Intelligent Safety Analyzer

Flagship model GPT-12000 Series

GW INSTEK

Made to Measure

GW Hi-Pot GPT series and GCT Line-up

1. The GPT-9800 series will continue serve in the market.

Model name	Capacity	ACW	DCW	IR	GB	GC
GPT-12001	200VA	✓				✓
GPT-12002		✓	✓			✓
GPT-12003		✓	✓	✓~1200Vdc		✓
GPT-12004		✓	✓	✓~1200Vdc	✓~32.00Aac	✓
GPT-9901A	500VA	✓				
GPT-9902A		✓	✓			
GPT-9903A		✓	✓	✓~1000Vdc		
GPT-9904		✓	✓	✓~1000Vdc	✓~32.00A ac	
GPT-9801	200VA	✓				
GPT-9802		✓	✓			
GPT-9803		✓	✓	✓~1000Vdc		
GPT-9804		✓	✓	✓~1000Vdc	✓~30.00A ac	
GPT-9601	100VA	✓				
GPT-9602		✓	✓			
GPT-9612		✓		✓50/100/250/1000Vdc		
GPT-9603		✓	✓	✓50/100/250/1000Vdc		
GCT-9040					✓~40.00A ac	

Flagship model GPT-12000 Series

GW Instek introduces the flagship model safety analyzer GPT-12000 series.

GPT-12000 series is the first safety analyzer in the world to comply with IEC 61010-2-034

200VA output capacity GPT-12000 provides better display, adjustment and measurement resolution, Ground Continuity check, more features such as Statistics, Analysis, Sweep and Rear Output, more functionalities such as IR mode, listed AUTO mode and User-Defined Signal I/O Output Signal, Capacitive load test capability up to 47μF and USB storage(Test result).

Outlook of GPT-12000 series

GPT-12001, GPT-12002, GPT-12003

GPT-12004

200VA GPT-12000 Series

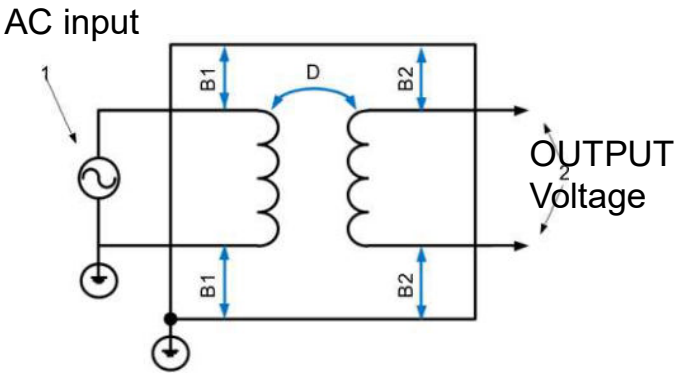
Model name	ACW 0.050k~5.000kV	DCW 0.050k~6.000kV	IR 50V~1200V dc	GB 03.00A~32.00A ac	GC(CONT) 100mA (Fixed)
GPT-12001	✓				✓
GPT-12002	✓	✓			✓
GPT-12003	✓	✓	✓		✓
GPT-12004	✓	✓	✓	✓	✓

IEC 61010-2-034

Safety analyzer-the GPT-12000 series, is the first safety analyzer in the world to comply with IEC 61010-2-034 (Safety requirement for electrical requirement for measurement, control and laboratory use - particular requirements for measurement equipment for insulation resistance and test equipment for electric strength).

IEC 61010-2-034 stipulates that the requirements of the software and hardware interfaces must be followed while designing high voltage and insulation resistance test and measurement instruments so as to ensure that users are provided with necessary protection and warning while using the instruments.

Double Insulation



1 - network circuit

2 - output voltage

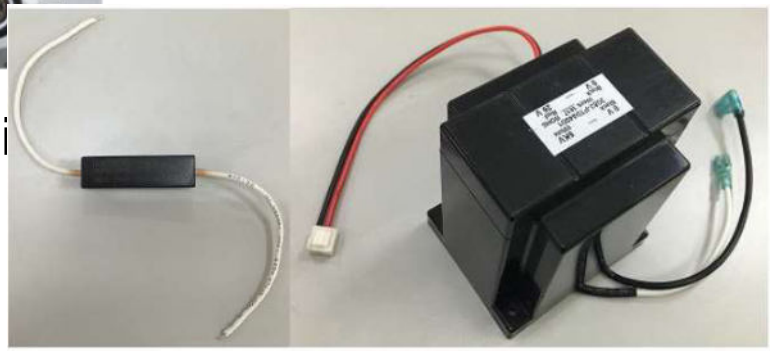
B1 and B2 - CLEARANCES values

D- CLEARANCE(mm) for DOUBLE INSULATION

Hazard indicator:

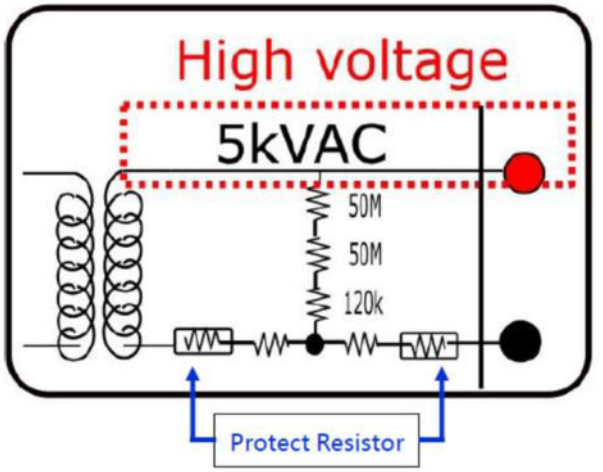
High volume audible

High contrast color visi



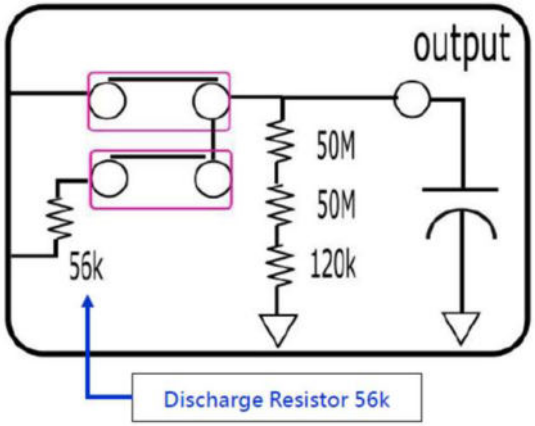
IEC 61010-2-034

Measurement circuit add protect resistor to isolate a danger voltage from high voltage side matching with the requirement of double insulation.



Increasing creepage distance of high voltage PCB to meet with the requirement of double insulation.

After completion of large capacitance tests in DC withstanding, must be discharged to a safe voltage within 10 seconds.

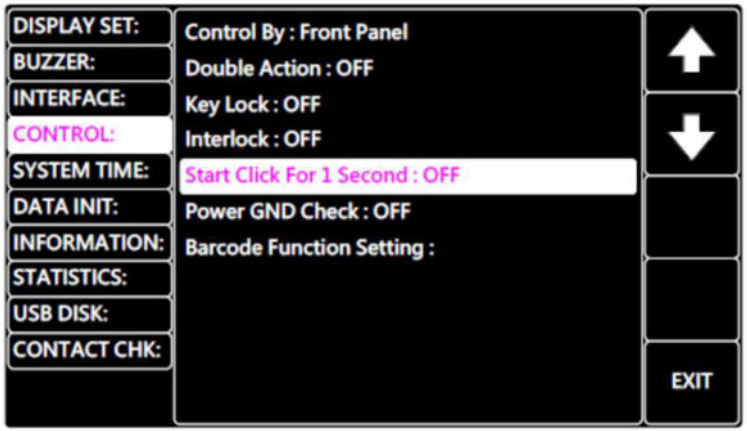


IEC 61010-2-034

Adding output indicator on rear panel

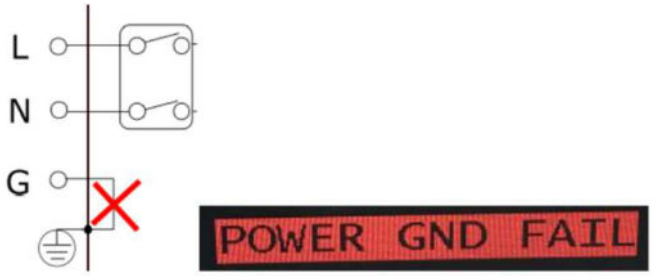
Safe output mechanism

Press and hold the START button for one second to confirm output. (This function Default is OFF and can be configured, by system->control->Start Click for 1 Second: On, off)
DISPLAY



Adding power line grounding failure protection.

When the power line grounding check is set to ON, if the grounding of power line is failed, the output will not be performed. (This function Default is OFF and can be configured, by system->control->Power GND Check: On, off)



Outlook of GPT-12000 Series

GPT-12001, GPT-12002, GPT-12003

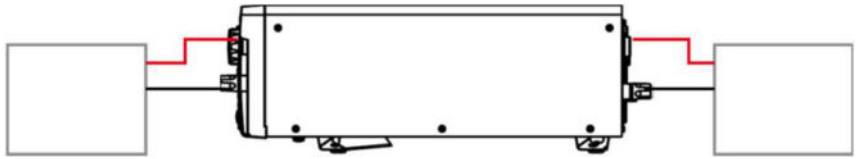
GPT-12004

Interface: Rear Output, RS-232C,USB device, Signal I/O, and Optional GPIB

Rear Output

Rear Output

Do not connect the DUT to the front and rear terminals at the same time.



Outlook with GPT-9000 series

330(W) x 148(H) x 452(D) mm
Approx. 19kg

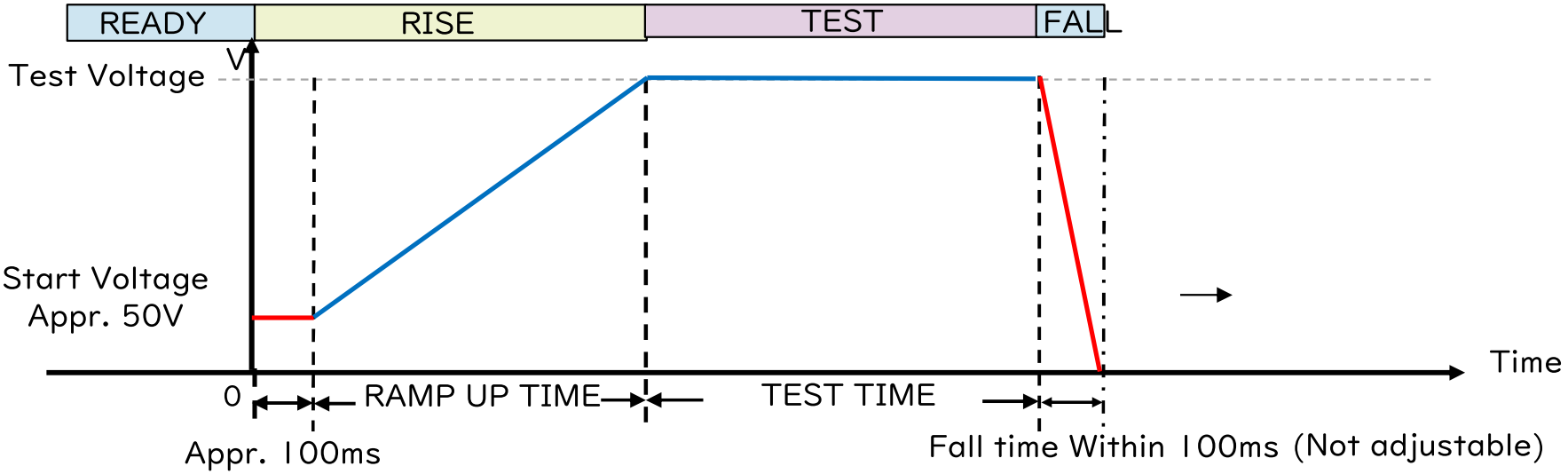
380(W) x 148(H) x 454(D) mm
Approx. 15kg

GPT–12000 Series Key Features

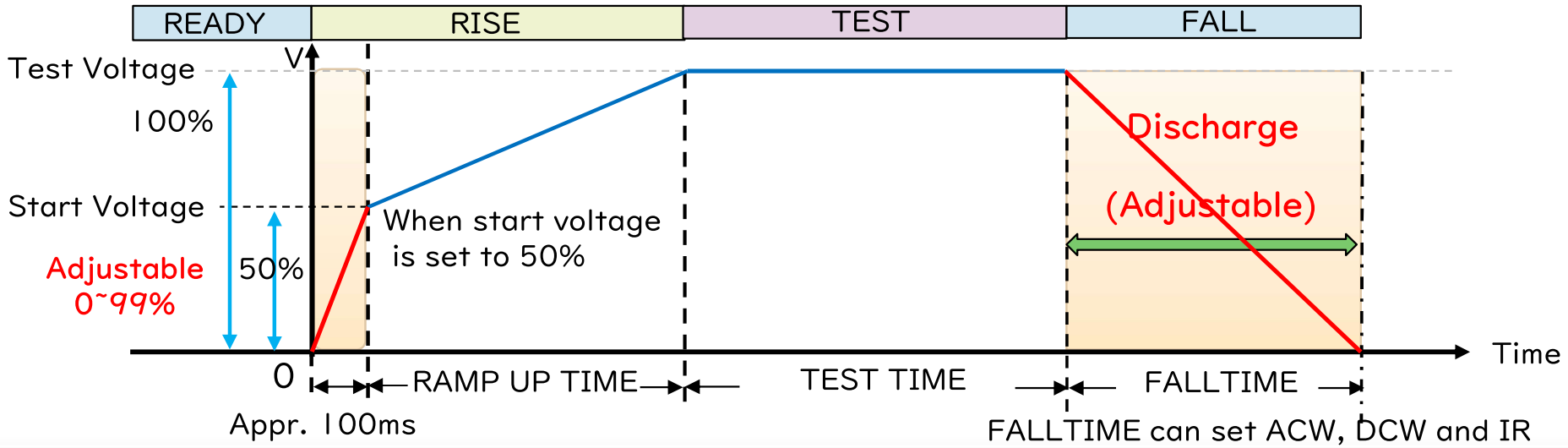
- 200VA AC Test Capacity
- 7” TFT LCD
- Comply with IEC 61010-2-034 design requirement
- Manual Test mode / Auto Test Mode
- True RMS Current Measurement
- Zero Crossing Turn-on Operation
- Controllable Ramp-up & Ramp-down Time
- Statistics & Analysis Function
- Capacitive Load Testing Capability up to 47μF
- Sweep Function for DUT Characteristic Analysis
- Convenience Listed AUTO mode easy to read result and judge
- USB Storage available
- Rear panel output available
- Interface : RS-232C, USB host/device, Signal I/O and GPIB (opt.)
- Universal power input

Main Feature1 : Time control ~ Ramp up & down

GPT-9000 Output Voltage Timing Chart (Resistive load at 3000V)



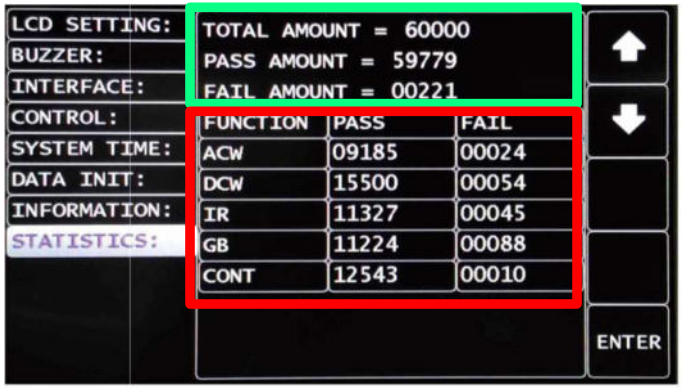
GPT-12000 Output Voltage Timing Chart (Resistive load at 3000V)



Main Features 2: Statistics

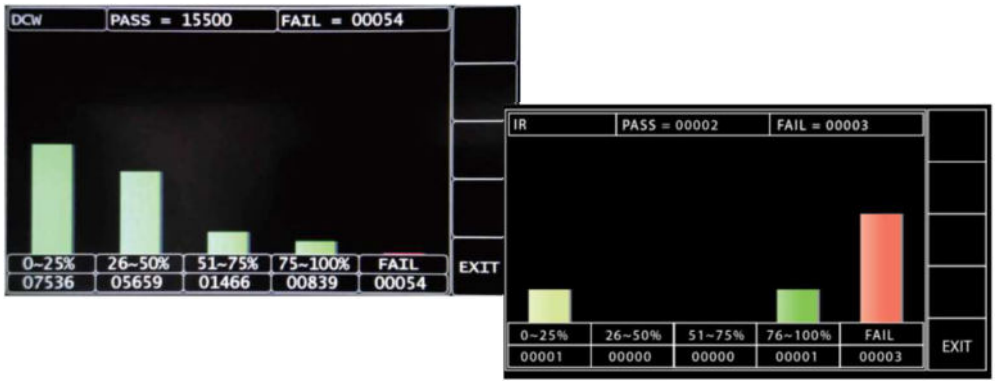
The STATISTICS setting where PASS and FAIL amounts and TOTAL amounts to date are shown in the green highlight below. Also, the detailed distributions of PASS and FAIL amounts from each test functions are well disclosed for viewing in the red highlight below.

PASS, FAIL amounts & TOTAL amounts



PASS & FAIL amounts distributions in each test function

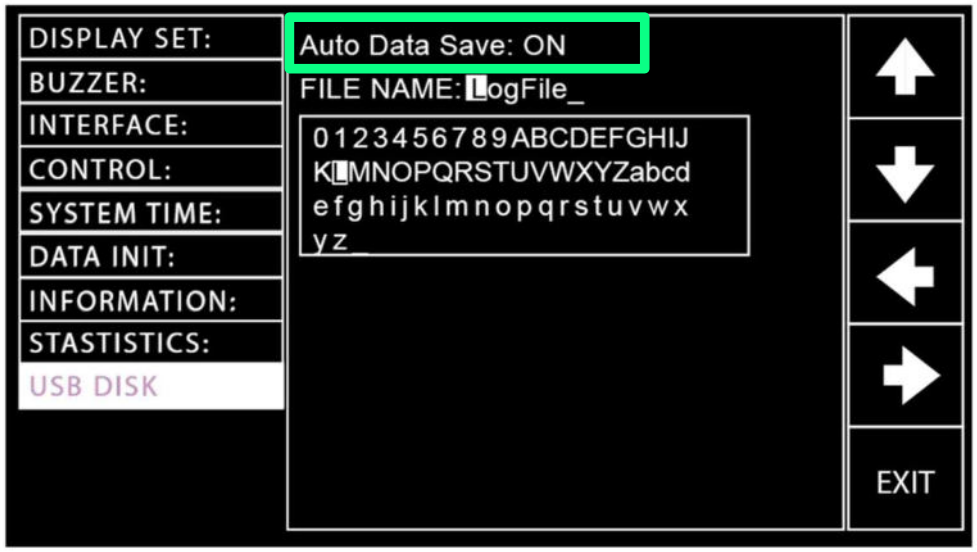
The distributions of PASS and FAIL statistics are well illustrated in the histogram with table display in which the upper side reads the individual PASS and FAIL amounts for test function. The mid and lower side depicts FAIL amounts in the far-right red strip with number below, whilst the PASS amounts are described in strips of different colors with numbers below indicating the percentage of varied measured values in relation to the set HI & LOW range.



USB storage function

In order to facilitate users to analyze the results of the safety test, GPT-12000 provides the USB storage function in addition to its own statistic and analysis functions. When a USB Flash disk is inserted and the storage function is activated, each time the test button (START) is pressed, the test results of all tests (every manual or automatic test item) are automatically saved to the USB in the form of a text file (txt) for follow-up analysis.

Auto Data Save setting ON



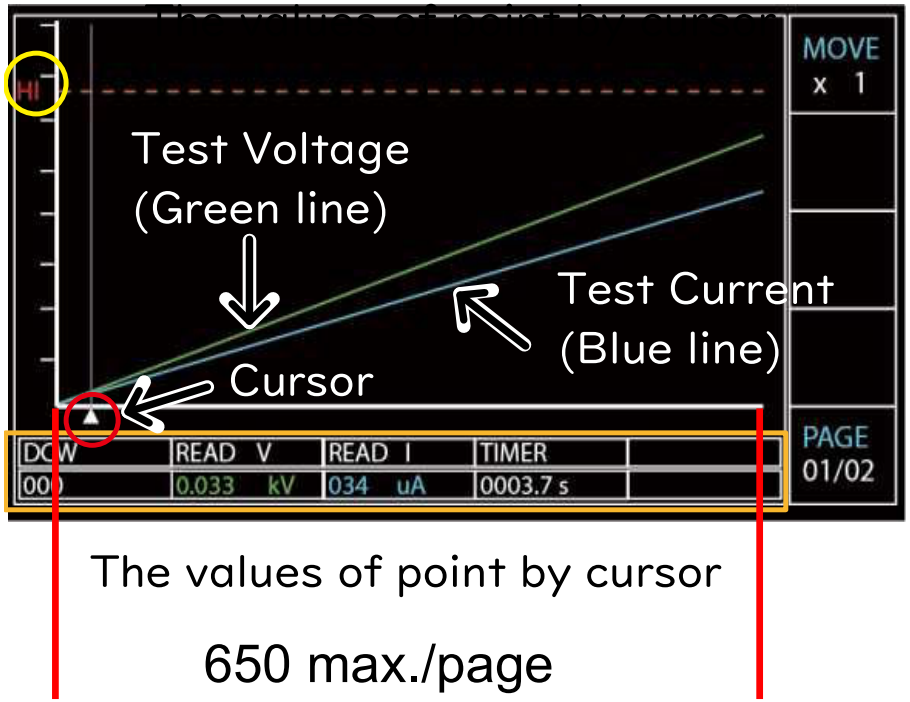
Data Save ON/OFF

```
       Date/Time   ,Stp,MOD,Judge,   V/A   , Reading , Timer
2019-07-02 11:56:30,000,ACW,PASS ,0.100kV,   000 uA ,T=001.0s
2019-07-02 11:56:32,000,ACW,PASS ,0.099kV,   000 uA ,T=001.0s
2019-07-02 11:56:34,000,ACW,PASS ,0.099kV,   000 uA ,T=001.0s
2019-07-02 11:56:37,000,ACW,PASS ,0.100kV,   000 uA ,T=001.0s
2019-07-02 11:56:39,000,ACW,PASS ,0.099kV,   000 uA ,T=001.0s
```

Main Feature3 : Sweep Function

The sweep mode function creates a graph of one of the ACW, DCW, IR, GB or CONT tests in either Manual test or the special MANU mode.

DCW Sweep Graph Example

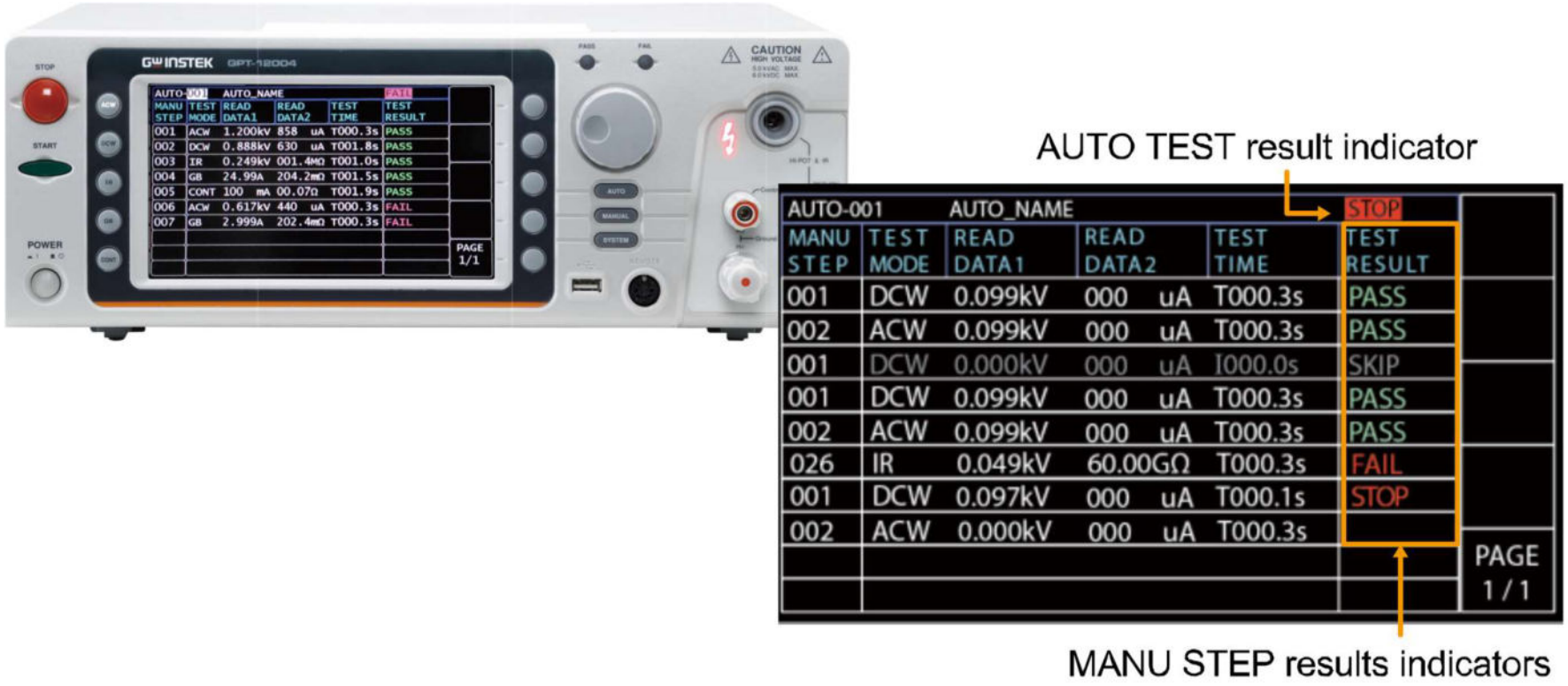


TEST	GREEN	BLUE
ACW	Test voltage	Test current
DCW	Test voltage	Test current
IR	Test voltage	Test resistance
GB	Test current	Test resistance
CONT	Test current	Test resistance

- **To show the trace graph of test results of the device under test. Suitable for product characteristic analysis such as break-down voltage/current.**

Main Feature4 : Listed AUTO Mode

- Better Observation :
  Makes testing condition, result and judgement in same screen



Main Feature4 : Listed AUTO Mode

- Up to 5 groups of AUTO tests can be interconnected.
- Example: AUTO-005 to AUTO-007(5+5+5)=15 Test

AUTO-005

AUTO-006

AUTO-007

AUTO-005 AUTO_NAME READY

MANU STEP	TEST MODE	V/I SETTING	HI SETTING	LOW SETTING	STEP HOLD
001	DCW	0.100kV	1.000mA	000 uA	P.C/F.H
002	ACW	0.100kV	1.000mA	000 uA	P.H/F.C
005	IR	0.050kV	066.8MΩ	000.1MΩ	P.C/F.S
010	ACW	0.200kV	2.000mA	000 uA	P.C/F.C
006	DCW	0.500kV	1.500mA	000 uA	P.H/F.S
CON					

SKIP DEL. STEP HOLD

AUTO-006 AUTO_NAME READY

MANU STEP	TEST MODE	V/I SETTING	HI SETTING	LOW SETTING	STEP HOLD
001	DCW	0.100kV	1.000mA	000 uA	P.C/F.H
002	ACW	0.100kV	1.000mA	000 uA	P.H/F.C
005	IR	0.050kV	066.8MΩ	000.1MΩ	P.C/F.S
010	ACW	0.200kV	2.000mA	000 uA	P.C/F.C
006	DCW	0.500kV	1.500mA	000 uA	P.H/F.S
CON					

SKIP DEL. STEP HOLD

AUTO-007 AUTO_NAME READY

MANU STEP	TEST MODE	V/I SETTING	HI SETTING	LOW SETTING	STEP HOLD
001	DCW	0.100kV	1.000mA	000 uA	P.C/F.H
002	ACW	0.100kV	1.000mA	000 uA	P.H/F.C
005	IR	0.050kV	066.8MΩ	000.1MΩ	P.C/F.S
010	ACW	0.200kV	2.000mA	000 uA	P.C/F.C
006	DCW	0.500kV	1.500mA	000 uA	P.H/F.S

SKIP DEL. STEP HOLD

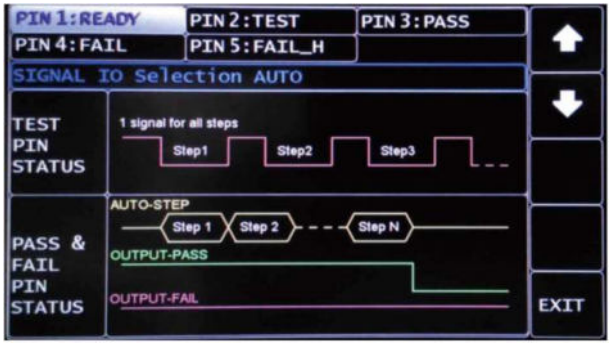
CON is chosen
from MENU STEP

Main Features5: User defined SIGNAL IO

- PIN-OUT define：can be set by user
- Output timing：can be edited by user based on production equipment requirement

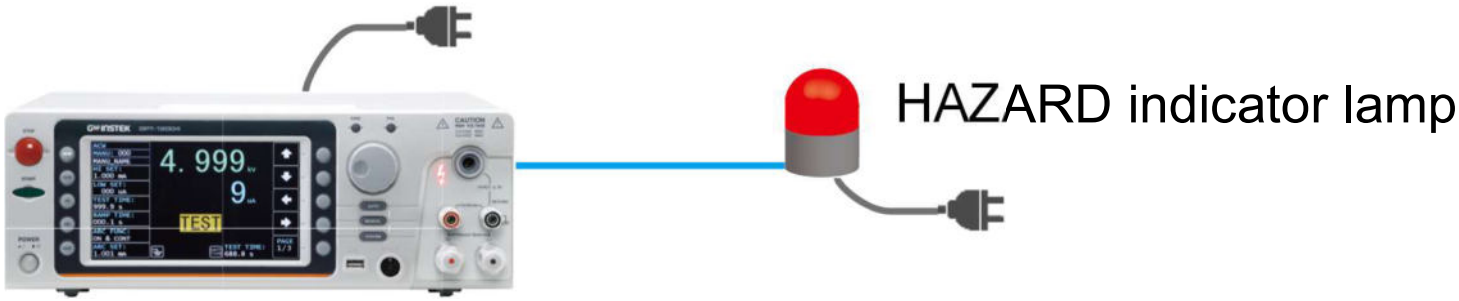
1 signal for all steps

It means one signal output of TEST PIN will be delivered to all steps all the way till the end of an AUTO test.



1 signal for each step

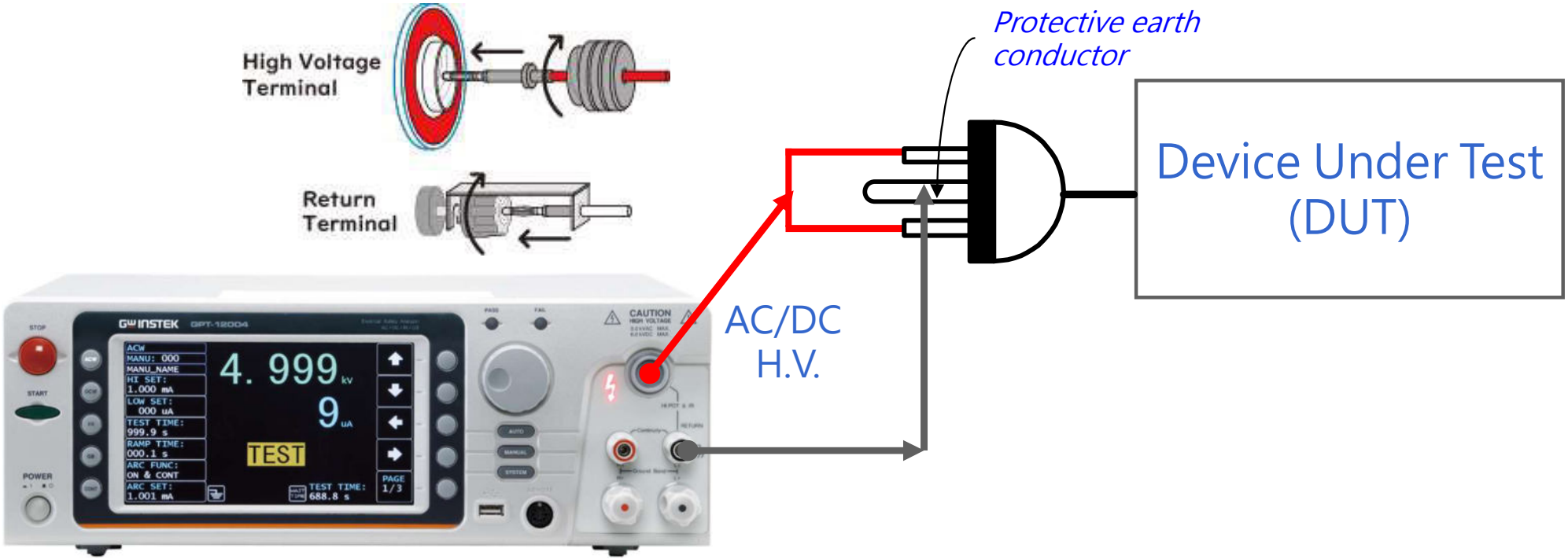
It means one signal output of TEST PIN will be delivered to each step with continuous counters within each interval between each step, which is particularly practical for certain applications.



AC/DC Withstanding Voltage test 1

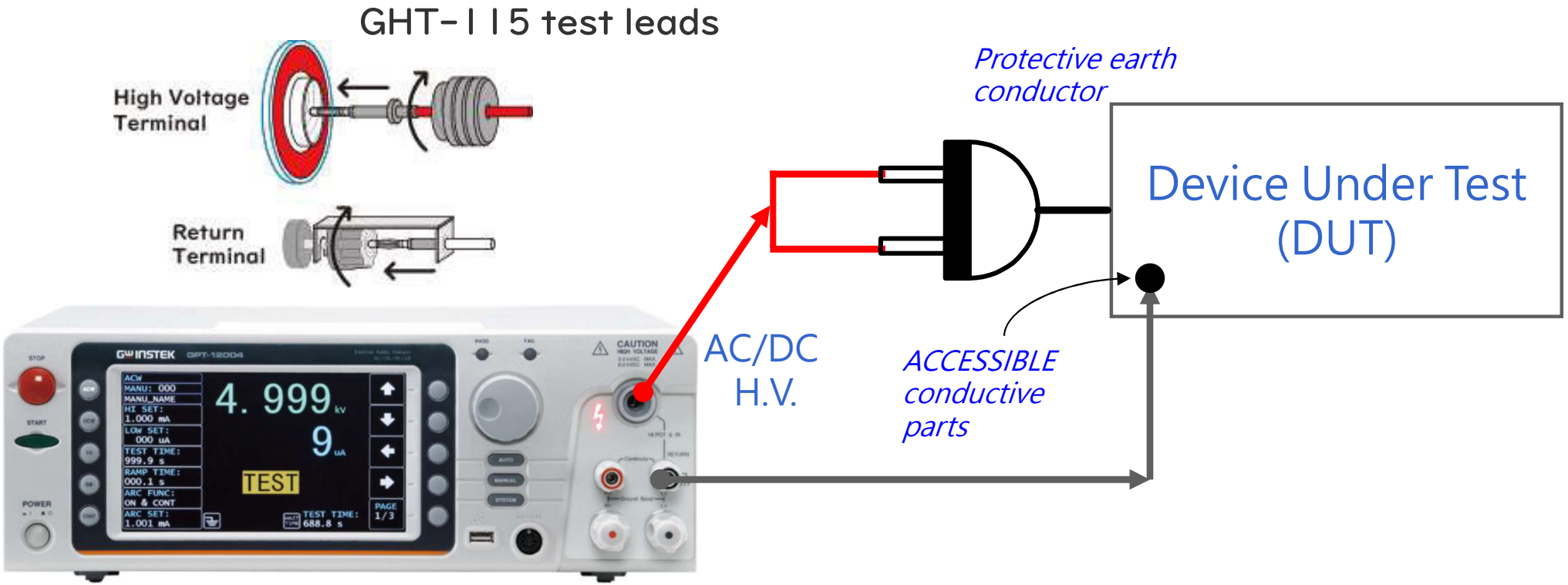
For equipment with a protective earth conductor, the test is made between the protective earth conductor and the line and neutral conductors joined together, with the test voltage (IEC 61010-1)

GHT-115 test leads



AC/DC Withstanding Voltage test 2

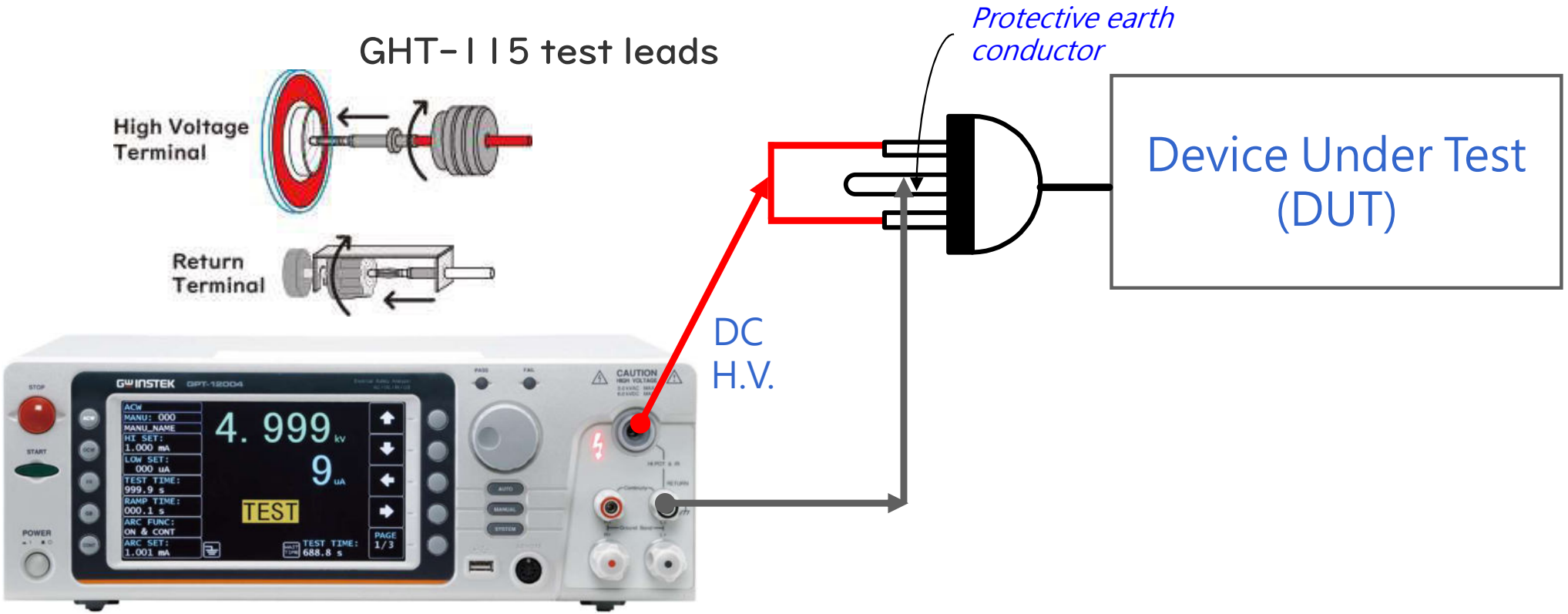
For equipment without a protective earth conductor, the test is made between ACCESSIBLE conductive parts of the equipment and the line and neutral conductors joined together, with the test voltage (IEC61010-1)



Insulation Resistance test

The insulation resistance shall be measured with a D.C. voltage of approximately 500 V, 1 min after the application of the voltage.

For the insulation of SELV parts of luminaires, the d.c. voltage to be used for measurement is 100 V. (EN 60598-1)



Ground Bond test

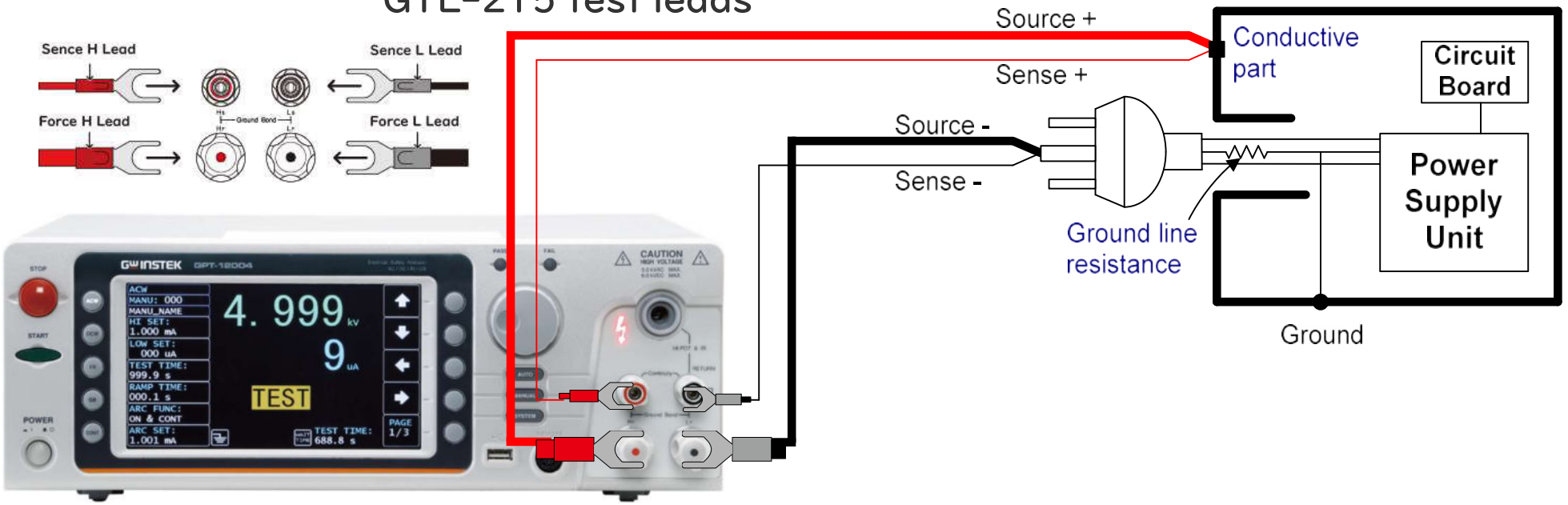
Conformity is checked by applying a test current for 1 min and then calculating impedance. (IEC 61010-1)

The test current is the greater of

a) 25 A A.C. rms at RATED MAINS frequency or D.C.,

b) a current equal to twice the RATED current of the equipment.

GTL-215 test leads



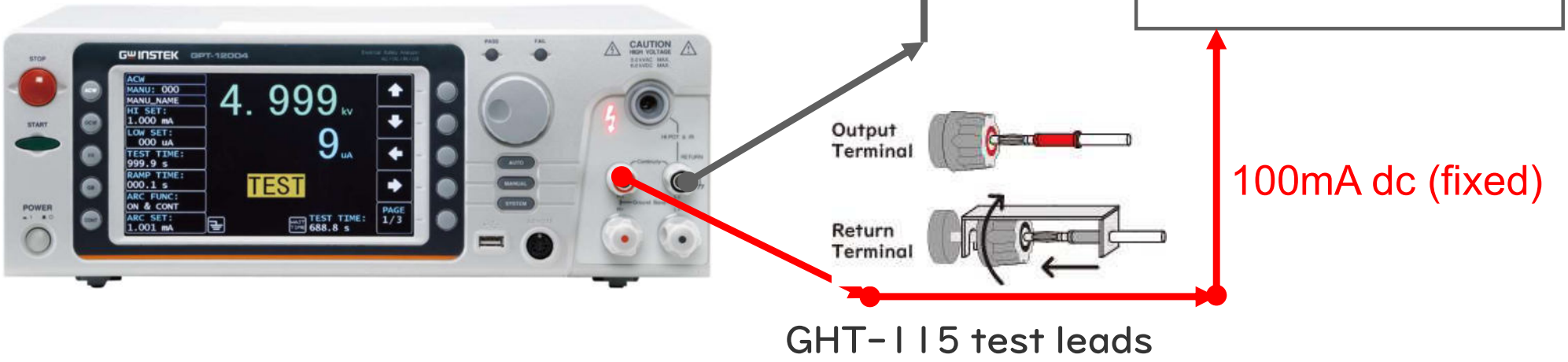
Ground Continuity test

The Ground Continuity test often are required to be performed along with or prior to the Hi-pot test.
The ground continuity test verifies the connection between the ground pin on the power cord and any exposed metal parts on the equipment.

An AC or DC voltage can be used, and the current is typically quite low, less than 1A. A simple handheld device can be used for testing

100mA d.c. (fixed)

Ohmmeter Meas. Range: 0.10Ω~ 70.00Ω



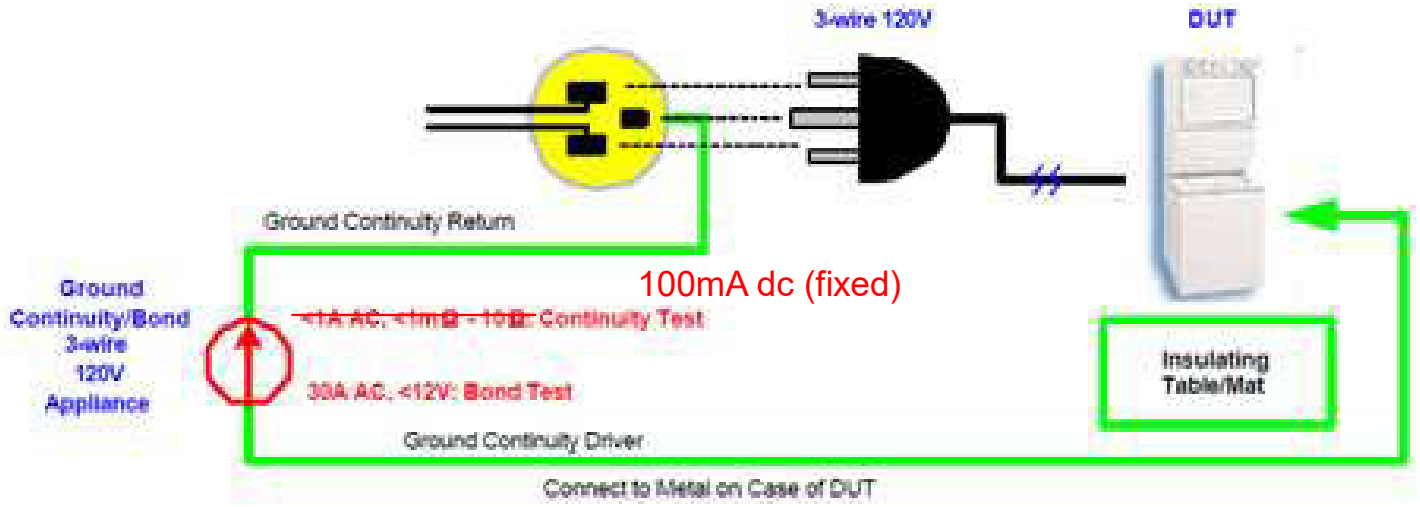
Ground Continuity(GC) Test

Ground Continuity Test

The purpose of a ground continuity test is to verify that all conductive parts of a product that are exposed to user contact are connected to the power line ground (the “green” wire). The theory is that if an insulation failure occurs that connects power line voltage to an exposed part and a user then comes into contact with that part, current will flow through the low resistance ground path to the green wire, tripping a circuit breaker or blowing a fuse, rather than flowing through the higher resistance of the user’s body. Connecting all exposed conductive parts solidly to ground safely diverts the current away from the person.

Figure 13:

Test Setup for Ground Continuity



Since many older homes may be wired as 2-wire systems without solid ground connections, regulatory agencies require all products manufactured with 3-wire cords to pass the same hi-pot tests as ungrounded products. In such cases, the user is protected by the electrical insulation rather than by the safety ground.

Ground continuity tests are normally performed with a low current DC signal that checks to ensure that the ground connection has a resistance of less than 1 ohm. Ground continuity testing is not only helpful in determining how well a product will fare during a laboratory investigation, but also is useful in a production line environment to ensure quality and user safety.

GB Test Lead Connection

Ground Bond Test

Ground bond testing requires application of a high current source to a conductive surface of the product and measurement of the voltage drop across the ground connection. This is to determine that bonding is adequate and that the circuit can carry the specified current safely. One common method of ground bond testing, shown in Figure 14, applies a 25A source between the protective grounding terminal of the device and all conductive parts that are accessible to the user. The tester used for this purpose supplies the required current and displays the ground circuit resistance in ohms or milliohms.

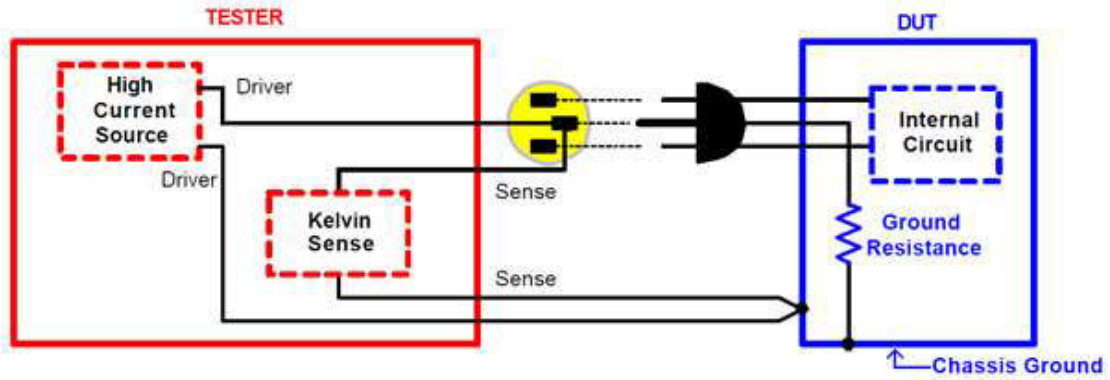


Figure 14: Ground Bond Test with a Kelvin Connection

Because the resistance to ground is usually a very low value, the resistance of the connecting leads from the tester itself can cause errors in the measurement. Such errors can be corrected either by measuring the resistance of the leads before the test and then subtracting that value from the test value or by using a "Kelvin" test setup. A Kelvin connection automatically compensates for the lead resistance by bringing an extra lead to the point of measurement. The extra lead is connected so as to balance out the resistance of the test lead. A typical test setup with a Kelvin connection is illustrated in Figure 14. Most standards recommend a ground resistance of <100 milliohms, excluding the power cable.

Accessories

Included Accessories

Quick Start Guide x 1, CD x1 (completed user manual)

Power cord x 1, Interlock key x 1, Remote terminal Cable GHT-119 x 1

Test lead GHT-115 x 1 (for GPT-12003/12002/12001)

Test lead GHT-115 x 1, GTL-215 x 1 (for GPT-12004)

Optional Interface: Opt.1 GPIB card

Optional Accessories

GHT-113: High Voltage Test Pistol

GHT-117: High Voltage Adapter Box

GHT-118: High Voltage / Ground Bond Adapter Box

GHT-205: High Voltage Test Probe

GTL-232: RS232C Cable, 9-pin Female to 9-pin, null Modem for Computer

GTL-246: USB Cable, A-B type, approx. 1.2m

GTL-248: GPIB Cable, approx. 2m

GRA-440: Rack Mount Kit

ACW Spec comparison ~ GPT-12000 vs GPT-9800

MODELS	GPT-12000 Series	GPT-9800 Series
	200VA	200VA
AC Withstanding (ACW)		
Output-Voltage Range	0.050kV~5.000kV	0.050kV~5.000kV
Output-Voltage Resolution	1V	2V
Output-Voltage Accuracy	± (1% of setting + 5V) [no load]	± (1% of setting + 5V) [no load]
Maximum Rated Load	200 VA (5kV/40mA)	200 VA (5kV/40mA)
Maximum Rated Current	40mA (0.5kV< V ≦5kV)	40mA (0.5kV< V ≦5kV)
	10mA (0.05kV≦ V ≦0.5kV)	10mA (0.05kV≦ V ≦0.5kV)
Output-Voltage Waveform	Sine wave	Sine wave
Output-Voltage Frequency	50 Hz / 60 Hz selectable	50 Hz / 60 Hz selectable
Voltage Regulation	± (1% + 5V) [maximum rated load → no load]	± (1% + 5V) [maximum rated load → no load]
Voltmeter Accuracy	± (1% of reading + 5V)	± (1% of reading + 5V)
Current Measurement Range	1μA~40.00mA	0.001mA~40.00mA
Current Best Resolution	1μA / 10μA	0.001mA / 0.01mA/ 0.1mA
Current Measurement Accuracy	±(1.5% of reading + 3μA) when I Reading < 1mA	±(1.5% of reading + 30 counts) when HI SET <1.11mA
	±(1.5% of reading + 30μA) when I Reading ≧1mA	±(1.5% of reading + 3 counts) when HI SET ≥1.11mA
Window Comparator Method	Yes	Yes
ARC Detect	Yes	Yes
RAMP UP (Rise Time)	0.1s~999.9s	0.1s~999.9s
RAMP DOWN (Fall Time)	0.0s~999.9s	X
TIMER (Test Time)	OFF, 0.3s~999.9s	OFF*, 0.5s~999.9s
WAIT TIME	0.0s~999.9s	X
GND	ON/OFF	ON/OFF

DCW Spec comparison ~ GPT-12000 vs GPT-9800

MODELS	GPT-12000 Series	GPT-9800 Series
	200VA	200VA
DC Withstanding (DCW)		
Output-Voltage Range	0.050kV~6.000kV	0.050kV~6.000kV
Output-Voltage Resolution	1V	2V
Output-Voltage Accuracy	± (1% of setting + 5V) [no load]	± (1% of setting + 5V) [no load]
Maximum Rated Load	50W (5kV/10mA)	50W (5kV/10mA)
Maximum Rated Current	10mA (0.5kV< V ≦6kV)	10mA (0.5kV< V ≦6kV)
	2mA (0.05kV≦ V ≦0.5kV)	2mA (0.05kV≦ V ≦0.5kV)
Voltage Regulation	± (1% + 5V) [maximum rated load → no load]	± (1% + 5V) [maximum rated load → no load]
Voltmeter Accuracy	± (1% of reading + 5V)	± (1% of reading + 5V)
Current Measurement Range	1μA~10.00mA	0.001mA~10.00mA
Current Best Resolution	0.1μA / 1μA / 10μA	0.001mA / 0.01mA/ 0.1mA
Current Measurement Accuracy	±(1.5% of reading + 3μA) when I Reading < 1mA	±(1.5% of reading + 30 counts) when HI SET <1.11mA
	±(1.5% of reading + 30μA) when I Reading ≧1mA	±(1.5% of reading + 3 counts) when HI SET ≥1.11mA
Window Comparator Method	Yes	Yes
ARC Detect	Yes	Yes
RAMP UP (Rise Time)	0.1s~999.9s	0.1s~999.9s
RAMP DOWN (Fall Time)	0.0s~999.9s	X
TIMER (Test Time)	OFF, 0.3s~999.9s	OFF*, 0.5s~999.9s
WAIT TIME	0.0s~999.9s	X
GND	ON/OFF	ON/OFF

IR Spec comparison ~ GPT-12000 vs GPT-9800

MODELS		GPT-12000 Series	GPT-9800 Series
		200VA	200VA
Insulation Resistance (IR)			
Output Voltage		50V~1200V dc	50V~1000V dc
Output-Voltage Resolution		50V	50V
Output-Voltage Accuracy		± (1% of setting + 5V) [no load]	± (1% of setting + 5V) [no load]
Resistance Measurement			
Test Voltage	Display Range	Measurement Range / Accuracy	Measurement Range / Accuracy
50V ≦ V ≦ 100V	0.1MΩ~ 10.00GΩ	0.1MΩ~1MΩ: ±(5% of reading + 3 count)	X
		1 MΩ~50MΩ: ±(5% of reading + 1 count)	1 MΩ~50MΩ: ±(5% of reading + 1 count)
150V ≦ V ≦ 450V	0.1MΩ~ 20.00GΩ	51MΩ~2GΩ: ±(10% of reading + 1 count)	51MΩ~2000MΩ: ±(10% of reading + 1 count)
500V ≦ V ≦ 1200V	0.1MΩ~ 50.00GΩ	0.1MΩ~1MΩ: ±(5% of reading + 3 count)	X
		1 MΩ~500MΩ: ±(5% of reading + 1 count)	1 MΩ~500MΩ: ±(5% of reading + 1 count)
		501MΩ~9.999GΩ: ±(10% of reading + 1 count)	501MΩ~9500MΩ: ±(10% of reading + 1 count)
		10GΩ~50GΩ: ±(20% of reading + 1 count)	X
Voltage Regulation		± (1% + 5V): [maximum rated load → no load]	X
Voltmeter Accuracy		± (1% of reading + 5V)	X
Short-Circuit Current		10mA max.	X
Output Impedance		2kΩ	600kΩ
Window Comparator Method		Yes	Yes
RAMP UP (Rise Time)		0.1s~999.9s	0.1s~999.9s
RAMP DOWN (Fall Time)		0.0s~999.9s	X
TIMER (Test Time)		0.3s~999.9s	0.5s~999.9s
WAIT TIME		0.0s~999.9s	X
GND		ON/OFF	OFF
IR Mode		Available	X

GB Spec comparison ~ GPT-12000 vs GPT-9800

MODELS	GPT-12000 Series	GPT-9800 Series
	200VA	200VA
Ground Bond (GB)		
Output-Current	03.00A~**32.00A** ac	03.00A~30.00A ac
Output-Current Resolution	0.01A	0.01A
Output-Current Accuracy	3A≦I≦8A：±(1% of reading + 0.2A)	3A≦I≦8A：±(1% of reading + 0.2A)
	8A<I≦32A：±(1% of reading + 0.05A)	8A<I≦30A：±(1% of reading + 0.05A)
Test-Voltage	**8Vac max** (open circuit)	6Vac max (open circuit)
Test-Voltage Frequency	50Hz/60Hz selectable	50Hz/60Hz selectable
Ohmmeter Meas.Range	**1mΩ**~ 650mΩ	10mΩ~ 650mΩ
Ohmmeter Meas. Resolution	0.1mΩ	0.1mΩ
Ohmmeter Meas. Accuracy	±(1% of reading + 2 mΩ)	±(1% of reading + 2 mΩ)
Window Comparator Method	Yes	Yes
TIMER (Test Time)	**0.3s**~999.9s	0.5s~999.9s
Test Method	Four Terminal	Four Terminal
GND	**ON/OFF**	OFF

New GC Spec comparison ~ GPT-12000 vs GPT-9800

MODELS	GPT-12000 Series	GPT-9800 Series
	200VA	200VA
Ground Continuity (GC)		
Output-Current	100mA dc (fixed)	X
Ohmmeter Meas. Range	0.10Ω~ 70.00Ω	X
Ohmmeter Meas. Resolution	0.01Ω	X
Ohmmeter Meas. Accuracy	±(10% of reading + 2 Ω)	X

Others

- Included Accessories
  Quick Start Guide x 1, CD x1(completed user manual), Power cord x 1,
  Interlock key x 1, Remote terminal Cable GHT-119 x 1,
  Test lead **GHT-115?** x 1 for GPT-12003/12002/12001
  Test lead **GHT-115?** x 1, **GTL-215** x 1 for GPT-12004
- Option
  Opt.1 GPIB card
- Optional Accessories
  GHT-113 High Voltage Test Pistol
  GHT-205 High Voltage Test Probe
  GTL-232 RS232C Cable, 9-pin Female to 9-pin, null Modem for Computer
  GTL-246 USB Cable, A-B type, approx. 1.2m
  GTL-248 GPIB Cable, approx. 2m
  GHT-117/117E HV adaptor box
  GHT-118/118E HV/GB adaptor box
- PC Software?, LabVIEW driver?

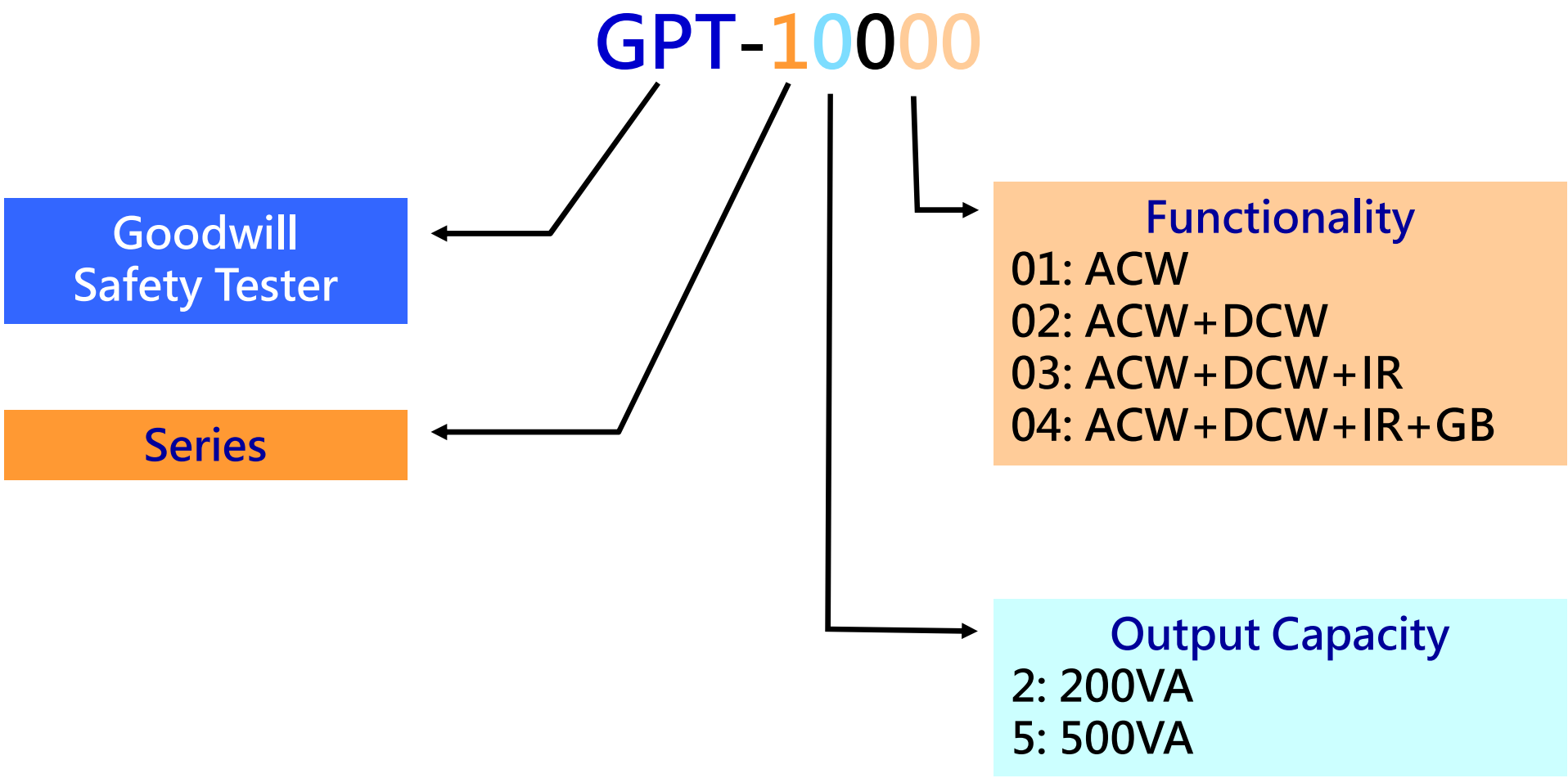
- **2 year warranty**

Q&A

GW INSTEK

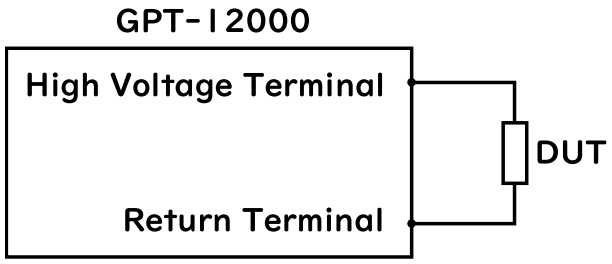
Thank You For Your Continuous Support

Model Name

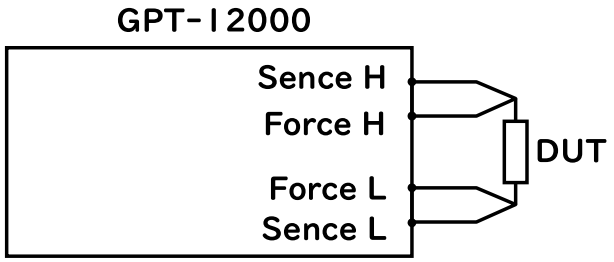

GPT-10000
Goodwill
Safety Tester
Series
Functionality
01: ACW
02: ACW+DCW
03: ACW+DCW+IR
04: ACW+DCW+IR+GB
Output Capacity
2: 200VA
5: 500VA

Test Lead Connection

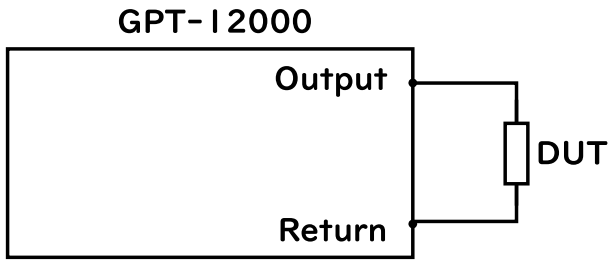
ACW, DCW, IR Connection



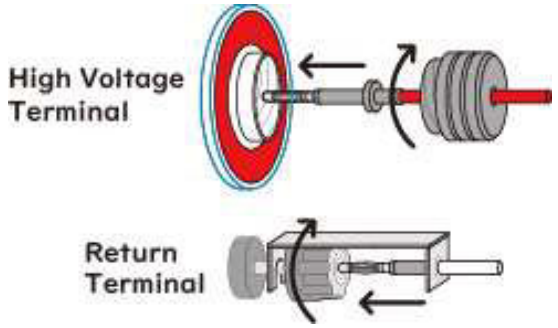
GB Connection



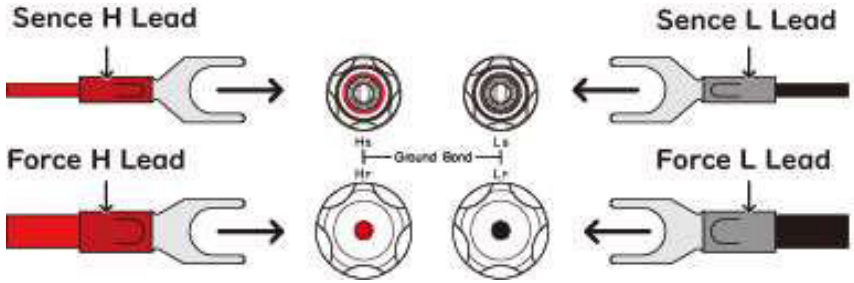
GC Connection



GHT-115 test leads



GTL-215 test leads



GTL-115 test leads