Differential Probe

GDP-025/050/100 Series

USER MANUAL

ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

The information in this manual was correct at the time of printing. However, Good Will continues to improve its products and therefore reserves the right to change the specifications, equipment, and maintenance procedures at any time without notice.

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SAFETY INSTRUCTIONS

This chapter contains important safety instructions that should be followed when operating and storing a differential probe. Read the following before any operation to ensure your safety and to keep the instrument in the best condition.

Safety Symbols

These safety symbols may appear in this manual or on the instrument.

 WARNING	Warning: Identifies conditions or practices that could result in injury or loss of life.
 CAUTION	Caution: Identifies conditions or practices that could result in damage to the instrument or to other objects or property.
	DANGER High Voltage
	Attention: Refer to the Manual
	Protective Conductor Terminal
	Earth (Ground) Terminal

Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.

Safety Guidelines

General Guideline CAUTION	• Do not use the probes in a damp environment or where there is risk of explosion. • Do not use the probe with the case open. • Disconnect the inputs and outputs of the probe before opening the case. • The probes are for indoor use only. • Do not place heavy objects on the instrument. • Avoid severe impact or rough handling that may damage the instrument. • Use only mating connectors, not bare wires, for the terminals. • The instrument should only be disassembled by a qualified technician.
Electrical Safety WARNING	• Make sure the maximum differential voltage does not exceed 400 V (DC+AC peak) or 480 V_{rms} for the GDP-025 or 7000 V (DC+AC peak) or 2300 V_{rms} for the GDP-050/GDP-100 • Make sure the maximum voltage between each input terminal and ground does not exceed 240 V_{rms} for the GDP-025 or 1200 V_{rms} for the GDP-050/GDP-100

Cleaning the instrument	• The probes do not require any particular cleaning. • A soft cloth dampened in a solution of mild detergent and water can be used to clean the case. • Do not spray any liquid into the instrument. • Do not use chemicals containing harsh products such as benzene, toluene, xylene, and acetone.
Operation Environment	• Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below) • Relative Humidity: 10 to 85 % (no condensation) • Temperature: 0 °C to 50 °C (Pollution Degree) EN 61010-1:2001 specifies pollution degrees and their requirements as follows. The instrument falls under degree 2. Pollution refers to "addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity". • Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence. • Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected. • Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled.
Storage environment	• Location: Indoor • Relative Humidity: 10 to 90 % (no condensation) • Temperature: -30 °C to 70 °C Note: If the probe is not in use for more than 60 days, please store in a de-humidified environment to keep the probe dry.

Reference environment	• Location: Indoor • Relative Humidity: ≤70 % (no condensation) • Temperature: +20 to 30 °C
Disposal 	Do not dispose this instrument as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. Please make sure discarded electrical waste is properly recycled to reduce environmental impact.

Power cord for the United Kingdom

When using the instrument in the United Kingdom, make sure the power cord meets the following safety instructions.

NOTE: This lead/appliance must only be wired by competent persons

⚠ WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in this lead are coloured in accordance with the following code:

Green/ Yellow:	Earth
Blue:	Neutral
Brown:	Live (Phase)

As the colours of the wires in main leads may not correspond with the coloured marking identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with either the letter E, the earth symbol ⏚ or coloured Green/Green & Yellow.

The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

If in doubt, consult the instructions provided with the equipment or contact the supplier.

This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, a cable of 0.75 mm2 should be protected by a 3 A or 5 A fuse. Larger conductors would normally require 13 A types, depending on the connection method used.

Any exposed wiring from a cable, plug or connection that is engaged in a live socket is extremely hazardous. If a cable or plug is deemed hazardous, turn off the mains power and remove the cable, any fuses and fuse assemblies. All hazardous wiring must be immediately destroyed and replaced in accordance to the above standard.

GETTING STARTED

The Getting Started chapter introduces the probe's features, appearance and functions.

Main Features

Model name	Bandwidth	Max differential voltage
GDP-025	25 MHz	480 V_{rms}
GDP-050	50 MHz	2300 V_{rms}
GDP-100	100 MHz	2300 V_{rms}

Features

- The GDP Series differential probes provide a safe means to measure differential voltages for all models of oscilloscopes.
- The differential probes convert high voltages (≤ 1400 Vpeak for GDP-025; 7000 Vpeak for GDP-050, GDP-100) into low voltages (≤7 V with ref to ground) for display on oscilloscopes.
- The GDP Series is designed to operate with the 1 MΩ impedance oscilloscopes. When combined with a 50 Ω load, the attenuation will be 2 times.

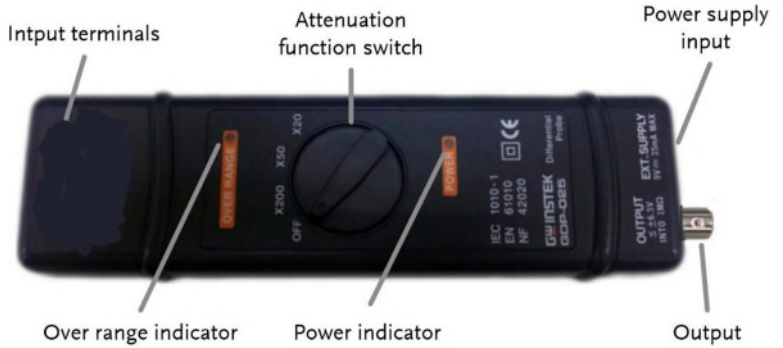
Accessories GDP-025

- AC Adapter (110 V or 220 V depending on region)
- BNC to BNC cable: 50 Ω resistance, RG58C UL, 100 cm
- Banana plug to banana plug silicon wire, UL 6 kV, 18AWG, Length 60 cm. (red x1, black x1)
- IC clip, UL 1000V CAT III (red x1, black x1)
- Alligator clip, UL 1000 V CATII, 10 A (red x1,

	black x1)
Accessories GDP-050	• Adapter (110 V or 220 V depending on region) • BNC to BNC cable: 50 Ω resistance, RG58C UL, 100 cm • Banana plug to banana plug silicon wire, UL 20 kV, 18AWG, Length 60 cm. (red x1, black x1) • HV IC clip, Max 6500 V (DC+ACp-p) (red x1, black x1) • Alligator clip, UL 1000 V CATII, 10 A (red x1, black x1)
Accessories GDP-100	• Adapter (110 V or 220 V depending on region) • BNC to BNC cable: 50 Ω resistance, RG58C UL, 100 cm • Banana plug to banana plug silicon wire, UL 20 kV, 18AWG, Length 60 cm. (red x1, black x1) • Test lead UL 1000 V, CATIII (red x1, black x1) • HV IC clip, Max 6500 V (DC+ACp-p) (red x1, black x1) • Alligator clip, UL 1000 V CATII, 10 A (red x1, black x1)

Instrument Overview

GDP-025



GDP-050/ GDP-100

Input terminals	Category III input terminals.
Power Indicator	The power indicator lights when the external power supply is connected.
Over range indicator	The over range indicator lights when the input voltage exceeds rating.
Power supply input	External power supply input. 9 V, 300 mA.
Output	Differential probe output.

MEASUREMENT

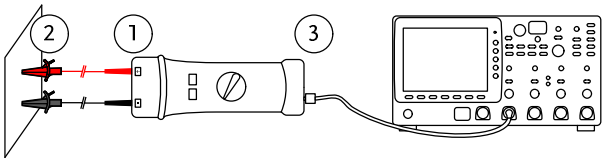
High voltage

Risk of electric shock. The GDP Series differential voltage probes are designed for use with high voltages. When operating with high voltages ensure proper safety precautions are taken at all times. Please see the safety section for more details.

Operation

Connection

1. Connect the test leads to the GDP differential probe INPUT terminal. Connect the low potential to the negative terminal. Connect the high potential to the positive terminal.
2. Connect the test lead to the EUT.
3. Connect the probe to the oscilloscope using the BNC to BNC cable.



Procedure

1. Adjust the vertical position on the oscilloscope.
2. Adjust the attenuation ratio and vertical deviation in accordance to the deviation table listed on the next page.

Caution

- The power light must come on
- Ensure the range light does not come on before measuring

Deviation Table						
Model	GDP-050 GDP-100	GDP-050 GDP-100	All	GDP-050 GDP-100	GDP-025	GDP-025
Attenuation	X 1000	X 500	X 200	X 100	X 50	X 20
Voltage input range (DC + AC Peak)	7000 Vp-p (±3500 Vdc)	3500 Vp-p (±1750 Vdc)	1400 Vp-p (±700 Vdc)	700 Vp-p (±350 Vdc)	350 Vp-p (±175 Vdc)	140 Vp-p (±70 Vdc)

Vertical Deviation on the Oscilloscope in V/div	Real Division in V/div					
	X 1000	X 500	X 200	X 100	X 50	X 20
Model	GDP-050 GDP-100	GDP-050 GDP-100	All	GDP-050 GDP-100	GDP-025	GDP-025
1	1000	500	200	100	50	20
0.5	500	250	100	50	25	10
0.2	200	100	40	20	10	4
0.1	100	50	20	10	5	2
50 m	50	25	10	5	2.5	1
20 m	20	10	4	2	1	0.4
10 m	10	5	2	1	.5	0.2
5 m	5	2.5	1	0.5	0.25	0.1
2 m	2	1	0.4	0.2	0.1	40 m

Note: The real vertical deviation in V/div is equal to the attenuation factor multiplied by the range of the vertical deviation selected on the oscilloscope. The real vertical deviation will be doubled if a 50 Ω load is used.

Example

With the probe set to a factor of X200, the oscilloscope set to a vertical deviation of 0.5 V/div, the real vertical deviation is 200 x 0.5 = 100 V/div. With a 50 Ω load on the input of the oscilloscope the deviation becomes 200 V/div.

APPENDIX

GDP Series Specifications

GDP-025	Bandwidth	DC to 25 MHz (-3 dB)
	Attenuation	x20, x50, x200
	Accuracy	± 2 %
	Voltage Input Range (DC+AC peak to peak)	≤ 140 Vp-p for x20 (≅ 48 V_{rms} or DC) ≤ 350 Vp-p for x50 (≅ 120 V_{rms} or DC) ≤ 1400 Vp-p for x100 (≅ 480 V_{rms} or DC)
	Permitted Max Input Voltage	Max differential voltage: 400 V (DC+AC peak to peak) or 480 V_{rms} Max voltage between each input terminal and ground: 240 V_{rms}
	Input Impedance	Differential: 4 MΩ/1.2 pF Between terminals and ground: 2 MΩ/2.3 pF
	Output	≤ ±7.0 V
	Output Impedance	50 Ω
	Rise Time	14 ns
	Rejection Rate on Common Mode	60 Hz: >80 dB; 100 Hz: >60 dB; 1 MHz: >50 dB
	Power Supply	Only external 9 V DC power supply
	Consumption	< 300 mA max
	Environmental Operating Conditions	Indoor Use only. Temperature: Reference: +20 ˚C to +30 ˚C; Use: 0 ˚C to +50 ˚C; Storage: -30 ˚C to +70 ˚C Relative Humidity: Reference: ≤70 % RH; Use: 10 % to 85 % RH; Storage: 10 % to 90 % RH.
	Dimensions and Weight	195 mm x 55 mm x 30 mm; 250 g

Electrical Safety to IEC 1010-1	Dual Insulation Installation Category III Degree of Pollution 2 Rated Voltage or Max Line-Earth: 240 Vrms

GDP-050	Bandwidth	DC to 50 MHz (-3 dB)
	Attenuation	X100, x200, x500, x1000
	Accuracy	± 2 %
	Voltage Input Range (DC+AC peak to peak)	≤ 700 Vp-p for x100 (≅230 V_{rms} or DC) ≤ 1400 Vp-p for x200 (≅460 V_{rms} or DC) ≤ 3500 Vp-p for x500 (≅1140 V_{rms} or DC) ≤ 7000 Vp-p for x1000 (≅2300 V_{rms} or DC)
	Permitted Max Input Voltage	Max differential voltage: 7000 V (DC+AC peak to peak) Max voltage between each input terminal and ground: 1200 V_{rms}
	Input Impedance	Differential: 16 MΩ/1.2 pF Between terminals and ground: 8 MΩ/2.3 pF
	Output	≤ ±7.0 V
	Output Impedance	50 Ω
	Rise Time	7 ns
	Rejection Rate on Common Mode	60 Hz: >80 dB; 100 Hz: >60 dB; 1 MHz: >50 dB
	Power Supply	Only external 9 V DC power supply
	Consumption	<300 mA max
	Environmental Operating Conditions	Indoor Use only. Temperature: Reference: +20 ˚C to +30 ˚C; Use: 0 ˚C to +50 ˚C; Storage: -30 ˚C to +70 ˚C Relative Humidity: Reference: ≤70 % RH; Use: 10 % to 85 % RH; Storage: 10 % to 90 % RH.
	Dimensions and Weight	240 mm x 80 mm x 30 mm; 280 g
	Electrical Safety to IEC 1010-1	Dual Insulation Installation Category III Degree of Pollution 2 Rated Voltage or Max Line-Earth: 1200 V_{rms}

GDP-100	Bandwidth	DC to 100 MHz (-3 dB)
	Attenuation	X100, x200, x500, x1000
	Accuracy	± 2 %
	Voltage Input Range (DC+AC peak to peak)	≤ 700 Vp-p for x100 (≅230 V_{rms} or DC) ≤ 1400 Vp-p for x200 (≅460 V_{rms} or DC) ≤ 3500 Vp-p for x500 (≅1140 V_{rms} or DC) ≤ 7000 Vp-p for x1000 (≅2300 V_{rms} or DC)
	Permitted Max Input Voltage	Max differential voltage: 7000 V (DC+AC peak to peak) Max voltage between each input terminal and ground: 1200 Vrms
	Input Impedance	Differential: 16 MΩ/1.2 pF Between terminals and ground: 8 MΩ/2.3 pF
	Output	≤ ±7.0 V
	Output Impedance	50 Ω
	Rise Time	3.5 ns
	Rejection Rate on Common Mode	60 Hz: >80 dB; 100 Hz: >60 dB; 1 MHz: >50 dB
	Power Supply	Only external 9 V DC power supply
	Consumption	< 300 mA max
	Environmental Operating Conditions	Indoor Use only. Temperature: Reference: +20 ˚C to +30 ˚C; Use: 0 ˚C to +50 ˚C; Storage: -30 ˚C to +70 ˚C Relative Humidity: Reference: ≤70 % RH; Use: 10 % to 85 % RH; Storage: 10 % to 90 % RH.
	Dimensions and Weight	240 mm x 80 mm x 30 mm: 280 g
	Electrical Safety to IEC 1010-1	Dual Insulation Installation Category III Degree of Pollution 2 Rated Voltage or Max Line-Earth: 1150 V_{rms}

EC Declaration of Conformity

We
GOOD WILL INSTRUMENT CO., LTD.
declare that the CE marking mentioned product
satisfies all the technical relations application to the product within the scope of council:
Directive: EMC; LVD; WEEE; RoHS
The product is in conformity with the following standards or other normative documents:

◎ **EMC**	
EN 61326-1	Electrical equipment for measurement, control and laboratory use –- EMC requirements
Conducted & Radiated Emission EN 55011 / EN 55032	Electrical Fast Transients EN 61000-4-4
Current Harmonics EN 61000-3-2 / EN 61000-3-12	Surge Immunity EN 61000-4-5
Voltage Fluctuations EN 61000-3-3 / EN 61000-3-11	Conducted Susceptibility EN 61000-4-6
Electrostatic Discharge EN 61000-4-2	Power Frequency Magnetic Field EN 61000-4-8
Radiated Immunity EN 61000-4-3	Voltage Dip/ Interruption EN 61000-4-11 / EN 61000-4-34
◎ Safety	
EN 61010-1 :	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

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