

HIPOT ANALYZER MODEL 19055/19055-C

Chroma 19055 Series Hipot Analyzers are designed for Hipot tests and analyses.

19055 Series has 500VA rating and AC output up to 5kV/100mA which complies with EN50191 requirements. (Please refer to the application notes for detail information.)

In addition to AC/DC/IR tests, 19055-C is equipped with a new measurement technology

- Corona Discharge Detection (CDD) that can detect the following via Discharge Level Analysis (DLA) test mode.
- Corona discharge Start Voltage (CSV)
- Flashover Start Voltage (FSV)
- Breakdown Voltage (BDV)

As to Contact Check during Hipot test, Chroma 19055 Series is equipped with a new function of High Frequency Contact Check (HFCC) besides Open Short Check (OSC). By conducting Contact Check during Hipot test, it can increase the test reliability and efficiency significantly.

For convenience use, Chroma 19055 has a large LCD screen for operation and judgment. In addition, the GFI human protection circuit and Floating safety output prevent the operators from electrical hazard. Other subsidiary functions including programmable voltage, time parameters, current limit, and etc. can enhance the test reliability and product quality as well as prevent the defected products from passing quality verification.

Applications

Motor: Chroma 19055 Series with 500VA output rating can be used to test and analyze the withstand voltage of high power and leakage current for products like motor stators and rotors with high parasitic capacitance. Corona detection can be used for turn-to-turn or turn-to-ground test to avoid winding insulation failure from corona discharge.

Transformer: If corona discharge is happened in the primary side of a transformer under normal usage, it could cause the adjacent components to be damaged. Chroma 19055-C provides the function of Corona Discharge Detection (CDD) which can improve the product quality.

High Voltage Capacitor, Photocoupler &

Insulation Material: If any gaps, voids or impurities appeared during molding in the manufacturing process, the insulation capability may be affected. The Corona Discharge Detection (CDD) equipped by 19055-C is able to detect the occurrence of corona discharge and enhance the product quality. With this CDD function, R&D engineers are able to analyze the products for the components with poor insulation and improve their quality.

Hipot Analyzer

MODEL 19055/19055-C

Functions:

- Hi-Pot
 - AC 5kV/100mA (4kV/120mA)
 - DC 6kV/25mA

- Insulation
 - 5kVmax
 - 1M Ω ~50G Ω

Key Features:

- 500VA output rating
- Floating output complies with EN50191
- Corona Discharge Detection (CDD, option)
- Flashover detection
- Discharge Level Analysis (DLA)
- Open Short Check (OSC)
- High Frequency Contact Check (HFCC)
- Ground fault interrupt
- Standard RS232 interface
- Option GPIB & HANDLER interface
- Key lock function
- Programmable voltage & test limit
- CE mark



Chroma



DIELECTRIC WITHSTAND TEST – BREAKDOWN / FLASHOVER / CORONA DISCHARGE 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 insulation failure and electrical discharge has been very important in insulation materials and high voltage components. Because electrical discharge and insulation capability are interrelated, discharge level detection is not only a safety issue but also crucial to product quality. Electrical discharge can be categorized into 3 groups which are Corona discharge, Glow discharge and Arc discharge according to the material discharge characteristic.

Corona Discharge: When two electrodes withstand higher voltage, the electrical field becomes stronger. If the strength of electrical field produced by the current is greater than the ionization potential of air, there will be temporary ionization of air on the surface of insulation material, and visible light and temperature rise around the discharge area. Long term corona discharge and temperature rising may cause Qualitative Change of material, insulation deterioration, and finally insulation failure. Figure 1 shows the discharge of corona. Corona discharge is a high frequency phenomenon which can be detected by high frequency measurement.

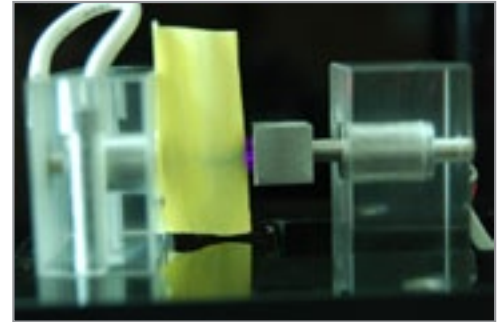


Figure 1: Corona Discharge

Glow Discharge and Arc Discharge: When high voltage applies to an insulation material, its inner and surface part might have electrical discharge. High voltage might make the insulation material lose its insulation capability and cause transient or discontinuous discharge which could form a carbonized conductive path and lead to product damage. Flashover/Arc discharge cannot be detected by monitoring leakage current only. The change rates of test voltage or leakage current are monitored to screen out the defected products. Flashover detection is one of the most indispensable test items for electrical safety test.

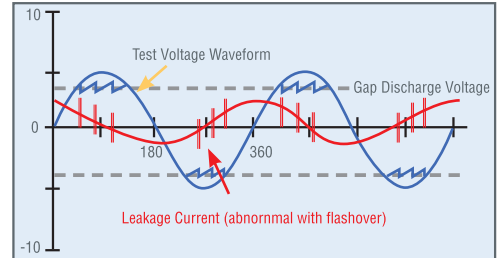


Figure 2: Flashover Waveform

For different electrical discharge characteristics, Chroma 19055 Series provides discharge level analysis including Corona discharge detection (19055-C only), ARC/Flashover detection and breakdown detection. These functions are the best tools for research and quality assurance.

CONTACT CHECK – HIGH FREQUENCY CONTACT CHECK (HFCC, PATENT PENDING) & OPEN SHORT CHECK (OSC, PATENT:254135)

OSC function can check if there is any Open (bad connection) or Short (DUT short circuited) occurred during test. If a DUT is open circuit during test, the unit might be misjudged as a good one. If a DUT has short circuit, OSC function can filter it out to diminish the damage to fixture and save the test cost.

In general, products under Hi-pot test have capacitance (C_x). C_x could be tens of pF to several μF in normal condition. When the circuit connection is interrupted, a small capacitance (C_c in Figure 3.2) will be formed on the broken interface that is usually lower than 10pF. It makes the entire capacitance of the product lower than normal value. The capacitance of a product may be higher than normal when the product is short-circuited or near short circuit. Thus the high/low limit of capacitance variation can be used to identify the short circuit problem.

HFCC (High Frequency Contact Check) is a new measurement technology for contact check. HFCC is able to be performed with AC/DC Hipot test simultaneously. Its test frequency is 1MHz which greatly improves the accuracy of contact check and production efficiency.

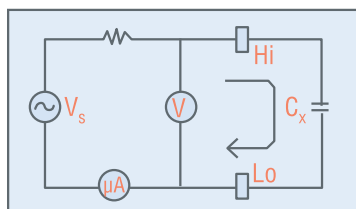


Figure 3.1 : Normal Condition

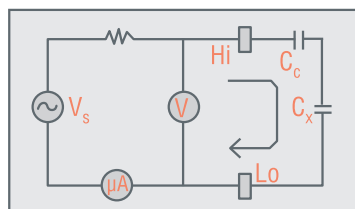


Figure 3.2 : If Circuit opened : $C_m = C_c * C_x / (C_c + C_x) \ll C_x$

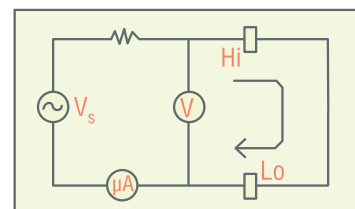


Figure 3.3 : If circuit shorted : $C_m \gg C_x$

DISCHARGE LEVEL ANALYSIS (DLA)

Dielectric withstanding voltage of passive component depends on the insulation material and manufacturing processes. To improve insulation ability, discharge level should be defined and analyzed including Corona discharge, Flashover and Breakdown level. Chroma 19055 has added Discharge Level Analysis mode (DLA) which let users to program start voltage, ramp time, steps, limits and so on for analysis.

Discharge Level Analysis (DLA) has three levels of judgment: Corona limit, ARC/Flashover limit and high limit for breakdown. DLA mode will show the withstanding voltage depending on the different level of limit set. The limits are Corona discharge Start Voltage (CSV), Flashover Start Voltage (FSV), and Breakdown Voltage (BDV). R&D and QC personnel are able to improve the insulation by data collection and analysis of discharge voltage.

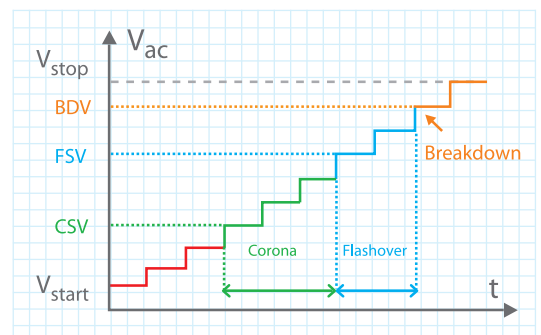


Figure 4: Discharge Level Analysis (DLA)

OPERATOR PROTECTION – FLOATING OUTPUT / GROUND FAULT INTERRUPT (GFI)

The purpose of electrical safety test is to protect the product users. Also the operators need to be protected by the test equipments during operation. Chroma 19055 has two mechanisms to protect the operators: Floating output and GFI (Ground Fault Interrupt).

For operator's safety when manipulating the tester, Chroma has developed a brand new technology - Floating output circuit that complies with EN50191 Equipment Safety Standard. When in Floating output state, no matter which Hipot test terminal the operator touches, the earth leakage current is lower than 3.5mA and the operator won't be injured by the electricity.

GFI (Ground Fault Interrupt) is another human protection circuit developed by Chroma. When the current difference i_H ($i_1 - i_2$) between i_1 and i_2 detected by current meters A_1 and A_2 is too high, the GFI device will cut off the power immediately to protect the human body from electrical shock. It is not only compliant to the safety standards but also a safeguard for test personnel.

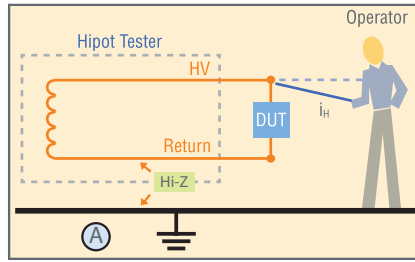


Figure 5: Floating output

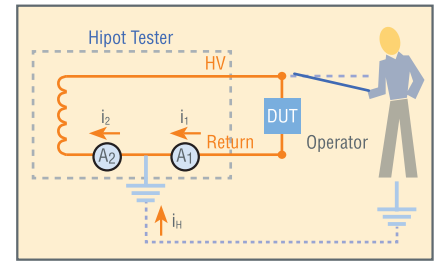


Figure 6: GFI

APPLICATIONS

CORONA DISCHARGE DETECTION (CDD)

Transformer: If the primary side of a transformer has improper insulation, such as in Figure 7.1, the primary winding may suffer from corona discharge. The insulation capability would be decreased if the primary side components are in corona discharge state for a long term use. For instance, most of the power transformers reserve an auxiliary coil for other circuits to use in the primary side as shown in Figure 7.2. When it is used under $V_p = 750V$ for a long time and if the manufacturing process was bad such as bad insulating tape or bad tubing, it would cause corona discharge to occur continuously. The insulation capability of primary winding would be affected and burned out at last due to the enameled carbonization.

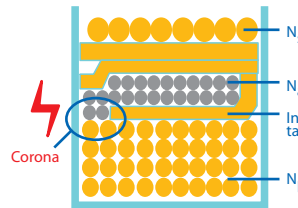


Figure 7.1: Corona

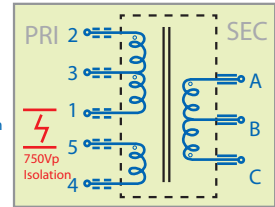


Figure 7.2: Primary winding fail cause insulation failure

Motor: Rotating machinery such as industrial motor or electric vehicle motors are often used for long hours and under the environment with large variation in temperature and humidity, high durability and reliability are most required. Temperature and humidity are also the key factors to influence the insulation capability. If corona discharge occurs in turn-to-turn or turn-to-ground, it would cause the temperature to rise for a long time and material qualitative change, and lead to insulation deterioration. Adding corona discharge detection to Hipot test will improve the quality requirement on insulation, and it also helps to find out the product with poor insulation earlier to reduce defect rate due to long-term use.



Figure 8: Corona discharge in motor

DISCHARGE LEVEL ANALYSIS FOR CAPACITOR / PHOTOCOUPLER / INSULATION MATERIAL

Discharge level analysis is often used to verify the high voltage capacitors, safety capacitors, photocouplers and insulation materials. When there are gaps or voids caused by the manufacturing process in the insulation medium, different electric fields will be formed and corona will be created once the Hipot test is conducted. The medium would change when such situation continues for a long time and quality issue would appear due to bad insulation.

Chroma 19055 Series Hipot Analyzers have the functions of Corona Discharge Detection (CDD) to detect the corona discharge and Discharge Level Analysis to find the CSV, FSV and BDV. They are capable of providing useful data to verify the product insulation capability and increasing the reliability of manufacturing.

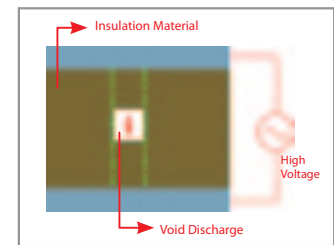
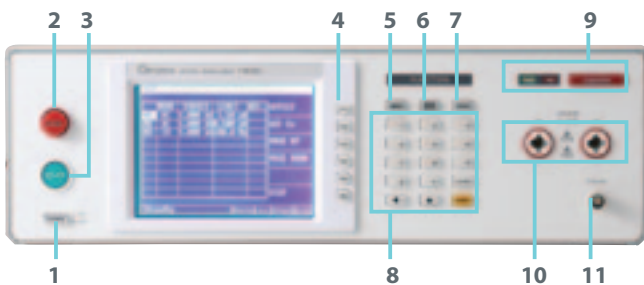
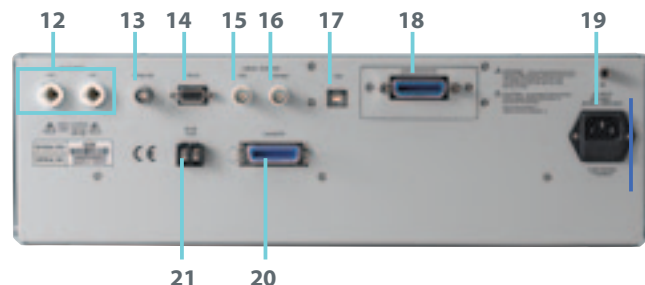


Figure 9: Void discharge

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 + 0.5% full range	
Voltage Accuracy	1% of setting + 0.5% full range	
Voltage Resolution	2V	
Cutoff Current	AC 5kV/100mA(4kV/120mA) ; DC:25mA	
Current Accuracy	1% of setting + 0.5% full range	
Current Resolution	AC : 1 μ A, DC : 0.1 μ A	
Output Frequency	50Hz / 60Hz	
Test/Ramp/Fall/Dwell Time	0.3 ~ 999 sec., continue / 0.1 ~ 999 sec., off / 0.1 ~ 999 sec., off / 0.1 ~ 999 sec., off	
Wtaveform	Sine wave	
Insulation Resistance Test		
Output Voltage	DC : 0.05 ~ 5kV	
Voltage Resolution	2V	
Voltage Accuracy	1% of setting + 0.5% full range	
IR Range	1M Ω ~ 50G Ω	
Resistance Resolution	0.1M Ω	
Resistance Accuracy	>1kV	1M Ω ~ 1G Ω : \pm 3% of reading + 0.1% of full range, 1G Ω ~ 10G Ω : \pm 7% of reading + 2% of full range, 10G Ω ~ 50G Ω : \pm 10% of reading + 1% of full range,
	\geq 500V	0.1M Ω ~ 1G Ω : \pm 3% of reading + 0.1% of full range, 1G Ω ~ 10G Ω : \pm 7% of reading + 2% of full range, 10G Ω ~ 50G Ω : \pm 10% of reading + 1% of full range,
	\leq 1kV	0.1M Ω ~ 1G Ω : \pm 3% of reading + 0.1% of full range, 1G Ω ~ 10G Ω : \pm 7% of reading + 2% of full range, 10G Ω ~ 50G Ω : \pm 10% of reading + 1% of full range,
	<500V	0.1M Ω ~ 1G Ω : \pm 3% of reading + (0.2*500/Vs)% full range
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 \pm 0.25mA AC, ON/OFF	
Panel Operation Lock	Present password	
Interlock	YES	
GO/NG Judgment Window	GO : Short sound, Green LED; NG : Long sound, Red LED	
Memory Storage	100 sets, max. 50 steps per set	
Interface		
RS232, Handler interface (Standard), GPIB interface (Optional).		
General		
Operation Environment	Temperature: 0 $^{\circ}$ C ~ 45 $^{\circ}$ C, Humidity: 15% to 95% R.H@ \leq 40 $^{\circ}$ C	
Power Consumption	500VA	
Power Requirements	90~132Vac or 198~264Vac, 47~66Hz	
Dimension (HxWxD)	130x430x500 mm/5.12x16.93x19.69 inch	
Weight	Approx. 20kg/44.09 lbs	

All specifications are subject to change without notice. Please visit our website for the most up to date specifications.

ORDERING INFORMATION

19055 : Hipot Analyzer AC/DC/IR

19055-C : Hipot Analyzer AC/DC/IR (with Corona discharge detection)

A190301 : 8 HV Scanning Box

A190344 : HV Gun (SP02)

A190356 : GPIB Interface

A190702 : 40kV HV Test Probe

A190708 : ARC (Flashover) Verification Fixture

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