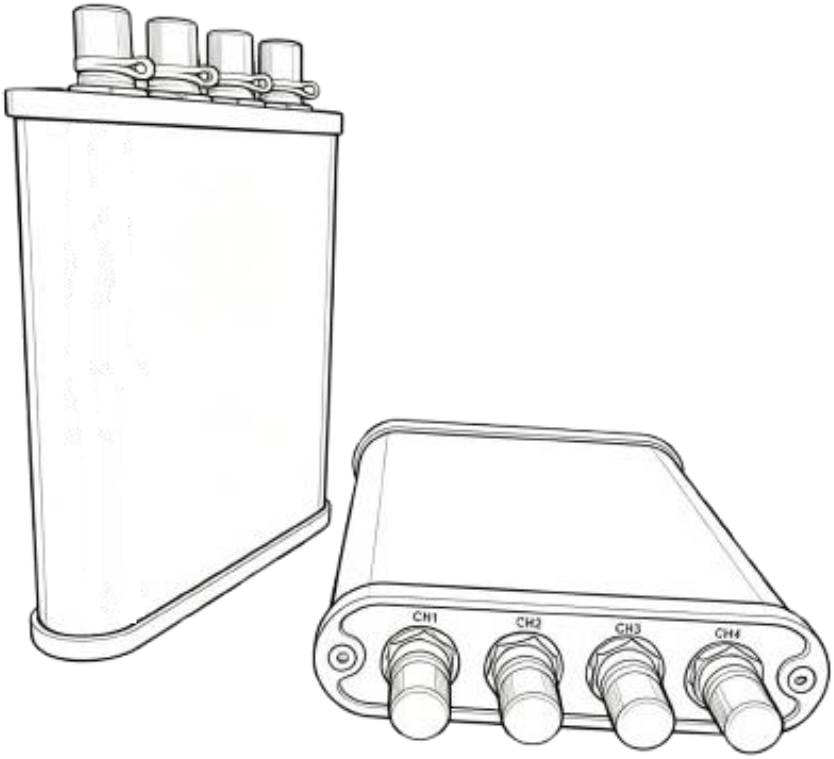
ZT-U8204I

Dynamic Signal Analyzer

User Manual



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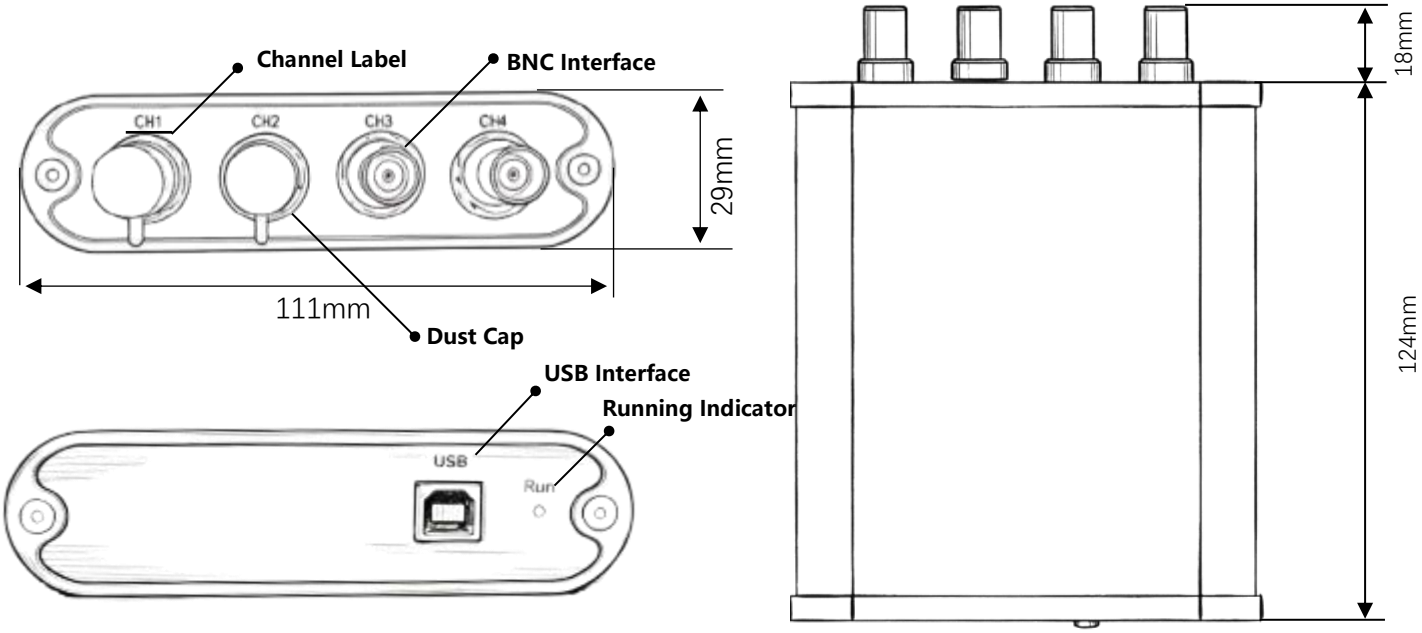
Contents

1.1 Product Overview



1.2 Product Functions

1.IEPE/ICP Signal Acquisition

- Function Description: Directly acquires signals from IEPE accelerometers and acoustic sensors.
- Detailed Specifications: Specifically designed for IEPE (Integrated Circuit Piezoelectric) sensors. The device provides constant current excitation to the sensor's internal preamplifier via the coaxial cable, converting the high-impedance charge signal into a low-impedance voltage signal.
- Applications: Widely applied in vibration testing, noise measurement (acoustics), and modal analysis. The low-impedance output ensures high noise immunity and supports long-distance signal transmission.

2.Charge Signal Conditioning (Optional)

- Function Description: Supports connection to external charge conditioners for use with piezoelectric sensors to measure dynamic pressure and vibration acceleration.
- Detailed Specifications: Targeting high-impedance piezoelectric sensors (e.g., piezoelectric accelerometers, dynamic pressure sensors), this circuit linearly converts minute charge outputs into standard voltage signals. It features ultra-high input impedance and an ultra-low cutoff frequency, ensuring distortion-free acquisition of low-frequency signals.
- Applications: Ideal for shock testing, blast testing, high-frequency dynamic pressure monitoring, and high-sensitivity precision vibration measurements.

3. Strain Gauge Signal Conditioning (Optional)

- Function Description: Interfaces with external strain gauge conditioners to perform stress and strain analysis using full-bridge, half-bridge, and quarter-bridge configurations.
- Detailed Specifications: Provides stable bridge excitation and supports full-, half-, and quarter-bridge wiring topologies. A built-in high-precision instrumentation amplifier effectively suppresses common-mode interference. The module also supports both software and hardware zero

balancing, as well as sensitivity scaling.

- Applications: Designed for use with resistive strain gauges in structural stress analysis, torque measurement, force weighing applications, and material mechanics testing.

4. Universal Voltage / Differential Input

- Function Description: Provides high-impedance, wide-range universal voltage input channels.
- Detailed Specifications: Compatible with standard analog voltage signals such as (0–5 V) or (0–10 V), and also supports direct input of millivolt-level signals from thermocouples (TC). Additionally, it allows direct connection to eddy current displacement sensors, magnetoelectric velocity sensors, and various industrial transmitters for the testing and analysis of multiple physical quantities.
- Applications: Covers shaft vibration/runout monitoring (eddy current), rotational speed measurement (magnetoelectric), temperature field distribution testing (thermocouple), and comprehensive acquisition of process control variables in rotating machinery.

5. RTD Temperature Acquisition (Optional)

- Function Description: Interfaces with various temperature sensors (such as platinum and copper resistance sensors) and corresponding signal conditioners to perform temperature testing and analysis.
- Detailed Specifications: Supports common temperature sensors such as platinum resistance (Pt100/Pt1000) and copper resistance (Cu50/Cu100). Utilizes constant current source excitation or bridge measurement methods to ensure measurement linearity and accuracy across a wide temperature range.
- Applications: Suitable for motor winding temperature, bearing temperature, environmental chamber monitoring, and precise temperature control and analysis of fluid media.

6. Compact Portable Dynamic Signal Analyzer (USB-Powered)

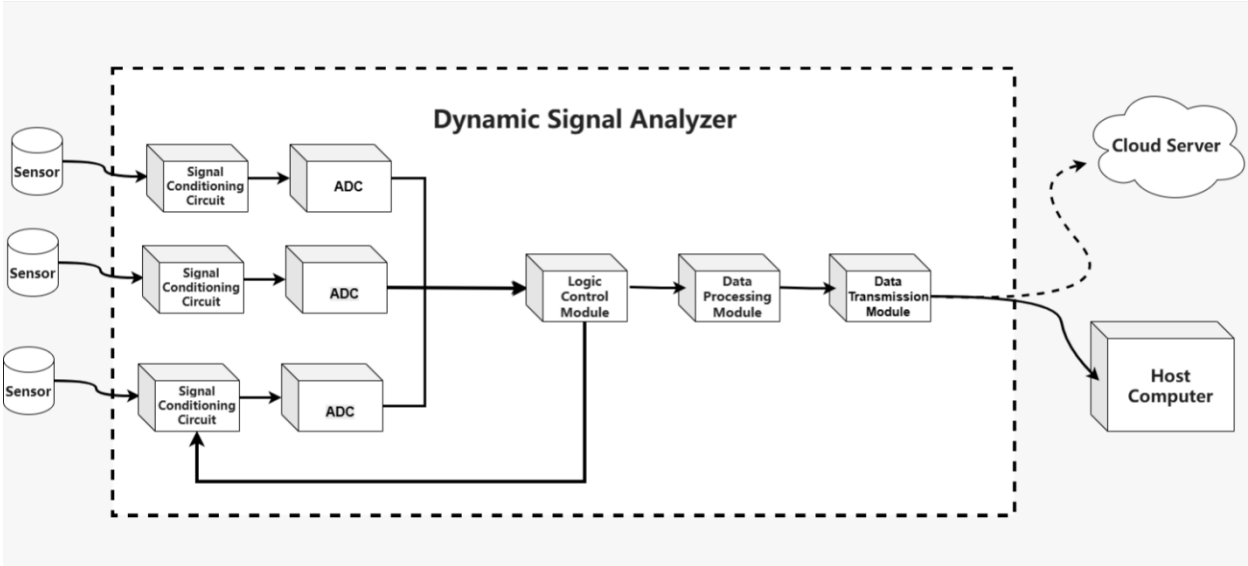
- Function Description: Integrates a miniaturized, portable dynamic signal analysis module powered directly via a standard USB interface without requiring an external power supply, enabling plug-and-play data acquisition and analysis functionality.
- Applications: Field equipment vibration monitoring and fault diagnosis (e.g., wind power, construction machinery); structural dynamic response testing in vehicle or aircraft environments; on-site acoustic testing (e.g.,

noise source identification, sound power measurement); portable signal analysis experiments in teaching laboratories.

1.3 Product Parameters

Input Channels	4CH
AD Resolution	24-bit
Sampling Mode	Parallel synchronous sampling
Sampling Rate	Up to 128KHz/CH, multi-gear adjustable
Data Transmission Interface	USB interface
Signal-to-Noise Ratio	≥95dB
Input Accuracy	≥99.7%
Linearity	≥99.9%
Input Mode	Voltage/IEPE, software configurable
Voltage Input Range	±10VP
IEPE Excitation Power	(4mA±1mA) /(20-24VDC)
Max Analysis Bandwidth	Voltage (DC) Input: 0Hz-50KHz
	IEPE Input: 0.3Hz-50KHz
Hardware Gain	1x, 10x, 100x
Filter	Independent analog filter + digital anti-aliasing filter per channel
	Cutoff frequency: 1/2.56 of sampling rate, set synchronously with sampling rate
	Stopband attenuation: approx. 100dB/oct
Dimensions	W109mm × H27mm × L142mm; Weight: 300g
Power Supply	USB powered

1.4 Working Principle Overview



The working principle of an analyzer is to convert analog signals from the physical world (such as temperature, pressure, vibration, etc.) into digital signals that can be processed by a computer. Its core process can be divided into four key stages: sensor perception, signal conditioning, analog-to-digital conversion, and data processing & transmission.

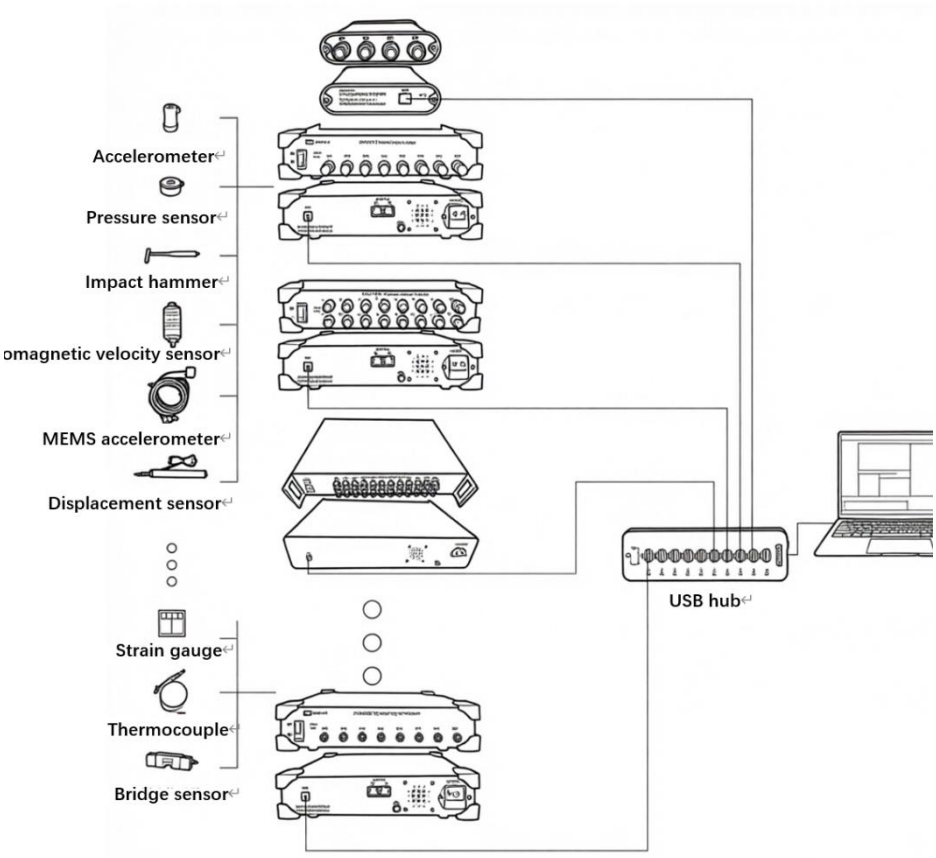
- **Sensors** act as the sensory terminals of the system, responsible for converting physical quantities (such as temperature, pressure, acceleration) into weak electrical signals (voltage or current). For example, a thermocouple converts temperature changes into millivolt-level voltages, and an accelerometer converts vibration into charge or voltage signals.

- **Signal conditioning circuit** serves as the coordinator for the signal, performing amplification, filtering, isolation, and linearization on the raw signal to meet the input requirements of the subsequent Analog-to-Digital Converter (ADC). For instance, the differential signal output by a strain gauge needs to be amplified by an instrumentation amplifier and converted into a single-ended voltage; AC signals require a DC bias to adapt to the ADC input range; meanwhile, an anti-aliasing filter removes high-frequency components above half the sampling frequency to prevent data distortion.

- **Analog-to-Digital Converter (ADC)** acts as the system's translator, precisely converting the processed analog voltage signal into a binary digital signal. High-precision ADCs (such as 24-bit) can achieve a measurement accuracy of ±0.1%, ensuring data accuracy.

- **The data processing and transmission module** is responsible for storing, analyzing, or transmitting the digital signal to a host computer or cloud platform via communication interfaces (such as RS485, Ethernet, USB). Some devices also have built-in BeiDou satellite modules for positioning, or support functions such as scheduled sampling and transmission, and remote parameter setting, making them suitable for scenarios like industrial automation, environmental monitoring, and geotechnical engineering.

1.5 Product Ecosystem Map



From tiny strain gauges to high-frequency accelerometers, and from precision temperature monitoring to complex modal analysis, Zhenzhong builds a one-stop testing and measurement solution for you. Our system is compatible with a full range of sensors, including accelerometers, pressure sensors, impact hammers, velocity sensors, displacement sensors, strain gauges, and thermocouples. Whether for portable field testing or large-scale distributed monitoring systems, Zhenzhong 's modular hardware and intelligent software work together seamlessly, ensuring that every data acquisition is precise and error-free.

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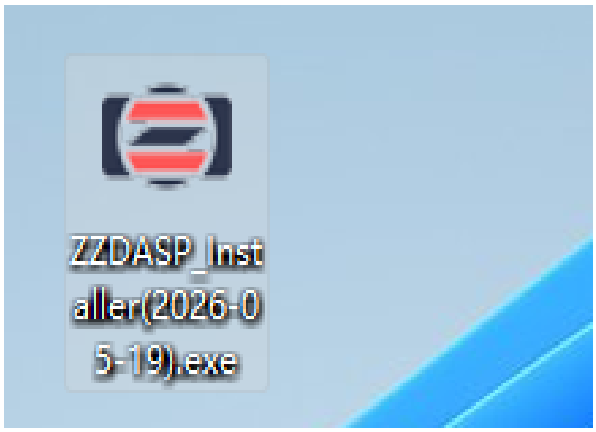
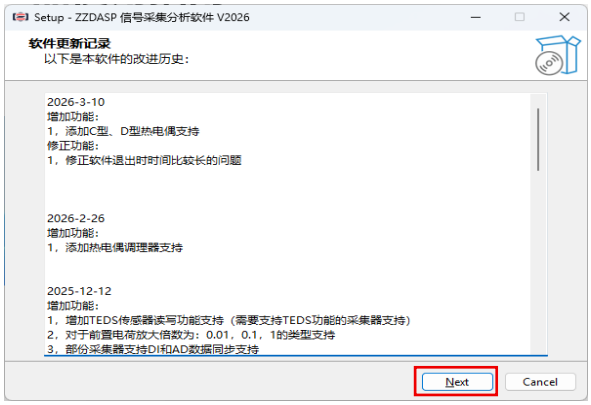
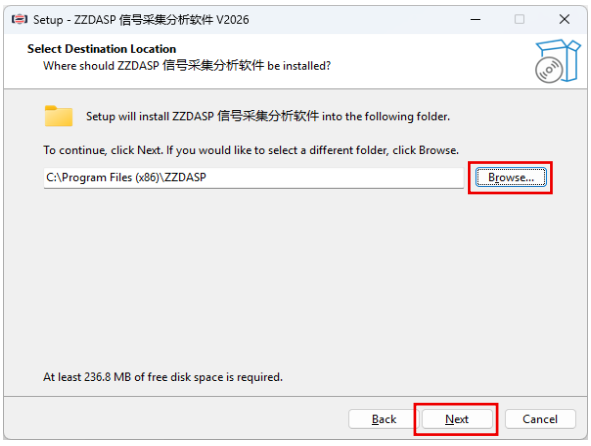
2.1 Software Installation Guide



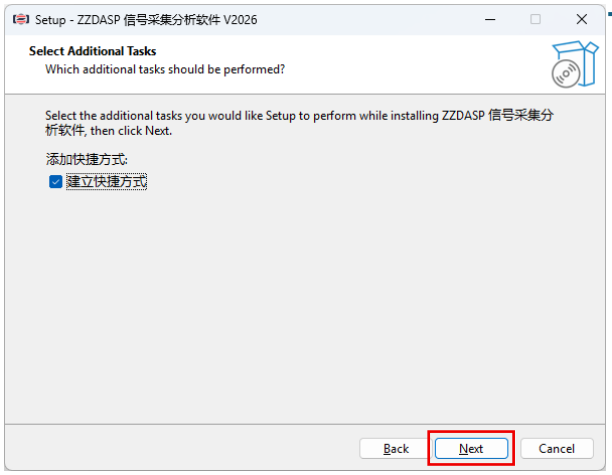
1、Double-click the software installer【ZZDASP_Installer(xxxx-xx-xx).exe】, Please check to ensure you have the latest version of the software. The version shown in the illustration was updated on May 19, 2026.



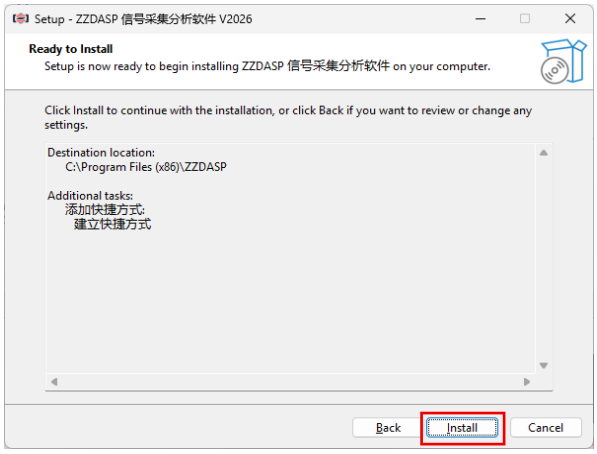
2、Double-click to open the installation window, where you can check the update history.Once verified, click "NEXT" in the bottom-left corner to continue.。



3、Specify the installation location. The default path is the C drive. You can click "Browse" on the right to change it. Once confirmed, click "Next" in the bottom-right corner to proceed.



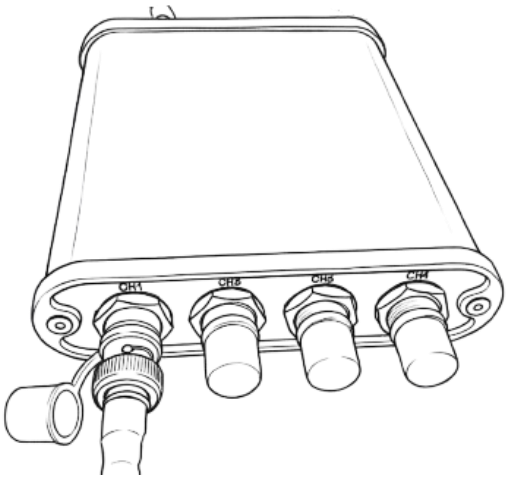
4、 Create desktop shortcut (checked by default). Click "Next" in the bottom-right to continue.



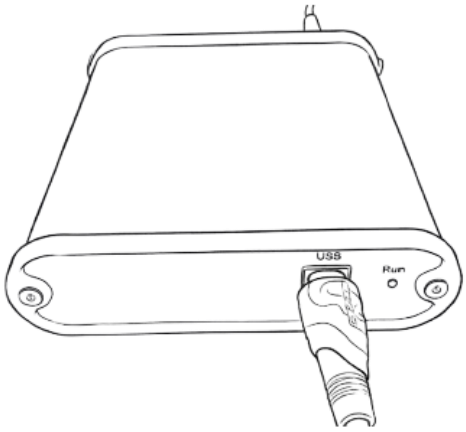
5、 Confirm installation details, including the install location and desktop shortcut options. Click "Install" in the bottom right to continue.

6、 Installation complete. Click "Finish" in the bottom right corner to exit the setup wizard. The option to automatically launch the program after installation is checked by default.

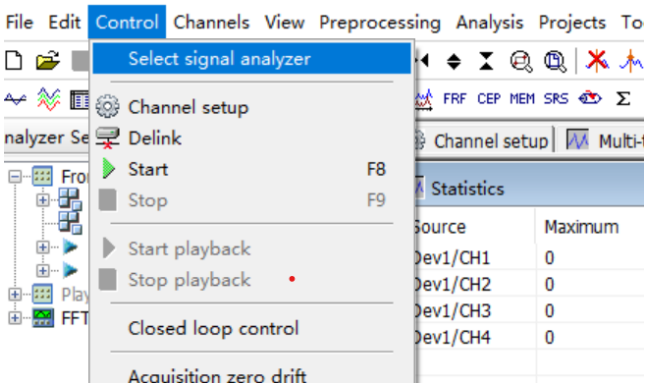
2.2 Device Connection Guide



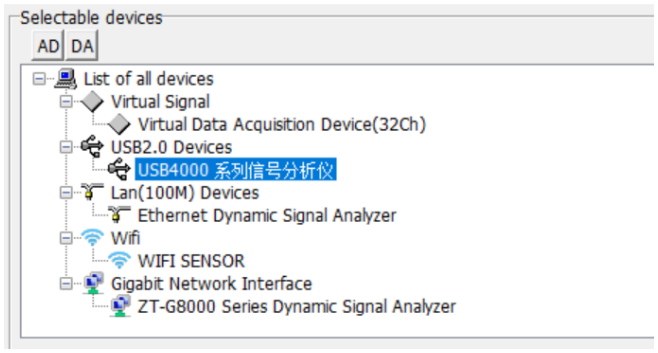
1、Remove the dust cap and connect to the BNC interface. Rotate clockwise to ensure the bayonet lock is securely fastened. Please verify the channel label; the illustration shows the connection to Channel 1.



2、Connect the USB port and check if the indicator light turns on.

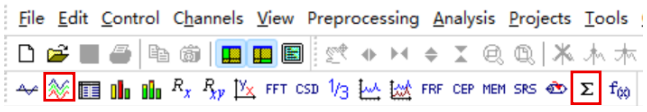


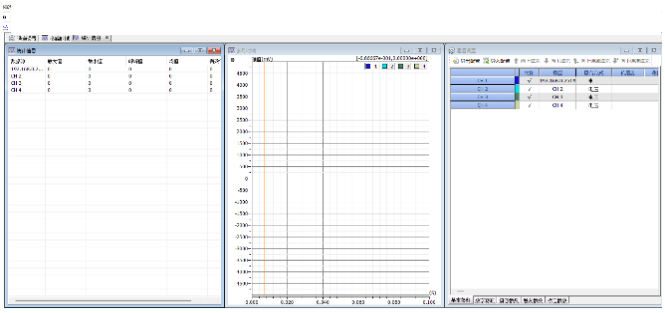
3、 Open the ZZDASP software, click Control, and select "Select Signal Analyzer" from the drop-down menu.



4、 In the "Selectable Device" window, navigate to USB 2.0 Interface > USB4000 Series Signal Analyzer, and click "OK" at the bottom right.

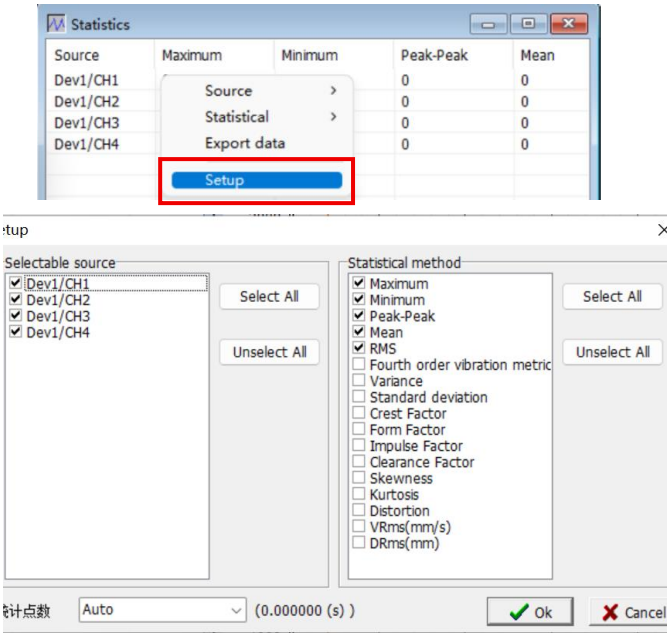
5、 Click the three options  in the menu bar to open the Channel Setup, Multi-trace, and Statistics pages respectively.



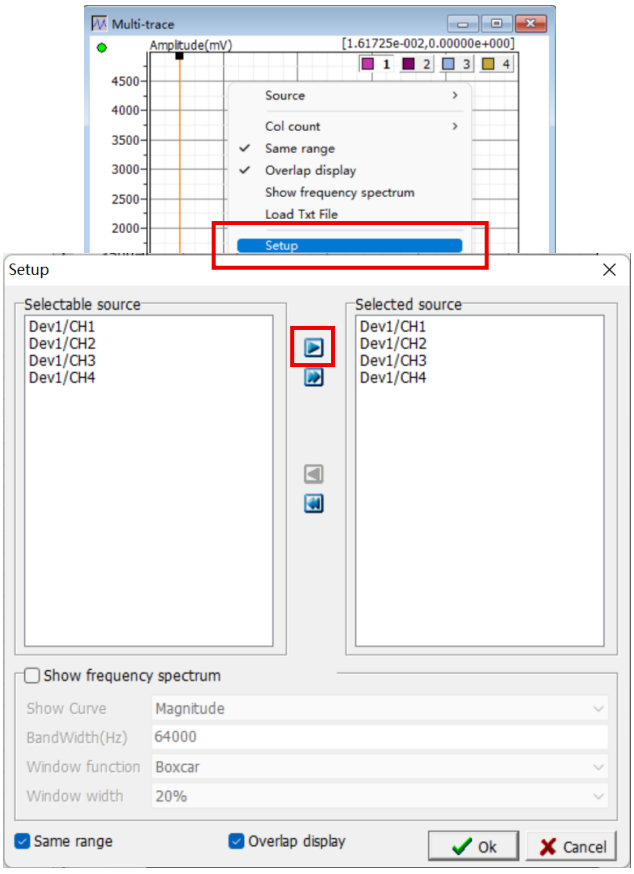


6、 Select Overlay, Side-by-Side, or Parallel display depending on your preference. The image below illustrates the side-by-side layout.

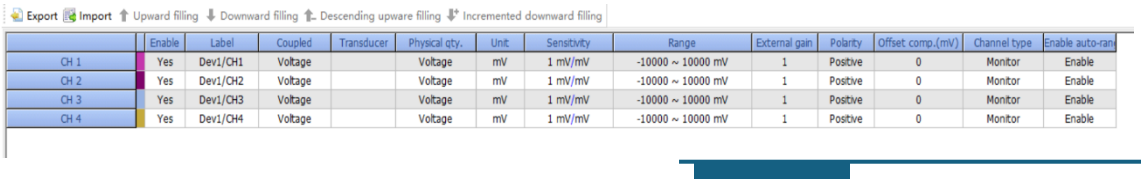
2.3 Data Collection Guide



1、 Right-click the Statistics page and select "Setup". On the Setup page, choose the channels and metrics to be displayed, then click "OK" to apply the changes.

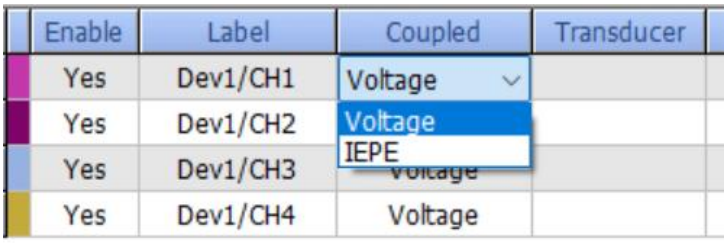


2、 Right-click the Multi-trace page and select "Settings". In the left panel of the Setup page, select the channels you want to display, click the button to move them to the right display area, and then click "OK" to apply the changes.



	Enable	Label	Coupled	Transducer	Physical qty.	Unit	Sensitivity	Range	External gain	Polarity	Offset comp.(mV)	Channel type	Enable auto-ran
CH 1	Yes	Dev1/CH1	Voltage		Voltage	mV	1 mV/mV	-10000 ~ 10000 mV	1	Positive	0	Monitor	Enable
CH 2	Yes	Dev1/CH2	Voltage		Voltage	mV	1 mV/mV	-10000 ~ 10000 mV	1	Positive	0	Monitor	Enable
CH 3	Yes	Dev1/CH3	Voltage		Voltage	mV	1 mV/mV	-10000 ~ 10000 mV	1	Positive	0	Monitor	Enable
CH 4	Yes	Dev1/CH4	Voltage		Voltage	mV	1 mV/mV	-10000 ~ 10000 mV	1	Positive	0	Monitor	Enable

3、 You can configure various device parameters in the channel setup interface, such as coupling method, measured physical quantity, sensitivity, and measurement range.



4、When setting the coupling method, the sensor type must be strictly matched:

IEPE: Designed for sensors with built-in amplifier circuits (e.g., piezoelectric accelerometers). Select IEPE mode to provide a constant current source (4 mA) and excitation voltage (+24 V DC).

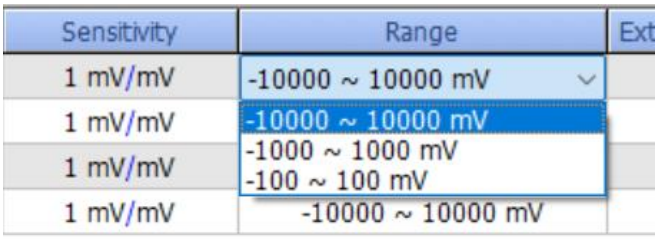
Voltage: Intended for passive sensors or externally conditioned voltage signals. The device does

not provide additional power in this mode.

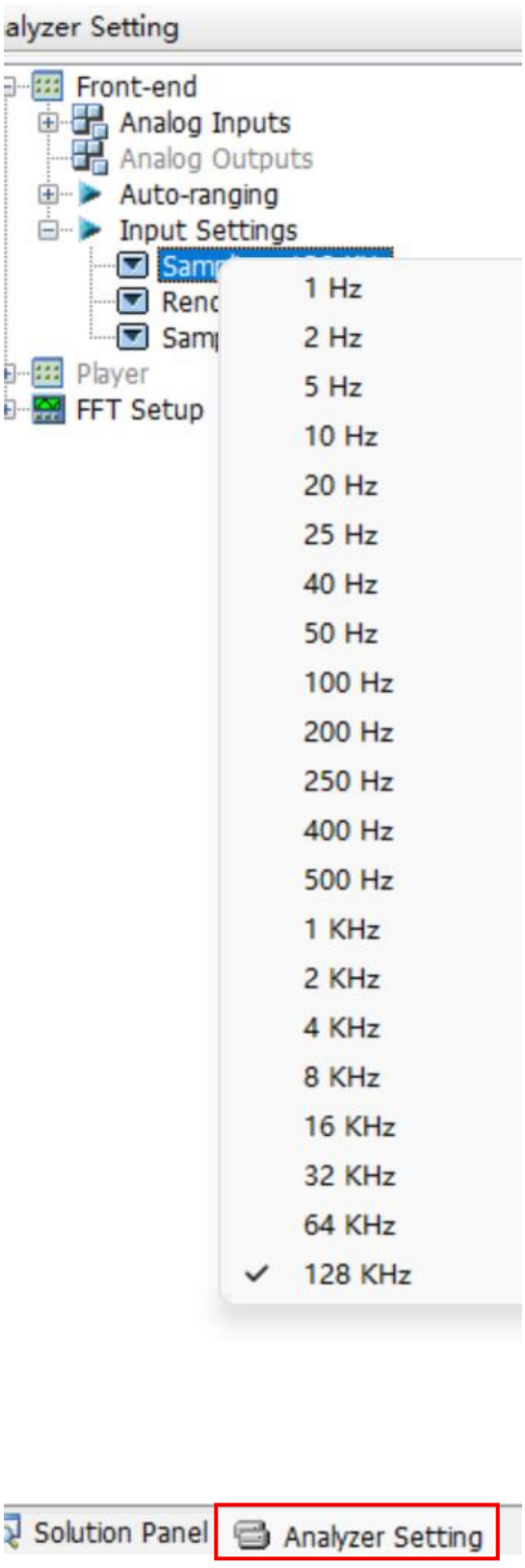
Consequences of incorrect configuration:

Connecting an IEPE sensor to "Voltage" mode will cause it to fail due to a lack of power.

Conversely, connecting a voltage signal to IEPE mode may introduce additional noise.



5、When setting the range, choose the one that best matches your input signal to get the optimal signal-to-noise ratio. For example, if your signal peaks at around ±700 mV, go for the ±1000 mV range. This helps you avoid clipping or losing resolution.



6、 You can set the analyzer's sampling frequency on the control panel on the far left of the software. First, click Analyzer Setting in the bottom left corner, then expand the Front End branch and the Input Settings branch. Finally, right-click Sampling Frequency to configure it.

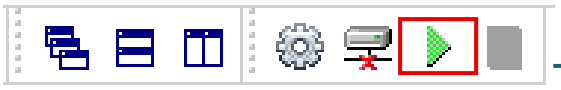
Sampling Rate Setting Rules:

The sampling rate f_s must be at least twice the maximum signal frequency f_{max}(i.e., $f_s \geq 2.56 f_{max}$) but it is typically set to 5 to 10 times this value to ensure accuracy.

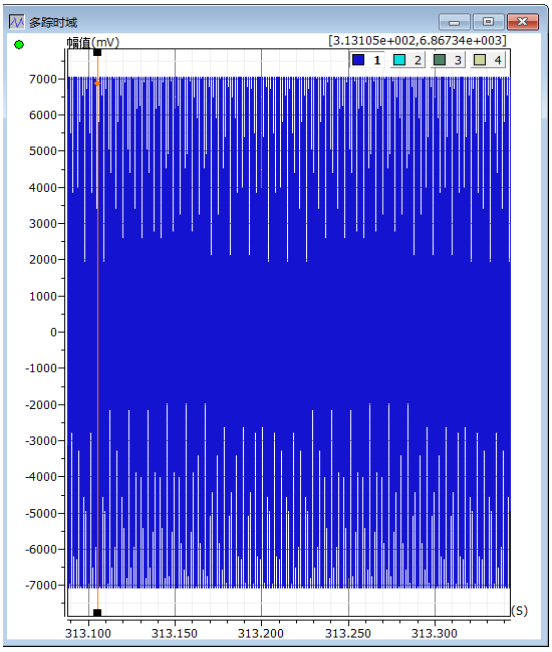
Storage Space Calculation:

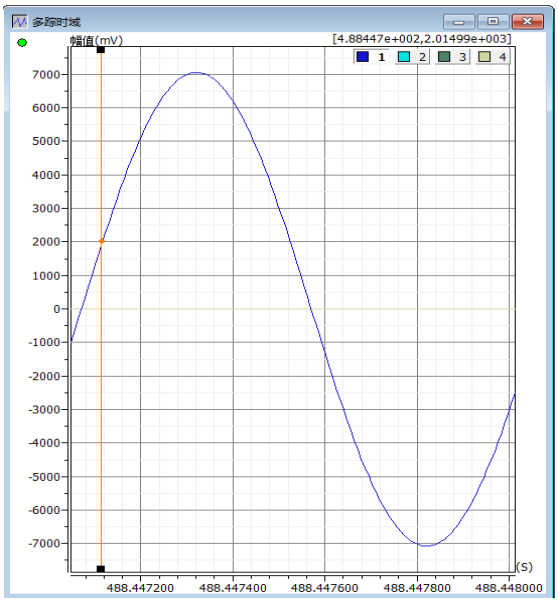
Storage Space (GB) ≈ (Channels × Sampling Rate × Bit Depth × Duration) ÷ (8×10^9)

Therefore, when using continuous data recording, it is especially important to select an appropriate sampling rate.。



7、 Once all parameters are properly configured, click to begin data acquisition. During the acquisition process, you can use the tools in the menu bar to adjust the waveform for better observation. For example, if the waveform appears too dense and is difficult to observe (as shown in the left legend), you can use the adjustment buttons to modify it. After adjusting, a smooth sine wave will be clearly visible.





With the exception of waveform adjustments, all other parameter changes must be made after stopping the data acquisition in order to take effect.

3.1 Connection and Power-on Sequence

Connect First, Power Later: Always ensure secure connections before applying power to prevent damage to the front-end circuitry.

3.2 Grounding requirements

Reliable Grounding: During measurements, the instrument must be properly grounded. Please use a standard three-prong power cord and ensure the ground wire in the outlet is effectively connected.

Anti-interference: Proper grounding not only ensures personal safety but is also a critical prerequisite for eliminating common-mode interference and achieving low-noise measurements.

3.3 System Warm-up

Precision Measurement: For high-precision testing, it is recommended to allow a 15-30 minute warm-up time after powering on. Once the internal components reach thermal equilibrium, zero drift and gain error will be minimized, ensuring the most accurate test results.

3.4 Computer Resource Manage

Dedicated Resources: Data acquisition demands high system real-time performance.

Before sampling: Please close antivirus software, automatic updates, and other unnecessary background applications.

During sampling: Do not launch heavy-duty software or perform high-load operations. This is to avoid occupying CPU or USB bandwidth, which may cause data packet loss or waveform distortion.

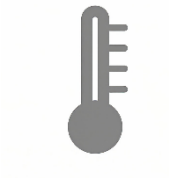
3.5 Wiring Code

Keep Away from Interference Sources: Signal input/output cables carry low-level signals and are highly susceptible to EMI. Keep them away from high-power lines, VFDs, transformers, and motors.

3.6 Environmental Electric Field Shielding

Avoid Strong Fields: Do not operate this instrument under high-voltage transmission lines, near large radio transmission towers, or in strong magnetic field environments. Strong electric fields may couple into the signal circuit, causing abnormal readings or even breaking down internal components.

3.7 Storage and Environmental Limits



Temperature and Humidity Control: The instrument should be operated within the specified temperature and humidity ranges (typically refer to the operating environment parameters in the technical specifications). Never use the instrument in high-temperature, high-humidity, or condensation environments.

Sun and Moisture Protection: Strictly prohibit exposing the instrument to direct sunlight or rain. When not in use for an extended period, store it in a well-ventilated, dry carrying case with desiccants.

3.8 Assembly and Disassembly Safety

Power-off Operation: Any cable connection, disconnection, or sensor replacement must be performed with both the instrument and the computer powered off and disconnected from the power supply.

4.1 Warranty Term

- A **one-year** free warranty service shall be provided, effective from the date of successful acceptance and inspection of the goods.

  Free Repair: Within the one-year warranty period, if the product experiences any malfunction or damage not caused by human error, we will provide free repair services.

4.2 Warranty Coverage

- **Free Repair:** Within the one-year warranty period, if the product experiences any malfunction or damage not caused by human error, we will provide free repair services.
- **Paid Repair:** After the one-year warranty period expires, if repair services are required, we will only charge the cost of parts and labor.。

4.3 Response Timeframe

Commitment to providing efficient after-sales support:

- Rapid Response: Once we receive your feedback regarding a malfunction, we will get back to you within 24 hours.
- Resolution Plan: We will provide a specific solution within 72 hours.

4.4 Disclaimer (Not Covered Under Warranty)

Damage caused by force majeure or human factors is not covered under the warranty, including but not limited to:

- Man-made damage
- Lightning strikes
- Flooding or water submersion caused by rainfall
- Other natural disasters or accidental incidents

4.5 Repair Shipping Instructions

When returning the product for factory repair, each party is responsible for their own shipping fees.