For your reference:

Please note that this product is no longer available and is provided as a reference technical document.

TEST FIXTURE

ZM2394

INSTRUCTION MANUAL

NF Corporation

DA00030792-001

TEST FIXTURE

ZM2394

INSTRUCTION MANUAL

Preface

Thank you for purchasing “ZM2394 TEST FIXTURE”.
Please read, first of all, "Safety Precautions" to use the instrument in the correct and safe manner.

■ Notes on marks, symbols and terminology used in this Manual

The marks shown below are used in this Manual to indicate Warning and Caution instructions. Please carefully follow the instructions that are indicated by these marks, so that users or operators are safe in using the instrument and that the instrument will not be damaged during operation.

⚠ WARNING

Instructions are given to avoid such potential hazardous situations that instrument operators would be involved in a risk of facing death and/or personal injury due to an electric shock or other reasons.

⚠ CAUTION

Instructions are given to avoid possible instrument damages due to incorrect use/operation of the instrument.

- This Instruction Manual comprises the following Chapters. Please read the Manual from the very beginning, i.e., from Chapter 1, if you use this type of instrument for the first time.

1. Outline
   This chapter involves such information as overview, features, and applications of the instrument.
2. Preparation before Use
   Information is given in this chapter on what should be done by users and other people concerned before you use the instrument. The quick operation check is also described.
3. Operation Method
   This chapter describes the functions and operations of each part.

Please read this chapter while operating the instrument.

4. Specifications
   Instrument specifications are provided in regard to functions and performance.

—— Safety Precautions ——

For safe use, ensure to obey the following warnings and cautions. We are not responsible for damage resulting from failure to obey these warnings and cautions.

- Observe all the instructions of this Instruction Manual by all means.
  This instruction manual contains instructions for safe operation and use of this product.
  Before using the product, please read this manual first.
  All the warning items contained in this instruction manual are intended for preventing risks that may lead to serious accidents. Ensure to obey them.

- React promptly if you notice anything wrong with the instrument.
  Promptly stop operating the instrument by turning off the connected LCR meter, if any amount of smoke or strange smell or sound comes out from the instrument, for example.
  Immediately contact NF Corporation or your dealer, if you have a problem as described above. Keep the instrument unoperated and take measures so that no one could operate it until the instrument will have been repaired.

- Do not operate the instrument in the gaseous environment.
  Operation of the instrument in any gaseous environment could cause an explosion.

- Do not remove the housing (cover) from the instrument.
  No one except the service technicians certified by NF Corporation is allowed to check or touch the inside of this instrument. Do not touch the inside by yourself in any case. The internal circuit may have dangerous voltage when the instrument is connected with others (the LCR meter or samples).

- Do not modify the product.
  Never modify or try to modify the instrument. Your modification of the instrument could cause unexpected accidents or failures. NF Corporation has the right to refuse providing services for

any instruments modified by unauthorized persons.

- Marks and codes to indicate safety information and/or instructions:
  General definitions for marks and codes to indicate safety information and/or instructions in this manual as well as at the instrument itself are the following:

   Instructions Manual reference mark
  This notifies the user of potential hazards and indicates that he/she must refer to the instruction manual.

   Electric shock damage mark
  This mark is used at locations where one can receive an electric shock under certain conditions.

  ⚠ WARNING Warning mark
  Instructions are given to avoid such potential hazardous situations that instrument operators would be involved in a risk of facing death and/or personal injury (e.g., electric shock).

  ⚠ CAUTION Caution mark
  Instructions are given to avoid possible instrument damages due to incorrect use/operation of the instrument.

- Other marks and codes

   This mark indicates a connection with the instrument housing.

   This mark indicates a connection with an earth ground.

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1. Outline

1.1 Overview

"**ZM2394** TEST FIXTURE" is a test fixture used to measure various surface mount components that have electrodes on the side. It is connected with a sample by the 2-terminal connection and suitable for measuring the impedance of 50 Ω or higher.

1.2 Features

- Support of various sample shapes and sizes
  This instrument conforms to various surface mount components that have electrodes on the side, from JIS 0603M (EIA 0201, thickness 0.3 mm) to 14 mm square.

- Easy to make a proper connection with the LCR meter
  The four measurement terminals can be connected together to the LCR meter, which makes it easy to make a proper connection.

- Small additional errors
  This instrument can be connected directly to the measurement terminal of the LCR meter, which eliminates an additional error caused by an extension cable.
  Compared to tweezer test leads, this instrument has more stable stray capacitance and residual inductance, which enables more accurate open and short corrections.

1.3 Applications

- Measure the ceramic capacitor
- Measure the tantalum capacitor
- Measure the inductor
- Measure the resistor

2. Preparation before Use

2.1 Checking before use

■ Ensuring safety

To ensure the safety, refer to "Safety Precautions" described in the beginning of this instruction manual before using **ZM2394**.

■ Check upon unpacking

At first, check that there is no damage caused by an accident or other reason during transportation.
After unpacking, refer to "Table 2-1 Composition list" to check the contents.

Table 2-1 Composition list

ZM2394 Main unit	1
Accessories	
Instruction Manual	1

2.2 Installation

2.2.1 General precautions on installation

⚠ WARNING

To avoid electric shock, the following instructions must be obeyed.

- Before connecting **ZM2394** to the LCR meter, confirm that the protective grounding terminal of the LCR meter is connected to an earth ground.
  When **ZM2394** is connected to the LCR meter, the instrument housing of **ZM2394** is connected to the signal ground of the LCR meter.
- Do not remove the cover. The instrument is often charged with dangerous high voltage.
  No one except the trained service technicians who are thoroughly experienced in the hazard prevention is allowed to check or touch the inside of this instrument. Do not touch the inside by yourself in any case.

⚠ CAUTION

- Do not apply strong force on **ZM2394** while it is connected to the LCR meter. Strong force may damage the connecting connector.

■ Instrument housing cleaning

When you find the surface of the instrument housing to be dirty, wipe it with a soft cloth. When it is extremely dirty, wipe it using a cloth firmly wrung out of a neutral detergent. Never wipe using organic solvents as thinner or benzine or chemically treated towels, since the surface treatment might be altered and/or its painting might be damaged.

2.2.2 Installation conditions

Install **ZM2394** in a place that satisfies the following temperature and humidity conditions.

Operation	0 to +40°C, 5 to 85%RH
	Furthermore, AH 1 to 25 g/m^3, no condensation
Storage	-10 to +50°C, 5 to 95%RH
	Furthermore, AH 1 to 29 g/m^3, no condensation

⚠ CAUTION

Do not install the instrument at the following locations:

- Place exposed to direct sunlight, or place near a heat source.
- Environment with dust, salinity, or metallic powder.
- Environment with corrosive gas, moisture, or oil smoke.
- Place of frequent vibration.
- Place near an intense magnetic or electric field source.
- Place near a pulse noise source.

2.3 Transportation and re-packaging

When transporting **ZM2394**, please obey the following instructions to avoid the damage, or dropping or missing of parts during transport.

- Align the probe with the V groove to fix the sample stage. Tighten loosely the screws located on the both sides of the stage.
- Move the two probes together to the center and fix them. Tighten the fixing screw of the right probe. Fix the left knob to the stopper using an adhesive tape.
- Turn the connector lever to the center. Confirm that there is no unnecessary projecting parts.
- Enclose the instrument in a transparent bag.
- Wrap the instrument with enough buffer materials to protect it from shocks.
- Put the instrument in a box resistant to shocks during transport.

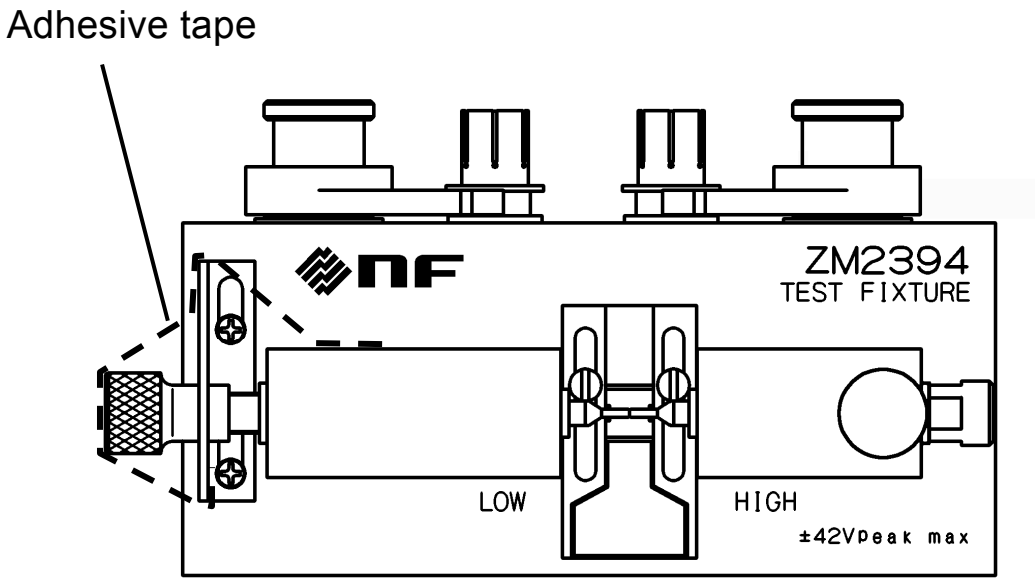


Figure 2-1 Packaging for Transportation

2.4 Quick operation check

1) Attach **ZM2394** to the LCR meter.
2) Set the LCR meter for a continuous measurement, for example, with the measurement signal level 1 V and the measurement frequency 1 kHz.
3) Keep a distance of approximately 1 mm between both probe tips, and check the stray capacitance (< about 1 pF). The value may be slightly larger due to the stray capacitance of the LCR meter.
4) Make the both probe tips contact each other, and check the residual impedance (< about 10 mΩ). The value may be slightly larger due to the contact resistance.
5) Measure a known sample (for example, a 1000 pF capacitor or 1 kΩ resistor), and confirm that the measurement is performed correctly.
   Note that the value of the sample capacitor or inductor itself varies greatly depending on the measurement conditions.
6) If you think something is wrong, check for:
   - Dirt at the tip of a probe
     For a dirty tip, clean it with an alcohol-saturated cotton swab.
   - Looseness of a probe
     If you find loose probes, turn them to the right to tighten.
   - Deformation or damage of a probe
     Damaged probes need to be replaced.
   - Disconnection
     If there is no conduction between the followings, repair is needed.
     Right probe (HIGH) - HCUR inner conductor
     Right probe (HIGH) - HPOT inner conductor
     Left probe (LOW) - LCUR inner conductor
     Left probe (LOW) - LPOT inner conductor
7) Check for loose screws of the instrument housing.
   When you find loose ones, tighten them. If there are loose screws, the measurement value may vary.

3. Operation Method

3.1 Component names and operations

This section describes the component names and operations of **ZM2394**.

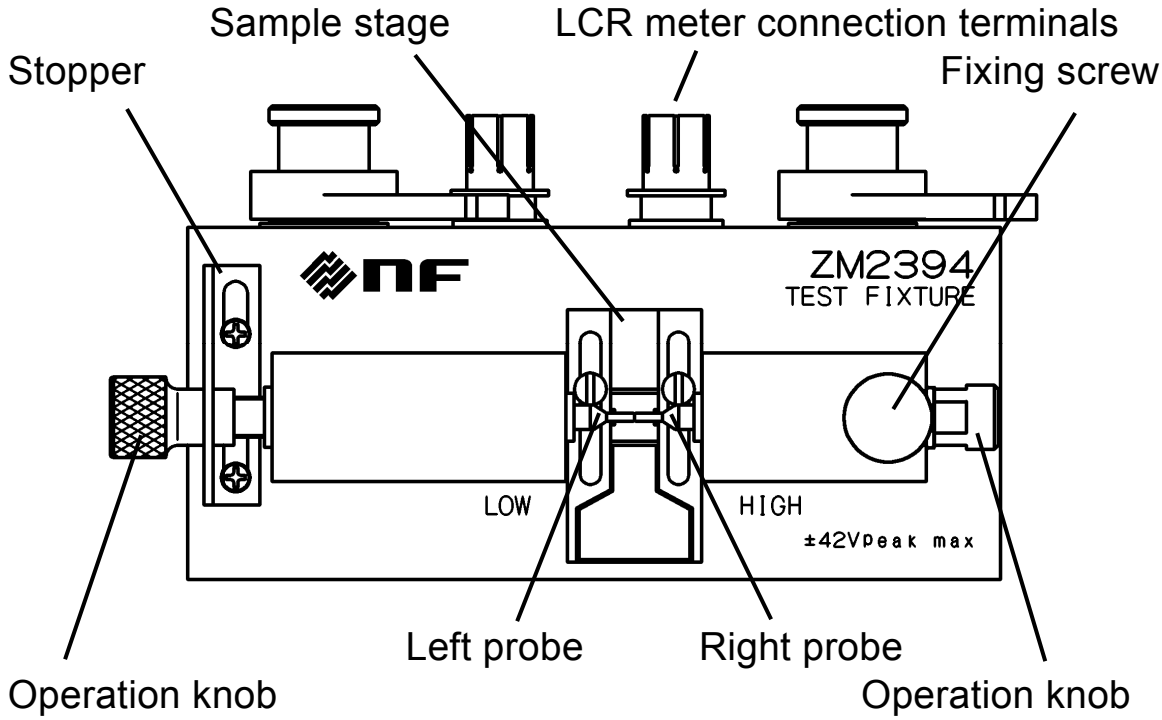


Figure 3-1 Component names and operations

- LCR meter connection terminals
  Terminals to connect to the measurement terminals of the LCR meter.

- Sample stage
  Plate on which the sample to be measured is placed. This plate can be moved back and forth to use the V groove (center), the plane stage (front), or the auxiliary stage (back) in accordance with the sample.

- Right probe/Operation knob/Fixing screw
  The right probe is a measurement electrode to be used at a fixed position in accordance with the sample. You can loosen the fixing screw and use the knob to adjust the probe position.

- Left probe/Operation knob/Stopper
  The left probe is a measurement electrode to be moved to grasp/release the sample. You can pull the knob to the left or turn it to the right to widen the probe interval. You can turn the

knob to fine adjust the probe interval in the open state. When the probe is adjusted to the right end position, you can pull the knob to the left end to move the stopper to the front and hold the left probe there.

3.2 Connecting with LCR meter

To connect the instrument to the LCR meter, perform the following steps. To disconnect it, perform these steps in the inverse order.

1) Turn the two levers to the left to align the protrusions and slits of the BNC connectors.
2) Fully insert the connectors.
3) Turn the two levers to the right to lock the connectors.

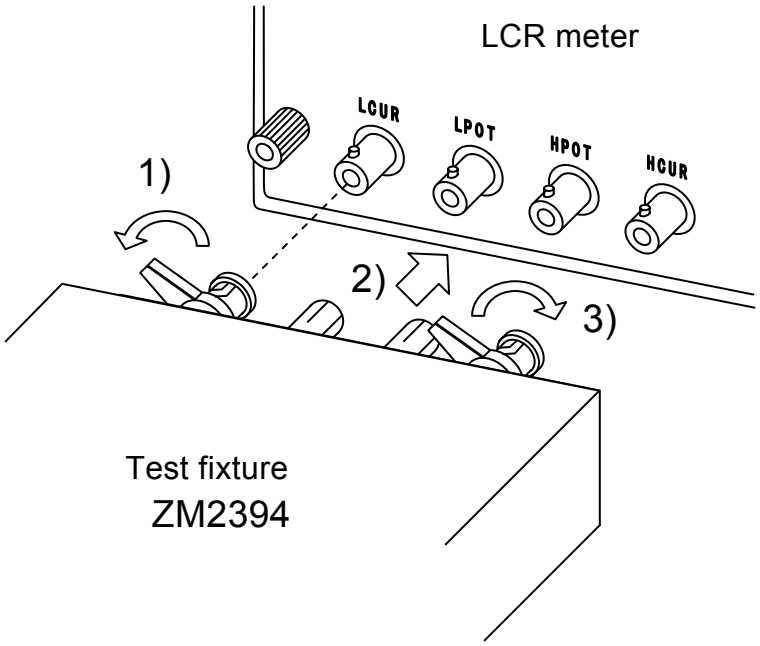


Figure 3-2 Connecting with LCR meter

Additional errors vary depending on the adapter, the extension cable, or the LCR meter model to use, and they can be corrected by the LCR meter. It is recommended to measure a known sample and confirm that there is no problem with operation and measurement accuracy.

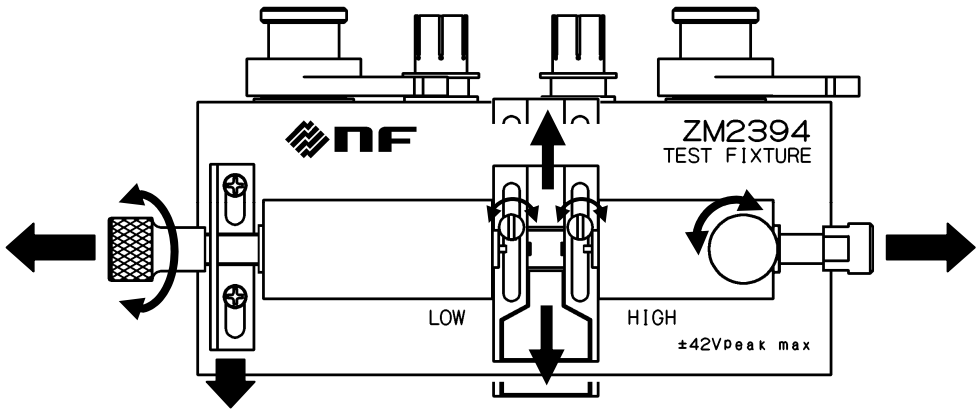
ZM2394 can also be attached to the **ZM2371/ZM2372** LCR meter via the **ZM2328** DC voltage bias adapter.

3.3 Connecting sample

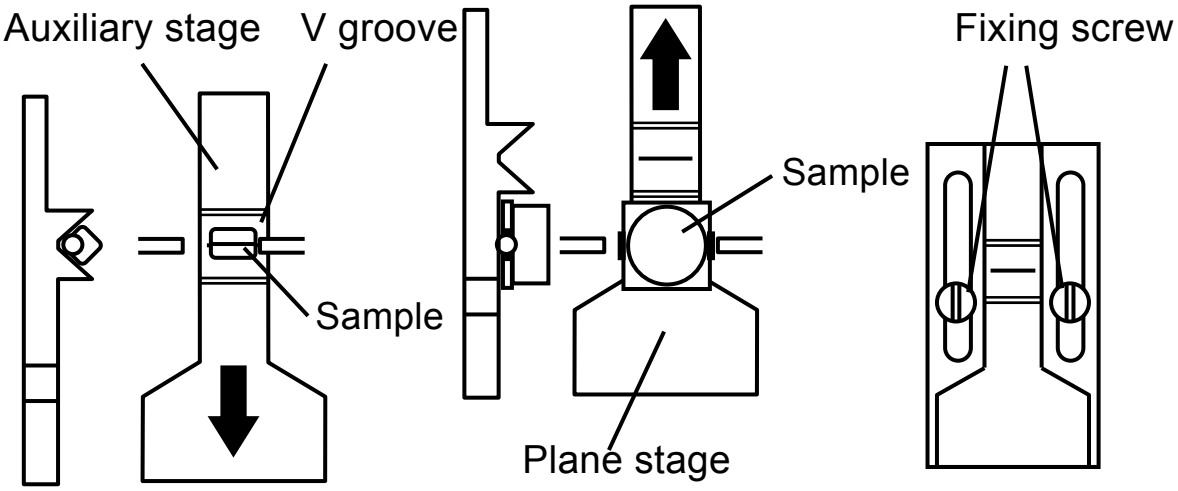
3.3.1 Adjusting sample stage

Operation procedure

1) Move the two probes apart and fix them.
2) Loosely tighten the stage fixing screws
   so as to need a little strong force to move the stage.
3) Move the stage to the appropriate position.
   Usually, use the V groove or the plane stage.
4) Fix the right probe at the appropriate position.
   The sample should be grasped in the center of the stage.



a) Components to operate



b) V groove c) Plane stage d) Fixing the stage

Figure 3-3 Adjusting sample stage

3.3.2 Sample suitable for V groove

It is recommended to use the V groove for a small sample whose entire sides are electrodes, such as a ceramic capacitor or resistor. The dimensions of suitable samples are as follows:

Minimum dimensions: JIS 0603M (EIA 0201), thickness 0.3 mm
Maximum dimensions: JIS 3225M (EIA 1210), thickness 2.5 mm

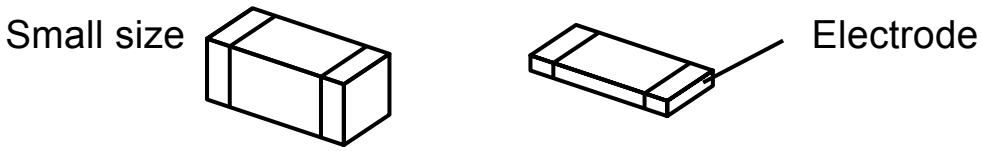


Figure 3-4 Sample suitable for V groove

Some samples may not be measured depending on their shapes, even when their sizes fall within the above range. A thin sample of 0.1 mm thickness will be trapped in the gap between a probe and the stage, and may damage the probe tip.

If the probes do not move smoothly, push them softly to make them touch with the sample.

3.3.3 Sample suitable for plane stage

It is recommended to use the plane stage for the following samples.

- Large size sample: JIS 4532M (EIA 1812) to 14 mm square
- Inductor or tantalum capacitor whose electrodes exist on the center of the bottom edge

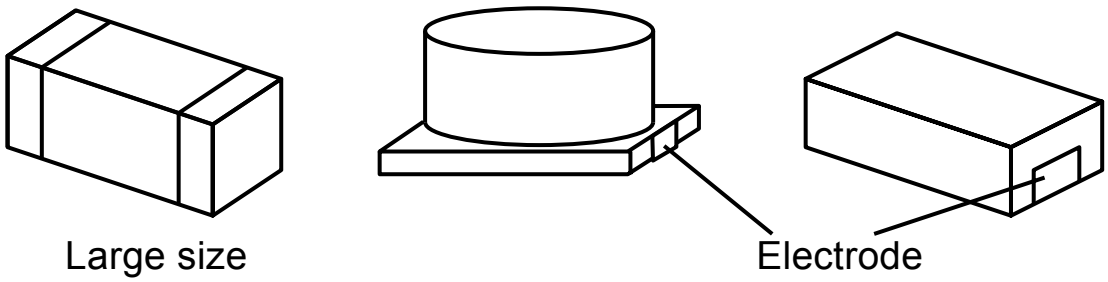


Figure 3-5 Sample suitable for plane stage

Some samples may not be measured depending on their shapes, even when their sizes fall within the above range.

3.3.4 Using vertical plane

If electrodes of the sample are recessed from the side surfaces, or if they are on the angle, place the sample upright on the vertical plane.

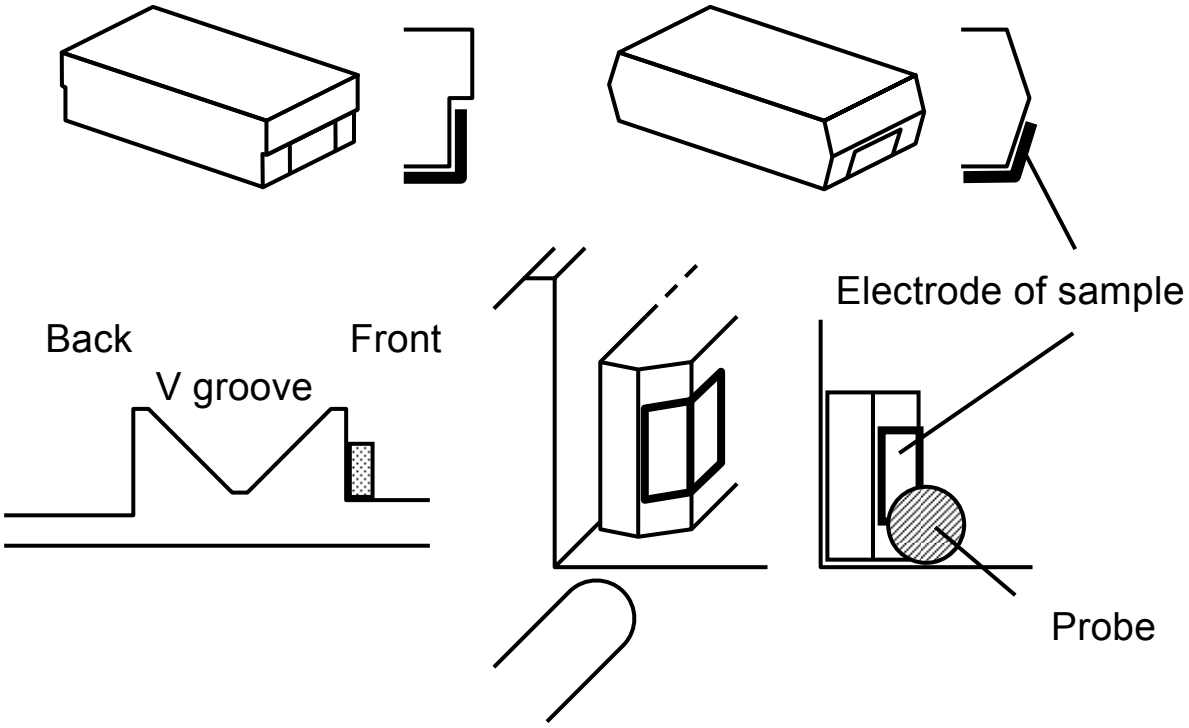


Figure 3-6 Measurement using vertical plane

3.3.5 Using Auxiliary Stage

The back auxiliary stage is slightly lower than the front plane stage. Some sample can be measured more easily by using the auxiliary stage. You can adjust the height by inserting sheets under the stage.

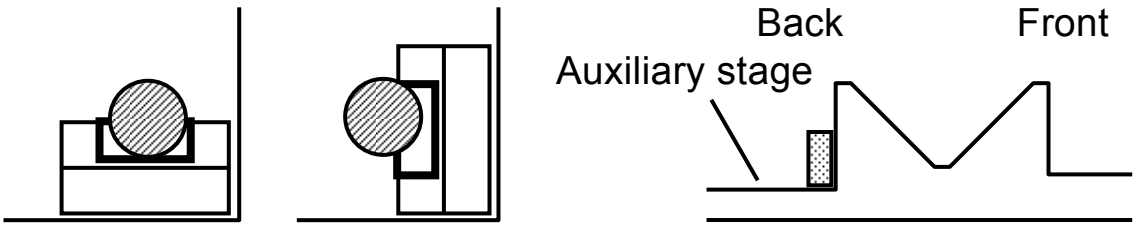


Figure 3-7 Measurement using auxiliary stage

It is recommended that the screws for fixing the sample stage is tightened loosely so as to need a little strong force to move the stage. This will eliminate the need to operate the screws each time you switch the stages. If you measure a great number of particular samples, or if you use the vertical plane, tighten the screws firmly to fix the stage.

When friction between the V groove and the probe offer resistance to probe's smooth motion, you need to adjust a position or an angle of the sample stage. If the probe does not move smoothly, the contact resistance may be increased.

⚠ WARNING

To avoid electric shock or instrument damage, the following instructions must be obeyed.

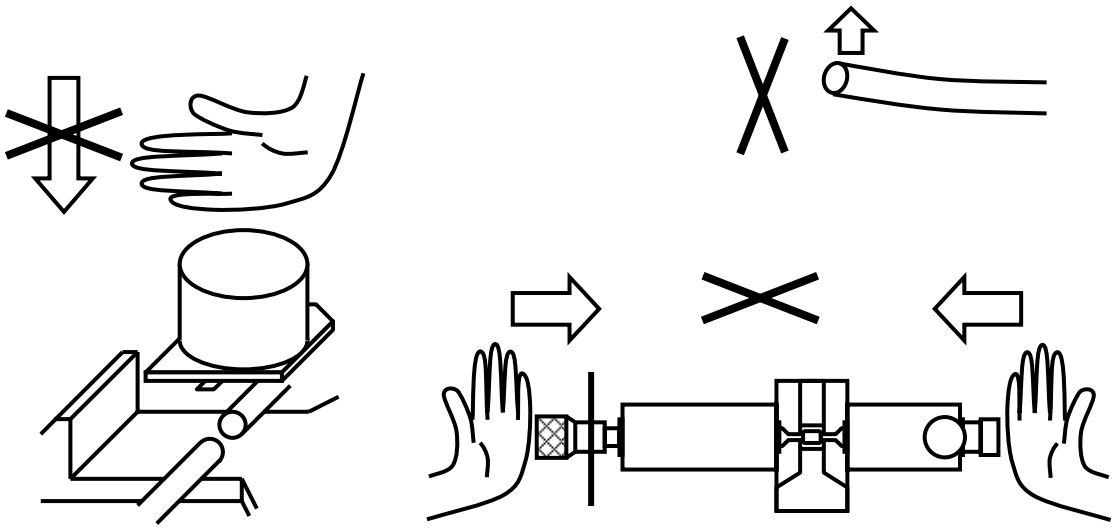
- Set the measurement signal level of the LCR meter and the bias voltage so that the voltage of the measurement terminal does not exceed the range of ±42 V (peak value).
- When you perform the measurement by flowing the DC bias current through the inductor, set the bias current back to zero before disconnecting the inductor. Otherwise, a high voltage is generated, which may cause electric shocks or damage the probes by discharge.

⚠ CAUTION

- Do not tighten the screws for fixing the sample stage too firmly.
  If you do so, the stage or screws may be damaged.
  You can use a commercial flathead precision screwdriver of 2 to 3.5 mm size to operate the screws.
- Do not tighten the screws for fixing the right probe too firmly.
  If you do so, the right probe may wear rapidly or be damaged.

⚠ CAUTION

- Discharge a charged capacitor before connecting it. Otherwise, high-energy discharge may damage the probes and the LCR meter.
- Do not release your hand from the knob while pulling the left probe fully.
  If the left probe collides with the sample or right probe, it may damage the sample or probes. To grasp a sample that is low in strength, turn the left knob to move the probe slowly.
- Do not apply a strong force to the probes.
  The probes may be deformed or broken.
- Do not push the probes by an excess force even when the contact is loose. If you do so, the sample and probes may be damaged.



<To Get Good Contact>

- Cleaning the probes
  If probe tips are dirty, clean them with alcohol-saturated cotton swabs or soft brush.

- Cleaning the sample electrodes
  If electrodes of the sample is oxidized or stained, clean them with fine abrasive paper. If not so much oxidized or stained, you can substitute a piece of writing paper.

- Inspecting and repairing the probes
  If you find loose probes, turn them to the right to tighten.
  If deformation or damage of a probe tip disables the measurement, the probe needs to be replaced.

⚠ CAUTION

- Do not tighten the probes too firmly. If you do so, the probes and surroundings may be damaged.
  A commercial 3.2 mm spanner will fit the H-shaped cut (⬡) of the probes.

- Repairing the sample stage
  If wear or deformation of the stage makes the measurement difficult, it needs to be replaced.

3.4 Operation of the LCR meter

3.4.1 Cable length correction

If your LCR meter has the cable length correction function, set the cable length correction to 0 m. The equivalent cable length of **ZM2394** is 0.1 m or less (value for information obtained from the capacitance between signal and ground).

3.4.2 Open correction

To measure the open correction value,

1) Set the both probe tips apart by the same distance as the electrode interval of the sample, and fix the probes.
2) Perform the open correction by the LCR meter.

You can turn the left knob to fine adjust the probe interval. The stray capacitance varies depending on the probe interval. To avoid variation of the stray capacitance, do not get your hand close to the instrument during the measurement.
Loose screws of the instrument housing may lead variation of the measurement value. When you find loose ones, tighten them.

3.4.3 Short correction

To measure the short correction value,

1) Ensure to have the both probe tips touch each other. Alternatively, have them grasp a reference metal chip.
2) Perform the short correction by the LCR meter.

ZM2394 is affected by the contact resistance. Check that the contact is stable before performing the correction.
Loose LCR meter connection terminals may lead variation of the measurement value or disable the measurement. When you find loose ones, repair them.

3.4.4 Load correction

If you perform the measurement at high frequency, the measurement error may slightly increase due to the equivalent cable length of **ZM2394**.
When any error cannot be ignored, you can use the load correction function of the LCR meter to match accurately with the sample that has been evaluated with another LCR meter.

4. Specifications

Supplementary value: These values show the supplemental data for reference and do not guarantee the performance.

4.1 Specifications

- Applicable LCR meter
  LCR meter that has measurement terminals of four-terminal-pair or four-terminal structure (BNC)

  The instrument may not fit the LCR meter, depending on the shape of the panel. For details, refer to "Figure 4-1 External dimensions diagram".

- Applicable sample
  Surface mount component that has electrodes on the side
  Minimum dimensions JIS 0603M (EIA 0201)
  Thickness 0.3 mm
  Maximum dimensions 14 mm square
  Some samples may not fit depending on their shapes, even when their sizes fall within the above range.

- Measurement frequency
  DC to 2MHz
  This frequency range is recommended in terms of measurement errors. It can be used at the frequency out of this range if additional errors can be tolerated.

- Voltage range
  ±42V
  This range is a signal voltage range that is determined in consideration of operator's safety.

- Additional errors (supplementary value)
  Stray capacitance Cp < 0.1pF
  for the probe interval 1 mm, and at 10 kHz
  Residual inductance Ls < 50nH
  when the both probe tips touch each other, and at 10 kHz
  Residual impedance |Z| < 10mΩ
  when the both probe tips touch each other, and at 1 kHz

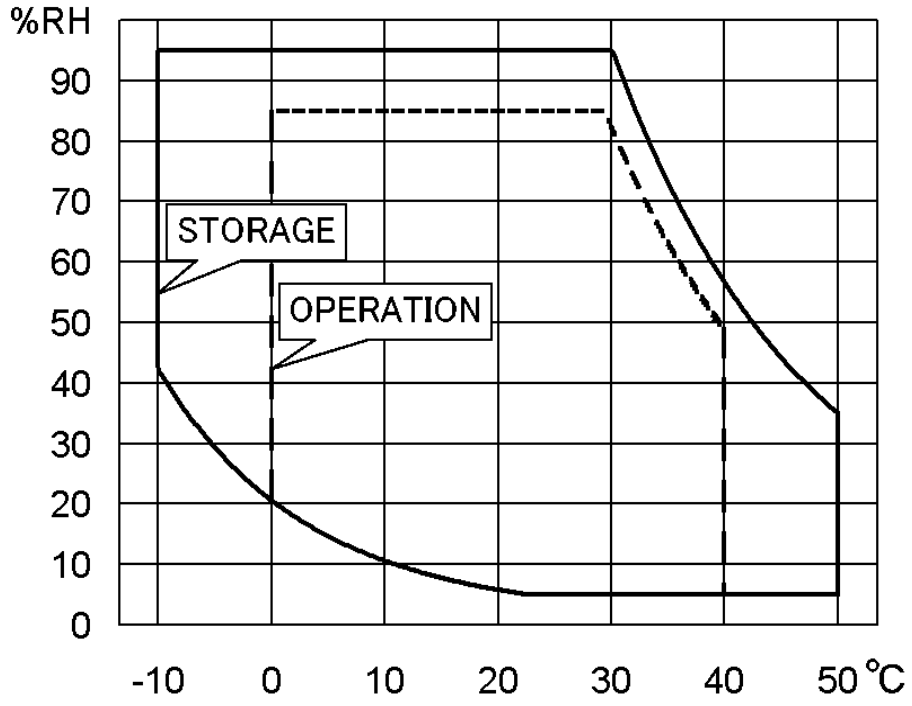
  Other conditions
  Connected directly to the measurement terminals of the LCR meter that has the four-terminal-pair structure

Additional errors can be corrected by the correction function of the LCR meter.
As the residual impedance includes the contact resistance, it may be larger than the above value, depending on dirt or contact pressure.

■ Measurement contact
Two-terminal connection

■ General specifications

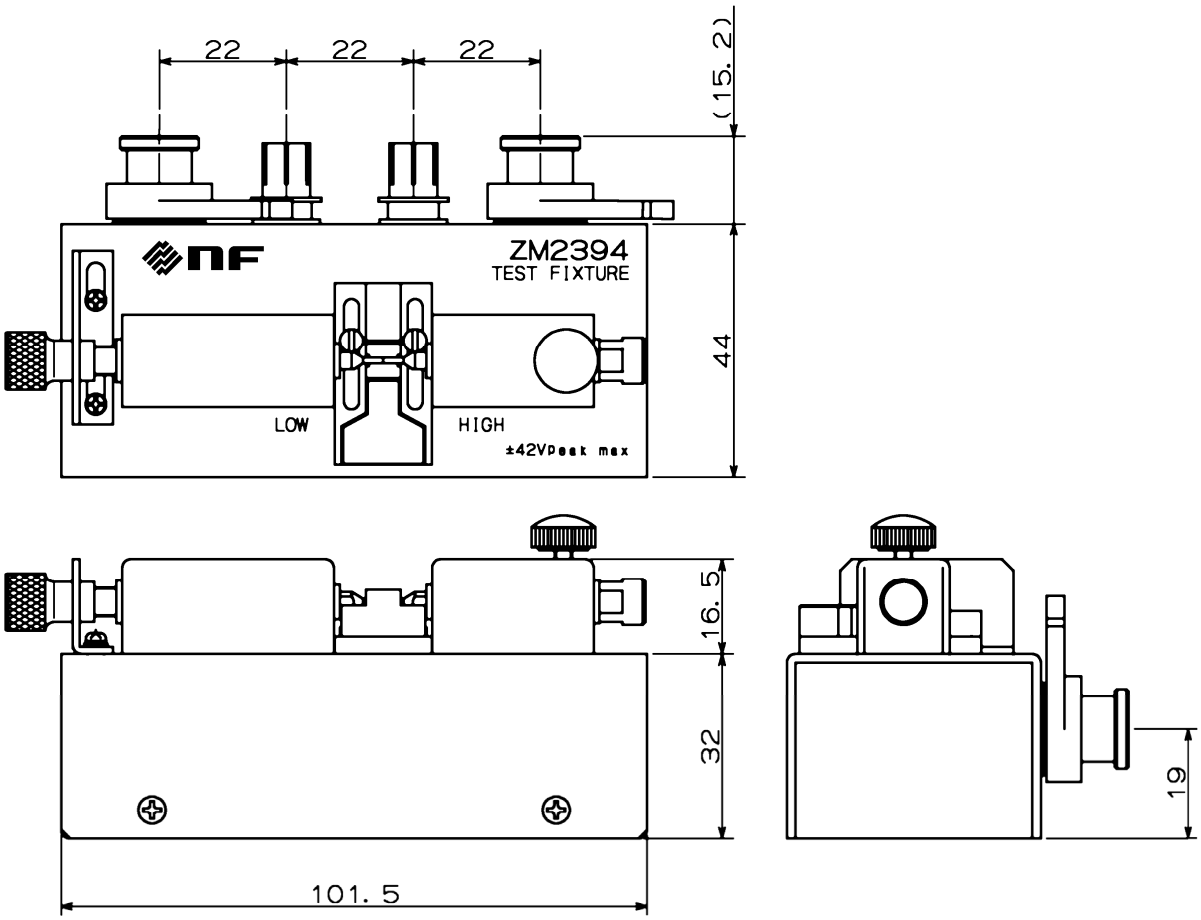
- Environmental conditions
  Operation Temperature: 0 to +40 °C
  Humidity: 5 to 85 %RH
  Furthermore, AH 1 to 25 g/m^3, no condensation
  Storage Temperature: -10 to +50 °C
  Humidity: 5 to 95 %RH
  Furthermore, AH 1 to 29 g/m^3, no condensation



- External dimensions About 101.5 (W) × 48.5 (H) × 44 (D) mm (without protrusions)

- Weight About 190 g (without accessories)

4.2 External dimensions diagram



Surface treatment
Instrument housing cover: Light gray leather-tone (Munsell 6PB7.6/1.2 leather-tone)

Figure 4-1 External dimensions diagram

WARRANTY

NF Corporation certifies that this product was thoroughly tested and inspected and found to meet its published specifications when it was shipped from our factory.

All **NF** products are warranted against defects in materials and workmanship for a period of one year from the date of shipment. During the warranty period, **NF** will repair the defective product without any charge for the parts and labor. For repair service under warranty, the product must be returned to either **NF** or an agent designated by **NF**. Purchaser shall prepay all shipping charge, duties and taxes for the product to either **NF** or the agent from another country, and shipping charge for the return of the product to purchaser shall be paid by **NF** side.

This warranty shall not apply to any defect, failure or damage caused by a) improper use; b) improper or inadequate maintenance and care; or c) modification by purchaser or personnel other than **NF** representatives.

NF Corporation

If there are any misplaced or missing pages, we will replace the manual. Contact the sales representative.

NOTES

- Reproduction of the contents of this manual is forbidden by applicable laws.
- The contents of this manual may be revised without notice.
- Information provided in this manual is intended to be accurate and reliable. However, we assume no responsibility for any damage regarding the contents of this manual.
- We assume no responsibility for influences resulting from the operations in this manual.

ZM2394 INSTRUCTION MANUAL

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