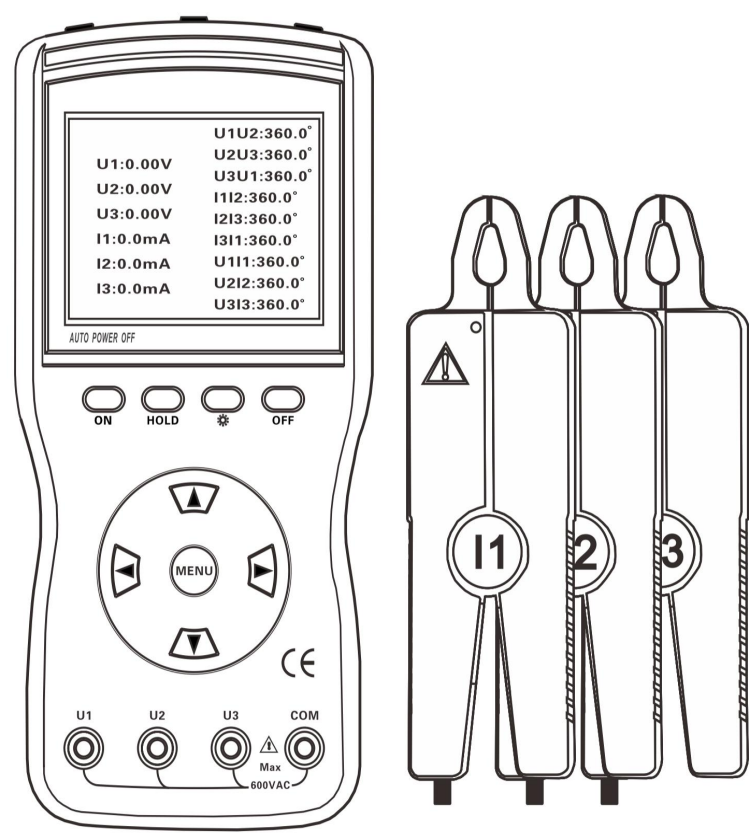


THREE PHASE DIGITAL PHASE METER



MANUAL

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## Precautions For Use



Thank you for purchasing the **Three Phase Digital Phase Voltmeter** manufactured by our company. In order to better for use of the product, please be certain:

——**Read this user manual in detail.**

——**Comply with the operating cautions in this manual.**

- ◆ Under any circumstance, shall pay special attention on safety in using this meter.
- ◆ The USB interface of the meter and the internal circuit are non-isolated interfaces. It is strictly forbidden to connect the computer when testing the voltage, otherwise it will burn out the meter or cause electric shock. After the voltage test cable must be pulled out from the meter, the USB data cable can be connected to the computer to read the data. The on-line monitoring in the manual is not applicable for monitoring voltage.
- ◆ Pay attention to the text labeled on the panel and backplane of the Meter.
- ◆ Before usage, please make sure that the instrument and accessories are in good condition and no damage, bare or broken wire.
- ◆ Don not use the instrument to measure line voltage higher than 600V.
- ◆ Prohibition of use when the rear cover of the meter and the battery cover plate are not properly covered.
- ◆ Make sure that the connection plug of the wire is tightly inserted into the socket. .
- ◆ Please do not use or replace the battery when the meter is in damp condition.
- ◆ Prohibition of testing in inflammable and dangerous places.
- ◆ The test line can be removed from the meter after removed from the tested wire. Do not touch the input socket to avoid electric shock.
- ◆ Do not use in strong electromagnetic environment to avoid affecting the normal operation of the instrument.
- ◆ Do not operate two or more keys at the same time, or the operation will be invalid.
- ◆ The instrument in usage, the case or test wire is broken and lead to the metal is exposed, please stop using.
- ◆ Do not place and store the meter in high temperature and humidity or dewy places and under direct sunlight for a long time.
- ◆ The instrument and current clamp should be maintained regularly and kept clean. It should not be wiped with corrosives or rough materials.
- ◆ Avoid any impact onto this meter, especially the Jaw contact surface.
- ◆ The instrument has function of auto shutdown.
- ◆ If long time not use this instrument, please take out the battery. Replace the battery please pay attention to the polarity of the battery.
- ◆ Pay attention to the measuring range and operating environment of this instrument.

Use, disassembly and maintenance of this leakage current meter shall hand by authorized personnel.

- ◆ Due to the reason of this instrument, if it is dangerous to continue using, should stopped and sealed immediately ,and handled by an authorized institution.
- ◆ The meter manual with the danger mark "  ", users must follow instructions to operate safely.
- ◆ The meter manual with the extremely dangerous mark "  ", users must in strict follow instructions to operate safely.









## 1. Introduction

**Three-phase Digital Phase Voltmeter** is a multifunctional, digital and intelligent instrument specially developed by our company for field testing. It has the characteristics of high accuracy, high stability, low power consumption and convenient to use etc. Under the condition of the tested circuit does not open-loop, it can measurement of three-phase AC voltage, current, phase between voltages, phase between current, phase between current and voltage, frequency, phase sequence, active power, reactive power, apparent power, power factor, current vector sum, judge transformer wiring group, sensibility and capacitive circuit, test the secondary circuit and differential bus protection system, read the phase relationship between differential protection between each groups CT, check watt hour meter wiring correctly or not, maintenance line equipment, etc., to provide a safe, accurate and convenient new power meter for electricity inspectors.

**Three-phase Digital Phase Voltmeter** with shake proof, skid proof, and high insulation sheath. Adopts 2.8 inch color LCD screen, dynamic display, vector diagram indication, clear and obvious, which shows the exquisite and luxurious appearance. Its sharp and small shape current clamp is suitable for the place where the wires arranging are dense.

**Three-phase Digital Phase Voltmeter** also name **intelligent three phase digital phase voltmeter, multifunction three phase digital phase voltmeter and three clamp digital phase voltmeter etc.** Suitable for electric power, petrochemical, metallurgy, railway, industrial and mining enterprises, scientific research institutions, measurement departments. It is especially suitable for electric energy billing system and relay protection system.

## 2. Electrical Symbols

	Extremely dangerous! The operator must strictly follow the safety rules, otherwise there would be danger of electric shock, causing personal injury or injury accident.
	Dangerous! The operator must strictly follow the safety rules, otherwise there would be danger of electric shock, causing personal injury or injury accident.
	Extremely dangerous! The operator must strictly follow the safety rules, otherwise there would be danger of electric shock, causing personal injury or injury accident.
	Dangerous! The operator must strictly follow the safety rules, otherwise there would be danger of electric shock, causing personal injury or injury accident.
	Warning! Operators must strictly follow safety rules , otherwise personal injury or equipment damage may occur
	AC
	DC
	Double insulation

### 3. Technical Specification

#### 3.1. Base Conditions and Working Conditions

Influence Quantity	Base Condition	Working Conditions	Remark
Environment Temperature	23°C±1°C	-10°C~40°C	
Environment Humidity	40%~60%	< 80%	
Signal Waveform	sine wave	sine wave	$\beta=0.01$
Signal Frequency	50HZ±1HZ	45HZ~65HZ	
Meter Working Voltage	9V±0.1V	9V±1V	
The current amplitude when measure the phase frequency and phase sequence	1A+0.2A	2mA~20A	----
The voltage amplitude when measure the phase frequency and phase sequence	100V±10V	10V~600V	----
The current amplitude when measure the power and power factor	1A+0.2A	20mA~20A	----
The voltage amplitude when measure the power and power factor	100V±10V	10V~600V	----
External Electric Magnetic Field	To be avoided		
The Tested Wire Position	Measured wire at approximately the geometric center of the clamp		

#### 3.2. General Specification

Function	in the case of the tested circuit is not open-loop, measure two AC voltages (), current, phase between voltages, phase between currents, phase, frequency, phase sequence, active power, reactive power, apparent power, and power factor between voltage and current. Discriminate the transformer wiring group, inductive and capacitive circuits, test the secondary circuit and the busbar protection system, read the phase relationship between the CTs of the differential protection groups, check the wiring of the meter for correctness, and repair the line equipment, etc.
CT Size	Φ8mm
Power Supply	DC9V Alkaline dry cell batteries (LR6 1.5V X6PCS)
Working Current	Max power consumption of open backlight: 135mA, battery power can continues working 6 hours Meter power consumption of close backlight: 90mA, battery power can continues working 9 hours
Display Mode	2.8 inch TFT color LCD screen, display area 58mmX44mm
Meter Size	196mmX92mmX54mm
Voltage Range	AC 0.00V~600V
Current Range	AC 0.0mA~20.0A
Phase Range	0.0°~360.0°
Frequency Range	45.00Hz~65.00Hz

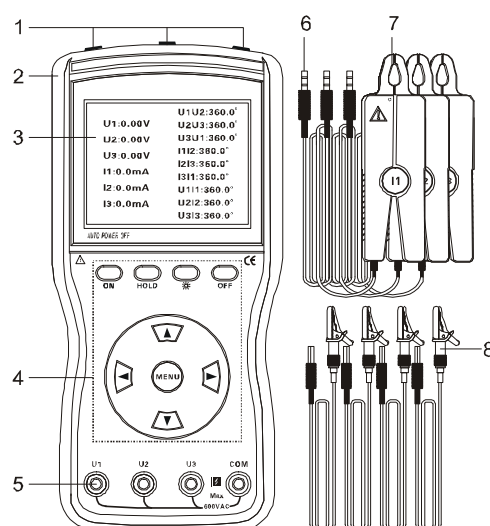
<b>Active Power Range</b>	0.0W~12kW
<b>Reactive Power Range</b>	0.0var~12kvar
<b>Apparent Power Range</b>	0.0VA~12kVA
<b>Power Factor Range</b>	-1.000~1.000
<b>Current Vector Sum</b>	0mA~60.0A
<b>Resolution</b>	Voltage: AC 0.01V
	Current: AC 0.1mA
	Phase: 0.1°
	Frequency: 0.01Hz
	Active power: 0.1W
	Reactive power: 0.1var
	Apparent power: 0.1VA
	Power factor: 0.001
<b>Phase Sequence</b>	Current vector Sum: 1mA
	Positive phase: U1, U2, U3 or I1, I2, I3 cursors flash from left to right Invert phase: U1, U2, U3 or I1, I2, I3 cursor flash from right to left
<b>Sampling Rate</b>	About 2 times/second
<b>Data Hold</b>	Press <b>[HOLD]</b> key to keep data, " <b>[DH]</b> " symbol display
<b>Data Storage</b>	500 groups
<b>Communication Interface</b>	USB interface, store data can be upload to computer, convenient to analyze management data
<b>Auto Shutdown</b>	15 minutes after boot up, the meter shuts down automatically without any operation
<b>Backlight Function</b>	Yes, Suitable for dark place and at night use
<b>Voltage Detection</b>	When the battery voltage is lower than 7.2V, low battery symbol appears, reminding replace battery
<b>Weight</b>	Host: 550g(include battery)
	Current Clamp: 180g*3
	Test wires: 180g
	Instrument box: 957g
	Total weight: 2.46kg(include accessories)
<b>Test Wire Length</b>	1.5m
<b>Current Clamp Length</b>	2m
<b>Working Temperature and Humidity</b>	-10°C~40°C; below 80%RH
<b>Storage Temperature and Humidity</b>	-10°C~60°C; below 70%RH
<b>Input Impedance</b>	Test voltage input impedance: 1MΩ
<b>Withstand Voltage</b>	It took 1 minute to withstand 1000V/50Hz sine wave AC voltage between the meter line and the out shell
<b>Insulation</b>	≥10MΩ between meter lines and sheath shell
<b>Structure</b>	Double insulation, with insulation vibration-proof sheath
<b>Suitable Safety Standard</b>	IEC61010-1 CAT III 600V, IEC61010-031, IEC61326, Pollution 2

### 3.3. Intrinsic Error And Performance Index Under Base Conditions

Category	Measurement Range	Resolution	Intrinsic Error
Voltage	AC 0.00V~600V	0.01V	$\pm(0.5\%\text{range})$
Current	AC 0.0mA~20.0A	0.1mA	$\pm(0.5\%\text{range})$
Phase	0.0°~360°	0.1°	$\pm 1^\circ$
Active Power Range	0.0W~12kW	0.1W	$\pm(1.0\%\text{range})$
Reactive Power Range	0.0var~12kvar	0.1var	$\pm(1.0\%\text{range})$
Apparent Power Range	0.0VA~12kVA	0.1VA	$\pm(1.0\%\text{range})$
Frequency	45Hz~65Hz	0.01Hz	$\pm(1.0\%\text{range})$
Power Factor Range	-1.000~1.000	0.001	$\pm 0.03$

**Note:** Phase error under working conditions: 10mA~600A is  $\pm 3^\circ$ ; Below 10mA  $\pm 6^\circ$

## 4. Instrument Structure



- 4.1. Three-phase current input interface
- 4.2. Insulation vibration-proof sheath
- 4.3. LCD display
- 4.4. Function keys area
- 4.5. Three-phase voltage input interface
- 4.6. Current clamp plug
- 4.7. Round current clamp
- 4.8. Voltage input test line


## 5. Operation Method

	<b>Before usage, check carefully whether all parts of the meter are damaged, no damage is allowed to use.</b>
	<b>Prohibition of use this instrument in dangerous place.</b>
	<b>Install the battery according to the manual.</b>
	<b>Don't operating simultaneously two or more buttons, the operation will be invalid.</b>

### 5.1. Start Up/Shut Down

Press **ON** key to start up, LCD display. Press **OFF** key to shut down; the meter will auto shut down after 15minutes without operation.

### 5.2. Backlight Control

After Start up, press  key to control the backlight, suitable for dark place or at night use.

### 5.3. Date Hold/Cancel/Storage

In test mode press **HOLD** key to keep the display data, "HD" symbol indicate, and then press **HOLD** key to cancel the hold function. While hold the data, the instrument will automatically numbering and store the present hold data, display group numbers such as "S: 001". The instrument can store up to 500 groups of data. If the storage is full, will display "FULL" symbol.

### 5.4. Date Access/ Exit

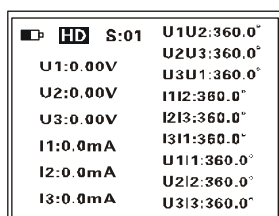
In test mode, press MEMU key enter into access date mode, display "RD" symbol, form group "R:01" data begin to access, Press "▲" key to increasing access with one step size, press "▼" key to increasing access with ten step size. Press "◀" key to exit date access mode, return to test mode.

### 5.5. Deleting Date

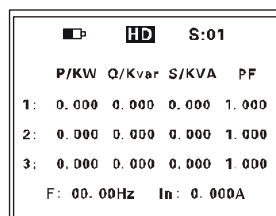
In data access mode, Press "▶" key enter into data delete menu. Then press "◀" key or "▶" key move the cursor to "YES" or "NO", Press **MENU** key ensure delete or exit, and then return back to test mode.

### 5.6. Test Display Mode Switch

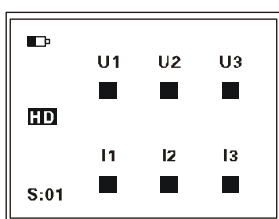
After start up, the meter auto enter into voltage, current and phase test display mode (figure A); Press "▼" key enter into active power, reactive power, apparent power, power factor, frequency, three-phase current vector test display mode (figure B); Press "▶" key enter into phase sequence display more (figure C); Press "◀" key enter into vector display more (figure D); Press "▲" key return to voltage, current and phase test display mode. In figure B, the three channel power and power factor are the corresponding power and power factor of U1I1, U2I2 and U3I3.



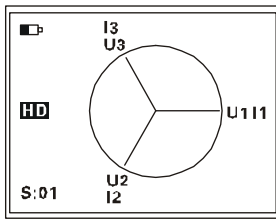
(A)



(B)






(C)



(D)



## 5.7. Test

	<b>Electric, dangerous! Must be operated by trained and authorized personnel. The operator must strictly follow the safety rules, otherwise there would be danger of electric shock, causing personal injury or injury accident.</b>
	<b>Cannot be used to measure voltage line over 600V, otherwise there is a danger of electric shock, causing personal injury or equipment damage.</b>
	<b>Dangerous! Can not be used to measure current over 20A. Otherwise it may damage the equipment.</b>
	<b>The wire connection must be strictly in accordance with the manual instructions, I1, I2, I3 cannot be inserted in reverse.</b>
	<b>After the testing, the test line must be removed from the tested line, and then can be pulled out from the meter.</b>
	<b>Phase Test relationship of the instrument: U1U2、U2U3、U3U1、I1I2、I2I3、I3I1、U1I1、U2I2、U3I3, for every relationship the measured phase shows the former signal ahead of the latter signal.</b>
	<b>The red U1, U2, U3 voltage jacks and the red dot marks or arrow symbols on the clamp are dotted terminals.</b>
	<b>In phase test the direction of the input current should be in line with the arrow symbol on the clamp.</b>

This instrument can test of three-phase ac voltage, current, phase between voltages, phase between currents, phase between voltages, phase between voltages, frequency, active power, reactive power, apparent power, power factor, three-phase current vector and, discriminating phase sequence, inductive and capacitive circuits etc.

Test wiring as follow:

Single phase test: connect the tested voltage line L and N to the U1 yellow and COM black jack of the meter, and clamp the current clamp I1 on the tested line L. can also connect to U2 green, COM black, I2 or U3 red, COM black, I3 to tests

Three-phase four-wire test: connect the tested voltage lines UA yellow, UB green, UC red and N black correspond to the U1 yellow, U2 green, U3 red and COM black jack of the meter, and clamp the current clamp I1, I2 and I3 on correspond to the tested lines IA, IB and IC.

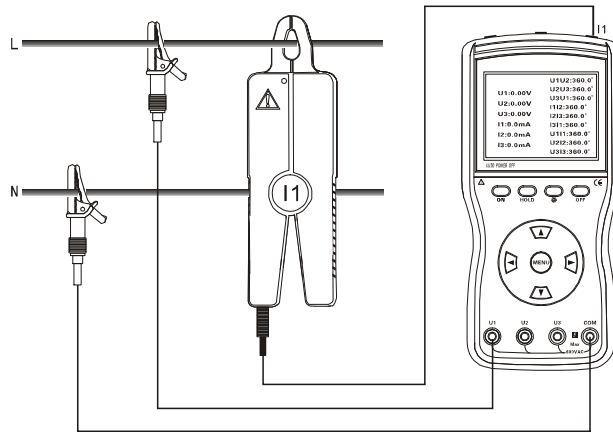
Three-phase three-wire test: connect the tested voltage lines UA yellow, UC red and UB green corresponding to the U1 yellow, U3 red and COM black jack of the meter, and clamp the current clamp I1 and I3 on corresponding to the tested line IA and IC. Refer to the wiring diagram.

During the test, inductive capacity load, phase sequence and polarity can be adjudged according to various phase relations. If the phase display of U1I1 is in the range of 00 ~ 900, the tested load is inductive; if the phase display is in the range of 2700 ~ 3600, the tested load is capacity. If the display phase is close to 1200, it is a positive phase sequence with the same polarity. If the display phase is close to 1200 and 3000, it is a positive phase sequence, and the polarity is opposite (there may be current clamp or circuit wiring is opposite), other situation is a negative phase sequence (not considering the lack of phase).

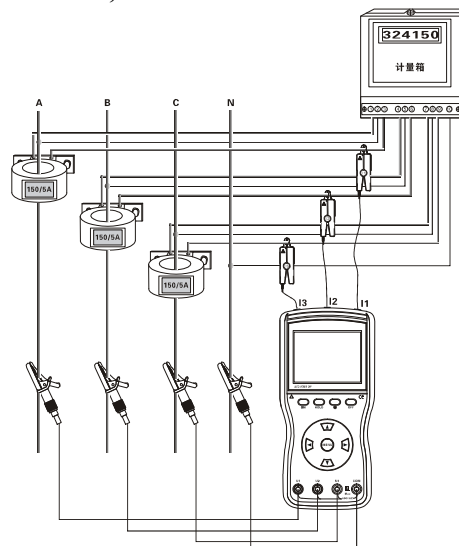
In the phase sequence test display mode, when U1, U2, U3 or I1, I2 and I3 are in positive phase sequence, the cursor flashes successively from left to right. In negative phase sequence, the cursor of U1, U2, U3 or I1, I2 and I3 flashes successively from right to left. If the cursor corresponding to U1, U2, U3 or I1, I2 or I3 is not bright, the phase may be missing or the signal amplitude is too low.

Wiring reference diagram:

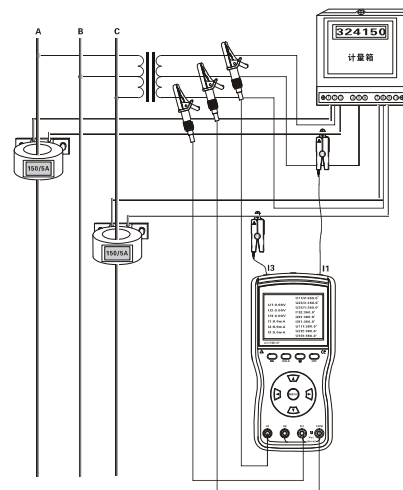
**Test single phase voltage, current, phase, frequency, power, etc.:**




**Test three-phase four-wire voltage, current, phase, phase sequence, frequency, power, power factor, etc.:**



**Test three-phase three-wire voltage, current, phase, phase sequence, frequency, power, power factor, etc.:**



## 6. Battery Replacement

	<b>Please pay attention to the battery polarity, must be installed according to the correct polarity, otherwise damage the meter.</b>
	<b>Forbidden to replace batteries in dangerous places</b>
	<b>Must use qualified alkaline batteries (1.5V AA×6)</b>
	<b>Mixing old and new batteries is not allowed</b>

6.1. When the power voltage of the meter is lower than 7.2V, and display a battery symbol, indicating insufficient battery power. Please replace the battery in time, as shown in the figure below.

6.2. Press OFF to shut down.

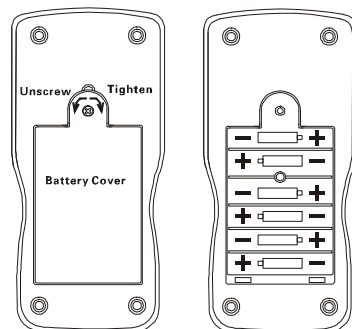
6.3. Use the cross screwdriver to loose a screw on the battery cover, open the battery cover.

6.4. Remove the old batteries and replace a new battery, please take note of the battery polarity.

6.5. Cover the battery cover, tighten the screws.

6.6. Press ON to switch on to check whether the battery is successfully replaced, repeat step 2 if it doesn't work.

6.7. Take out the batteries if the instrument will not be used for a long time.



## 7. Other Descriptions and Notes

7.1. The specificity of current clamp

The three current clamps of each instrument are specificity to use for this instrument, and cannot be changed to another instrument. The current clamp is strictly protected against collision. The clamp jaw must be kept clean and the test of complete closure is reliable.

7.2. The maintenance of current clamp

After finish the test of current clamps, the dust of the clamp mouth plane should be removed in time. It cannot clean the clamp mouth plane with rough materials or corrosion aid. It is better to wipe it gently with soft cloth and lubrication aid (such as wd-40 lubrication aid).It must also be cleaned and reused before testing.

7.3. This instrument is used for secondary circuit and low-voltage circuit detection. It cannot be used to measure the current in high-voltage circuit to prevent electric shock.

7.4. Three-phase four-wire system (Phase of three phase load balance) :

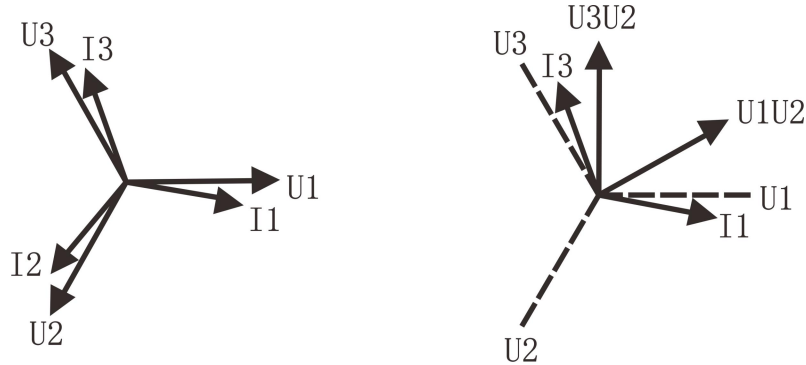
Phase Relationship	Phase Value	Phase Relationship	Phase Value
Ua-Ub	120°	Ia-Ib	120°
Ub-Uc	120°	Ib-Ic	120°
Uc-Ua	120°	Ic-Ia	120°

7.5. Three-phase three-wire (Phase of three phase load balance) :

Phase	Phase Value	Phase	Phase
-------	-------------	-------	-------

Relationship		Relationship	Value
$U_{ab}-U_{cb}$	$300^\circ$	$I_c-I_a$	$120^\circ$
$U_{ab}-I_a$	$30^\circ$	$U_{cb}-I_c$	$330^\circ$

7.6. Three-phase four-wire vector diagram and Three-phase three-wire vector diagram :



Three-phase four-wire vector diagram

Three-phase three-wire vector diagram

	<b>If the direction of current clamp or current line is reversed there's a phase value difference of <math>180^\circ</math>, viz. adding <math>180^\circ</math> to the standard value.</b>
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## 8. Accessories

Host	1 PCS
Meter Box	1 PCS
Current Clamp	3 PCS
Test Wire	4 PCS
Data Cable	1 PCS
Manual , Warranty card and quality certificate	1 SET



**The company is not responsible for other losses caused by use.**

**The contents of this user manual cannot be used as a reason to use the product for special purposes.**