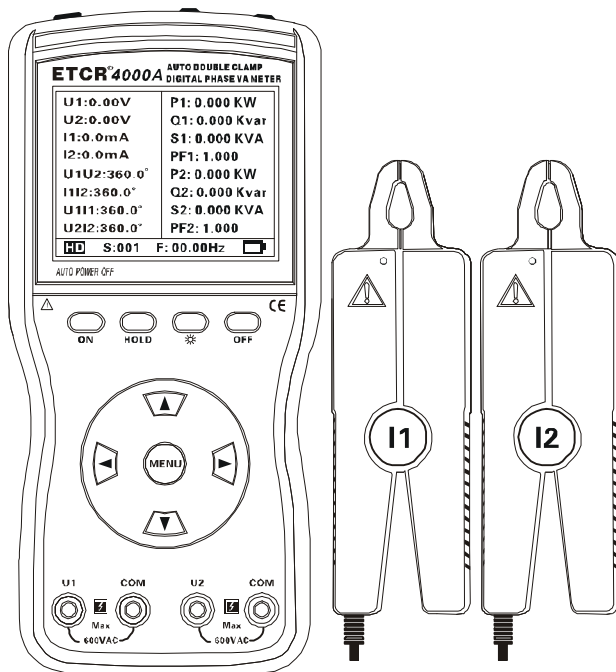


ETCR[®] AUTO DOUBLE CLAMP DIGITAL PHASE VA METER

ETCR 4000A
ETCR 4200A



<http://www.etcrc.com>

MANUAL

ETCR Electronic Technology Co.,Ltd

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Warning





Thank you for purchasing our ETCR4000A、ETCR4200A Intelligent Double Clamp Digital Phase Volt-Ampere Meter (Full-automatic Double Clamp Digital Phase Volt-Ampere Meter), in order to better use of this product, be sure to:

---- To read this user manual carefully.

---- Comply strictly with safety rules and precautions set out in this manual.

- ⊍ Pay special attention to safety under any circumstances while using the instrument.
- ⊍ Take note of the label text and symbols on the panel and back of the instrument.
- ⊍ Make sure that the instrument and accessories are intact and there's no damage to the instrument or test wire insulation layer, or bare and broken wires before using it.
- ⊍ Make sure that the function switch has been set up within the appropriate range before the test.
- ⊍ Can not be used to test voltage higher than 600V.
- ⊍ It's prohibited to use the instrument without the rear cover and battery cover in place.
- ⊍ Make sure that the connection plug is closely inserted in the socket.
- ⊍ Don't use or replace batteries if the instrument is wet.
- ⊍ Test is prohibited in flammable and dangerous places.
- ⊍ The test line could only be pulled out from the instrument after being removed from the measured wire; don't touch the plug jack by hand to avoid an electric shock.
- ⊍ Do not use the instrument in strong electromagnetic environment in order to prevent the equipment from work improperly.
- ⊍ Don't operating simultaneously two or more buttons, the operation will be invalid.
- ⊍ Stop using the meter in case of metal exposure due to a broken chassis or fractured test line.

- ⊍ Do not place or keep the device in hot and humid environment, or places of dew condensation or long time direct sunshine.
- ⊍ The instrument and current clamp must be maintained regularly to keep clean, corrosive solution and coarse materials can't be used to clean the clamp.
- ⊍ Keep the current clamp from any impact, especially the clamp joints.
- ⊍ The instrument has an automatic shutdown function.
- ⊍ Remove or replace the battery if the instrument is not used for a long time, and take note of the battery polarity.
- ⊍ Take note of the measurement range and application environment required for the instrument.
- ⊍ The operation, demolition, calibration and maintenance of the instrument must be carried out by qualified personnel authorized to do so.
- ⊍ The meter should be stopped from being used immediately and sealed if danger is brought up in case of continued use; only a competent body can be authorized to deal with it.
- ⊍ The two COM ports of the instrument is internally short circuited, belong to the same point.
- ⊍ “” in the manual is the safety warning sign, the contents of this manual must be followed for safe operation.
- ⊍ “” and other safety signs, the contents of this manual must be followed for safe operation.

I . Introduction

ETCR4000A 、 ETCR4200A Intelligent Double Clamp Digital Phase Volt-Ampere Meter (Full-automatic Double Clamp Digital Phase Volt-Ampere Meter) is a well-developed full-automatic, multi-functional, digital, intelligent meter specifically designed for field testing, which is a overall upgrade product based on mechanical knob phase volt-ampere meter, can simplify operation and reduce the possibility of misoperation, featuring high accuracy, high stability, low power consumption, easiness to use and so on. It can directly measure AC voltage and AC current without opening the measured circuit, phases between three voltages, three currents and phase between the voltage and current; in addition, the power factor and power of the circuit can be indirectly measured, it can also be used to distinguish three-phase sequence, transformer wiring group, inductive and capacitive circuits, test second circuit and bus differential protection systems, read the phase relationship between CTs of the differential protection, check the meter wiring right, repair lines and equipment, etc.

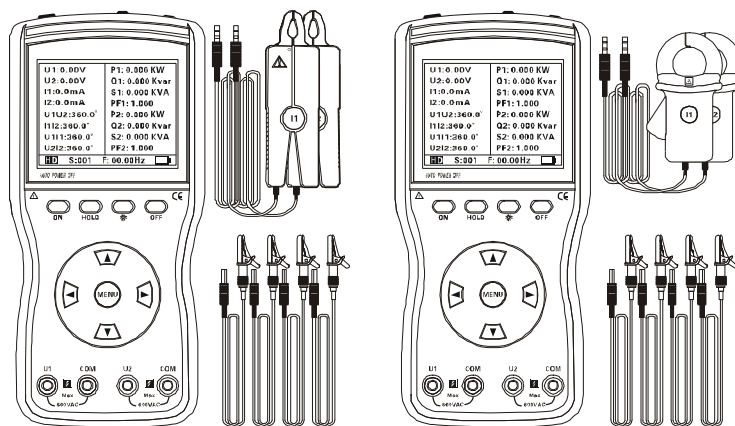
ETCR4000A 、 ETCR4200A Intelligent Double Clamp Digital Phase Volt-Ampere Meter has well designed shell mould made of newest material, attach with shakeproof, skidproof, high insulation sheath, has a 240dots×160dots LCD screen, all the test data display on the screen simultaneously, vector diagram indication, and looks exquisite and comfortable. Meter equipped with USB-RS232 interface, can store 500 sets of data, through the system software upload stored data to the computer, implementing online real-time monitoring and historical inquires, dynamic display. Can read, save, report, print history data, etc. At the same time, its current clamps have two kinds of specification optional, small mouth clamps are suitable for line densely places, big round clamps are applicable to thick wire detection, to meet the different place needs.

ETCR4000A 、 ETCR4200A Intelligent Double Clamp Digital Phase







Volt-Ampere Meter (Full-automatic Double Clamp Digital Phase Volt-Ampere Meter) applies to electric power, petroleum chemical industry, metallurgy, railway, and meteorology, industrial and mining enterprises, scientific research institutions, measurement sector and so on. Especially for the electricity billing system and relay protection system, and electricity measurement, electricity check, power inspection for power marketing department. Assembling, relay protection, differential detection, start experiment, substation overhaul, or power practical training, skills match for biotech department.

II. Model

Model	Clamp Size	Note
ETCR 4000A	7.5mm×13mm	acuminate current clamp
ETCR 4200A	35mm×40m	round current clamp



III. Electrical Symbols

	Extremely dangerous! The operator must strictly abide by the safety rules; otherwise there is risk of electric shock, resulting in bodily injury or fatalities.
	Dangerous! The operator must strictly abide by safety rules; otherwise there is risk of electric shock, resulting in bodily injury or fatalities.
	Warning! Safety rules must be strictly abided by, otherwise personal injury or equipment damage may be caused.
	Alternate Current (AC)
	Direct Current (DC)
	Double Insulation


IV. Technical Specification

1. Base Conditions and Working Conditions

Influence Quantity	Base Condition	Working Condition	Remark
Ambient Temperature	23℃±1℃	-10℃~40℃	----
Ambient Humidity	40%~60%	< 80%	----
Signal Waveform	sine wave	sine wave	β=0.01
Signal Frequency	50HZ±1HZ	45HZ~65HZ	----
Meter Working Volt	9V±0.1V	9V±1.5V	----
Current Amplitude in Phase/Frequency/Phase Sequence Test	1A±0.2A	2mA~20A	----
Voltage Amplitude in Phase / Frequency/ Phase Sequence Test	100V±20V	10V~600V	----
Current Amplitude in Power / Power Factor Test	1A±0.2A	20mA~20A	----
Voltage Amplitude in Power / Power Factor Test	100V±20V	10V~600V	----
External Electric Magnetic Field	To be avoided		
Measured Wire Position	Measured wire at approximately the geometric center of the clamp		

2. General Specification

Function	Simultaneous measurement of two AC voltage, current, phase between voltage, phase between current, phase between voltage and current, frequency, phase sequence, active power, reactive power, apparent power, power factor, distinguish transformer wiring group, inductive and capacitive circuits, test second circuit and bus differential protection systems, read the phase relationship between CTs of the differential protection, check the meter wiring right, repair lines and equipment, etc.
Power	DC9V alkaline batteries (1.5V AA×6)
Consumption	About 70mA at most with enabled backlight, battery working continuously for about 14 hours
	About 40mA with disabled backlight, battery working continuously for about 20 hours
Display Mode	LCD display, 240dots×160dots
Meter Size	Length, Width, Height : 196mm×92mm×54mm
Clamp Size	acuminate current clamp:7.5mm×13mm (optional)
	round current clamp:35mm×40mm (optional)
Measurement Range (automatic shift)	AC Voltage : 0.00 V~600V (automatic shift)
	AC Current : 0.0mA~20.0A (automatic shift)
	Phase : 0~360°
	Frequency: 45.00Hz~65.00Hz
	Active Power: 0.0W~12kW
	Reactive Power: 0.0W~12kVAR
	Apparent Power: 0.0W~12kVA
Power Factor: -1~+1	
Resolution	Voltage: AC 0.01V
	Current: AC 0.1mA
	Phase: 0.1°
	Frequency: 0.01Hz
	Active Power: 0.1W
	Reactive Power: 0.1VAR
	Apparent Power: 0.1VA
Power Factor: 0.001	
Sample Rate	About 2 times/second
Data Hold	Press HOLD key to keep data, " DH " symbol appears
Data Storage	1500 sets
RS232 Interface	USB-RS232 interface, download data to computer for analysis and management
Automatic	Automatic shutdown about 15 minutes later after launching to

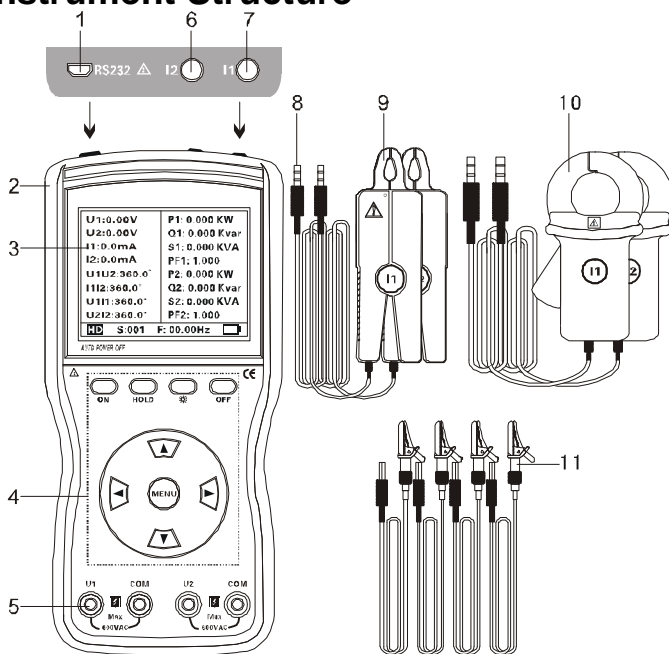
Shutdown	reduce battery consumption
Backlighting	Suitable for dark place and nightly use
Voltage Detection	Low battery symbol "  " appears to remind the replacement of battery when the battery voltage drops below 7.2V.
Weight	Main Unit about 550g (with battery), acuminate current clamp about 170g×3, round current clamp about 185g×3, test line about 250g
Test Line Length	1.5m
Current Clamp Length	2m×φ5mm
Working Temperature and Humidity	-10℃~40℃ ; below 80%Rh
Storage Temperature and Humidity	-10℃~60℃ ; below 70%Rh
Input Impedance	Testing voltage the input impedance is 2MΩ
Withstand Voltage	Withstand 1000V/50Hz sine wave AC voltage for 1 minute between the meter lines and shell; Withstand 500V/50Hz AC voltage sine wave for 1 minute between the two voltage inputs
Insulation	≥100MΩ between meter lines and shell or between the two voltage inputs
Structure	Double insulation, with insulation vibration-proof sheath
Safety Specifications	IEC61010-1 CAT III 600V, IEC61010-031, IEC61326, 2 class of pollution

3. Intrinsic Error and Performance Indicators under Base Conditions

Category	Measurement Range	Resolution	Intrinsic Error
Voltage	AC 0.0V~600V	0.01V	±(1.5%rdg+3dgt)
Current	AC 0.0mA~20.0A	0.1mA	±(1.5%rdg+3dgt)
Phase	0.0°~360°	0.1°	±1°
Active Power	0.0W~12kW	0.1W	±(3%rdg+3dgt)
Reactive Power	0.0VAR~12kVAR	0.1VAR	±(3%rdg+3dgt)
Apparent Power	0.0VA~12kVA	0.1VA	±(3%rdg+3dgt)
Frequency	45HZ~65HZ	0.01HZ	±(2%rdg+3dgt)
Power Factor	-1~+1	0.001	±0.03


Note: In working condition, phase error is ±3°(10mA~20A); ±6°(under 10mA).

V. Instrument Structure



1. USB-RS232 interface
2. Insulation vibration-proof sheath
3. LCD display
4. Function keys area
5. Two voltage input interface
6. Current clamp input interface I2
7. Current clamp input interface I1
8. Current clamp output plug
9. Acuminate current clamp (optional)
10. Round current clamp (optional)
11. Voltage input test line


VI. Method of Operation

	Check carefully before using the instrument whether there're damaged parts, no damage is allowed.
	The instrument is prohibited from use in dangerous places.
	Install the battery according to the manual.
	Don't operating simultaneously two or more buttons, the operation will be invalid.

1. Switch On/Off

Press **ON** button to switch on as shown on the LCD or press **OFF** to switch off; Boot needs 5 seconds, to finish instrument internal automatic calibration, the device powers off automatically about 15 minutes later

2. Backlight Control

Press  to control the backlight in dim places.

3. Date Lock/Release/Storage

In test model, press HOLD key to Lock currently displayed value and display “HD” symbol. At the same time, this lock-values as a set of data followed by auto-ID and store, display the group number such as “S:01”, and then press HOLD key to cancel the lock, “HD” symbol disappeared, can continue to measure. Loop operation, can store 500 sets of data. If the memory is full, blinking display “FULL” symbol.

4. Date Access/ Exit

At the test state, press the **MEMU** key to access date inquiry form group “R:01”, and display “RD” symbol. It is allowed to rapidly navigate to the desired page number. Press “ Δ ” key to increase the page number by one, press “ ∇ ” key to increase the page number by ten. Press “ \triangleleft ” key to exit date inquiry, back to test state.

5. Deleting Date


At the date inquiry state, press “ \triangleright ” key to access deleting data menu, press “ \triangleleft ” or “ \triangleright ” keys to move the cursor to “YES” or “NO” item. Press the **MEMU** key with the cursor located at “YES” to delete the stored data.


Press the **MEMU** key with the cursor at “NO” to cancel the deletion and return to the test state.


6. Date Upload

Connecting the meter and computer with USB-RS232 communication line attached in package. Start up the meter, run software, choose history access, then read, save, report, print history data, etc. The more data storage, take the longer time to read it. Historical data can be saved in Txt text or Excel format.

7. Measurement

	High voltage, very dangerous! Only qualified personnel after training could conduct operation on it. The operator should obey safety regulations; Otherwise there will be the danger of electric shock resulting in personal injury or casualty.
	Dangerous! Can not be used to test voltage higher than 600V. Otherwise there will be the danger of electric shock resulting in personal injury or casualty.
	Dangerous! Can not be used to test current higher than 20A. Otherwise it may damage the equipment.

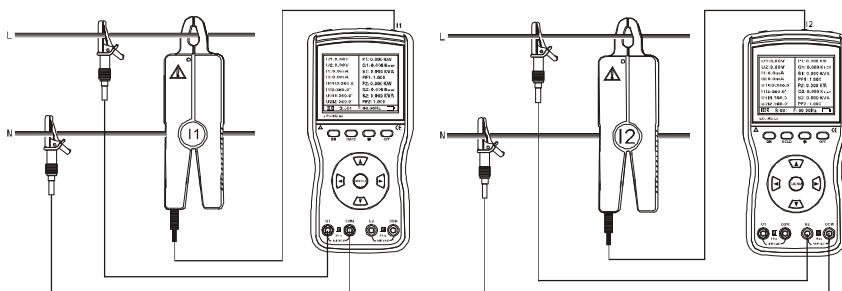
	Connecting wire strictly accordance with the manual instructions, I1, I2 can't be confused.
	After testing, must firstly move the test wire away form the measured circuit, then pull out the test wire from meter.

	Phase Test relationship of the instrument: U1U2、I1I2、U1I1、U2I2, for every relationship the measured phase shows the former signal ahead of the latter signal.
	P1、Q1、S1、PF1 corresponding to the parameters of U1-I1; P2、Q2、S2、PF2 corresponding to the parameters of U2-I2.
	The red U1,U2 voltage jacks and the red dot marks or arrow symbols on the clamp are dotted terminals.
	In phase test the direction of the input current should be in line with the arrow symbol on the clamp.

This instrument can test two AC voltage, current, phase between voltage, phase between current, phase between voltage and current, frequency, active power, reactive power, apparent power, power factor, three-phase current vector sum, distinguish phase sequence, inductive, capacitive circuit, etc.

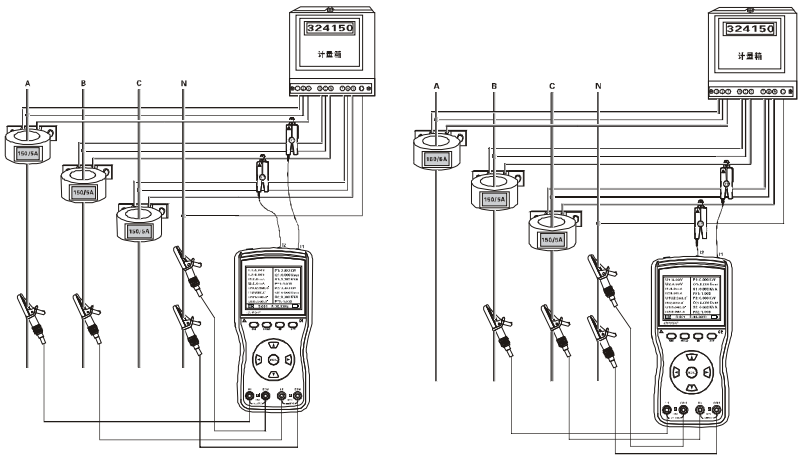
Test connections as follow:

Single-phase test: connecting the measured wire L/N corresponding to U1 red/COM black jack of the instrument, clamp L wire by current clamp I1. To test the single line voltage, current, phase, frequency, power parameters, etc. Also can connect U2 red, COM, I2 to test. As showed below:

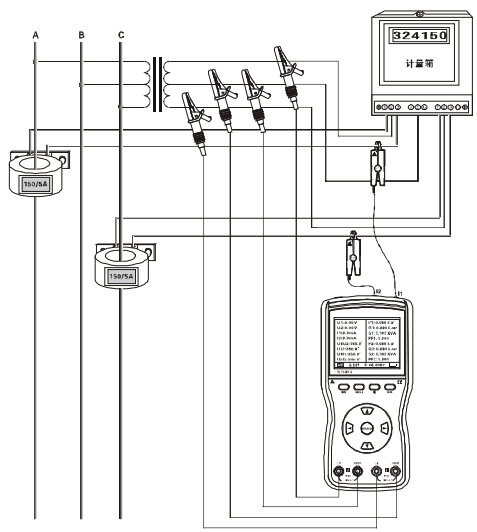


Three-phase four-wire test: connecting wires in two steps to test three-phase four-wire voltage, current, phase, phase sequence, frequency, power, power factor, etc. As showed below: (the two COM ports of the instrument is internally short circuited, connect either of them to null line N)

Step 1		Step 2	
Three-phase four-wire circuit	Meter	Three-phase four-wire circuit	Meter
UA yellow	U1 red	UB green	U1 red
UB green	U2 red	UC red	U2 red
N black	COM black	N black	COM black




Three-phase three-wire test: connecting the measured wire UA yellow, UB green, UC red corresponding to U1 red, COM black, U2 red jack of the instrument, clamp wire IA, IC respectively by current clamp 11, 12. To test three-phase three-wire voltage, current, phase, phase sequence, frequency, power, power factor, etc. As showed below: (the two COM ports of the instrument is internally short circuited, connect either of them to null line N)

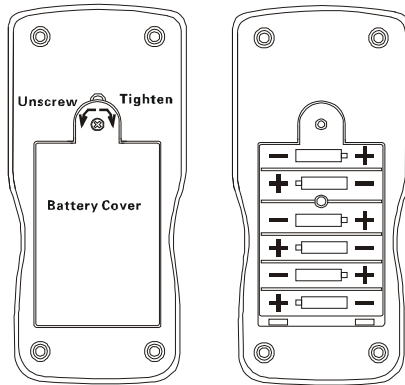


During test, according to various phase relationship, inductive or capacitive loads, phase sequence and polarity can be judged. If U111 phase display within $0^{\circ} \sim 90^{\circ}$ range, the measured load is perceptual; if within $270^{\circ} \sim 360^{\circ}$ range, the measured load is capacitive. If the phase display near 120° , it is positive phase sequence, and the same polarity; if near 120° or 300° , it is positive phase sequence, and the opposite polarity (may be current clamp or wire reverse connection). Other conditions for negative phase sequence (except default phase).

VII. Battery Replacement

	Take note of the battery polarity, the polarity must be properly installed, otherwise it causes damage to the instruments
	Batteries replacement is prohibited in hazardous area
	Must use qualified alkaline batteries (1.5V AA×6)
	Old and new batteries are not allowed to mix in use.

1. "I +"
2. Press **OFF** to switch off
3. Use the cross screwdriver to loose a screw on the battery cover, open the battery cover.
4. Remove the old batteries and replace a new battery, please take note of the battery polarity.
5. Cover the battery cover, tighten the screws.
6. Press **ON** to switch on to check whether the battery is successfully replaced, repeat step 2 if it doesn't work.
7. Take out the batteries if the instrument will not be used for a long time.



VIII. Other Descriptions and Notes

1. The special utility of current clamp

The two current clamps of each meter could only be used on this instrument.

The current clamp should be prevented from any impact, the clamp surface must be kept clean and could fully close for a reliable test.

2. The maintenance of current clamp

The dust on the surface of the current clamp should be removed promptly after use; don't use rough material or corrosive to clean the clamp, which is best to be gently wiped clean with soft cloth and lubricants (for example: WD-40 lubricants).

3. Preheat 3 to 5 minutes before the measurement to ensure the measurement accuracy

4. The instrument should be used for secondary and low-voltage circuit detection, and cannot be used to measure the current of high-voltage lines to prevent electric shock.

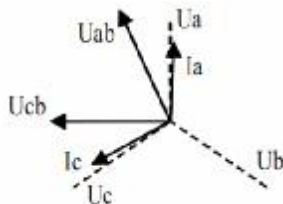
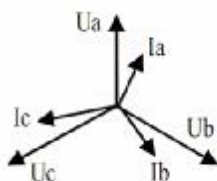
5. Three-phase four-wire system (Phase of a balanced threephase load)

Phase Relationship	Phase Value	Phase Relationship	Phase Value
Ua-Ub	120°	Ia-Ib	120°
Ub-Uc	120°	Ib-Ic	120°
Uc-Ua	120°	Ic-Ia	120°

6. Three-phase three-wire (Phase of a balanced threephase load) :

Phase Relationship	Phase Value	Phase Relationship	Phase Value
Uab-Ucb	300°	Ia-Ic	240°
Uab-Ia	30°	Ucb-Ic	330°

7. Three-phase four-wire vectogram and Three-phase three-wire vectogram :



Three-phase four-wire vectogram Three-phase three-wire vectogram



If the direction of current clamp or current line is reversed there's a phase value difference of 180°, viz. adding 180° to the standard value.

IX. Accessories

Main Unit	1 piece
Meter Box	1 piece
Current Clamp	3 pieces
Test Line	4 pieces (2 Yellow, 2 Black)
RS232 Data Line	1 piece
Disk	1 piece
Battery	6 pieces (Alkaline Dry Battery: 1.5V AA)
User Manual	1 copy
Guarantee Card	1 copy
Certification	1 copy

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