Defibrillation Test

Pulse Generator

User Manual

Model: KP-1050S

Table of Contents

(Right-click the TOC and select "Update Field" to refresh page numbers)

About This Manual

Thank you very much for purchasing the Defibrillation Test Pulse Generator KP-1050S.

This manual is intended for users who are using this instrument for the first time. It contains product introduction, parameter settings, operating methods, maintenance, and usage precautions.

To maximize the functionality of this equipment, please read and understand this manual carefully. If you encounter any operational questions or problems during use, please refer to this manual again for solutions.

After reading, please keep this manual properly for future reference. Additionally, when transporting or moving this equipment, please carry this manual together with the device.

If you find any binding errors, missing pages, or other issues with this manual, the company will provide free replacement service. If the manual is lost or damaged accidentally, the company can also provide a new manual for a fee. In any case, please contact the sales point where you purchased the product or contact our company directly.

If any part of this manual is unclear or not detailed enough, please contact our company, and we will resolve it for you as soon as possible.

Applicable Firmware Version

This manual applies to the Defibrillation Test Pulse Generator Model KP-1050S.

When consulting about this instrument, please provide:
- Firmware Version
- Serial Number
- Software Version

Product specifications and manual contents are subject to change without notice.

Safety Symbols

To ensure you can use this device safely and maintain it in a safe condition, the following symbols are used in this manual and on the product body. Please understand and familiarize yourself with the meaning of each symbol, and strictly follow all safety requirements.

	This area involves high voltage exceeding 1000V. Accidental contact may result in electric shock, leading to death or serious injury. When contact is necessary, please ensure operation in a safe environment.
	The caution icon is a visual warning symbol designed to alert users or observers to important information, potential risks, or operating guidelines.
	This symbol indicates that ignoring the sign and improper operation may lead to serious consequences including personal injury or even death. It is usually accompanied by a prominent warning icon.
	The prohibition icon is a visual symbol with clear warning function, used to inform people that certain behaviors or activities are explicitly prohibited.
	The ground terminal icon is typically used to indicate the grounding connection point in electrical equipment, which is crucial for ensuring safe operation of the equipment and personnel safety.
	The power plug icon connects electrical equipment to power outlets, used to transmit electrical energy from the grid to the equipment.
	The power ON icon typically indicates power on or that the device is in working condition.
	The power OFF icon typically indicates power off or that the device is in shutdown condition.

Terminology Used in This Manual:

- "Pulse Generator KP-1050S" is referred to as "Defibrillation Test Pulse Generator"
- The device under test is referred to as "EUT" (Equipment Under Test)
- The defibrillation test network box is referred to as "Network Box"
- The differential current probe is referred to as "Current Probe"
- The differential voltage probe is referred to as "Voltage Probe"

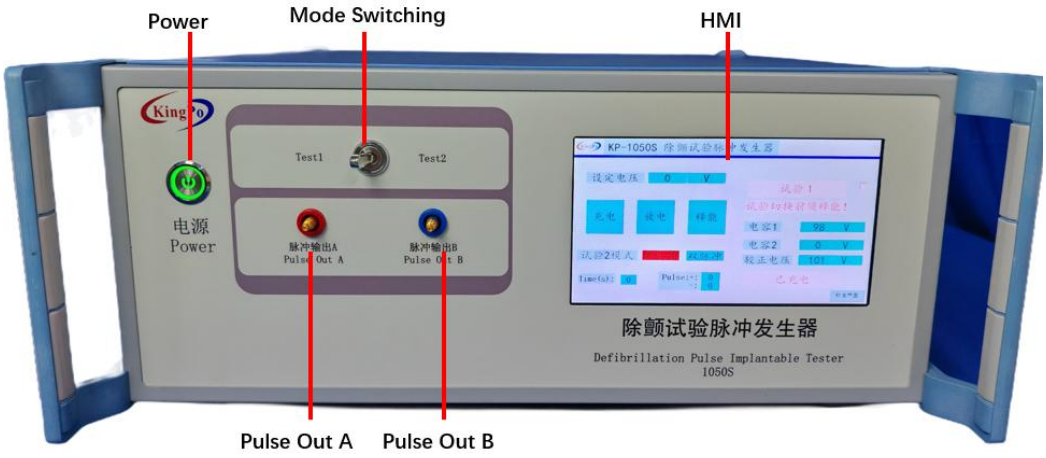
Technical Specifications

Applicable Standards	GB 16174.1-2024 20.2, ISO 14117:2012, ISO 14708-1:2003, EN 45502-1:2015, EN 45502-2-2:2008
Test 1 Voltage	140 V/380V (Tolerance: +5%/-0%)
Test 1 Circuit	RLC Circuit
Damped Sinusoidal Defibrillation Waveform	1.5ms < Tp < 2.5ms; 3ms < Tw50 < 5.5ms
Output Polarity	Positive and negative polarity output can be freely set
Test 1 Sequence	Send 3 positive voltage pulse sequences first (20+2s interval between each pulse), then after 60+2s interval, send one negative voltage pulse
Test 2 Voltage	140 V/270V (Tolerance: +5%/-0%)
Phase Switching	Single-phase/dual-phase can be freely set
Single/Dual-phase Truncated Exponential Defibrillation Waveform	9.5ms<Td<10.5ms; 1μs<tr<5μs; 1μs<tf<5μs
Test 2 Sequence	Send 3 positive single-phase voltage pulse sequences first (20+2s interval between each pulse), then after 60+2s interval, send one negative voltage pulse
Evaluation Criteria	Confirm compliance by verifying whether active implantable medical devices are not permanently affected after completing the full Test 1 and Test 2 procedures and whether they can be reprogrammed to restore settings
External Test Network	Test Network Box: KP-1050-1
Test Count	1 - 999 times
Input Power	AC 220/110V±10%, 50Hz/60Hz
Dimensions	480*460*200mm
Weight	Approx. 10 kg

1. Instrument Appearance Introduction

1.1 Front Panel

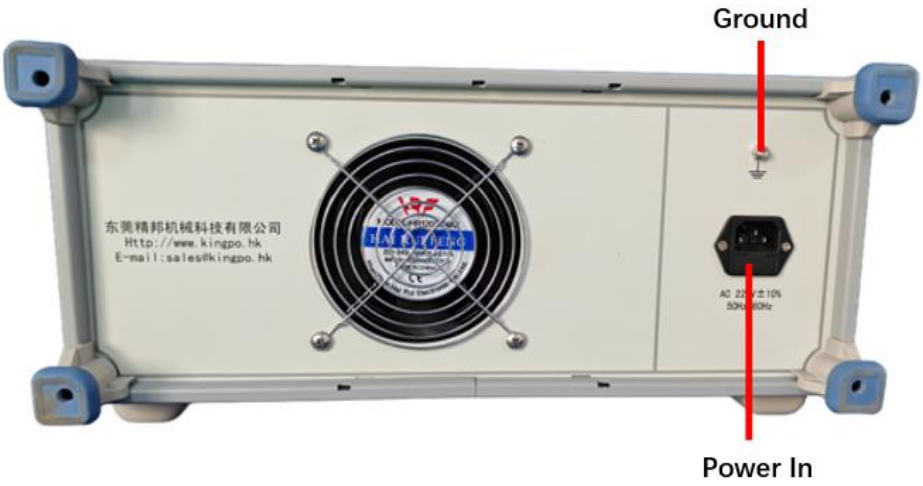
The front panel includes: Touch display, Power button, Test switch, Pulse voltage output ports (2)



No.	Name	Function
1	Power Button	Instrument power switch
2	Test Switch	Switches between Test 1 and Test 2
3	Touch Screen	Parameter setting, output setting, calibration functions, etc.
4	Positive Pulse Output Port	Positive pulse voltage output interface
5	Negative Pulse Output Port	Negative pulse voltage output interface

1.2 Rear Panel

The rear panel includes: Instrument power supply port, M5 ground port



No.	Name	Function
1	Instrument Power Port	220/110VAC±10%, frequency 50Hz or 60Hz, max power 300W
2	Ground Port	Instrument chassis ground port, M5

2. Accessories and Usage Instructions

2.1 Accessory Check

When you receive the product, please first check whether all accompanying items are complete, and check whether the product has any damage during transportation. If you find any damage or missing parts, please contact the sales point or our company in time. For future transportation needs, we recommend that you keep the original packaging materials of the product.

2.2 Power Connection

:This device is an IEC Safety Class I device (equipment with protective conductor terminal). To prevent electric shock, be sure to ground the device.

This device is grounded through the power cord grounding wire. Please be sure to plug the power cord into a properly grounded outlet.

2.2.1 Connecting Power to This Instrument

Steps:

1. Turn off the Power button;
2. Confirm that the connected AC power cord meets the input rated specifications of this device. The acceptable input voltage is 220/110VAC, frequency is 50Hz or 60Hz;
3. Connect the power cord to the AC jack (AC LINE) on the rear panel, and insert the power plug into a socket with grounding.

2.2.2 Disconnecting Power

Steps:

1. Reset the Power button to turn off the power;
2. Pull out the power cord from the rear panel to disconnect the power.

3. Basic Operations

3.1 Instrument Overview

The KP-1050S Pulse Generator is a test instrument designed to generate defibrillation test pulses, compatible with both Test 1 and Test 2. This instrument is designed and manufactured according to the requirements of GB 16174.1-2024 20.2, ISO 14117:2012, and ISO 14708-1:2003 standards. It evaluates whether active implantable medical devices are permanently affected when subjected to damped sinusoidal defibrillation waveforms and truncated exponential defibrillation waveforms, and whether they can be reprogrammed to restore settings, thereby assessing product safety and programmability.

The system mainly includes two types of test pulses: Damped Sinusoidal Defibrillation Waveform (Test 1) and Truncated Exponential Defibrillation Waveform (Test 2). The truncated exponential defibrillation waveform is further divided into single-phase truncated exponential defibrillation waveform and dual-phase truncated exponential defibrillation waveform.

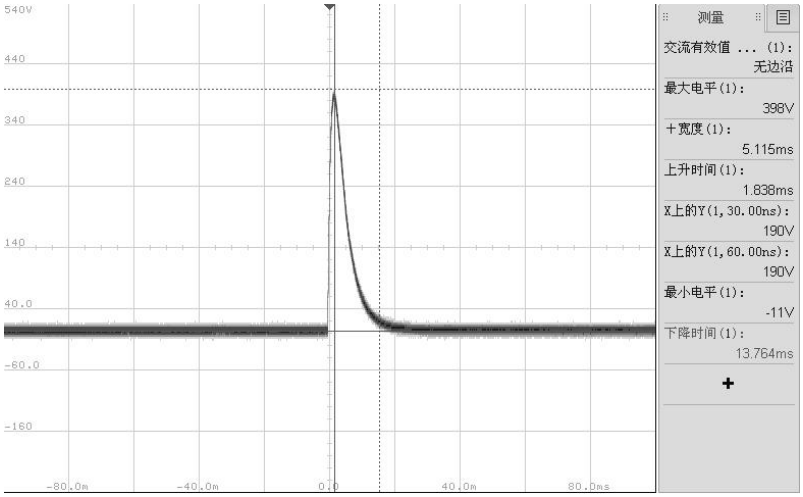


Figure 1. Damped sinus waveform

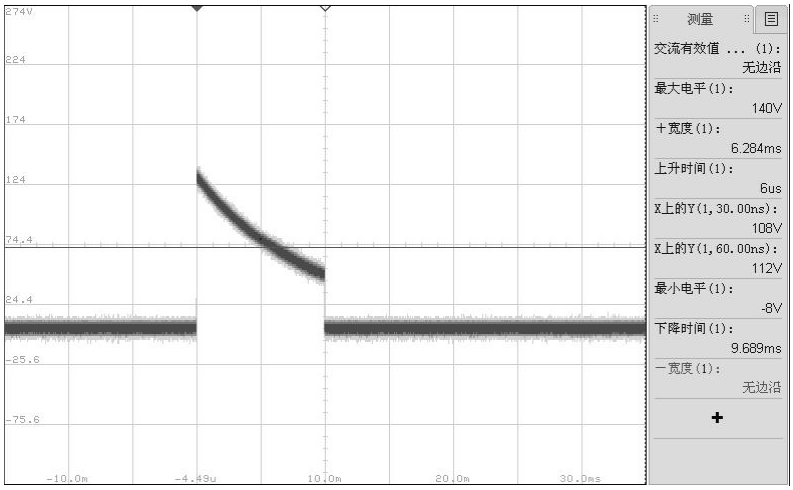


Figure 2. Monophasic waveform

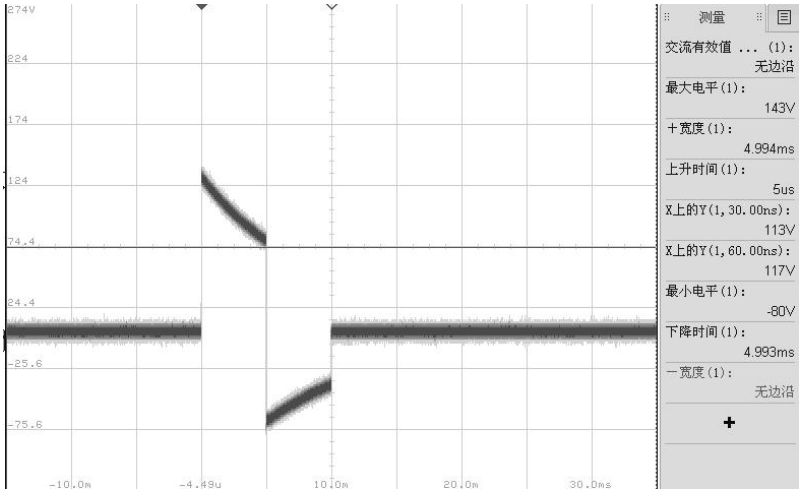


Figure 3. Biphasic waveform.

Resistor Network for the Pulse Generator KP-1050S-1

This test network box is designed to be used in conjunction with the KP-1050S defibrillation test pulse generator, complies with ISO 14117standards, and is compatible with Test1 and Test2 testing functions. The physical image, wiring diagram, and test circuit schematic of the network box are shown below:

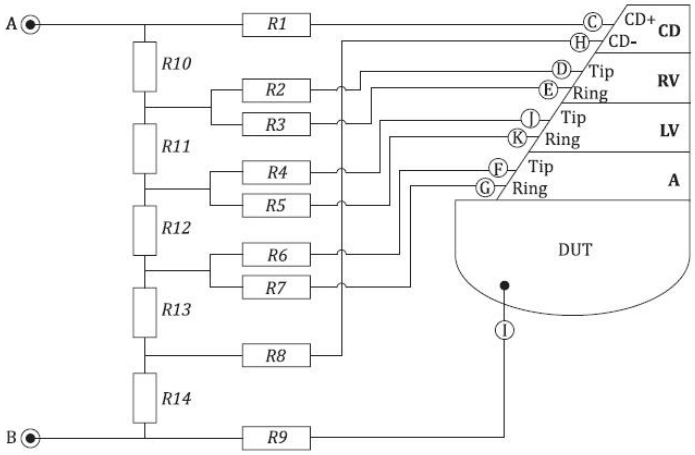


Figure 47 — Resistor network for Tests 1 and 2

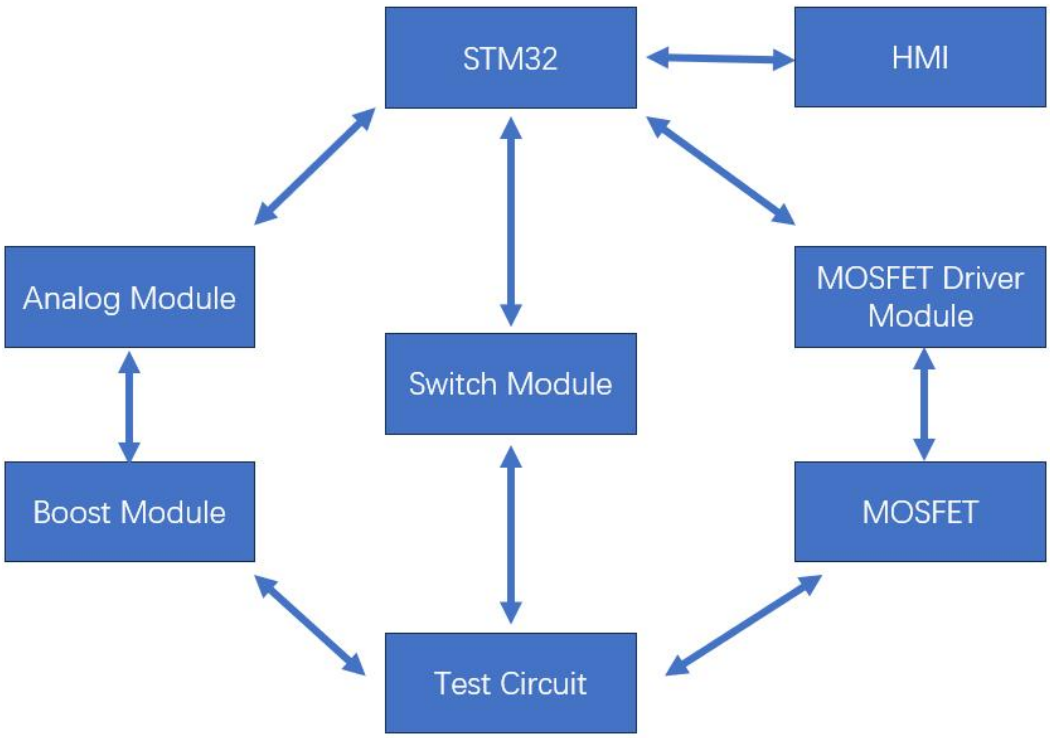
Table 13 — Resistor network parameters

Test	R1 Ω	R2 Ω	R3 Ω	R4 Ω	R5 Ω	R6 Ω	R7 Ω	R8 Ω	R9 Ω	R10 Ω	R11 Ω	R12 Ω	R13 Ω	R14 Ω
1	50	800	400	800	400	800	400	50	50	5	5	5	20	30
2	50	600	300	600	300	600	300	50	50	5	5	5	20	30
NOTE All resistors will be ±5 %; resistors R1 and R8 to R14 will be 25 W.														

Resistor network for ISO 14117

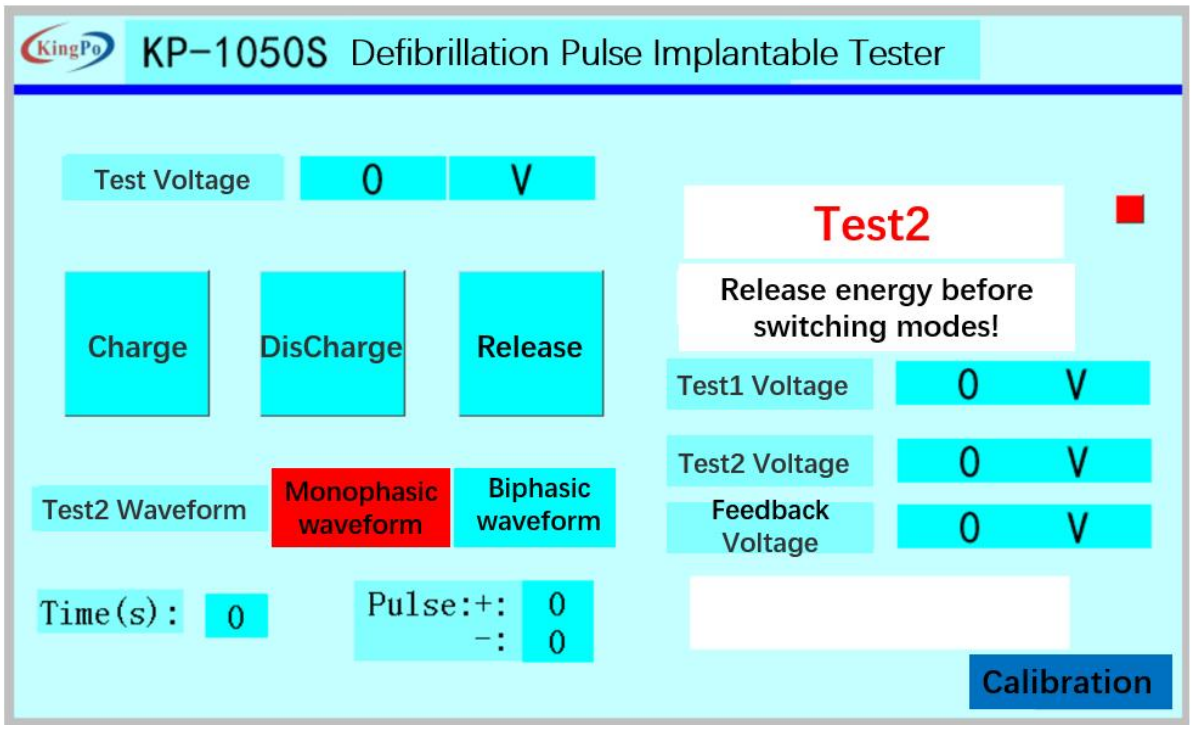
3.2 Control Schematic

The core of this module consists of an STM32 microcontroller, a set of analog inputs/outputs, a network switching module, and a semiconductor switch control module. The microcontroller serves as the control core, responsible for all module control functions, including: controlling the module for voltage regulation; completing timing and counting functions for charging and discharging; switching and controlling different test networks; controlling the closing and opening of the semiconductor switch module; communicating with the touch screen for data exchange to complete parameter display and settings.



3.3 Basic Operation Procedure

Press the Power button to enter the touch screen interface. The system automatically enters the test operation interface.



Operation Buttons on the Test Operation Interface:

- "Set Voltage": Set the voltage to be tested. Test 1 voltages are 140V and 380V; Test 2 voltages are 140V and 270V.
- "Charge": After setting the test voltage, click the charge button. The high-voltage power supply charges the energy storage capacitor.
- "Discharge": After charging is complete, click the discharge button. The energy storage capacitor discharges to the test network, generating the corresponding pulse voltage according to the fixed sequence.
- "Single Pulse": When the test switch is set to Test 2, selecting single pulse gives a single-phase truncated exponential defibrillation waveform.
- "Dual Pulse": When the test switch is set to Test 2, selecting dual pulse gives a dual-phase truncated exponential defibrillation waveform.
- "Calibration Interface": Enter the next interface for voltage calibration.

Display Contents on the Interface:

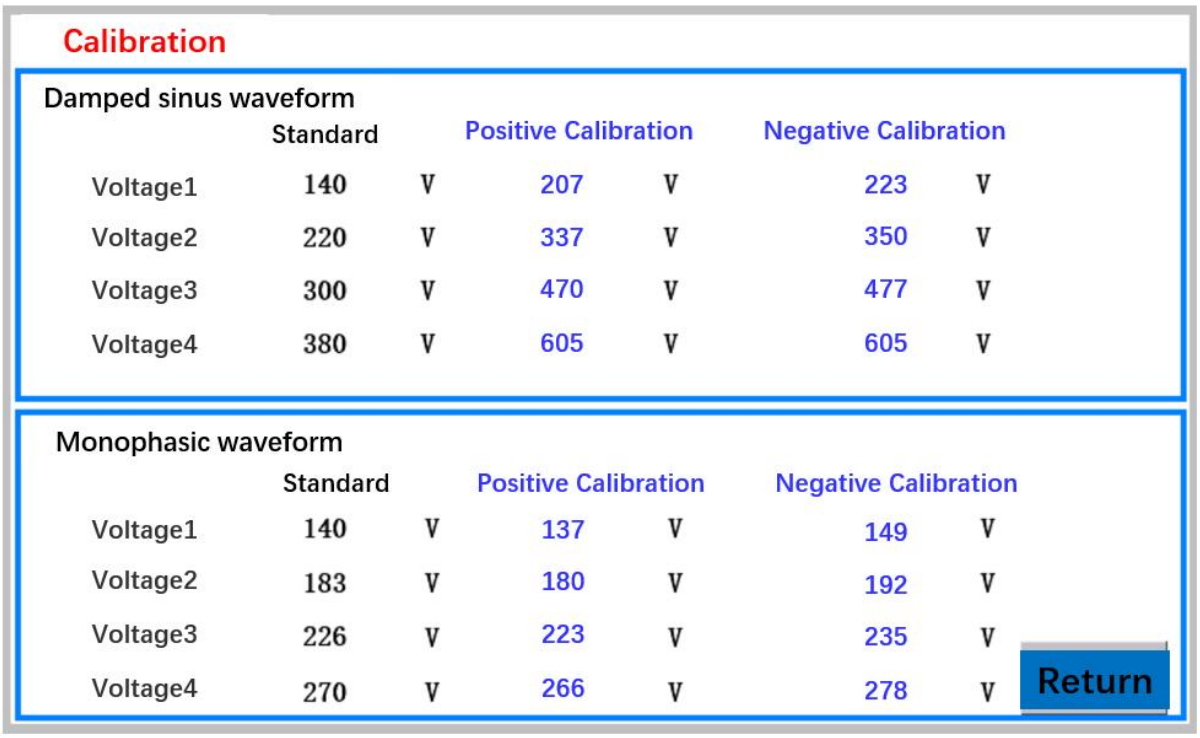
- "Current Test Type": Displayed at the top right of the interface. After switching the test pulse switch, the corresponding test type is displayed: Test 1 or Test 2.
- "Capacitor 1": Current voltage value of the energy storage capacitor for Test 1.
- "Capacitor 2": Current voltage value of the energy storage capacitor for Test 2.
- "Calibration Capacitor": Set energy storage capacitor voltage value for the current test pulse.
- "Time (s)": Timer displaying the test process.
- "Pulse + -": Display of sent positive and negative pulse counts during testing.
- "Current Status": Status display during the test process at the bottom right of the interface: Charging, Ready to Charge, Discharging, Discharge Complete, Energy Releasing.

4. Calibration

4.1 Voltage Calibration and Compensation

During instrument metrological calibration, compensation parameters can be set to meet accuracy requirements.

Click the "Calibration Interface" button to enter the test voltage calibration interface. Currently, voltage calibration functions for two test waveforms are set. Each test voltage waveform has four calibration voltages that can be set (currently, the meter calibration only calibrates 140V, 380V, and 270V voltages; the additional voltage settings are reserved functions and not subject to metrological requirements). Each voltage can be set with positive voltage calibration and negative voltage calibration.



Warranty Information

Dear Customer,

Thank you for purchasing and using our company's products! We will provide you with excellent after-sales service and strive to resolve your issues in a timely manner.

To protect your legal rights and eliminate your concerns, our company makes the following warranty commitments:

0. The product is guaranteed to be qualified upon opening. Within one week of purchase (based on invoice date) or with receipt, if serious quality problems are found, free replacement will be provided after confirmation by our technical department or authorized distributor.

- Please keep the manual properly for warranty service reference. Free warranty is provided within one year from the date of manufacture (excluding wearing parts). After one year, paid service is provided, with long-term technical support.

1. When the product fails, please record the fault phenomenon and parameters in detail, and fax (or call) to our service department. We will respond to you within 24 hours and confirm the follow-up service process.

Packing List

Category	Item Name	Qty	Unit	Remarks
Main Unit	Defibrillation Test Pulse Generator	1	Unit	
Accessories	Power Cord	1	Piece	
Accessories	High Voltage Cable	2	Piece	
Documentation	User Manual	1	Copy	
Documentation	Warranty Card	1	Copy	Attached in manual
Documentation	Packing List	1	Copy	Attached in manual

Note: This packing list lists the equipment and documentation that should be included in the package. It does not include optional components. If you have ordered additional optional components, please check them thoroughly at the time of purchase.

KP-1050S

Defibrillation Test Pulse Generator

Dongguan Jingbang Mechanical Technology Co., Ltd.