



**1J23000**

**DC fixture**

**Operating instructions**

**Version 1.0**

**22.01.2024**



## Safety precautions

The following general safety precautions must be observed during all phases of operation of this appliance. Failure to observe these precautions or specific WARNINGS elsewhere in this manual may impair the protection of the appliance. It also violates the safety standards used in the design, manufacture and intended use of the appliance.

Wayne Kerr accepts no liability for the customer's failure to comply with these requirements.

The person responsible must ensure that this device is only used in the manner specified. If it is not used in this way, the protection provided by the device may be impaired. This product is not intended for use in explosive, corrosive or harmful atmospheres. It is not suitable for use in safety-critical or medical applications. The appliance can be dangerous if it is not used in accordance with these instructions. Read them carefully and follow them in every respect.

If the device is connected to the high-voltage power supply unit, the internal terminals may be energised.

**WARNING: Opening the lid or covers, as well as removing parts (with the exception of those that can be accessed by hand) exposes live parts!**

**Capacitors inside the appliance may still be charged even if the appliance has been disconnected from all voltage sources.**

Any adjustment, maintenance or repair of the open energised appliance must be carried out by a qualified person who is aware of the risks involved.

Do not use the appliance if it is damaged. In such a case, stop working with this appliance immediately. It must be labelled as defective and secured against further use.

**Safety note: The 1J23000 must be earthed via the negative pole (black cable) of the high-voltage power supply unit.**

**Do NOT operate in potentially explosive atmospheres**

Do not operate the appliance in the vicinity of flammable gases or vapours. Operating an electrical appliance in such an environment represents a clear safety risk.

**Keep away from live circuits**

Operating personnel must not remove any appliance covers. The replacement of components and internal settings must be carried out by qualified maintenance personnel. Do not replace any components when the mains cable is connected. Under certain conditions, dangerous voltages may be present even when the mains cable is disconnected. To avoid injury, always switch off the power supply and discharge the circuits before touching them.

**Service or adjustment**

Maintenance or adjustment should only be carried out by Wayne Kerr service centres.

**DO NOT replace any parts or modify the appliance**

Do not install replacement parts or make unauthorised modifications to the appliance, as this may result in additional hazards. Send the appliance to a Wayne Kerr branch for maintenance and repair to ensure that the safety functions are maintained.

**Warnings of dangerous processes**

Warnings, such as the following example, are provided in this manual before potentially dangerous procedures. The instructions contained in the warnings must be followed.

**WARNING: Dangerous voltages are present on this appliance, which can lead to death. Be careful with the Handling, testing and adjusting this device extremely cautious.**

## Safety instructions

The following are general definitions of safety instructions used on the device or in the manual.

**WARNING!** This warning sign indicates a hazard. It draws attention to a handling, practice, condition or similar which, if not carried out or adhered to correctly, could result in personal injury or death.

**CAUTION:** This warning sign indicates a hazard. It draws attention to a handling, practice, condition or the like which, if not correctly performed or observed, may result in damage to or destruction of a part or the entire product

**NOTE:** A note indicates important information. It draws attention to a handling, practice, condition or similar that must be emphasised.

**Warranty:** Wayne Kerr fixtures and adapters are warranted for 90 days. Wayne Kerr will decide whether to repair or replace the product if a product proves to be defective during the warranty period. This warranty does not apply to defects resulting from improper use or maintenance by the purchaser.

## Introduction

This chapter contains complete information on the 1J23000 DC biasing device.

## Product description

The 1J23000 is a four-pole test adapter designed for use with four-pole LCR meters and impedance analysers.

It is specially designed for applications in which the device under test must be charged with a DC voltage if the measuring device is either not equipped with an internal DC voltage source or cannot output the required voltage. By connecting an external voltage source to the HV Input BNC connector on the rear, components can be charged with up to 3000V. The DC voltage across the device under test can be monitored via the two banana plug sockets on the rear of the device (HV monitoring output). The monitoring voltage output is output at a ratio of 10:1 to the applied HV voltage. A DMM with an internal resistance of 10M $\Omega$  must be used for impedance matching.

Due to internal resistors in the device, the voltage that can be measured at the DUT (HV monitoring output) is always slightly lower than the voltage set at the HV power supply unit!

Further information can be found under DC BIAS.



Figure 1-1 1J23000 Test fixture

**Switch and LED function:**

- 1) Power on/off
- 2) Power LED
- 3) Status LED
- 4) Activate/deactivate

## Specifications

### Specifications of the 1J23000

Function:	Test adapter for applications that require DC charging from an external DC voltage source.
Suitable Instruments	LCR meter and impedance analyser with four connections 41xx series, 43xx series, 65xx series, 54xx series Devices from the 32xx and 64xx series can only be used to a limited extent. The calibration of the DC adapter can only be carried out with Spot Trim>100Hz.
External DC bias voltage:	BNC socket H.V. Input max. 3000VDC
Input resistance:	96 k +/- 2 %
Divisor ratio: Remote output	10:1 optimised for DMM with 10M $\Omega$ Internal resistance
Frequency range:	50 Hz to 10 MHz (preliminary specification)
Series capacitor:	0.75 $\mu$ F
Dimensions:	265 (W) $\times$ 160 (H) $\times$ 220 (D) mm
Weight:	1500 g

**NOTE:** The signal level applied to the device under test is influenced by the series capacitor. In most cases, the applied signal level is not equal to the set value. The DC voltage applied to the DUT when using the remote output is lower than the high voltage applied to the BNC input socket. This is due to the internal resistance of the remote DMM and the internal resistance of the fixture.

## Compensation of the residual impedance error of the device

The 1J23000 has inherent stray capacitances that influence the accuracy of the measured values

Open and short calibration of the measuring bridge is required to compensate for or minimise this. HF calibration is also required if the measuring bridge supports this.

The procedure is described in the operating instructions for the device. Use the short-circuit plate supplied when carrying out short-circuit compensation.

## Operation

Below you will find step-by-step instructions on how to carry out a measurement with the 1J23000.



Figure 2 Connection sockets

### **WARNING!**

**The high-voltage source must be switched off!**

**The 1J23000 adapter may only be operated with a high-voltage power supply unit that has a positive high-voltage output. (If this is not observed, the voltage could be diverted to the housing and cause injury or even death).**

1. Connect the “LCR” BNC sockets of the 1J23000 directly to the BNC sockets of the measuring bridge using the BNC cable supplied.
2. Connect the enclosed power supply unit to the fixture. To do this, insert the 5mm hollow plug into the corresponding socket on the back of the adapter (see Fig. 2).
3. After this the plug-in power supply unit is connected to the mains voltage.
4. Connect the BNC plug of the supplied HV cable to the socket of the adapter.

5. Connect the white plug (H.V. positive voltage) at the other end of the cable to the positive output socket of the high-voltage device. The black plug on the lead with the blue cable is connected to the negative connection of the HV power supply unit.

**Optional:**

6. If necessary, connect a digital voltmeter to the black and red banana plug sockets to measure the voltage applied to the device under test. The divider ratio is 10:1 and the DMM should have an internal resistance of 10M $\Omega$ .

**WARNING!**     **Never switch on the high-voltage supply when the cover is open; the adapter would be severely damaged!**

**ATTENTION**     The device only supports DC high-voltage sources with a positive output voltage. Pay attention to the polarity of electrolytic capacitors. The positive pole on the fixture is the contacts on the right-hand side.

**NOTE**             When measuring capacitors with large values, allow sufficient time for the capacitor to charge up to the applied voltage.

**NOTE**             The HV voltage is applied to the output "HV monitoring Output" is displayed. This has no influence on the measurement results.

## Start the measuring process:

**Attention:** All measurements may only be carried out with the lid closed!

1. Connect the device as described above.
2. Press the black power switch on the front left. The left-hand LED flashes red, after a while it lights up continuously. The right-hand green LED is on or off, depending on whether the lid is open or closed.
3. Next, an open/short compensation must be carried out. To do this, it is necessary to close the cover first! Use the enclosed short-circuit plate for short compensation. If the measuring bridge offers HF compensation, this must also be carried out.

## IMPORTANT:

It is important to ensure that no DC compensation is carried out, as this will fail due to the internal wiring of the DC fixture. With some measuring bridges, only a spot trim is possible!

4. Open the lid, insert the DUT into the test adapter and close the lid.
5. Set the desired test voltage on the HV power supply unit. If a voltage ramp is to be used, it is necessary to programme this in steps with a sufficient delay before the measurement. Otherwise the measurement results of the measuring bridge will be falsified by recharging processes in the fixture!

**WARNING!** The test voltage must not exceed 3000V DC. Higher voltages will damage the fixture and the measuring bridge!

## 6. Start component test:

- a. Clamping the DUT
- b. Close the lid.
- c. Press the red start/stop button on the top right-hand side of the housing. The cover is locked! The start/stop button lights up red.
- d. Only now switch on the high voltage at the HV Switch on the power supply unit. The right-hand LED flashes red, indicating the charging process and the presence of high voltage at the DUT.

7. Switch off the HV voltage at the end of the test. Then press the Start/Stop button again to end the test, the button light goes out. The right LED on the front flashes green. This indicates that the DUT is discharging. Once the voltage at the DUT has dropped to a safe level, the LED will light up green continuously. The cover is automatically unlocked. The test procedure is complete and the DUT can be replaced.

**WARNING!** Before inserting or changing the test specimen, always ensure that the HV voltage is switched off!

**WARNING!** If the test sample is not discharged after a specified period of time, a warning message is issued by the device. There is a fault in the discharge electronics. The appliance must be taken out of operation.

### Note:

To carry out a measurement with the measuring bridge, it is not necessary to press button 4, “activate/deactivate fixture“. Only the cover needs to be closed. Only for measurements with high voltage it is necessary to press button 4, “activate/deactivate fixture“, in order to clear the paths for the high voltage and activate the fixture's safety device.

### **Status explanation of the LED display on the front of the adapter:**

1. After pressing the power switch, the left LED flashes red. After a short time, a short signal tone sounds and the LED lights up continuously. The appliance is now ready for operation.
  
2. a) The right-hand LED is off when the cover is open. It lights up green when the lid is closed.  
  
b) The right-hand LED flashes red when voltage is applied to the DUT. It flashes green during the discharging process. Once this is complete, it lights up green again continuously.

### **Warning:**

**There is a risk of touching conductive contacts when the cover is open!**

3. When inserting or changing a device under test, always ensure that the voltage output of the HV power supply unit is switched off. Only if it's off, the DUT may be changed. It is not possible to start the test procedure with the "Activate/ Deactivate" button when the cover is open.
  
4. If the cover is closed and the "Activate/ Deactivate" button is pressed, the cover is locked. The right-hand LED remains green. It only flashes red when the H.V voltage is switched on. It is expressly forbidden to override this protective mechanism. The operator's life may depend on it!
  
5. If the cover opens for any reason during the live test, the device recognises this and a permanent warning tone sounds. This can only be switched off if all voltages are disconnected from the adapter.

6. When the DUT is discharging, the right-hand LED flashes green.
7. Once the discharging process is complete, the right-hand LED lights up permanently green again (ready for the next test).
8. If the lid does not lock during operation, or if anything on the locking mechanism is damaged, the fixture must be taken out of service immediately and returned to Wayne Kerr for repair.
9. It is expressly pointed out that the operating licence expires if the appliance is damaged. The same applies if you attempt to repair the appliance yourself.

**Caution!** If capacitors with high values are measured, sufficient time must be allowed to charge the capacitor up to the applied voltage.

**Attention!** The HV test voltage applied to the DUT can be taken from the rear of the device via the banana plug sockets for testing purposes. The HV voltage is applied there at a ratio of 10:1. The input resistance of the DMM should be 10M $\Omega$ .

## DC-BIAS

The 1J23000 contains a  $0.75\mu\text{F}$  capacitor that is connected in series with the measurement object. Its function is to block the return flow of the applied DC voltage into the measuring device. Due to this connection, it is not possible to utilise the DC bias voltage of the measuring bridge.

The external HV DC voltage source used to charge the DUT should be capable of delivering at least 35mA at 3000V. The HV Input BNC input of the 1J23000 has a  $96\text{k}\Omega$  current limiting resistor in series with the device under test.

## Control of the fixture via USB:

- 1) The driver must be installed before connecting the device to the PC. This can be found on the USB stick in the Software/Driver folder. Drivers for Win XP to Win10 are included.

- 2) **RS232 communication settings**

Baud rate= 576000

Stop Bits= none

Parity= none

Data Bits= 8

The command is sent as a data string followed by a return character. This is particularly important as it signals the end of the command to the microcontroller. The microcontroller responds to each command sent with a data string followed by a return character, which signals the end of the communication.

### **D2XX.dll Communication settings (Preferred)**

Baud rate = 576000

Stop Bits= none

Parity = none

Data bits = 8

Direct communication takes place with this DLL. It is not necessary to determine the COM port. The device can be addressed directly via the serial number or the device name "WK 23000". It is also possible to control several similar devices with one PC via the serial number.

The command is sent as a data string followed by a return character. This is particularly important as it signals the end of the command to the microcontroller. The microcontroller responds to every command sent with a data string followed by a return character, which signals the end of the communication.

## Command list for PC control

Command	Description of the	Command string	Explanation	Return values
1	Starts or stops the electronics in the fixture. Equivalent to the red button on the top of the fixture. This is mandatory, otherwise the high voltage will not reach the DUT.	1,x	1 = Command x = 0, stops the Fixture x = 1, Starts the Fixture Start/Stop button on the fixture lights up.	0 = Fixture inactive 1 = Fixture active
2	Interrupt remote connection	2	No further arguments	0 = Command received
3	Status query fixture active/inactive	3	No further arguments	1 = Active 0 = Inactive
16	Device message output corresponds to IDN	16	No further arguments	3000V DC Fixture
18	MCU software reset	18	No further arguments	0 = Command received
20	Display firmware version no.	20	No further arguments	V 1.2024.01.09

If the return value is "54", the command sent has not been received correctly.  
Send command again!