
After zeroing is completed, the zeroing values are saved in the internal memory.

Details: During zeroing, FAIL may occasionally appear — the low-resistance shorting bar may not have been used or contact was not reliable; short again and retry.
The instrument zeroes all ranges at all frequencies and saves the data in non-volatile memory; when changing the test frequency under the same test conditions, zeroing again is not required.

3.11 Setup

Operation: In the testing state, press Setup ; a screen similar to the following appears:



Press ▲▼ to page through the setting items.
Exit: press Cancel key returns to the setup main screen.
Execute: press Enter key enters the submenu settings.

All menu items are as follows:

Setup	
STD	Primary parameter nominal value
SEC	Secondary parameter (if the primary parameter is L, R or Z, q-L is displayed; if the primary parameter is C, d-H is displayed)
P1-H	Bin 1 upper limit (enter a positive percentage, e.g. 5% — the primary parameter window shows 5.000)
P1-L	Bin 1 lower limit (enter a negative percentage, e.g. -5% — the primary parameter window shows -5.000)

P2-H	Bin 2 upper limit (enter a positive percentage, e.g. 10% — the primary parameter window shows 10.000)
P2-L	Bin 2 lower limit (enter a negative percentage, e.g. -10% — the primary parameter window shows -10.00)
P3-H	Bin 3 upper limit (enter a positive percentage, e.g. 15% — the primary parameter window shows 15.000)
P3-L	Bin 3 lower limit (enter a negative percentage, e.g. -15% — the primary parameter window shows -15.00)
BEEP	Beeper settings: OFF: Off P1: PASS bin P1 beep P2: PASS bin P2 beep P3: PASS bin P3 beep AU: Secondary-parameter fail beep NG: Beep when both primary and secondary parameters fail
SrES	Source resistance settings: 100: 100Ω source resistance 30: 30Ω source resistance
LEVEL	Test level settings: 0.1: 0.1V 0.3: 0.3V 1.0: 1.0V
EQU	Equivalent-circuit settings: SER: Series equivalent PAL: Parallel equivalent
CAL	System calibration page. (Password-protected; not open to users)

3.11.1 Sorting Settings

Before configuring sorting, first understand the AT2811 sorting mechanism:

The AT2811 has an enhanced sorting discrimination mechanism.

P1, P2, P3 indicate whether the primary parameter passes. On fail, the NG indicator lights and sorting ends; on pass, indicators P1~P3 light and the secondary-parameter comparison continues.

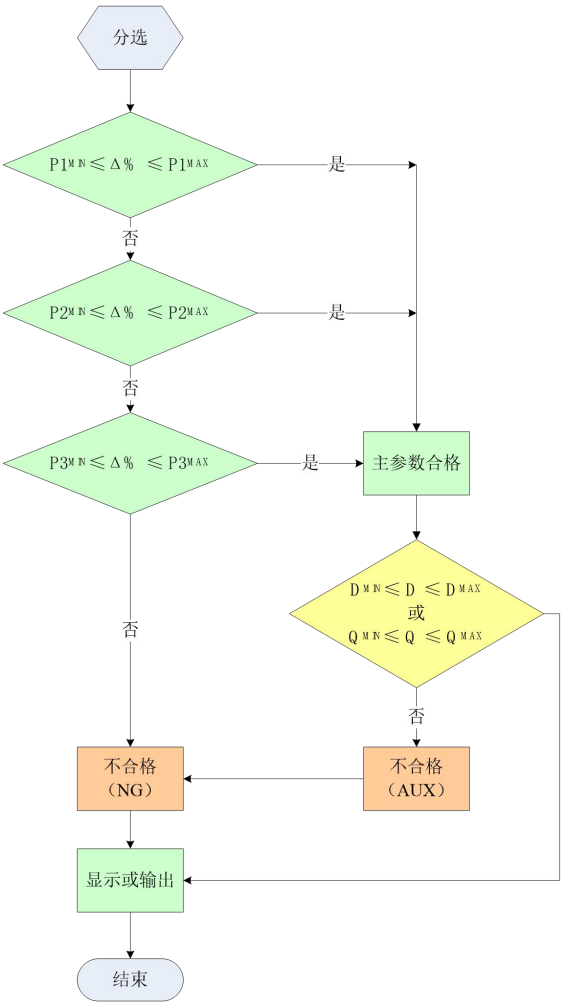
AUX indicates whether the secondary parameter passes. On fail, the AUX indicator lights; on pass, it goes out.

NG: if either the primary or the secondary parameter fails, NG lights.

Several possible sorting indications:

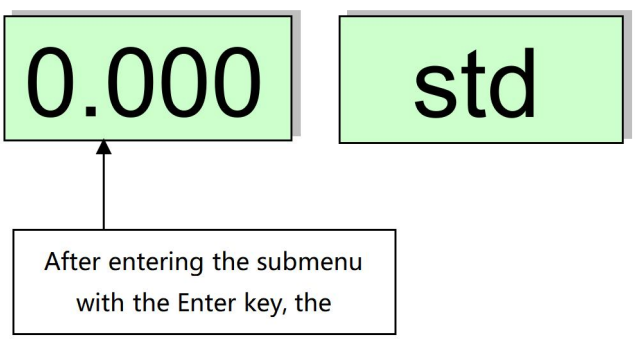
P1	P2	P3	AU	NG	
●	○	○	○	○	Primary parameter P1 and secondary parameter **all** pass
○	○	○	○	●	Primary parameter fails
○	○	○	●	●	Primary parameter passes, secondary parameter **does not** pass

Figure 3- 5
Sorting Process



3.11.2 Entering Sorting Values

Figure 3- 6
Input Box



Press ◀▶ to select the digit position.
Press ▲▼ to increase or decrease the digit value, or change the unit.
Exit: press Cancel returns to the main menu.
Execute: press Enter saves the data and returns to the main menu.

Note: if a lower limit (P1-L, P2-L, P3-L) is a negative deviation, the minus sign (—) must be entered.

4. Specifications

You will learn the following:
- Technical specifications
- General specifications
- Dimensions

4.1 Technical Specifications

The following data are measured under the following conditions:
Temperature condition: 23℃±5℃
Humidity condition: ≤65% R.H.
Zero adjustment: open- and short-circuit zeroing before testing
Warm-up time: >60 minutes
Calibration interval: 12 months

Test frequency accuracy:0.02%
Basic accuracy: 0.25%

C: 0.25% (1+ Cx/Cmax+ Cmin/Cx)(1+Dx)(2+kf);
L: 0.25% (1+ Lx/Lmax+ Lmin/Lx)(1+1/Qx)(2+kf);
Z: 0.25% (1+ Zx/Zmax+ Zmin/Zx)(2+kf);
R: 0.25%(1+ Rx/Rmax+ Rmin/Rx)(1+Qx)(2+kf);
D: ±0.0025(1+ Zx/Zmax+ Zmin/Zx)(1+Dx+Dx^2)(2+ kf);
Q: ±0.0030(1+ Zx/Zmax+ Zmin/Zx)(Qx+1/Qx)(2+ kf);

Where:
1. L, C, R, Z are relative errors; D, Q are absolute errors
2. Subscript x is the measured value of the parameter; max is the maximum and min the minimum
3. kf is the frequency factor

Maximum and minimum measurement parameters affecting accuracy

	100Hz	**120Hz**	**1kHz**	**10kHz**
Cmax	800μF	667μF	80μF	8μF
Cmin	1500pF	1250pF	150pF	15pF
Lmax	1590H	1325H	159H	15.9H
Lmin	3.2mH	2.6mH	0.32mH	0.032mH
Zmax/ Rmax	1MΩ			
Zmin/ Rmin	1.59Ω			

Test frequency error factor kf
When f = 100Hz, 120Hz, 1kHz kf=0;
When f = 10kHz kf=0.5

4.2 General Specifications

Screen: Digital LED display.
Test parameters: L, C, R, Z, D, Q and parameter auto.
Test frequency: 100Hz, 120Hz, 1kHz, 10kHz
Test level: 0.1Vrms, 0.3Vrms and 1.0Vrms (1±10%)
Basic accuracy: 0.25%

Measurement	L	100/120Hz	1μH – 9.999kH

range:			
		1kHz	0.1μH - 999.9H
		10kHz	0.01μH – 99.99H
	C	100/120Hz	1p – 9.999mF
		1kHz	0.1p – 999.9μF
		10kHz	0.01p – 99.99μF
	R, |Z|	0.0001Ω - 99.99MΩ	
	D/Q	0.0001 – 9999	

Display digits: Primary/secondary parameters: 5 digits
Test speed: Slow: 3 readings/second, fast: 10 readings/second
Output impedance: 30Ω and 100Ω
Max. reading: 33000
Ranging mode: Auto and manual
Equivalent circuit: Series and parallel
Correction: Open-sweep zeroing, short-sweep zeroing
Comparator: 5 bins: P1, P2, P3, AUX, NG
Beep: P1, P2, P3, AUX, NG, off

Environment: Specification: Temperature 18℃~28℃ Humidity ≤ 65% RH
Operation: Temperature 10℃~40℃ Humidity 10~80% RH
Storage: Temperature 0℃~50℃ Humidity 10~90% RH

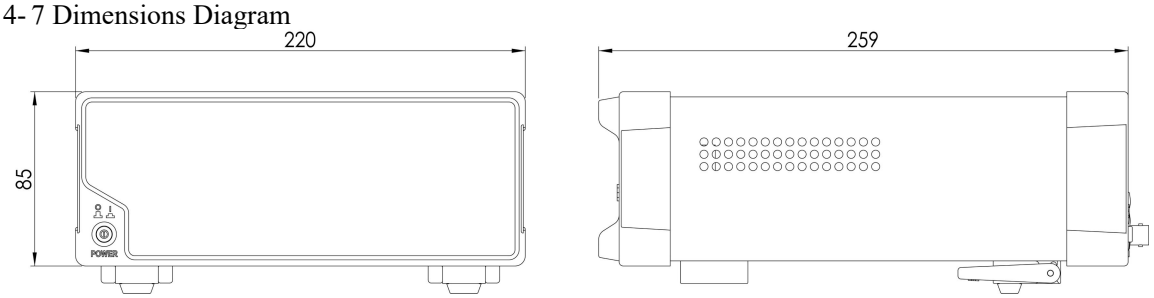
Power: 198V ~ 252VAC 48.5Hz ~ 52.5Hz
Fuse: 250V 0.5A slow-blow
Power consumption: Max. 10VA

Weight: Approx. 2 kg.

Supplied accessories: ATL501 test cable, AC power cord, quality certificate

4.3 Dimensions

Figure 4- 7 Dimensions Diagram



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