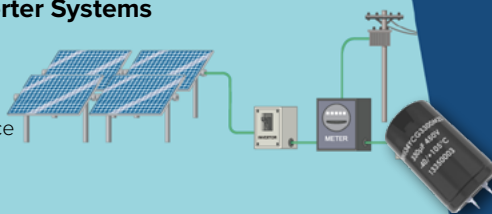


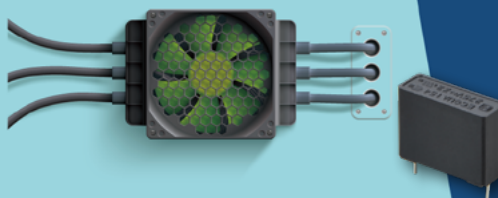
## Filter Capacitors in Solar Inverter Systems

In solar inverter systems, high voltage, high frequency, and continuous ripple currents are generated. It is crucial to control the Equivalent Series Resistance (ESR) to suppress thermal effects and ensure stable filtering performance.



## DC-Link Film Capacitors for Three-Phase Motor Drives

ESR (Equivalent Series Resistance) determines whether a capacitor can safely absorb PWM ripple currents, preventing thermal runaway or failure.



## DC-Link Film Capacitors for On-Board Charger (OBC) Systems in Electric Vehicles

In OBC (On-Board Charger) modules, capacitors must withstand high voltages of 400V/ 800V/ 1200V and endure prolonged exposure to fast, high frequency current ripples. If the ESR is too high, it can lead to abnormal temperature rise, accelerating material degradation and causing reliability issues such as dielectric shrinkage and cracking.



## Accurately Assess Actual Capacitor Loss ESR

### ESR Is the Key Indicator

Capacitor loss mainly comes from dielectric polarization loss and heat dissipation caused by conductor contact impedance. Excessive loss reduces performance and shortens capacitor lifespan.

While LCR Meters measure Resistance ( $R_s$ ) to estimate loss,  $R_s$  represents a combined impedance component under specific conditions. ESR (Equivalent Series Resistance) is the critical indicator for actual loss, accurately reflecting dielectric and conductor losses. ESR closely relates to heating, energy dissipation, and high-frequency performance, making it the standard for engineers and manufacturers to evaluate capacitor quality.

MICROTEST 6632C measures ESR directly in Meter Mode, ensuring capacitor reliability and performance under real circuit conditions.

## 6632C precisely measures ESR across varying frequencies masterfully mastering capacitor performance.

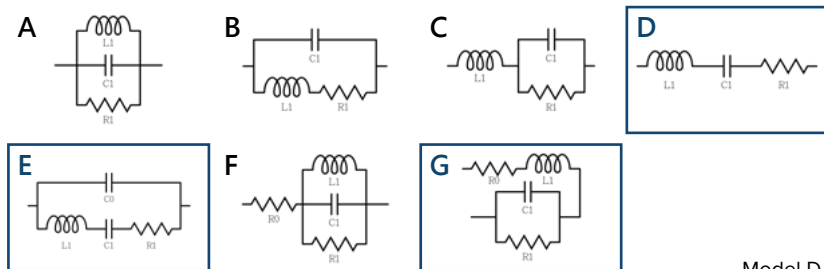


## 6632C Capacitor Analyzer

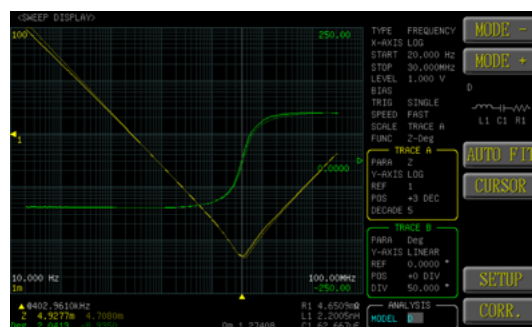
Built-in ESR measurement

Sweep Mode

## Support Equivalent Circuit Analysis



Model D



6632C features an equivalent circuit model function to analyze high-frequency characteristics and parasitic effects of capacitors.

Parasitic resistance arises from electrode conductivity and contact impedance, while parasitic inductance relates to lead length and structural loops. These parameters affect impedance and frequency response at high frequencies.

In Equivalent Circuit Analysis Mode, engineers can adjust parasitic parameters (e.g., ESR/ESL) directly on the instrument to simulate frequency response under different conditions in real-time, enabling prediction of material and structural impacts on high-frequency capacitor behavior without physical samples.

# Capacitor Analyzer

## 6632C

Frequency Range

10Hz~10MHz

Component Tester



MICROTEST 6632C offers comprehensive capacitance measurement capabilities, including ESR, Impedance(Z), Phase Angle( $\theta$ ), and Capacitance(C) values, with a frequency range of 10Hz to 10MHz for precise analysis of capacitance loss and frequency response.

In Meter Mode, it features built-in ESR measurement to display real-time capacitance loss. In Sweep Mode, it analyzes Impedance(Z) and Phase( $\theta$ ) changes across frequencies to identify the Self-Resonant Frequency (SRF). The instrument also includes an equivalent circuit analysis function using an RLC model to help engineers evaluate SRF and ESR characteristics. 6632C supports DC Bias Voltage testing up to 2000V and C-V curve sweeps of capacitive components.

For material analysis, the 6632C has a built-in dielectric constant ( $\epsilon_r$ ) function, eliminating manual calculations and quickly providing dielectric constant and loss measurements.

## Application

Aluminum Electrolytic Capacitors | Measure ESR to evaluate aging and filtering efficiency

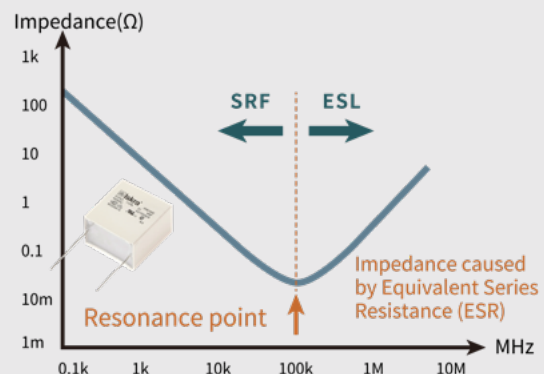
Conductive Polymer Solid Aluminum Capacitors | Measure ultra-low ESR characteristics to meet high-speed digital power supply requirements

MLCCs for Power Supply Decoupling | Measure ESR to assess power filtering, decoupling performance, and EMI suppression

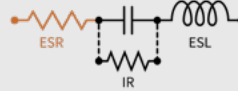
Film Capacitors | In high-frequency, high-power applications, measure ESR to evaluate energy loss and thermal effects, enhancing component reliability

## Features

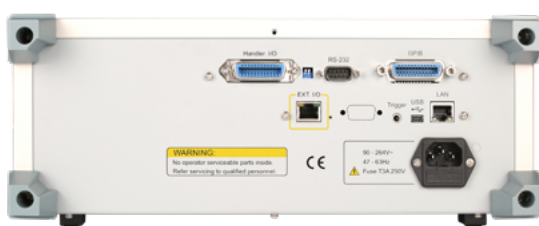
- Frequency range: DC, 10Hz~10MHz
- Equivalent Circuit Analysis
- Basic accuracy up to  $\pm 0.08\%$  (typical  $\pm 0.05\%$ )
- In Meter Mode, built-in  $R_{ESR}$  (Equivalent Series Resistance) parameter
- Built-in Dielectric constant- $\epsilon_r$
- Built-in Permeability- $\mu_r$
- Built-in DC Bias voltage  $\pm 12V$
- External DC bias testing ( $\pm 200V/600V/2000V$ )
- Support Sweep/ List/ Meter Measurement Mode
- Binning and Comparator Function
- Automatic Level Control (ALC)
- Output impedance 25 $\Omega$ / 100 $\Omega$ , switchable
- Open circuit/ short circuit/ load correction function
- Access configuration files via USB
- Store test data and capture screenshots of the test screen



### ESR (Equivalent Series Resistance)



Under AC conditions, energy losses from internal conductors, electrode materials, and junctions manifest as the capacitor's equivalent series resistance (ESR). This ESR impacts filtering efficiency and thermal behavior, making it a critical parameter in high frequency power supply design.



### Standard Interfaces

RS-232

USB Host

LAN

Handler

USB Device

EXT. I / O

## Specification

| Model                             | 6632C                                                      |                                                                             |
|-----------------------------------|------------------------------------------------------------|-----------------------------------------------------------------------------|
| Frequency Range                   | 10Hz~10MHz                                                 |                                                                             |
| Points of Test Frequency          | Programmable                                               |                                                                             |
| Frequency Resolution              | 100mHz, 6 digits of setting                                |                                                                             |
| Frequency Output Accuracy         | ±0.01%                                                     |                                                                             |
| Basic Accuracy                    | ±0.08% (typical±0.05%)                                     |                                                                             |
| AC Drive Level                    | Voltage                                                    | 10mV~2Vrms(FREQ. ≤ 1MHz), 10mV~1Vrms(FREQ.>1MHz or FREQ. ≤ 1MHz and RO=25Ω) |
|                                   | Current                                                    | 100μA~20mA <sub>rms</sub> (RO=100Ω), 200μA~40mA <sub>rms</sub> (RO=25Ω)     |
|                                   | Voltage Minimum Resolution                                 | 1mV                                                                         |
|                                   | Current Minimum Resolution                                 | 10μA                                                                        |
| DC Drive Level                    | DCR Voltage                                                | 1Vdc (40mA max.)                                                            |
| ALC                               | ALC ON : 6% * Voltage ±2mV<br>ALC OFF : 10% * Voltage ±2mV |                                                                             |
| Output Impedance                  | 25Ω, 100Ω (switchable)                                     |                                                                             |
| Test Time (Fastest)               | <3mS                                                       |                                                                             |
| Built-in DC Bias Voltage          | ±12V                                                       |                                                                             |
| Measurement Parameters and Ranges | Z                                                          | 0.000mΩ~9999.99MΩ                                                           |
|                                   | R, X                                                       | ±0.000mΩ~9999.99MΩ                                                          |
|                                   | Y                                                          | 0.00000μS~999.999kS                                                         |
|                                   | G, B                                                       | ±0.00000μS~999.999kS                                                        |
|                                   | θRAD                                                       | ±0.00000~3.14159                                                            |
|                                   | θDEG                                                       | ±0.000°~180.000°                                                            |
|                                   | Cs, Cp                                                     | ±0.00000pF~9999.99F                                                         |
|                                   | Ls, Lp                                                     | ±0.00nH~9999.99kH                                                           |
|                                   | D                                                          | 0.00000~9999.99                                                             |
|                                   | Q                                                          | 0.00~9999.99                                                                |
|                                   | Δ                                                          | ±0.00%~9999.99%                                                             |
|                                   | Rdc                                                        | 0.00mΩ~99.9999MΩ                                                            |
|                                   | ε <sub>r</sub> ' ε <sub>r</sub> ''                         | 0~100000                                                                    |
|                                   | μ <sub>r</sub> ' μ <sub>r</sub> ''                         | 0~100000                                                                    |
|                                   | R <sub>AC</sub>                                            | ±0.000mΩ~9999.99MΩ                                                          |
|                                   | R <sub>ESR</sub>                                           | ±0.000mΩ~9999.99MΩ                                                          |

## General

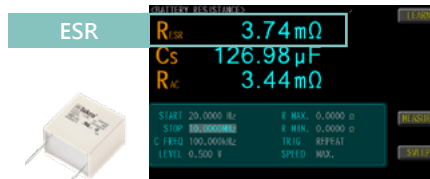
|                     |                                                                                                     |                                                            |
|---------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Measurement Mode    | Meter Mode, List Mode, Sweep Mode                                                                   |                                                            |
| Measurement Circuit | Series/ Parallel                                                                                    |                                                            |
| Correction          | Open Circuit/ Short Circuit/ Load correction                                                        |                                                            |
| Cable Compensation  | 0/ 0.5/ 1/ 2m                                                                                       |                                                            |
| List Mode           | 50 groups of Multi-Steps setting (Each group contains up to 15 steps)                               |                                                            |
| Built-in DC Bias    | -12 to +12V, 0.3% ±1.5mV, 10Hz to 10MHz                                                             |                                                            |
| BIN                 | 9                                                                                                   |                                                            |
| Comparator          | ABS, ΔABS, Δ%, OFF                                                                                  |                                                            |
| Built-in Storage    | 100 sets LCR Meter setting documents, 50 sets List Mode setting documents                           |                                                            |
| USB Host Storage    | LCR setting documents, list mode setting documents, BMP graphics, Sweep screen and test result data |                                                            |
| Trigger Test        | Auto/ Manual/ RS-232/ Handler/ GPIB (Option OP-663201)                                              |                                                            |
| Interface           | RS-232/ Handler/ LAN/ USB Host/ USB Device/ GPIB (Option OP-663201)                                 |                                                            |
| Option              | PC link Software                                                                                    |                                                            |
|                     | MLCC Component Measurement (Option FX-LR0001)                                                       | MLCC (Class 2) AC Voltage Level Compensation Test Function |
|                     | Output DC Bias Voltage/ Current (Option F420005)                                                    | 0~±40V/±100mA                                              |
| Power Supply        | Voltage : 100~240Vac                                                                                |                                                            |
|                     | Frequency : 50~60Hz                                                                                 |                                                            |
|                     | Low power consumption : Maximum 30W                                                                 |                                                            |
| Power Consumption   | 30VA                                                                                                |                                                            |
| Display             | 7" TFT, Color LCD (800*480)                                                                         |                                                            |
| Environment         | Temperature : 10~40°C, Humidity : 20~80%RH                                                          |                                                            |
| Dimension (W*H*D)   | 358×148×343mm                                                                                       |                                                            |
| Weight              | 3.95Kg                                                                                              |                                                            |

# Functions

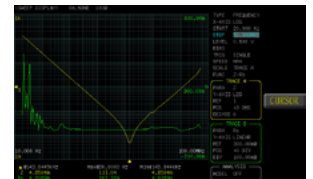
## 6632C built-in ESR (equivalent series resistance) measurement and supports sweep analysis.

6632C Capacitor Analyzer supports high frequency measurements from 10 Hz to 10 MHz and features built-in ESR (equivalent series resistance) measurement. In Meter Mode, it rapidly acquires  $R_{ESR}$  values to help engineers assess capacitor losses and thermal stability in real time.

In Sweep Mode, Impedance (Z) and Phase ( $\theta$ ) versus frequency to identify the Self-Resonant Frequency (SRF). By examining the capacitor's frequency response curve, engineers can optimize filter and power decoupling designs, ensuring component performance at different operating frequencies and enhancing the reliability and effectiveness of filtering, decoupling, and power applications.



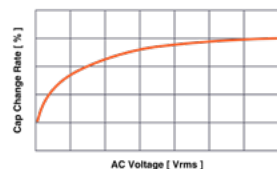
Meter Mode-Built-in  $R_{ESR}$



Sweep Mode-Capacitor frequency-response curve

## AC Signal Level Enhancement Solution for Accurate MLCC

The regulations (JIS C 5101-1:1998) stipulate standards for test signals. When measuring MLCC capacitance, the LCR Meter must enable the Automatic Level Control (ALC) function. This function introduces a stable level circuit into the test circuit to automatically correct any level offset back to the user-set voltage signal value.



ALC Open

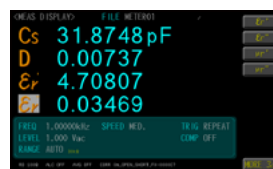
### External AC Voltage Level Compensation Box (FX-LR0001)

|                               |               |
|-------------------------------|---------------|
| Frequency Range               | 100Hz~100kHz  |
| Voltage compensation (ALC ON) | 0.1Vrms~1Vrms |
| Current compensation (ALC ON) | 0.15A         |

The figure below shows the measured MLCC capacitance value. Without enabling the ALC function, the measured capacitance value (7.85μF) is lower than the standard value. By using an External AC Voltage Level Compensation Box (FX-LR0001), the measured capacitance value under stable level signals is closer to the standard value (9.09μF).

## Material Analysis - Dielectric Constant

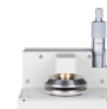
The relative dielectric constant can be measured using 6632C Capacitor Analyzer, which provides an AC excitation signal to the material, while simultaneously monitoring the actual voltage on the material. By measuring the material's dimensions and its capacitance value along with the loss factor D, the material's relative dielectric constant  $\epsilon_r$  is obtained.



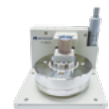
Monitoring  $\epsilon_r'/\epsilon_r''$  in Meter Mode

### Dielectric Constant & Loss Test Solution

Based on the material form, the 6632C Capacitor Analyzer tester can be equipped with the following Dielectric Constant test fixtures.



Solid-State/ Thin-Film material selection  
**FX-0000C7**

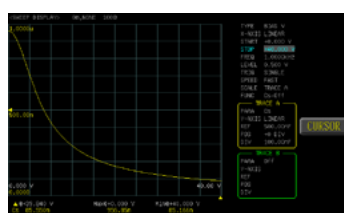


Liquid material selection  
**FX-000C20**

## Capacitor DC-Bias Voltage Characterization Solution

In electronic circuits, capacitors serve filtering, decoupling, energy storage, and voltage stabilization, but their capacitance can drop sharply under DC bias. Applied DC voltage suppresses dielectric polarization, especially in high-k ceramics, leading to significant capacitance loss. Ignoring this effect in power modules, decoupling networks, DC-DC converters, or high speed communications can cause increased ripple, instability, and EMI issues.

MICROTEST 6632C built-in  $\pm 12$  V DC Bias voltage measurement capability for precise analysis of capacitor bias characteristics. Additionally, it offers the following external DC Bias testing solutions:



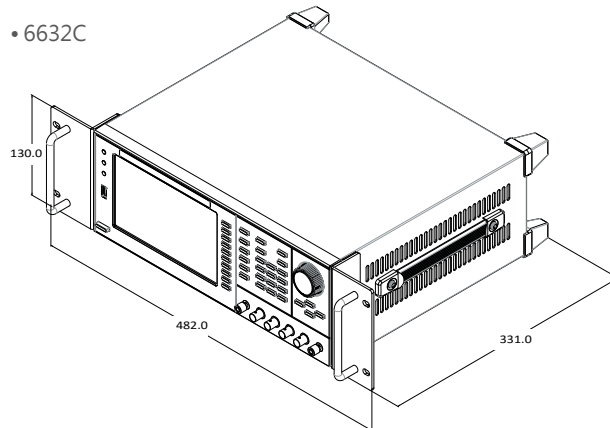
Sweep Mode:Capacitance Drop Curve

| F420003    | F420005                  | F420001     | F420006      |
|------------|--------------------------|-------------|--------------|
| $\pm 40$ V | $\pm 40$ V/ $\pm 100$ mA | $\pm 200$ V | $\pm 2000$ V |
| 100Hz~1MHz | $\leq 30$ MHz            | 100Hz~1MHz  | 100Hz~1MHz   |
|            |                          |             |              |

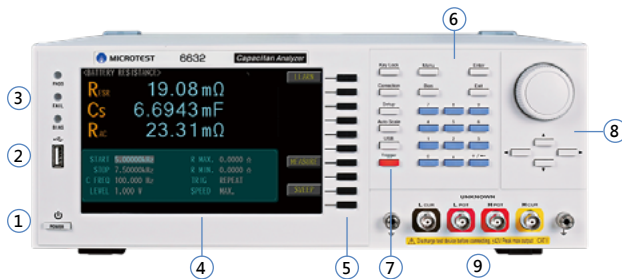
## Automatic Chassis Dimension

• Dimension (mm)

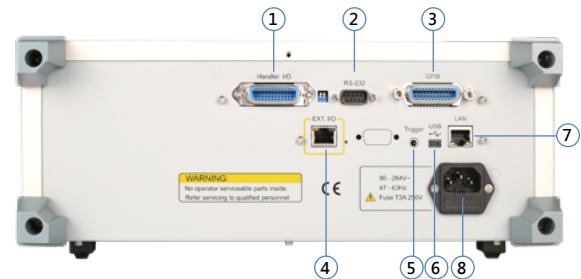
• 6632C



## Appearance



1. Power Switch
2. USB
3. PASS/ FAIL/ BIAS
4. LCD Screen
5. Function
6. Setup/ Number Key
7. Trigger
8. Direction
9. BNC Terminal



1. Handler
2. RS232
3. GPIB (Optional)
4. EXT. I/O
5. Trigger
6. USB
7. LAN
8. Power Jack/ Fuse Block

## Ordering Information

| 6632C Capacitor Analyzer                                                            | Standard                                                                                         | Optional                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>6632C(Frequency Range 10Hz~10MHz)</li> </ul> | <ul style="list-style-type: none"> <li>FX-000C19 DIP Test Fixture</li> <li>Power Cord</li> </ul> | <ul style="list-style-type: none"> <li>F423906A Kelvin Clip Leads (100cm)</li> <li>F423906B Kelvin Clip Leads (50cm)</li> <li>F663001A BNC Test Leads (50cm)</li> <li>F663001B BNC Test Leads (100cm)</li> <li>F663001C BNC Test Leads (200cm)</li> <li>F420001 External Voltage Bias (±200V/1MHz)</li> <li>F420003 External Voltage Bias (±40V/1MHz)</li> <li>F420005 External Voltage/ Current Bias (±40V/100mA)</li> <li>F420006 External Voltage Bias (±2000V/1MHz)</li> <li>FX-0000C6 DIP Test Fixture</li> <li>FX-0000C7 Dielectric Material</li> <li>FX-0000C8 Magnetic Material Test Fixture</li> <li>FX-0000C9 Material Testing Fixture</li> <li>FX-000C10 Bottom Electrode SMD Test Fixture</li> <li>FX-000C11 SMD Tweezers Test Leads</li> <li>FX-000C12 SMD Test Fixture</li> <li>FX-000C20 Liquid Dielectric Material Test Fixture</li> <li>FX-LR0001 Automatic Level Compensation Fixture</li> <li>FX-0000C4 DIP Test Fixture</li> <li>TL-000003 RS-232 Cable (180cm)</li> <li>TL-000007 USB Cable (180cm I Type-A TO Type-B)</li> <li>OP-663201 GPIB Interface</li> <li>PC Link Software</li> </ul> |

## Fixture & Accessories

**FX-000C19**  
DIP Test Fixture



**F423906A**  
Kelvin Clip Leads (100cm)

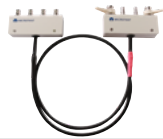


**F423906B**  
Kelvin Clip Leads (50cm)



|                       |                             |                             |                             |
|-----------------------|-----------------------------|-----------------------------|-----------------------------|
| Frequency             | DC~50MHz                    | DC~1MHz                     | DC~1MHz                     |
| Max. Voltage/ Current | ±42V                        | ±42V                        | ±42V                        |
| DUT Size              | -                           | Max. 6mm                    | Max. 6mm                    |
| Applicable Models     | 6632/ 6621/ 6630/ 6363~6367 | 6632/ 6621/ 6630/ 6363~6367 | 6632/ 6621/ 6630/ 6363~6367 |

**F663001A**  
BNC Test Leads (50cm)



**F663001B**  
BNC Test Leads (100cm)



**F663001C**  
BNC Test Leads (200cm)



|                       |                             |                             |                             |
|-----------------------|-----------------------------|-----------------------------|-----------------------------|
| Frequency             | DC~20M                      | DC~10M                      | DC~5MHz                     |
| Max. Voltage/ Current | ±200V                       | ±200V                       | ±200V                       |
| DUT Size              | -                           | -                           | -                           |
| Applicable Models     | 6632/ 6621/ 6630/ 6363~6367 | 6632/ 6621/ 6630/ 6363~6367 | 6632/ 6621/ 6630/ 6363~6367 |

**F420001** External Voltage Bias (±200V/1MHz) **F420003** External Voltage Bias (±40V/1MHz)

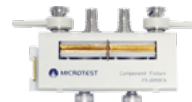


**F420005** External Voltage/Current Bias (±40V/100mA)

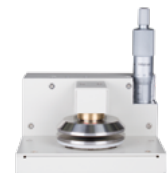


|                       |                             |                             |                  |
|-----------------------|-----------------------------|-----------------------------|------------------|
| Frequency             | 100Hz~1MHz                  | 100Hz~1MHz                  | ≤ 30 MHz         |
| Max. Voltage/ Current | ±200V                       | ±40V                        | DC ±40V          |
| Accessory Description | -                           | -                           | DC ±100mA        |
| Applicable Models     | 6632/ 6621/ 6630/ 6363~6367 | 6632/ 6621/ 6630/ 6363~6367 | 6632/ 6621/ 6630 |

**F420006** External Voltage Bias (±2000V/1MHz) **FX-0000C6** DIP Test Fixture



**FX-0000C7** Dielectric Material

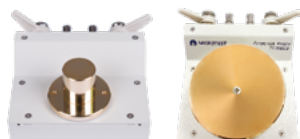


|                       |                             |                             |                                         |
|-----------------------|-----------------------------|-----------------------------|-----------------------------------------|
| Frequency             | 100Hz~1MHz                  | DC~30MHz                    | ≤30MHz                                  |
| Max. Voltage/ Current | ±2000V                      | ±42V                        | ±42V                                    |
| DUT Size              | -                           | -                           | ≤10mm (Electrode Diameter : 38mm 、 5mm) |
| Applicable Models     | 6632/ 6621/ 6630/ 6363~6367 | 6632/ 6621/ 6630/ 6363~6367 | 6632/ 6621/ 6630                        |



**FX-0000C8**

Magnetic Material Test Fixture

**FX-0000C9**

Material Testing Fixture

**FX-000C10**

Bottom Electrode SMD Test Fixture



|                       |                                                                                                      |                             |                             |
|-----------------------|------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------|
| Frequency             | ≤30MHz                                                                                               | DC~30MHz                    | DC~30MHz                    |
| Max. Voltage/ Current | ±42V                                                                                                 | ±42V                        | ±42V                        |
| DUT Size              | Type A : OD 8, ID 3.1, H 3mm<br>Type B : OD 20.5, ID 4.8, H 11mm<br>Type C : OD 65.5, ID 7.1, H 28mm | ≤10mm                       | ≤9x9x5mm                    |
| Applicable Models     | 6632/ 6621/ 6630                                                                                     | 6632/ 6621/ 6630/ 6363~6367 | 6632/ 6621/ 6630/ 6363~6367 |

**FX-000C11**

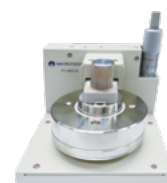
SMD Tweezers Test Leads

**FX-000C12**

SMD Test Fixture

**FX-000C20**

Liquid Dielectric Material Test Fixture



|                       |                             |                             |                                                                    |
|-----------------------|-----------------------------|-----------------------------|--------------------------------------------------------------------|
| Frequency             | DC~10MHz                    | DC~30MHz                    | DC~30MHz                                                           |
| Max. Voltage/ Current | ±42V                        | ±42V                        | ±42V                                                               |
| DUT Size              | ≤10mm                       | ≤7mm                        | Electrode Diameter : 38mm<br>Gap of electrodes : 0.3/0.5/1/2/3/5mm |
| Applicable Models     | 6632/ 6621/ 6630/ 6363~6367 | 6632/ 6621/ 6630/ 6363~6367 | 6632/ 6621/ 6630                                                   |

**FX-LR0001**

Automatic Level Compensation Fixture

**FX-0000C4**

DIP Test Fixture



|                         |                              |                       |                             |
|-------------------------|------------------------------|-----------------------|-----------------------------|
| Frequency               | 100Hz~100kHz                 | Frequency             | DC~1MHz                     |
| Output Impedance        | 10 Ω (ON), 25 Ω/ 100 Ω (OFF) | Max. Voltage/ Current | ±42V                        |
| Output Voltage Sweeping | AC 0.1 ~ 1V rms (ALC ON)     | DUT Size              | Max. 64mm                   |
| Max. Output Current     | 0.15A                        | Applicable Models     | 6632/ 6621/ 6630/ 6363~6367 |
| Applicable Models       | 6632/ 6621/ 6630             |                       |                             |

**TL-000003**

RS-232 Cable

**TL-000007**

USB Cable



|                       |                             |                          |
|-----------------------|-----------------------------|--------------------------|
| Applicable Models     | 6632/ 6621/ 6630/ 6363~6367 | 6632/ 6621/ 6630         |
| Accessory Description | 180cm                       | Type-A TO Type-B I 180cm |