

ZLCP Series

High-Frequency AC/DC Current Probe

USER MANUAL

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1. Introduction

The ZLPROBE ZLCP Series High-Frequency AC/DC Current Probe uses open-loop Hall-effect sensing technology and supports simultaneous measurement of DC, pulse, and high-frequency AC currents. A standard BNC output interface is provided for compatibility with oscilloscopes from major manufacturers. It is widely suited to R&D and production testing in new energy, switching power supplies, motor drives, and power electronics.

Before operating the equipment, read this manual completely and strictly follow all safety requirements and operating procedures. The company assumes no responsibility for personal injury, equipment damage, or measurement failure caused by improper operation.

Important: Incorrect operation may cause electric shock or equipment damage. Improper use may also cause mechanical damage, reduced measurement accuracy, and accelerated component aging. Following the specified operating instructions helps maintain measurement accuracy and extend service life.

2. Typical Applications

1. R&D and performance testing of switching and linear power supplies.
2. Current waveform acquisition for new-energy vehicles, energy storage systems, photovoltaic inverters, and EV chargers.
3. Commissioning of variable-frequency appliances, servo motors, and industrial drives.
4. Performance testing of LED drivers, electronic ballasts, and transformers.
5. Dynamic current testing of power semiconductor devices such as MOSFETs and IGBTs.
6. Experiments on locomotive, avionics, and rail-transit power systems.
7. Teaching and laboratory experiments in power electronics and electrical/electronic engineering.
8. Current waveform analysis for UPS systems, welding machines, and industrial control equipment.

3. Product Overview & Key Advantages

3.1 Product Description

The ZLPROBE high-frequency AC/DC current probe is an active open-loop Hall-effect current clamp covering DC to 120 MHz. Its dual-range design supports both precise milliamp-level small-signal measurements and high-power transient current capture. The standard BNC interface is compatible with oscilloscopes from major manufacturers. The probe features low noise, low insertion loss, high immunity to interference, and low waveform distortion.

3.2 Key Advantages

1. **Wide-band, multi-model coverage:** DC–120 MHz options with fast rise time for capturing transient current spikes with minimal waveform distortion.
2. **Dual-range switching:** Independent high/low-current ranges; the low range provides higher resolution for milliamp-level measurements.
3. **One-button degaussing and auto-zero:** Completes degaussing and zeroing in 3 seconds to remove core remanence and improve DC measurement accuracy; manual zero-offset fine adjustment is supported.
4. **Dual audible/visual alarms:** Red overload indicator with buzzer, plus jaw-unlocked indication, helping ensure safe operation and reliable measurements.
5. **High safety insulation rating:** 600 V CAT II / 300 V CAT III, compliant with the EN 61010 international safety standard.
6. **High linearity and low noise:** No low-frequency attenuation and flat high-frequency response, suitable for precision analysis of power supplies and inverters.
7. **Universal compatibility:** Supplied with a 1 m shielded coaxial cable for all oscilloscope brands. A 1 M Ω input impedance is recommended.
8. **Stable low-ripple power supply:** Dedicated factory-supplied DC 12 V/1 A adapter for low thermal drift during extended testing.

4. Electrical Specifications

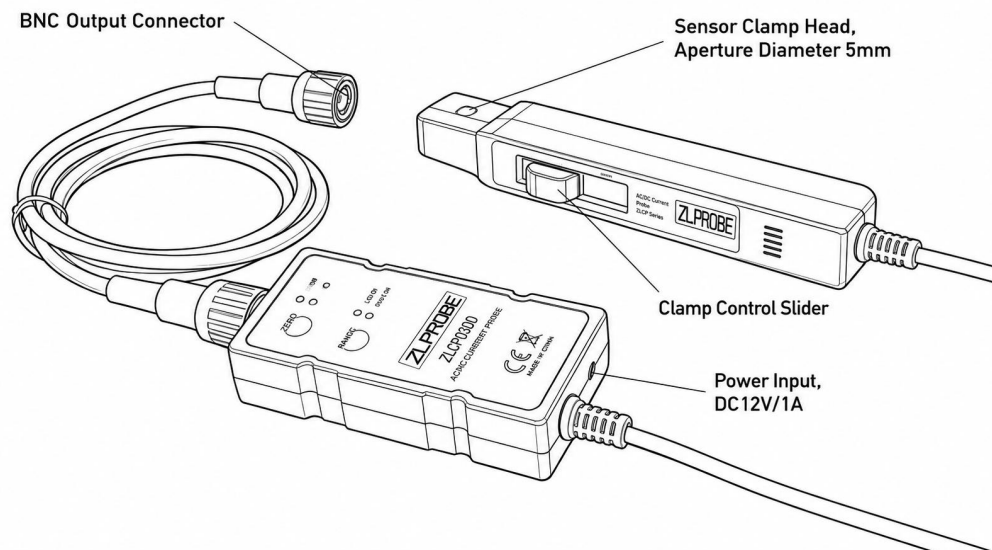
Parameter	ZLCP0330D (30 MHz / 30 A)	ZLCP0350D (30 MHz / 50 A)	ZLCP0370D (30 MHz / 70 A)
Bandwidth (-3 dB)	DC–30 MHz	DC–30 MHz	DC–30 MHz
Rise time	≤11.6 ns	≤11.6 ns	≤11.6 ns
Continuous rated current	30 Arms	50 Arms	70 Arms
Peak pulse current	50 Apk	75 Apk	100 Apk
Dual-range configuration	30 A / 5 A	50 A / 7.5 A	70 A / 10 A
Output sensitivity	30 A: 0.1 V/A 5 A: 1 V/A	50 A: 0.1 V/A 7.5 A: 1 V/A	70 A: 0.05 V/A 10 A: 0.5 V/A
Resolution	30 A: 10 mA 5 A: 1 mA	50 A: 10 mA 7.5 A: 1 mA	70 A: 20 mA 10 A: 2 mA
DC measurement accuracy	±1% ±10 mA (30 A) ±1% ±1 mA (5 A)	±1% ±10 mA (50 A) ±1% ±1 mA (7.5 A)	±1% ±20 mA (70 A) ±1% ±2 mA (10 A)
Overcurrent alarm threshold	≥50 Apk / ≥5 Apk	≥75 Apk / ≥7.5 Apk	≥100 Apk / ≥10 Apk
Probe inherent delay	TBD	TBD	TBD
Oscilloscope load	≥100 kΩ; 1 MΩ recommended	≥100 kΩ; 1 MΩ recommended	≥100 kΩ; 1 MΩ recommended
Power supply	DC 12 V / 1 A	DC 12 V / 1 A	DC 12 V / 1 A

Parameter	ZLCP0530D (50 MHz / 30 A)	ZLCP0550D (50 MHz / 50 A)	ZLCP1230D (120 MHz / 30 A)
Bandwidth (-3 dB)	DC–50 MHz	DC–50 MHz	DC–120 MHz
Rise time	≤7 ns	≤7 ns	≤2.92 ns
Continuous rated current	30 Arms	50 Arms	30 Arms
Peak pulse current	50 Apk	75 Apk	50 Apk
Dual-range configuration	30 A / 5 A	50 A / 7.5 A	30 A / 5 A
Output sensitivity	30 A: 0.1 V/A 5 A: 1 V/A	50 A: 0.1 V/A 7.5 A: 1 V/A	30 A: 0.1 V/A 5 A: 1 V/A
Resolution	30 A: 10 mA 5 A: 1 mA	50 A: 10 mA 7.5 A: 1 mA	30 A: 10 mA 5 A: 1 mA
DC measurement accuracy	±1% ±10 mA (30 A) ±1% ±1 mA (5 A)	±1% ±10 mA (50 A) ±1% ±1 mA (7.5 A)	±1% ±10 mA (30 A) ±1% ±1 mA (5 A)
Overcurrent alarm threshold	≥50 Apk / ≥5 Apk	≥75 Apk / ≥7.5 Apk	≥50 Apk / ≥5 Apk
Probe inherent delay	TBD	TBD	TBD
Oscilloscope load	≥100 kΩ; 1 MΩ recommended	≥100 kΩ; 1 MΩ recommended	≥100 kΩ; 1 MΩ recommended
Power supply	DC 12 V / 1 A	DC 12 V / 1 A	DC 12 V / 1 A

Additional notes

1. Maximum continuous current decreases as frequency increases. Prolonged operation beyond specification may cause overheating and damage. For high-frequency testing, use the high-current range whenever possible.
2. Position the conductor at the center of the jaw to reduce measurement error caused by conductor-position deviation.
3. For high-accuracy DC measurement, warm up the probe for 30 minutes and wait for thermal drift to stabilize before testing.

5. Mechanical Structure & Functions



5.1 Main Components

1. **Sensor clamp head:** Integrated magnetic core and Hall sensing element; maximum jaw diameter: 5 mm.
2. **Clamp control slider:** Move to UNLOCK to open the jaw and insert the conductor; move to LOCK to fully close and secure the jaw. Failure to lock the jaw completely can cause significant measurement errors.
3. **BNC output connector:** Standard shielded output interface for connection to the oscilloscope via the supplied coaxial cable.
4. **Power input:** Connect the dedicated factory-supplied DC 12 V/1 A adapter.

5.2 Indicators & Buttons

1. **Red overload indicator:** Stays on when the measured current exceeds the peak value of the selected range, accompanied by intermittent beeping. Need to switch to the higher range.
2. **UNLOCK indicator:** Illuminates when the control slider is not fully locked. It must be off during formal measurement.
3. **Green range indicator:** Shows the currently selected current range.
4. **Zero degaussing/auto-zero button:** Press once to start automatic degaussing and zeroing; one cycle takes approximately 3 seconds.
5. **Range button:** Cyclicly switch between large and small measurement ranges.
6. Press and hold the 'Range' and 'Zero' buttons simultaneously for 3 seconds to switch off the switch buzzer

6. Mechanical & Environmental Specifications

Item	Specification
Maximum jaw diameter	5 mm
Main unit cable length	100 cm
Supplied standard BNC coaxial cable	100 cm
Power adapter dimensions	38 × 26 × 54 mm
Handle dimensions (L × W × H)	151 × 36 × 19 mm
Control box dimensions	90 × 44 × 20 mm
Total weight	Approx. 228 g
Operating temperature / humidity	0 °C to 40 °C; RH ≤80%, non-condensing
Storage temperature / humidity	−10 °C to 50 °C; RH ≤80%, non-condensing

7. Package List

Item Description	Quantity	Remarks
AC/DC Current Probe Host Unit	1 unit	Includes Sensor Probe Head and Control Box
DC 12V Power Adapter	1 piece	Original Factory Dedicated 12V / 1A Adapter
BNC Shielded Coaxial Output Cable	1 piece	100 cm 50Ω Shielded Cable
User Manual	1 copy	This Instruction Manual
Product Warranty Card	1 copy	Official Service & Warranty Certificate
Factory Calibration Test Report	1 copy	Factory Accuracy Calibration Data

8. Safety Requirements

8.1 Safety Warnings

1. The maximum voltage of the insulated conductor under test is 600 V CAT II / 300 V CAT III. Do not measure high-voltage circuits exceeding these ratings. The probe jaw and magnetic core have no external insulation; do not touch exposed energized conductors.
2. Do not touch the conductor under test or the sensor clamp head during measurement. The oscilloscope used with the probe must have double insulation and be reliably grounded.
3. Do not operate the probe in wet environments or with wet hands. The product is not waterproof or dustproof and must not be used in standing water, heavy dust, or rain.
4. Do not continuously measure above the rated current. High-frequency high current may saturate the magnetic core and overheat or damage the probe. After an overload, degauss and auto-zero the probe again to remove remanent magnetism.
5. When multiple test instruments measure the same circuit simultaneously, the instruments must meet the required basic insulation level to prevent damage caused by potential differences.
6. Only use the dedicated factory-supplied DC 12 V/1 A adapter. Using a non-standard power supply may directly damage the internal control circuit.

8.2 Operational Precautions

1. Avoid severe drops and impacts during transport and operation. The magnetic core and Hall element are precision components and impact may permanently degrade measurement performance.



2. Avoid direct sunlight, high temperatures, and condensation. Prolonged high temperature accelerates insulation aging and increases thermal-drift error.
3. Keep the jaw contact surfaces free of dust and metal debris. Clean only with an anti-static soft cloth; do not scratch the mating surfaces.
4. Do not pull the output cable forcefully or bend it sharply and repeatedly. Damage to the internal shield may increase noise and waveform distortion.
5. Do not use acetone, thinner, gasoline, ether, or other organic solvents to clean the housing. Use neutral water and a soft cloth only.
6. Do not force the jaw open while it is in the LOCK position. This may tear the magnetic-core shielding and cause irreversible damage.
7. Keep away from high-power transformers, inverters, and RF equipment. Strong external magnetic fields may cause measurement offset and waveform distortion.

9. Standard Operating Procedure

9.1 Pre-Measurement Preparation

1. **Visual inspection:** Check that the jaw is free of damage, cables are intact, connectors are free of oxidation, and all accessories are present.
2. **Power connection:** Connect the adapter to the probe power input. The power indicator remains on after power-up.
3. **Signal connection:** Connect one end of the coaxial cable to the probe BNC connector and the other end to the appropriate oscilloscope channel.
4. **Oscilloscope setup:** Set channel input impedance to **1 M Ω** ; do not use a **50 Ω** load. Set coupling to **DC**. For high-precision high-frequency measurements, disable channel bandwidth limiting.
5. **Range selection:** Select the range according to the expected current. Use the high range for larger currents and the low range for small signals to improve resolution.

9.2 Degaussing & Auto-Zero — (Mandatory Before Every Measurement)

1. Push the control slider fully closed to LOCK and confirm that the UNLOCK indicator is off.
2. Ensure there is NO conductor or current inside the jaw.
3. Short-press the Zero button. Green indicator turns on and auto-degaussing runs for ~3 seconds.
4. **Completion:** Two short beeps sound, green light turns off, indicating zero calibration complete.
5. **Failure Handling:** A long 1-second beep indicates degaussing failed. Clear the clamp jaws, move away from magnetic fields, power off for 30 seconds, and retry.

Note: Auto-degaussing and zeroing **MUST** be re-executed after range switching, overload events, or long idle periods.

9.3 Current Measurement

1. Pull the control slider to open the jaw. Align the current direction of the conductor with the arrow on the clamp head to ensure correct waveform polarity.
2. Position a single conductor at the geometric center of the jaw. Do not clamp multiple conductors simultaneously.
3. Push the control slider fully until the UNLOCK indicator is off and the jaw is completely closed.
4. Observe the oscilloscope waveform and read the current value. If the red overload indicator appears, immediately disconnect the circuit under test, switch to the high range, perform degaussing/auto-zero again, and repeat the measurement.
5. **After measurement,** remove the conductor first, switch off the probe power, and then disconnect the BNC cable. Do not pull the cable forcefully from the connector.



9.4 Advanced Measurement Techniques

- 1. Small-current amplification:** Wind the conductor N turns through the jaw and divide the oscilloscope reading by N to obtain the actual current. More turns reduce bandwidth and are not suitable for high-frequency signals.
- 2. High-frequency noise reduction:** If measurement noise is excessive, enable the oscilloscope channel bandwidth limit or place the probe on the low-voltage side of the circuit under test.
- 3. Interference optimization:** Keep the probe away from transformers and power inductors, and route the probe cable away from power cables to reduce electromagnetic coupling noise.

10. Troubleshooting

Fault Symptom	Possible Cause	Corrective Action
No DC waveform or measured value abnormally low	1. Oscilloscope set to AC coupling. 2. Clamp jaws not locked. 3. Power supply disconnected. 4. Oscilloscope input set to 50Ω load.	Switch oscilloscope to DC coupling; fully lock clamp lever; check power adapter connection; set channel input impedance to 1 MΩ.
Auto Degaussing / Zeroing fails repeatedly	Live conductor inside jaws; strong external magnetic field interference; metal debris on jaw surfaces.	Disconnect test circuit; clean jaw mating surfaces; move probe away from high-power equipment and retry.
Waveform amplitude consistently low across all frequencies	Oscilloscope impedance set to 50Ω; poor BNC cable contact; jaws not fully closed.	Change oscilloscope input impedance to 1 MΩ; replug BNC connectors; lock clamp control lever fully.
High waveform noise or severe baseline drift	Lack of preheating; missing degaussing; strong electromagnetic interference; dust/debris in clamp jaws.	Preheat probe for 30 min; re-execute degaussing & zeroing; keep away from VFDs and interference sources; clean jaws with anti-static cloth.
Overload Red Light continuously alarm	Current exceeds active range peak; high frequency current exceeds continuous rating limit.	Disconnect power, switch to higher range, let probe cool down, then re-degauss and re-test.
UNLOCK Yellow Light stays illuminated	Control lever not pushed completely to end; foreign object trapped in magnetic jaw core.	Clear debris from clamp jaws; push control lever completely into LOCK position.
No LED indicators turn ON after power connection	Damaged power adapter; poor contact at DC jack; power supply circuit abnormality.	Replace with original ZL-AD1210 adapter; verify mains power socket is working properly.

11. After-Sales Service & Warranty

ZLPROBE ZLCP Series current probes feature a 5-year free warranty for the main probe unit. Original power adapters and BNC cables carry a 1-year warranty. Warranty service is valid upon presentation of the Warranty Card and Purchase Order record. Warranty covers natural component failures under normal operation only. Damage resulting from accidental drops, liquid ingress, over-range burn-out, unauthorized third-party disassembly, or use of non-standard power adapters is explicitly excluded from warranty coverage.

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