Corecloud IDC7100 Series 24-bit IEPE Data Acquisition and Analysis Instrument — Specification

2026-09-18

Rev.B

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Revision History

Version	Date	Description	Status
Rev.A	2026-01-20	Initial release	Released
Rev.B	2026-09-18	1. Added envelope feature output description 2. Added total error / feature accuracy chapters; sampling rate revised to the 8-option specification; constant-current source bias / withstand-voltage wording unified; dynamic range qualification added; displacement / velocity guaranteed bands defined by long-window capability	Released

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1 Product Overview



Figure 1-1 Product Image

The Corecloud IDC7100 Series 24-bit IEPE Data Acquisition and Analysis Instrument is a high-end four-channel IEPE signal acquisition and edge-computing device with 128 kHz high-speed synchronous sampling, designed for precision vibration analysis, low-frequency structural monitoring, machinery fault diagnosis, and scientific research experiments. The instrument integrates four independent high-precision 4 mA constant-current sources that directly drive standard IEPE accelerometers without an external signal conditioner. Each channel has an independent 24-bit Σ-Δ high-speed ADC; the four channels sample synchronously at up to 128 kHz with an effective bandwidth of 0.2 Hz~54 kHz, and the 24-bit resolution delivers outstanding dynamic range and weak-signal capture capability with nonlinearity as low as 0.1% FS.

Equipped with a 480 MHz high-performance 32-bit processor (2500 CoreMark®), the device integrates powerful edge computing to perform real-time calculation of acceleration, velocity and displacement and feature extraction at the device end. TCP/IP over the 100M Ethernet interface streams 24-bit raw ADC codes, floating-point voltage values or floating-point acceleration values in real time, while the MQTT protocol flexibly uploads features to the cloud. The USB-C interface supports quick parameter configuration via disk files. In addition, the device has a built-in envelope demodulation engine that outputs envelope peak, RMS and crest factor simultaneously.

With standard DIN rail mounting, 9~30 VDC wide power input, -40 °C~85 °C wide-temperature operation and OTA remote firmware upgrades, it adapts to various industrial sites and laboratory environments. Benchmarked against imported high-end data acquisition equipment, IDC7100 is an ideal choice for university research, high-end vibration analysis and precision fault diagnosis.

2 Key Features

2.1 Four-Channel 24-bit High-Speed Synchronous Acquisition

Four independent IEPE inputs with built-in 4 mA constant-current sources directly drive standard IEPE accelerometers without an external signal conditioner. Each channel has an independent 24-bit Σ-Δ ADC; the four channels sample synchronously at up to 128 kHz with an effective bandwidth of 0.2 Hz~54 kHz, covering the full frequency domain from quasi-static structural monitoring to precision diagnosis in the ultrasonic band. The 24-bit resolution provides approximately 120 dB of dynamic range, capturing weak vibration signals and high-amplitude shock events simultaneously.

- **Four-channel synchronous sampling:** four 24-bit Σ-Δ ADCs sample synchronously at 128 kHz, 0.1% FS non-linearity
- **Full-band coverage:** 0.2 Hz~54 kHz effective bandwidth, 1 kHz~128 kHz sampling rate selectable in 8 options, low-frequency mode for structural monitoring
- **Built-in constant current source:** four independent 4 mA sources, max. 12 V bias voltage, driving standard IEPE sensors directly
- **24-bit resolution:** approximately 120 dB dynamic range, capturing weak signals and impact events simultaneously

2.2 Advanced Edge Computing and Feature Calculation

The built-in real-time calculation engine for acceleration, velocity and displacement completes the full conversion from raw IEPE signals to engineering physical quantities and feature extraction at the device end, significantly reducing host or cloud processing load.

- **Direct physical output:** full-chain real-time conversion from raw voltage to acceleration (m/s^2), velocity (mm/s) and displacement (μm)
- **7 vibration features:** acceleration peak and RMS, velocity peak and RMS, displacement peak and peak-to-peak, and frequency peak, calculated and output automatically
- **Envelope features:** envelope peak, RMS and crest factor via band-pass filtering → rectification → low-pass demodulation, for early warning of impact-type faults such as bearing defects; 3 preset demodulation bands (500 Hz~10 kHz / 1 kHz~20 kHz / 2 kHz~20 kHz) or user-defined; the sampling rate is adjusted automatically to satisfy the demodulation band when enabled.

- **Dynamic real-time calculation:** acquisition at configured intervals with all sample points in the interval participating in the calculation (up to 10000 points), 1-second feature waveform window, balancing real-time performance and accuracy

2.3 Industrial-Grade Reliability Design

A 480 MHz high-performance processor (2500 CoreMark®), 9~30 VDC ultra-wide power input, standard DIN rail mounting and -40 °C~85 °C wide-temperature operation are designed for long-term stable running in industrial control cabinets.

- **High-performance processor:** 480 MHz, 2500 CoreMark®, handling real-time processing of four channels at 128 kHz/24-bit
- **Industrial-grade reliable power:** 9~30 VDC wide DC input for complex industrial sites; -40 °C~85 °C wide temperature; DIN rail mounting
- **Power interface:** isolated power design with 1500 VDC isolation voltage, featuring input undervoltage, overvoltage, overcurrent and reverse-polarity protection
- **ESD protection:** ±8 kV/±15 kV ESD protection and PCB conformal coating for harsh industrial environments

2.4 100M Ethernet Communication and Plug-and-Play Configuration

Standard 100M Ethernet interface with TCP/IP + MQTT 3.1.1 dual protocols, balancing high-speed data streaming and lightweight cloud upload; zero-threshold USB disk-based configuration, plug and play.

- **TCP/IP high-speed transmission:** real-time push of four-channel 24-bit raw ADC data over 100M Ethernet
- **Flexible MQTT cloud upload:** four independent push channels — status / features / real-time waveform / feature waveform — with independently configurable intervals
- **USB disk configuration:** connecting to a PC via USB Type-C is recognized as a USB drive; edit config.ini to complete all parameter settings without drivers or dedicated software
- **Broad compatibility:** supports LabVIEW, MATLAB, Python and mainstream industrial IoT platforms
- **OTA upgrades:** online firmware upgrades without on-site operations

3 Application Scenarios

- **Precision Fault Diagnosis of High-Speed Rotating Machinery**
  Precision fault diagnosis of high-end equipment such as steam turbines, centrifugal compressors and high-speed spindles requires vibration data with high sampling rates and high resolution. IDC7100's 128 kHz sampling rate and 24-bit resolution precisely capture high-frequency low-amplitude signals such as early bearing fault features and gear meshing impacts. The 100M Ethernet interface streams four-channel raw data in real time, supporting online monitoring and offline deep analysis. The MQTT protocol pushes features to the factory equipment management platform for around-the-clock predictive maintenance.
  Typical monitored objects: steam turbines · centrifugal compressors · high-speed motors · precision spindles · gearboxes · rolling bearings

- **Industrial Site Precision Testing and Calibration**
  Factory performance testing, vibration standard traceability and sensor calibration require high-precision vibration data acquisition. IDC7100's 24-bit ADC and 0.1% FS non-linearity meet precision measurement requirements, and it supports outputting 24-bit raw ADC codes for third-party software analysis. USB-C disk file configuration is plug-and-play, enabling rapid redeployment between test benches.
  Typical monitored objects: vibration sensor calibration · factory vibration testing · vibration damper performance verification · material damping characteristic testing

- **University Laboratories and Research Platforms**
  University laboratories in mechanical engineering, civil engineering and mechanics need cost-effective data acquisition equipment for teaching and research. IDC7100's four-channel synchronous acquisition and 128 kHz/24-bit specifications benchmark against imported high-end equipment. Raw ADC codes and standard TCP/IP protocols seamlessly integrate with LabVIEW, MATLAB, Python and other research platforms. USB MSC disk configuration is plug-and-play, and MQTT supports remote experiment data monitoring.
  Typical monitored objects: rotor dynamics experiments · modal analysis teaching · vibration control research · bearing fault simulation test benches · structural health monitoring algorithm verification

4 Product Specifications

Unless otherwise specified, all parameters below are tested at room temperature (25 °C).

Table 4-1 Product Specifications

General Parameters	Operating Temperature Range		-40℃~85℃
	Storage Temperature Range		-40℃~85℃
	IP Protection Rating		IP34
	Dimensions		114.6*99.0*22.6mm(1)
	Weight		Approx. 86g
	Housing Material		Engineering plastic
	ESD Rating		HBM contact discharge8KV， air discharge15KV
	Applicable Standards		IEC 61000-6-2:2016 / IEC 60529:2013 / IEC 60068-2-1 / IEC 60068-2-2
System Power	Power Supply		9~30 VDC input
	Rated Power		1W
Analog Interfaces	Coupling Mode	IEPE Input Mode	AC-coupled with constant current source output, bipolar ±10 V
		AC Input Mode	AC-coupled, bipolar ±10 V
	Sensitivity	IEPE Input Mode	1~10000 mV/g (2) (default 100 mV/g)
	Output Current	IEPE Input Mode	Typical 4 mA (3)
	Constant-current source bias	IEPE Input Mode	Bias voltage typically 12 V; maximum withstand voltage of the constant-current loop 24 V
	Sampling Rate		128 kHz / 64 kHz / 32 kHz / 16 kHz / 8 kHz / 4 kHz / 2 kHz / 1 kHz
	Voltage Resolution		1.192 μV
	Non-linearity		0.1% FS
	3 dB Frequency Response		0.2Hz~54kHz
	Dynamic range		Approx. 120 dB (after Sinc5 + 96-tap FIR filtering, typical)
	Noise floor		<0.001 μV/√Hz (IEPE input connected to a standard bias load at rest, ADC 24-bit Σ-Δ;

			system noise is determined by the external sensor)
Configuration	Configuration Interface		USB-C interface
	Configuration Protocol		USB disk file configuration
	Firmware Update		Local USB disk file firmware upgrade / online OTA
Digital Interfaces	On-state Voltage	DO Trigger Output Interface	≤30 V
		DI Trigger Input Interface	3~30 VDC
	On-state Current	DO Trigger Output Interface	≤0.75 A
Signal processing	Raw Values		Configurable as voltage (mV) or acceleration (m/s^2)
	Features		Acceleration peak, acceleration RMS, velocity peak, velocity RMS, displacement peak, displacement peak-to-peak, spectral peak frequency, envelope peak, envelope RMS, envelope crest factor (4)
	Envelope Demodulation Band		500 Hz~10 kHz / 1 kHz~20 kHz / 2 kHz~20 kHz or user-defined; the demodulation band must satisfy 2 Hz ≤ high-pass < low-pass ≤ min(20 kHz, 0.4 × sampling rate); when enabled, the sampling rate (up to 128 kHz) is adjusted automatically to the lowest setting that satisfies the requirement.
	Acceleration Accuracy		0.1% FS (including noise, ADC 24-bit, 1 LSB=1.192 μV) Under ideal-sensor (zero sensitivity error) conditions: from 0.1 Hz (within the 3 dB band); actual performance is affected by the external sensor sensitivity error
	Frequency accuracy		±(2% of reading or half-bin = sampling rate/8192), whichever is greater
	Velocity Accuracy		From 2 Hz: ±(0.02 mm/s or 5% of reading), whichever is greater Under ideal-sensor conditions, 0.1~2 Hz serves as trend reference only; actual values are affected by the sensor sensitivity error
	Displacement		2 Hz~1 kHz: ±(5 μm or 5% of reading),

	Accuracy	whichever is greater Under ideal-sensor conditions, 0.1~2 Hz serves as trend reference only; actual values are affected by the sensor sensitivity error
	Envelope accuracy	Tolerance ±20%; Trend metrics have no dedicated accuracy specification; the demodulation band is available in three options (500 Hz~20 kHz)
Communication Standards	Wired Network	100M Ethernet interface supporting TCP/IP real-time data streaming + MQTT 3.1.1 protocol cloud upload

⚠Notes

(1) See Mechanical Dimensions.

(2) Supports IEPE sensors with a voltage swing up to ±10 V; with a sensor sensitivity of 1 V/g, the maximum supported acceleration range is ±10 g.

(3) The built-in 4 mA constant current source (max. 24 V) powers the external IEPE sensor; the sensor operating voltage must not exceed 24 V.

(4) These features are physically and engineering-wise correct and valid only when the device is connected to a vibration sensor and its output format is configured to the corresponding physical quantity (acceleration).

5 Interfaces and Indicators



Figure 5-1 Interface and Indicator Locations

IDC7100 has one LED indicator (RUN) on the front panel showing the device operating status in real time. The device connects to external sensors, power and communication equipment through standard 3.81 mm pitch industrial terminals; the terminal definitions are listed in the table below.

Table 5-1 Interface and Indicator Definition

Interface/Indicator Name		Definition
IEPE Input	IN1~4 / GND	Four IEPE inputs (4 mA output, 12 V ±10 V signal input) / ground
RJ45 interface		100M Ethernet interface supporting TCP/IP real-time data streaming + MQTT 3.1.1 protocol cloud upload
Type-C interface		USB disk mode, plug-and-play recognition, edit config.ini to configure parameters, zero-driver installation
DO and DI	DO / COM	Trigger signal output / common
	DI / COM	Trigger signal input / common
Power and Output	12 V / GND	12 V power output / ground
	12 V / GND	12 V power output / ground
Run Status Indicator		Green flashing (normal) / red flashing (data not ready)

6 Mechanical Dimensions

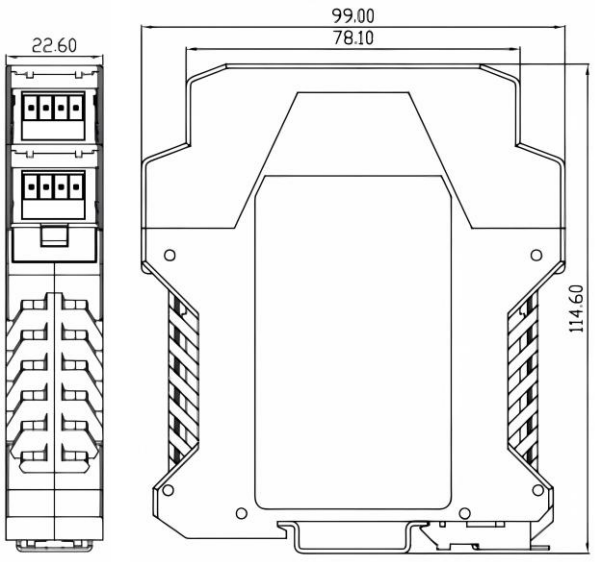


Figure 6-1 Mechanical Dimensions (unit: mm)

7 Accessories and Installation



Figure 7-1 DIN Rail Clip

IDC7100 is designed for standard DIN rail mounting. The pre-installed rail clip on the bottom snaps directly onto a 35 mm standard DIN rail (EN 50022); installation and removal require no tools. It suits standard rail mounting environments in industrial control cabinets and instrument boxes.

8 Installation Notes

- Align the bottom clip of the device with the top edge of the DIN rail and press down until a "click" sound confirms locking
- To remove, gently pry the bottom clip release tab with a flat-blade screwdriver and lift the device upward
- Reserve at least 20 mm of clearance above and below the device for heat dissipation and convenient wiring
- Use a flat-blade screwdriver for terminal wiring with a torque not exceeding 0.5 N·m

9 Analog Signal Chain Description

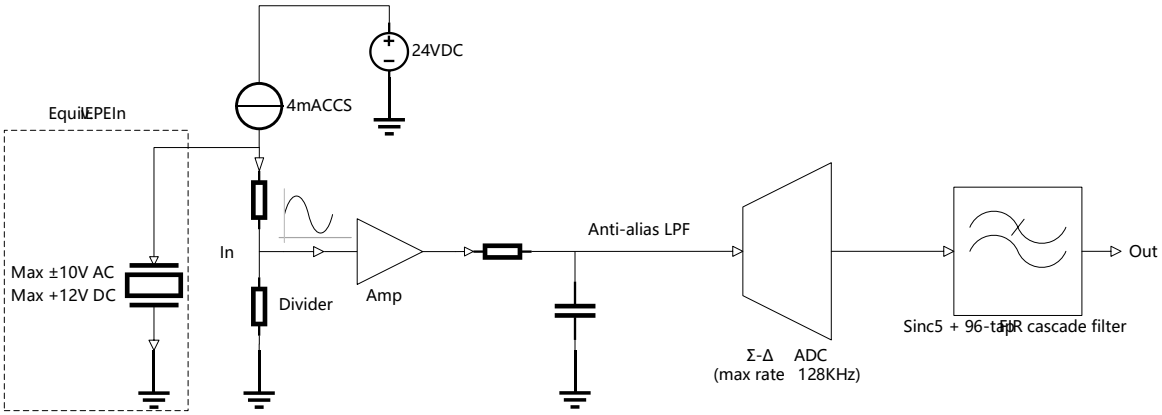


Figure 9-1 IEPE Signal Chain

IDC7100 has four independent built-in 4 mA constant current sources supporting up to 24 V DC bias voltage and accepts IEPE signal inputs in the ±10 V range. The signal chain processing flow is:

① IEPE sensor connection → powered by the built-in 4 mA constant current source, with the AC vibration signal superimposed on the DC bias;
② Signal conditioning → resistive voltage division into an instrumentation amplifier for impedance matching and gain adjustment;
③ Anti-aliasing filtering → an analog low-pass filter removes frequency components above 64 kHz to satisfy the Nyquist sampling theorem;
④ ADC decimation and filtering → a cascaded Sinc5 + 96-tap FIR digital filter performs decimation, anti-aliasing and passband flatness compensation, with four channels outputting 24-bit sampling results synchronously;
⑤ Sampling rate configuration → 13 software-selectable settings, with output format selectable as raw voltage (mV) or acceleration (m/s²).
Users can modify the configuration file to select the sampling rate and filter bandwidth flexibly according to the frequency characteristics of the monitored target.
Bandwidth selection suggestions: use 20~200 Hz for low-frequency structural monitoring, 1 k~8 kHz for general rotating machinery monitoring, and 8 k~128 kHz for bearing/gear fault diagnosis.

10 Notes

- Avoid severe impacts or drops during use to prevent damage to internal components.
- Do not store the device at temperatures above 85 °C for extended periods, otherwise accuracy and reliability may be affected.
- Envelope features are trend indicators; it is recommended to set thresholds by comparing against the device's own historical baseline.
- Do not insert sharp objects into terminals or housing gaps to avoid damaging the conformal coating and affecting product reliability.
- The IEPE sensor operating voltage must not exceed 24 V; verify the sensor power specifications before connection.
- Perform terminal wiring with the power off to avoid equipment damage from short circuits or surges.
- For first use or after long-term storage, a 30-minute warm-up is recommended to achieve rated accuracy.
- For 100M Ethernet, use shielded twisted-pair cables of Cat 5e or above.

11 Ordering Information

Model code: IDC7100-[Max Sampling Rate]
Max Sampling Rate：128K = 128kHz

Table 11-1 Ordering Information Overview

Name	Model	Specification
24-bit IEPE Data Acquisition and Analysis Instrument	IDC7100-128K	Max sampling rate 128 kHz