



Product Name	GAOTek Wireless High Voltage Phase Sequence Tester
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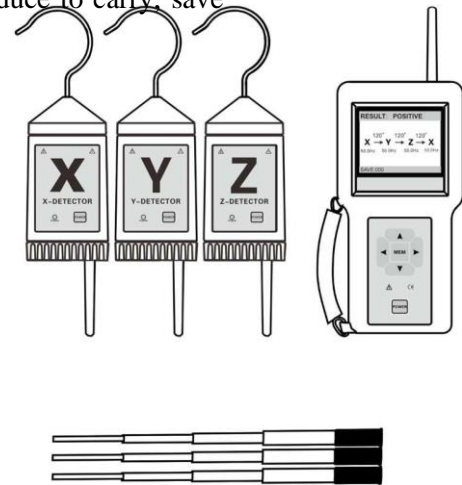
1- PRECAUTIONS FOR USE:

In order to better use the product, please be sure to read the instruction manual in detail. The operator must fully understand the manual instructions and be able to operate the instrument proficiently before field testing and comply with safety regulations and cautions listed in manual.

- ◆ In any case, shall pay special attention on safety when using the detector, especially in high voltage phase detection.
- ◆ Pay attention to the text labeled on the panel and backplane of the detector.
- ◆ If the measured line voltage exceed 400V, must be connected with the insulation rod to use, and hold the insulation sheath end of the insulation rod.
- ◆ When the line voltage exceed 110KV, must be phase detecting with non-contact method.
- ◆ The insulation rod should be made the withstand voltage test when use the detector first time, and qualified insulation rods must be used.
- ◆ Because of the high voltage line circuit is very dangerous, the operator must pass strict training and obtain the national high voltage operation certification before using the instrument to field test.
- ◆ Do not place and store the tester in high temperature and humidity or dewy places and under direct sunlight for a long time.
- ◆ It is recommended that the detector should be tested for dielectric strength at least once one year.
- ◆ Please prohibit use if the detector, insulation rod and other parts are damaged.
- ◆ Replace the battery, please pay attention to the battery polarity. If will not use the tester for a long time, please take out batteries.
- ◆ Use, disassembly, calibration, and repair of this tester must be performed 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 tester and instruction manual with the danger mark "  ", users must follow instruction to operate safely.
- ◆ The tester manual with the extremely dangerous mark "  ", users must in strict follow instructions to operate safely.

2- INTRODUCTION:





GAOTek Wireless High Voltage Phase Sequence Tester is well-designed and manufactured for phase detecting of high voltage line and high voltage switchgear (centrally installed switchgear, ring main unit, etc.), the instrument breakthrough voltage level limit problem of traditional phase detector, which can be phase detected in very low voltage lines, fully realized automatically phase detection from 10V~500KV voltage, do not need to purchase multiple phase detector based on voltage grade, save cost, reduce to carry, save time and quick. This detector not only has the phase sequence detecting function, but also has the functions of testing phase, frequency, phase, frequency and so on, as well as with electricity testing and line circuit voltage display function. When the line voltage exceeds 110kV, must use the non-contact method to phase detecting. When phase detecting, the metal probe hook of the detector gradually close to the wire, the electric field signal is sensed and the phase detecting can be completed, it don't need to direct contact with the high-voltage wire, which is safe and fast.



GAOTek Wireless High Voltage Phase Sequence Tester is composed of host, detector, telescopic insulation rod, monitoring software, USB communication cable, etc. The host adopts 3.5-inch real color LCD screen, which can display phase, frequency, phase sequence and phase detecting results on the same screen; Vector diagram indication, phase indication, clear and intuitive; With "X signal normal, Y signal normal, same phase, out phase" and other voice prompt functions, make the test is more simple and easy.

The monitoring software has the functions of online real-time monitoring, historical data query, vector graph indication and phase indication. With historical data reading, accessing, saving, printing and other functions.

3- ELECTRICAL SYMBOL:

	<p>Extremely dangerous! The operators must keep to the safety rules strictly, otherwise, electric shock will result in death or injury.</p>
	<p>Dangerous! The operators must keep to the safety rules strictly, otherwise, electric shock will result in will result in death or injury.</p>
	<p>Warning! The operators must keep to the safety rules strictly, otherwise, personal injury or equipment damage will occur.</p>
	<p>Double insulation.</p>



~	Alternating current (AC).
— — —	Direct current (DC).

4- SAFETY ATTENTION:

The phase detect operation shall be carried out in accordance with the relevant requirements of the live operation in [state grid corporation of China's power safety work regulations] and shall be carried out in fine weather. During phase detecting operation, the operator shall wear insulation gloves. The safety distance between the person and the live object and the effective insulation length of the insulation rod shall be required. See the sheet as below:

4.1 The safety distance between the person and the live object:

Voltage Grade	10kV	35kV	66kV	110kV	220kV	330kV	500kV
Safety Distance	0.4m	0.6m	0.7m	1.0m	1.8m	2.2m	3.4m

4.2 The minimum effective insulation length of the insulation rod in live working:

Voltage Grade	10kV	35kV	66kV	110kV	220kV	330kV	500kV
Min. effective insulation length	0.7m	0.9m	1.0m	1.3m	2.1m	3.1m	4.0m



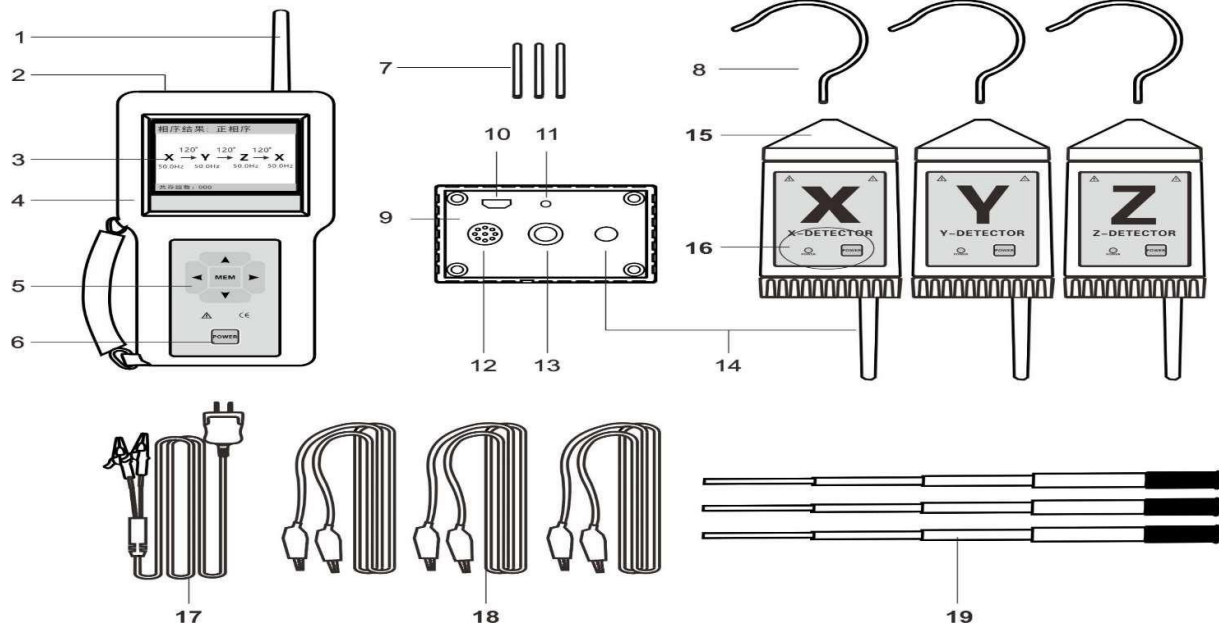
5- TECHNICAL SPECIFICATIONS:

Functions	High voltage line and high voltage switchgear (metalclad withdraw switchgear, ring main unit, etc.) phase sequence detection, phase detection, frequency, phase testing and electricity testing.
Power Supply	Host: 3.7V 2600mAh, rechargeable lithium battery Detector: 3.7V 1000mAh, rechargeable lithium battery
Phase Detection Mode	Contact type phase detection: $\leq 110\text{kV}$ line circuit. Non-contact type phase detection: $\geq 10\text{kV}$ and $\leq 110\text{kV}$, it can phase detecting on the insulation skin of the cable; when the line voltage $> 110\text{kV}$, it must use non-contact type phase detection
Phase Detecting Voltage	AC 10V~500KV
Transmission Distance	200m
Communication Distance	130m(the communication distance between host and detector)



Phase Qualitative	In phase: $-20^{\circ}\sim 20^{\circ}$ Out phase: $100^{\circ}\sim 140^{\circ}$ and $220^{\circ}\sim 260^{\circ}$
Range	Test phase: $0.0^{\circ}\sim 360.0^{\circ}$
	Test frequency: $45.0\text{Hz}\sim 65.0\text{Hz}$
Accuracy	Phase: $\leq \pm 8^{\circ}$
	Frequency: $\leq \pm 2\text{Hz}$
Resolution	Phase: 1° ; Frequency: 0.1Hz
Transmitting Frequency	433MHz
LCD Size	3.5 inch colorful screen; display area: $71\text{mm}\times 53\text{mm}$
Phase Indication	Vector diagrams and figures are displayed simultaneously
Power Indication	The detector equip with green power indicator
Electricity Testing Indication	“Du--Du-Du” buzzer sound
Voltage Display Range	$0.4\text{kV}\sim 110\text{kV}$
Display Speed Rate	2 times/second
Data Store	200 groups(power down or replace battery will not lose data)
Automatic Shut Down	15 minutes after power up, the meter will shut down automatically without any operation
Battery Voltage	The host battery shows 4 cells of power, when only 1 or 0 grip, please charge; When the indicator light of the detector flashes quickly, it indicates that the battery voltage is low, please charge it.
Rated Current	Detector: 30mA Max ; Host: 150mA Max
Instrument Weight	Total weight about: 8kg (include accessories)
Instrument Size	Host: $195\text{mm}\times 100\text{mm}\times 45\text{mm}$; Detector: $130\text{mm}\times 65\text{mm}\times 45\text{mm}$
Insulation Rod Length	Contraction state: 1000mm ; Stretched state: 4300mm .
Insulation Test	The insulation rod stretched to both ends: $\text{AC } 220\text{ kV / rms}$ Host, detector: $\text{AC } 3700\text{V / rms}$ (between exposed metal and plastic shell)
External Interference	No extremely strong electromagnetic fields, No 433MHz same-frequency signal interference
Working Temperature	$-10^{\circ}\text{C}\sim 40^{\circ}\text{C}$; Below $80\%\text{rh}$
Storage Temperature	$-10^{\circ}\text{C}\sim 60^{\circ}\text{C}$; Below $70\%\text{rh}$
Protection Level	IP63
Suitable Safety Standard	GB13398—92、GB311.1—311.6—8、3DL408—91, 《General technical requirements for portable nuclear power apparatus for use in $1\text{kV} \sim 35\text{kV}$ portable power plants DL/T971-2005》 IEC61481—A2; 2004;IEC 61243—1 ed.2:2003

6- INSTRUMENT STRUCTURE:



1. Host antenna

3. Colorful LCD

5. Host button area

7. Detector probe (3PCS)

9. Detector pedestal

11. Detector charge indicator

13. Insulation rod connection interface

15. Detector

17. Self-calibration line

19. Stretch insulation rod

2. Host USB /Charge port

4. Host

6. Host power key

8. Detector probe hook (3PCS)

10. Detector charge port

12. Detector buzzer

14. Detector antenna

16. Detector power key /indicator light

18. Alligator clip (for ring main unit)



7- OPERATION:

7.1. Host Power Up & Shut Down:

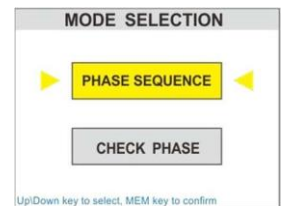
Press **POWER** key to start up, LCD display measurement interface, press **POWER** Key again to shut down. If the LCD display is continue dark and flash after start up, the battery voltage may be low, please replace the battery. The host start up after 15 minutes will automatic shutdown without any operation, to reduce the battery consumption.

7.2. Detector Start Up & Shut Down:

Press **POWER** key to start up, **POWER** indicator light on and the detector enter into test mode, press **POWER** key again to shut down, If the **POWER** indicator flash rapidly or darken after start up, the battery voltage may be low, please replace the battery. The detector start up after 15 minutes will automatic shutdown without any operation, to reduce the battery consumption.

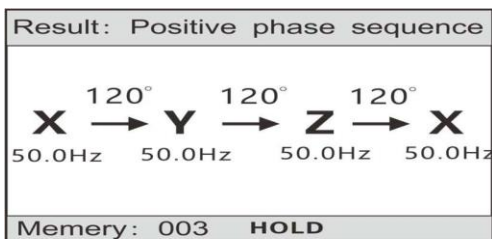
7.3. Test Mode Selection:

After the host start up, need to select the phase detection mode first, press the up or down arrow buttons to select, press **MEM** key confirm to enter. as shown below

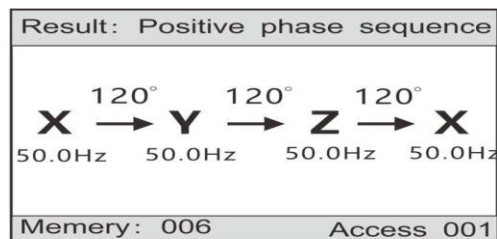


7.4. Data Hold:

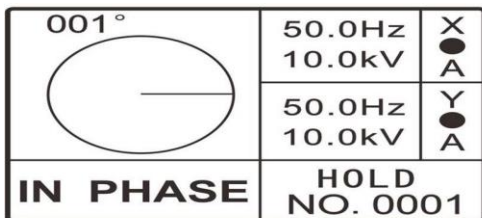
In test mode, press **←** key, can hold LCD indicate, and “HOLD” symbol display. Press **←** again to cancel data lock and return to test mode, “HOLD” symbol disappear.



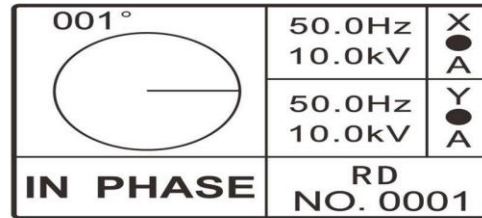
Data Hold
(Phase sequence detecting)



Data Access
(Phase sequence detecting)



Data Hold
(High voltage phase detecting)



Data Access
(High voltage phase detecting)



7.5. Date Store:

In test mode, when ◀ press key to hold data, the meter will auto number and store present hold data. The meter can store 200 groups of data, if the storage is full, will not storage again, must clear storage and then can storage the data.

7.6. Data Access:

In test mode, press MEM key enter into data access mode, “RD” symbol display, and auto display the 0001 group storage data, press ▲/▼ key move cursor to select “+1, -1”,press the key ◀▶ “+10,-10” step to browse, press MEM key exit reading mode, return to test mode

7.7. Data Delete:

In data access mode, press MEM key and hold, then press ▲ key to delete all stored data and return to test mode:

	Delete the data, cannot be recovered, please operate carefully.
	The delete operation is to delete the all stored data at once.

7.8. Data Upload:

The USB driver and the instrument upload software need to be installed before use. Log in to the official website to download the data upload software for the corresponding model. Connect the USB communication cable between the computer and the host, run the software, then can read the historical data stored in the instrument, upload to the computer and manage the data. The software can be installed on Windows XP, Win7, and Win10 systems (please install and run as an administrator under Win7, Win10 system), and has the functions of historical query, data storage, vector diagram indication, and phase indication; reading, query, saving and printing historical data and other functions.

7.9. Self-calibration:

Please make the self-calibration before on-site phase detecting to confirm the detector can work normally.

7.9.1. Phase sequence detection self-calibration:

Connect the two clips of the self-calibration cable to the X and Y detectors probes respectively, then insert the plug of the self-calibration cable into the AC 220V power socket, self-calibration on the same live line, and host receiver show the phase difference between X-Y is between 340° ~ 359° or 0° ~ 20°, mean the detector works normally; then connect the Y and Z detectors probes respectively, and perform self-calibration in the same way as above, and the phase difference between Y-Z is 340° ~359° or between 0° and 20° mean the detector works




Normally, if there is no electricity, may connect to neutral line, at this time reversed plug of the self-calibration line should work. (Note: self-calibration must strictly pay attention to safety, should wear insulating gloves to avoid the risk of electric shock!)

7.9.2. High voltage line circuit phase detection self-calibration:

Connect the two clips of the self-calibration cable to the probes of the two detectors respectively, and then insert the plug of the self-calibration cable into the AC 220V power socket, self-calibration on the same live wire, the host indicates the same phase, if there is no power, it may be connect with the zero line, plug the self-calibration line plug in reverse can be working. (Note: Self-calibration must strictly pay attention to safety, wear insulating gloves to avoid the danger of electric shock!)

7.10. Phase Sequence Detection, Phase Detection, Electricity, Frequency:

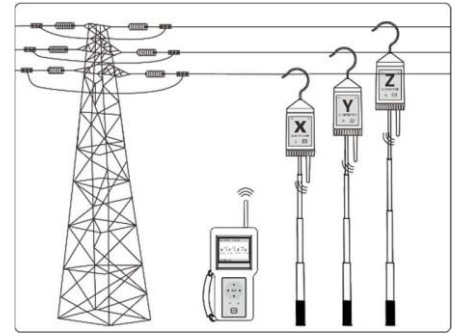
	Electricity, dangerous! Must be operated by trained and authorized personnel. The operator must strictly follow the safety rules, otherwise there would be danger of electric shock, causing personal injury or injury accident.
	Cannot be used to test the lines over voltage of 220KV. Otherwise there is a danger of electric shock, resulting in personal injury or equipment damage.
	High Voltage test, must connect the insulation rod and fully stretch, Hold the insulation sheath end of the insulation rod.
	The safety withstand voltage level of this insulation rod is 500kV Max. When the voltage exceed 110kV, must use non-contact phase detecting. Strictly prohibit direct contact with the bare wire above 110kV, otherwise there is a danger of electric shock, causing personal injury or equipment damage.
	For safety, use a metal probe for non-contact measurements

Connect the insulation rod and start up. If the communication between the host and the detector is normal, the corresponding indicator will light on, if the communication is not normal and the indicator will not light on. At the same time, the host machine will voice "X signal working", "Y signal working" and "Z signal working".

7.10.1. Phase sequence detection:

Move the X detector, Y detector and Z detector close and touch the phase line. When make the high voltage detecting, the detector does not need to contact the high-voltage wire directly, and the detector hook is gradually approached to the wire. When the electric field is sensed, the detector will have a "beep-beep-beep" sound and the indicator light will continue to flash, and the electrical testing is completed.

During the non-contact test, if the phase wires are relatively close to each other, the test should be carried out at a position far away from other wires. After the test is completed, the receiver host will display positive phase sequence or negative phase sequence.



Phase Sequence Detect Diagram

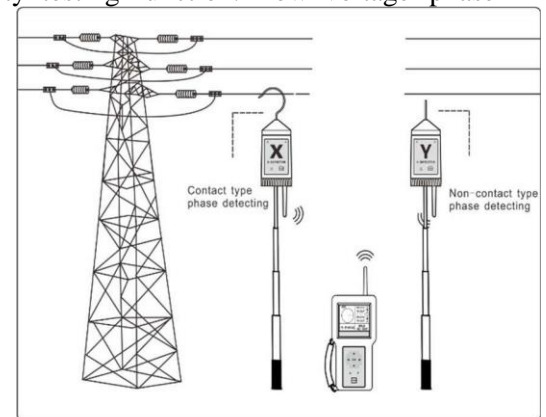
7.10.2 .Phase Detection:

When the phase detecting, the X detector is approached or touched any phase line first, and the Y detector is approached or touched other phase lines of detecting. In the case of high voltage phase detecting, the detector no need to directly contact with the high voltage wire. the detector gradually approach the probe hook to the conductor, and when the electric field is induced, the detector will give out a "bee-bee-beep" prompt sound and the indicator light will continuous flashing to complete the electricity testing function. Low voltage phase

detecting (400V and below), especially for low voltage phase detecting distribution box, please replace metal probe hook with metal probe. In the case of non-contact phase detecting, if the phase lines are relatively close to each other, should be select the position of far away from other wires for testing.

The phase detecting is based on X detector, which is fixed to display A phase. If the phase Angle difference between the two detectors is within the range of $-20^{\circ}\sim 20^{\circ}$ ($340^{\circ}\sim 360^{\circ}$ or $0^{\circ}\sim 20^{\circ}$), the detection result of Y detector is A phase, which is characterized as the same phase. If the

phase Angle difference between the two detectors is within the range of $100^{\circ}\sim 140^{\circ}$ or $220^{\circ}\sim 260^{\circ}$, which is characterized as out of phase. At the same time, the host voice prompts "IN PHASE" or "OUT PHASE".



Phase Detecting Diagram



8- HOST & DETECTOR BATTERY CHARGE:

	Pay attention to battery polarity, otherwise damage the meter.
	The battery is low, please charge in time

- 8.1. When the battery level indicator of the host is only 1 or 0 grid, please charge it. Plug one end of the USB mini cable into the charger, the other end into the charging port of the meter, and then plug the charger into the 220V power socket to charge. In addition, it can also be charged directly through the USB port of the computer.
- 8.2. When the battery voltage of the detector drops to 3.6V±0.1V, the power indicator flashes rapidly, indicating that the battery is low, please charge it.
- 8.3. If the instrument is not used for a long time, please charge the instrument every 1-2 months to avoid battery failure.

9- ACCESSORIES:

Host	1 PCS
Detector	3 PCS
Probe Hook, Probe	3 PCS Each
Self-checking Wire	1 PCS
Alligator Clip Line (use for ring main unit)	3PCS
USB Communication/Charge Cable	1 PCS
Charge adaptor	1PCS
Monitor software (CD)	1 COPY
Instrument bag	1 PCS
Stretch Insulation Rod	3 PCS
User Manual, Warranty card and quality certificate	1 SET