HIPOT ANALYZER
MODEL 19055/19055-C

The Chroma 19055 Series Hipot Analyzer is designed for Hipot test and analysis. It has a maximum output power of 500VA, a maximum AC output of 5kV/100mA, and Floating output for EN50191 requirements. (Please refer to the application notes for more detail information.)

The 19055-C includes ACW/DCW/IR tests, but also has a new measurement technology; Corona Discharge Detection (CDD). In addition, the Breakdown Voltage (BDV) Analysis can detect faults as follows;
- Corona discharge Start Voltage (CSV)
- Flashover Start Voltage (FSV)
- Breakdown Voltage (BDV)

The Chroma 19055 series also has both High Frequency Contact Check (HFCC) and Open Short Check (OSC) functionality. This increases the test reliability and efficiency significantly through application of the contact check during the Hipot test.

The Chroma 19055 series is equipped with a large LCD screen which is convenient for the user to operate and judge. In addition, a GFI human protection circuit and Floating output design prevents exposing users to electrical hazards.

Applications

Motor : The 19055 Series Hipot Analyzers with 500VA output power can be used to test and analyze the high power withstand voltage and leakage current for products like motor stators and rotors with larger parasitic capacitance.

Transformer : When a power transformer is used under normal voltage, Corona discharge from the primary side could cause damage to nearby components. Corona Discharge Detection (CDD), which is a function of 19055-C, can be used to detect this discharge during the design phase for improvement of product quality. Corona Discharge Detection (CDD) can also be used for coil-to-coil or coil-to ground tests to eliminate winding insulation failure due to Corona discharge.

High Voltage Capacitor, Photo-coupler & Insulation Material : If any gap, void or impurity is produced during molding of parts in the manufacturing process, the insulation capability of the product can be affected. The Corona Discharge Detection (CDD) function of the 19055-C is able to detect this discharge for improving the final product quality.

GPIB RS-232 USB HANDLER CE

MODEL 19055/19055-C

KEY FEATURES

- 500VA output power
- Floating output complies with EN50191
- Corona Discharge Detection (CDD, 19055-C only)
- Flashover Detection
- Breakdown Voltage (BDV) Analysis
- High Frequency Contact Check (HFCC)
- Open Short Check (OSC)
- Ground Fault Interrupt
- Standard RS-232 & HANDLER interface
- Optional GPIB interface
- Key lock when fail
- Programmable voltage & test limit
- Support for the A190301 8HV Scanning Box

FUNCTIONS

- Hipot
  - AC 5kV/100mA
  - DC 6kV/25mA
- Insulation
  - 5kVmax
  - 1MΩ~50GΩ

Chroma

Dielectric Withstand Test - Corona Discharge / Flashover / Breakdown Detection

What does dielectric withstand fail mean? Most of the regulations state: "During the test, no flashover or breakdown shall occur." Nowadays, the study of the insulation failure and the electrical discharge is very important for insulation materials and the high voltage components. Because the electrical discharge and insulation capability are interrelated, discharge level detection is not only a safety issue but also crucial to product quality. The electrical discharge can be categorized into 3 groups; Corona discharge, Glow discharge, and Arc discharge, each according to the material discharge characteristic.

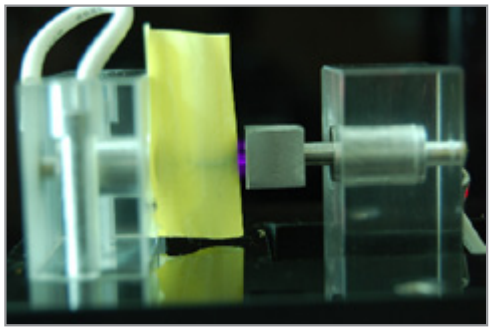


Figure 1: Corona Discharge

Corona Discharge : When the voltage between two electrodes increases, the electrical field becomes stronger. If the strength of the electrical field; produced by the current, is greater than the ionization potential of air, there will be temporary ionization of the air near the surface of the insulation materials. When this ionization occurs, visible light is produced and the temperature rises around the discharge area. Long term Corona discharge and heat may cause a Qualitative Change of the material, insulation deterioration, and finally insulation failure. Corona discharge, which is shown in Figure 1, is a transient discharge with a high frequency which can be detected by using high frequency measurements.

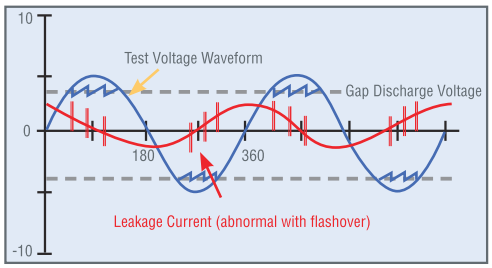


Figure 2: Waveform with Flashover

Glow Discharge and Arc Discharge : When a high voltage is applied to an insulation material, a portion of the material may have electrical discharges. The high voltage may make the insulation material lose its insulation capability and cause transient or discontinuous discharges. This can form a carbonized conductive path through the insulation, or damage the product. As Shown in Figure 2, Glow discharge or Arc discharge cannot be detected by monitoring only the leakage current, but can be detected by Flashover detection - which is monitoring the change rates of the test voltage or the leakage current. This can be used for sorting out defective products. Flashover detection is one of the most indispensable test items in electrical safety testing.

The Chroma 19055 Series provides Breakdown Voltage (BDV) Analysis, which includes Corona Discharge Detection (CDD, 19055-C only), Flashover (ARC) detection, and Breakdown detection. Breakdown Voltage (BDV) Analysis is the best tool for research & development and quality assurance testing.

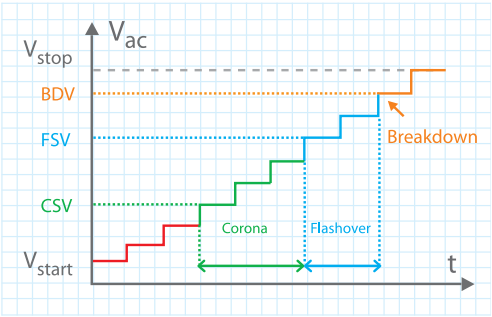


Figure 3 : Discharge Level Analysis (DLA)

Breakdown Voltage (BDV) Analysis

The dielectric withstand voltage of the passive components depend on the insulation materials and the manufacturing processes. To improve the insulation capability, the discharge level, which combine Corona discharge, Flashover, and Breakdown, should be defined and analyzed. The Chroma 19055 series has added Breakdown Voltage (BDV) Analysis which allows users to program the start voltage, end voltage, test time, test steps, test limits and more for analysis.

Breakdown Voltage (BDV) Analysis has three levels of judgment. These are Corona limit, Flashover (ARC limit) and Breakdown (high limit). When discharge occurs during the test, the withstand voltage, which depends on the limits from the different levels, is determined through the Breakdown Voltage (BDV) Analysis. The withstand voltage represents Corona discharge Start Voltage (CSV) for Corona limit fail, Flashover Start Voltage (FSV) for ARC limit fail, and Breakdown Voltage (BDV) for high limit fail. R&D personnel are able to research and improve the insulation capability by collecting the test results from Breakdown Voltage (BDV) Analysis.

Contact Check - High Frequency Contact Check (HFCC) & Open Short Check (OSC, PATENT #: 254135)

High Frequency Contact Check (HFCC) is a new measurement technology for the contact check function. HFCC can be performed during the AC/DC Hipot test. The HFCC test frequency, which is around 500 kHz, has greatly improved the accuracy of the contact check function and production efficiency.

The Open Short Check (OSC) function can check for any open circuit (poor connection) or short circuit (Shorted DUT) that occurs during the test. The DUT may not be judged correctly if an open circuit occurs during the test. Furthermore, a shorted DUT can be sorted out prior to damage to the fixture, saving test costs.

The capacitance (Cx) of a product (DUT) could be tens of pF to several μF under Hi-pot test in normal conditions. If the connection with the product is poor or the connecting cable is broken, a small capacitance (Cc; shown in Figure 4.2), which is formed in the gap between the surfaces of the poor connection, is usually lower than 10pF. This small capacitance (Cc) makes the equivalent capacitance (Cm) of the load lower than the normal value of the DUT capacitance (Cx). When the product is short or almost short, the equivalent capacitance (Cm) of the load is higher than the normal value of the capacitance (Cx). Thus the high/low limit of the capacitance (Cx) can be used to identify contact issues on the production line.

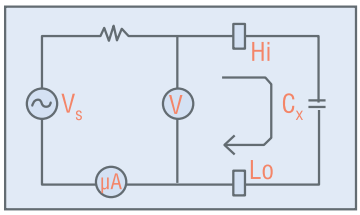


Figure 4.1 ; Normal Condition

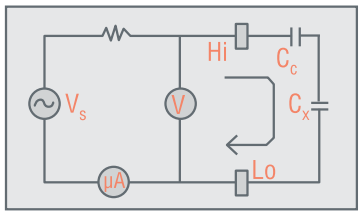


Figure 4.2 ; Open Circuit
Cm = Cc * Cx / (Cc + Cx) << Cx

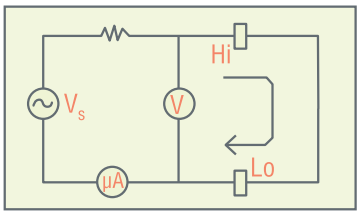


Figure 4.3 ; Short Circuit
Cm >> Cx

Operator Protections – Floating Output & Ground Fault Interrupt (GFI)

The purpose of electrical safety testing is to protect users. In addition, the operators need to be protected by the test equipment during the test operations. The Chroma 19055 series has two types of protection mechanisms; Floating output and Ground Fault Interrupt (GFI).

For operators to manipulate the tester safely, Chroma has developed a brand new technical protection: Floating output. This protection complies with EN50191; Equipment Safety Standard. Because earth leakage current (iH) from the Floating output is less than 3.5mA, no matter which terminal the operator touches during Hipot test, the operator will not be injured by the electricity. (Shown in Figure 5)

Ground Fault Interrupt (GFI), developed by Chroma, is another human body protection for operators. The currents (i1 & i2) can be measured by the current meters (A1 & A2). When the current difference iH (iH=i1-i2), which is the difference between i1 and i2, is too large, the GFI protection cuts output power immediately to protect the human body (operators) from getting an electrical shock. (Shown in Figure 6)

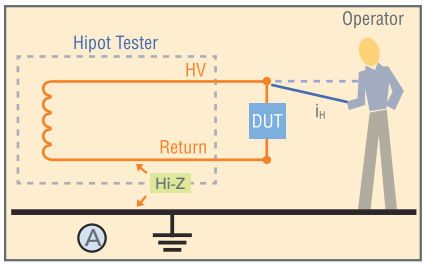


Figure 5 : Floating output

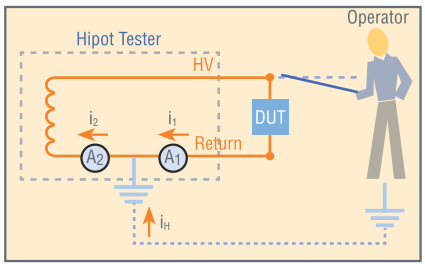


Figure 6 : GFI

APPLICATIONS

The Chroma 19055 Series Hipot Analyzers have functions for Corona Discharge Detection (CDD) to detect Corona discharge (19055-C Only) and Breakdown Voltage (BDV) Analysis to find the CSV, FSV and BDV. These analyzers are capable of providing useful data for verifying product insulation capability and the reliability of the manufacturing process.

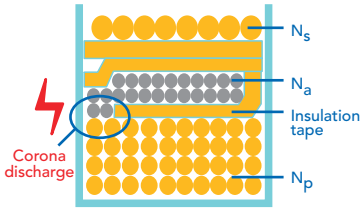


Figure 7.1 : Corona discharge

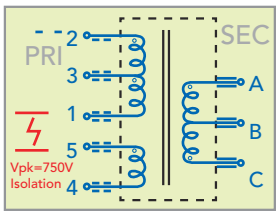


Figure 7.2 : Primary winding fail cause insulation failure

Corona Discharge Issue

Transformer : When the primary side of a transformer has poor insulation, Corona discharge occurs on the primary winding under normal usage (Shown in Figure 7.1). The insulation capability of the primary side will be decreased after Corona discharge has occurred over time. For instance, most power transformers reserve an auxiliary coil in the primary side for other circuits to use (Shown in Figure7.2). When the peak voltage (Vpk) between pin 1 and pin 5 is 750 volts, if the manufacturing process was bad (For example, bad taping with insulation tape or a bad wire sleeve), Corona discharge occurs continuously under usage. The insulation capability of the primary winding will be decreased, and eventually the power transformer will burn out due to the enameled carbonization.

Figure 8 : Corona discharge in motor

Motor : Electric rotating machineries (For example, industrial motors, electric vehicle motors, etc.) are often used for a long time under environments with large variations in temperature and humidity, so high durability and reliability are required. Temperature and humidity are key factors that influence insulation capability. When Corona discharge occurs in turn-to-turn or turn-to-ground over time, it will cause the temperature to rise and the material quality to change, and lead to insulation deterioration. Adding Corona Discharge Detection (CDD) into the Hipot test improves the quality requirement on insulation, and also sorts out products with poor insulation to reduce defective rates due to long-term use.

Discharge Issue for Capacitor/Photocoupler /Insulation Material

Breakdown Voltage (BDV) Analysis is often used to verify the withstand voltage for high voltage capacitors, safety capacitors, photo-couplers and insulation materials. When gaps or voids caused by manufacturing processes are produced in the insulation medium, different electric fields - which are formed inside the DUT during Hipot test - cause Corona discharge to occur. The insulation medium changes and the insulation quality issues appear due to long-term use.

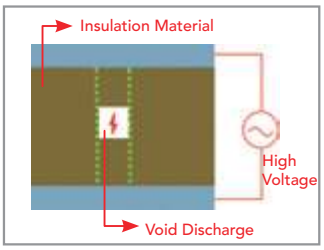
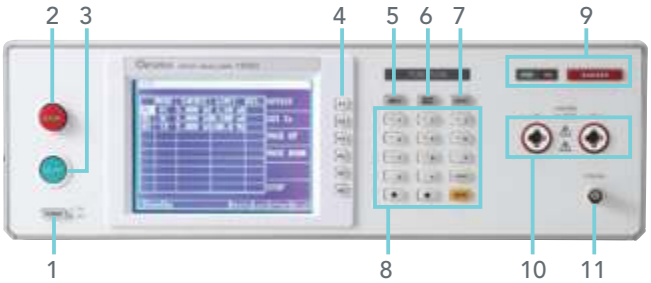
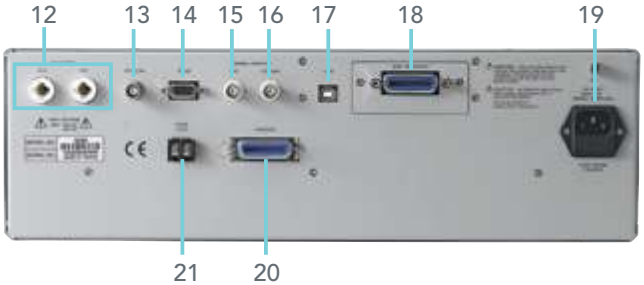


Figure 9: Void discharge

PANEL DESCRIPTION



1. Power Switch
2. Stop key
3. Start key
4. Function keys
5. Menu key
6. Main index key
7. Local Key
8. Data entry keys/program keys
9. Indicator
10. HV1 / HV2
11. RTN/LOW



12. HV1 / HV2 (rear)
13. RTN/LOW (rear)
14. RS232 Interface
15. ARC signal monitor
16. Corona signal monitor
17. USB interface
18. GPIB interface (option)
19. Power inlet
20. Handler interface
21. Interlock

SPECIFICATIONS

Model			19055/19055-C
Mode			ACV / DCV / IR
Withstanding Voltage Test			
Output Voltage			AC : 0.05 ~ 5KV, DC : 0.05 ~ 6KV
Load Regulation			≦(1% of setting + 0.1% full range)
Voltage Accuracy			±(1% of setting + 0.1% full range)
Voltage Resolution			2V
Cutoff Current			AC : 100mA ; DC : 25mA
Current Accuracy			± (1% of reading + 0.5% of range)
Current Resolution			AC : 1μA, DC : 0.1μA
Output Frequency			50Hz ~ 600Hz
Test/Ramp/Fall/Dwell Time			0.3 ~ 999 sec., continue / 0.1 ~ 999 sec., off / 0.1 ~ 999 sec., off
Waveform			Sine wave
Insulation Resistance Test			
Output Voltage			DC : 0.05 ~ 5kV
Voltage Resolution			2V
Voltage Accuracy			±(1% of reading + 0.1% of full scale)
IR Range			0.1MΩ ~ 50GΩ
Resistance Resolution			0.1MΩ
Resistance Accuracy	>1kV	1MΩ ~ 1GΩ	± (3% of reading + 0.1% of full scale)
		1GΩ ~ 10GΩ	± (7% of reading + 2% of full scale)
		10GΩ ~ 50GΩ	± (10% of reading + 1% of full scale)
	0.5kV ~1kV	1MΩ ~ 1GΩ	± (3% of reading + 0.1% of full scale)
		1GΩ ~ 10GΩ	±(7% of reading + 2% of full scale)
		10GΩ ~ 50GΩ	± (10% of reading + 1% of full scale)
	<500V	0.1MΩ ~ 1GΩ	± (3% of reading + (0.2 x 500/Vs)% of full scale)
Flashover Detection			
Setting Mode			Programmable setting
Detection Current			AC: 20mA ; DC: 10mA
Contact Check Function			
HFCC			High frequency contact check
OSC (open/short check)			600Hz, 0.1s
Electrical Hazard Protection Function			
Floating output design			Leakage current <3 mA
Fast Output Cut-off			0.4ms after NG happen
Ground Fault Interrupt			0.5mA ±0.25mA AC, ON/OFF
Panel Operation Lock			Present password
Interlock			YES
GO/NG Judgment Window			
Indication, Alarm			GO : Short sound, Green LED ; NG : Long sound, Red LED
Memory Storage			100 sets, max. 50 steps per set
Interface			
Interface			RS-232, Handler interface (Standard), GPIB interface (Optional)
General			
Operation Environment			Temperature: 0°C ~ 45°C, Humidity: 15% to 95% R.H@≦ 40°C
Power Consumption			500VA
Power Requirements			90~132Vac or 180~264Vac, 47~63Hz
Dimension (H x W x D)			130 x 430 x 500 mm / 5.12 x 16.93 x 19.69 inch
Weight			Approx. 20kg / 44.09 lbs

ORDERING INFORMATION

19055 : Hipot Analyzer (AC/DC/IR)
19055-C : Hipot Analyzer (AC/DC/IR with Corona discharge detection)
A190301 : 8HV Scanning Box
A190355 : 19" Rack Mounting Kit
A190356 : GPIB Interface
A190708 : ARC (Flashover) Verification Fixture

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