Differential Probe

GDP-025/050/100 Series

USER MANUAL

GW INSTEK PART NO. &2DP-10000MA1

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.

(Measurement categories) EN 61010-1:2001 specifies the measurement categories and their requirements as follows. The GDP Series falls under category III.

- Measurement category IV is for measurement performed at the source of a low-voltage installation.
- Measurement category III is for measurement performed in a building installation.
- Measurement category II is for measurement performed on circuits directly connected to a low voltage installation.
- Measurement category I is for measurements performed on circuits not directly connected to Mains.

Electrical Safety ⚠ WARNING	• Make sure the maximum differential voltage does not exceed 1400V (DC+AC peak) or 450 Vrms for the GDP-025 or 7000V (DC+AC peak) or 2200 Vrms for the GDP-050/GDP-100 • Make sure the maximum voltage between each input terminal and ground does not exceed 600 Vrms for the GDP-025 or 6500 Vrms 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% • 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% • 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% • 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 0.75mm2 should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A 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	25MHz	450Vrms
GDP-050	50MHz	6500Vrms
GDP-100	100MHz	6500Vrms

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 (7000 peak for GDP-050, GDP-100) into low voltages (≤7V with ref to ground) for display on oscilloscopes.
- The GDP Series is designed to operate with the 1MΩ impedance oscilloscopes. When combined with a 50Ω load, the attenuation will be 2 times.

Accessories

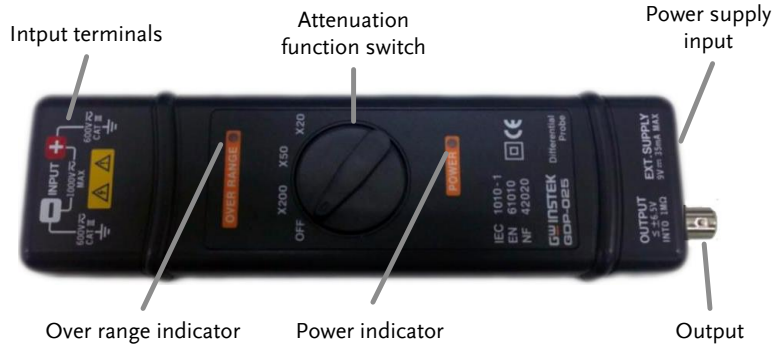
GDP-025

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

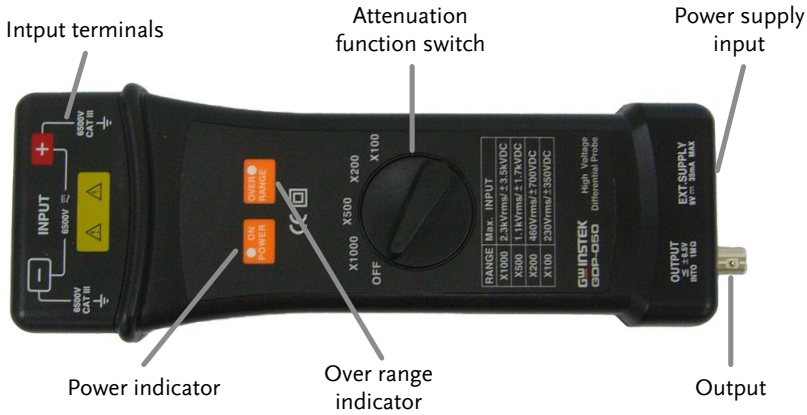
	black x1)
Accessories GDP-050	• Adapter (110V or 220V depending on region) • BNC to BNC cable: 50Ω resistance, RG58C UL, 100cm • Banana plug to banana plug silicon wire, UL 20kV, 18AWG, Length 60cm. (red x1, black x1) • HV IC clip, Max 6500V (DC+ACp-p) (red x1, black x1) • Alligator clip, UL 1000V CATII, 10A (red x1, black x1)
Accessories GDP-100	• Adapter (110V or 220V depending on region) • BNC to BNC cable: 50Ω resistance, RG58C UL, 100cm • Banana plug to banana plug silicon wire, UL 20kV, 18AWG, Length 60cm. (red x1, black x1) • Test lead UL 1000V, CATIII (red x1, black x1) • HV IC clip, Max 6500V (DC+ACp-p) (red x1, black x1) • Alligator clip, UL 1000V CATII, 10A (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. 9V, 200mA.
Output	Differential probe output. ≤±6.5V into 1MΩ

MEASUREMENT

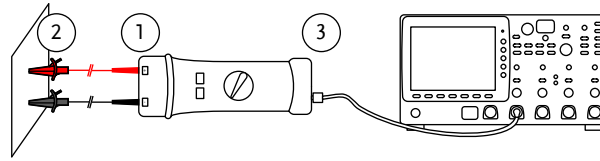
High voltage

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 (±3500Vdc)	3500 Vp-p (±1750Vdc)	1400 Vp-p (±700Vdc)	700 Vp-p (±350Vdc)	350 Vp-p (±175Vdc)	140 Vp-p (±70Vdc)

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
50m	50	25	10	5	2.5	1
20m	20	10	4	2	1	0.4
10m	10	5	2	1	.5	0.2
5m	5	2.5	1	0.5	0.25	0.1
2m	2	1	0.4	0.2	0.1	40m

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 50Ω load is used.

Example

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

APPENDIX

GDP Series Specifications

GDP-025	Bandwidth	DC-25MHz (-3dB)for x50, x200 DC-50MHz (for attenuation x20)
	Attenuation	x20, x50, x200
	Accuracy	± 2%
	Voltage Input Range (DC+AC peak to peak)	≤ 140Vp-p for x20 (≅ 45Vrms) ≤ 350Vp-p for x50 (≅ 110Vrms) ≤ 1400Vp-p for x200 (≅ 450Vrms)
	Permitted Max Input Voltage	Max differential voltage: 1400 V (DC+AC peak to peak) or 450 Vrms Max voltage between each input terminal and ground: 600 Vrms
	Input Impedance	Differential: 4MΩ/1.2pF Between terminals and ground: 2MΩ/2.3pF
	Output	≤ ±7.0V
	Output Impedance	50Ω
	Rise Time	14ns for x50, and x200; 23.4ns for x20
	Rejection Rate on Common Mode	60Hz: >80dB; 100Hz: >60dB; 1MHz: >50dB
	Power Supply	External 9V DC power supply
	Consumption	Max. 35mA (0.4 Watt)
	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%; Use: 10% to 85%: 10% to 90% Storage: 10% to 90%
	Dimensions and Weight	195mm x 55mm x 30mm: 250g

Electrical Safety to IEC 1010-1	Dual Insulation Installation Category III Degree of Pollution 2 Rated Voltage or Max Line-Earth: 600Vrms

GDP-050	Bandwidth	DC-50MHz (-3dB)for x200, x500, x1000 DC-25MHz (for attenuation x100)
	Attenuation	X100, x200, x500, x1000
	Accuracy	± 2%
	Voltage Input Range (DC+AC peak to peak)	≤ 700Vp-p for x100 (≅230Vrms) ≤ 1400Vp-p for x200 (≅460Vrms) ≤ 3500Vp-p for x500 (≅1140Vrms) ≤ 7000Vp-p for x1000 (≅2300Vrms)
	Permitted Max Input Voltage	Max differential voltage: 7000 V (DC+AC peak to peak) Max voltage between each input terminal and ground: 6500 Vrms
	Input Impedance	Differential: 54MΩ/1.2pF Between terminals and ground: 27MΩ/2.3pF
	Output	≤ ±7.0V
	Output Impedance	50Ω
	Rise Time	7ns for x200, x500 and x1000; 14ns for x100
	Rejection Rate on Common Mode	60Hz: >80dB; 100Hz: >60dB; 1MHz: >50dB
	Power Supply	External 9V DC power supply
	Consumption	Max. 35mA (0.4 Watt)
	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%; Use: 10% to 85%: 10% to 90% Storage: 10% to 90%
	Dimensions and Weight	240mm x 80mm x 30mm: 280g
	Electrical Safety to IEC 1010-1	Dual Insulation Installation Category III Degree of Pollution 2 Rated Voltage or Max Line-Earth: 6500Vrms

GDP-100	Bandwidth	DC-100MHz (-3dB)for x200, x500, x1000 DC-50MHz (for attenuation x100)
	Attenuation	X100, x200, x500, x1000
	Accuracy	± 2%
	Voltage Input Range (DC+AC peak to peak)	≤ 700Vp-p for x100 (≅230Vrms) ≤ 1400Vp-p for x200 (≅460Vrms) ≤ 3500Vp-p for x500 (≅1140Vrms) ≤ 7000Vp-p for x1000 (≅2300Vrms)
	Permitted Max Input Voltage	Max differential voltage: 7000 V (DC+AC peak to peak) Max voltage between each input terminal and ground: 6500 Vrms
	Input Impedance	Differential: 54MΩ/1.2pF Between terminals and ground: 27MΩ/2.3pF
	Output	≤ ±7.0V
	Output Impedance	50Ω
	Rise Time	3.5ns for x200, x500 and x1000; 7ns for x100
	Rejection Rate on Common Mode	60Hz: >80dB; 100Hz: >60dB; 1MHz: >50dB
	Power Supply	External 9V DC power supply
	Consumption	Max. 35mA (0.4 Watt)
	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%; Use: 10% to 85%: 10% to 90% Storage: 10% to 90%
	Dimensions and Weight	240mm x 80mm x 30mm: 280g
	Electrical Safety to IEC 1010-1	Dual Insulation Installation Category III Degree of Pollution 2 Rated Voltage or Max Line-Earth: 6500Vrms

EC Declaration of Conformity

We

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GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.
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declares that the below mentioned product

GDP-025, GDP-050, GDP-100

Are herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Law of Member States relating to Electromagnetic Compatibility (89/336/EEC, 92/31/EEC, 93/68/EEC) and Low Voltage Equipment Directive (2006/95/EC). For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Equipment Directive, the following standards were applied:

◎ **EMC**

EN 61326-1 :	Electrical equipment for measurement, control and laboratory use –– EMC requirements (1997+A1: 1998+A2: 2003)
Conducted and Radiated Emissions EN 61326: 1997+A1: 1998+A2:2 003 Class B	Electrostatic Discharge IEC 61000-4-2: 1995+A1: 1998+A2: 2000
Current Harmonic EN 61000-3-2: 2006	Radiated Immunity IEC 61000-4-3: 2002+A1: 2002
Voltage Fluctuation EN 61000-3-3: 1995+A1: 2001+A2 : 2005	Electrical Fast Transients IEC 61000-4-4: 2004
----------	Surge Immunity IEC 61000-4-5: 1995+A1: 2000
----------	Conducted Susceptibility IEC 61000-4-6: 2003+A1: 2004
----------	Voltage Dips/ Interrupts IEC 61000-4-11: 2004

◎ **Safety**

Low Voltage Equipment Directive 2006/95/EC
Safety Requirements IEC/EN 61010-031: 2002+A1: 2008