Corecloud IDC5100 Series IEPE Sensor Acquisition Instrument — Specification

2026-09-18

Rev.C

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Revision History

Version	Date	Description	Status
Rev.A	2023-08-04	Initial release	Released
Rev.B	2024-07-20	1. Upgraded sampling rate 2. Added adjustable bandwidth function 3. Optimized text descriptions	Released
Rev.C	2026-09-18	1. Added envelope feature output description 2. Added resolution and accuracy descriptions	Released

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1 Product Overview



Figure 1-1 Product Image

The Corecloud IDC5100 Series IEPE Sensor Acquisition Instrument is a dual-channel, 25 kHz industrial-grade IEPE signal acquisition and edge computing device designed for rotating machinery condition monitoring and industrial vibration analysis. The device has two independent 4 mA constant current sources to drive standard IEPE accelerometers directly without external signal conditioners. Each channel has an independent 16-bit high-speed ADC that synchronously samples both IEPE channels at up to 25 kHz, with an effective bandwidth of 5 Hz to 10 kHz covering the full spectrum from sub-hertz vibration to 10 kHz bearing fault frequencies.

The device integrates powerful edge computing to perform real-time calculation of acceleration, velocity and displacement and feature extraction at the sensor end. It provides a 4~20 mA analog output that can be flexibly configured to any physical quantity such as acceleration peak, RMS, velocity peak or displacement peak for direct connection to PLC, DCS or SCADA systems. A standard RS485 digital interface supports the Modbus RTU protocol to read all feature calculation results simultaneously. IEPE signal buffered outputs allow third-party acquisition systems to analyze the raw signals in parallel. In addition, the device has a built-in envelope demodulation engine that outputs envelope peak, RMS and crest factor simultaneously.

The device has a built-in 4th-order Butterworth digital filter with 6 software-configurable bandwidths, allowing users to select filter parameters flexibly according to the monitored target. A 9~30 VDC ultra-wide power input and standard DIN rail mounting enable easy integration into industrial control cabinets.

2 Key Features

2.1 Dual-Channel High-Speed Synchronous IEPE Acquisition

Dual-channel independent IEPE inputs with built-in 4 mA constant current sources drive standard IEPE accelerometers directly without external signal conditioners. Two 16-bit high-speed ADCs sample synchronously at up to 25 kHz with an effective bandwidth of 5 Hz to 10 kHz, covering the full spectrum from sub-hertz vibration to 10 kHz bearing fault frequencies. Each channel provides an independent IEPE signal buffered output for third-party systems to analyze the raw signals in parallel.

- **Dual synchronous sampling:** two 16-bit ADCs sample synchronously at 25 kHz, effective bandwidth 5 Hz~10 kHz
- **Built-in constant current source:** two independent 4 mA sources, max. 24 V bias voltage, driving IEPE sensors directly
- **IEPE buffered output:** each channel has an independent buffered output providing raw signals to third-party acquisition systems

2.2 Advanced Feature Edge Computing

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~10 kHz / 2 kHz~10 kHz) or user-defined, -3 dB cutoff frequency tolerance ±20%
- **Digital filter:** 4th-order Butterworth filter with 6 software-configurable bandwidths to suit different monitored targets

2.3 Flexible Output and System Integration

Two standard industrial interfaces — 4~20 mA analog output and RS485 digital output — flexibly adapt to PLC, DCS, SCADA and other industrial control systems without protocol conversion or additional gateways.

- **4~20 mA analog output:** configurable to any one feature of acceleration, velocity or displacement for direct connection to PLC analog input modules
- **RS485 digital output:** standard Modbus RTU protocol reading all 7 features and the spectral peak frequency simultaneously
- **Compatible with mainstream industrial systems:** seamless integration with PLC, RTU, DCS, SCADA and CMMS equipment management systems
- **Flexible parameter configuration:** dual protocols (AT commands and Modbus RTU) for easy integration into existing industrial systems

2.4 Industrial-Grade Reliability Design

A 240 MHz high-performance processor (825 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:** 240 MHz processor with 825 CoreMark® computing performance
- **Industrial-grade reliable power:** 9~30 VDC wide input, -40 °C~85 °C wide temperature, DIN rail mounting
- **ESD protection:** ±8 kV/±15 kV ESD protection and PCB conformal coating for harsh industrial environments

3 Application Scenarios

- **Rotating Machinery Condition Monitoring and Predictive Maintenance**
  Vibration monitoring of rotating machinery (pumps, fans, compressors, motors, gearboxes, etc.) is the core of industrial predictive maintenance. IDC5100 acquires vibration signals at critical measurement points in real time through IEPE accelerometers, and the edge computing engine outputs acceleration, velocity and displacement features simultaneously. The 4~20 mA current output connects directly to PLC/DCS systems for vibration over-limit alarms and automatic shutdown interlocking; the RS485 digital interface supports reading all 7 features simultaneously, providing complete vibration data sources for equipment management systems (CMMS) and condition monitoring platforms.
  Typical monitored objects: industrial pump sets · centrifugal/axial fans · screw/centrifugal compressors · motors and bearing housings · gearboxes · conveyor systems · mixers

- **Industrial Site Equipment Acceptance and Commissioning**
  During installation, commissioning and post-maintenance acceptance, the equipment vibration level must be precisely evaluated. IDC5100 can be deployed quickly next to the equipment; the IEPE buffered outputs can connect to a portable vibration analyzer for on-site spectral comparison and verification. The 4~20 mA output can be temporarily connected to a commissioning PLC to help judge whether the operating status meets acceptance criteria.
  Typical monitored objects: equipment installation and commissioning · post-maintenance trial-run acceptance · vibration standard compliance verification · dynamic balancing correction · alignment calibration

- **Factory CMMS Integration**
  The equipment management systems (CMMS) of modern factories need reliable equipment condition data sources. Through the RS485 Modbus RTU protocol, IDC5100 outputs all vibration features to the factory host system simultaneously. The 4~20 mA current output connects directly to PLC analog input modules without protocol conversion or additional gateways. Standard DIN rail mounting and 9~30 VDC wide power input allow convenient deployment in existing control cabinets.
  Typical monitored objects: factory control cabinet integration · CMMS data source · PLC interlock protection · SCADA system access

- **Industrial IoT (IIoT) Edge Data Acquisition**
  In industrial IoT architectures, IDC5100 serves as an edge-layer data acquisition node that completes the full conversion and calculation from raw IEPE signals to engineering physical quantities. Features output at the device end go directly to upper-level analysis platforms or data platforms, greatly reducing network bandwidth and cloud computing consumption. The standard Modbus protocol seamlessly integrates with various industrial gateways and edge computing devices.

Typical monitored objects: industrial gateway data acquisition · MES system integration · cloud condition monitoring platforms · remote device health management

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	IEPE Input Interface	Voltage Range	23 VDC (2)
		Sensitivity	1~10000 mV/g (default 100 mV/g)
		Output Current	Typical 4 mA (3)
		Sampling Rate	25 kHz
		Voltage Resolution	0.567 mV (equivalent to 16-bit ADC)
		Non-linearity	1% FS
		3 dB Frequency Response	5 Hz~10 kHz
		Noise floor	<0.03 μV/√Hz (IEPE input connected to a standard bias load at rest; system noise is determined by the external sensor)
	IEPE Output Interface	Output Signal	IEPE input signal buffered output
	AIO Output		4 mA~20 mA
Configuration	Configuration Interface		Shared with the communication interface
	Configuration		AT commands

	Protocol		
Digital Output	RS485 Interface	Feature Output	Simultaneously outputs acceleration peak, acceleration RMS, velocity peak, velocity RMS, displacement peak, displacement peak-to-peak and frequency peak, plus envelope peak, envelope RMS and envelope crest factor
		Envelope Demodulation Band	500 Hz~10 kHz (default) / 1 kHz~10 kHz / 2 kHz~10 kHz or custom
		Interface Type	RS485 (4)
		Input Voltage	-7 VDC~12 VDC (5)
		Baud Rate	4.8 kbps / 9.6 kbps / 115.2 kbps / 460.8 kbps / 921.6 kbps / 1 Mbps
		Communication Speed	Typical 1.6 KB/s~25 KB/s (6)
		Communication Protocol	Modbus RTU
	AIO Interface		Output any one of acceleration peak, acceleration RMS, velocity peak, velocity RMS, displacement peak or displacement peak-to-peak as required (default: velocity RMS corresponding to 0 mm/s~200 mm/s)
Signal processing	Acceleration Range		The range is determined by the connected IEPE sensor; the AIO interface can be set to a maximum output of 1 m/s²~1000000 m/s² (default 200 m/s²)
	Acceleration Resolution		0.0001 m/s²
	Acceleration Accuracy		±1% FS (including gain/offset/nonlinearity/noise, FS=±10 V; ADC 16-bit, 1 LSB=0.305 mV≈3 μg/√Hz; external sensor excluded)
	Velocity Range		The AIO interface can be set to a maximum output of 1 mm/s~1000000 mm/s (default 200 mm/s)
	Velocity Resolution		0.01 mm/s
	Velocity Accuracy		From 20 Hz: ±(0.02 mm/s or 10% of reading), whichever is greater Under ideal-sensor conditions, <20 Hz serves as trend reference only, and actual values are affected by the sensor sensitivity error
	Displacement Range		The AIO interface allows the maximum output value to be set from 1 μm~1000000 μm

		(default 2000 μm)
	Displacement Resolution	0.01 μm
	Displacement Accuracy	20 Hz~1 kHz: ±(5 μm or 10% of reading), whichever is greater Under ideal-sensor conditions, 5~20 Hz serves as trend reference only, and 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~10 kHz)

⚠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) Non-isolated RS485: pay attention to the common-mode voltage to prevent equipment breakdown; when connecting to the RS485 bus, a 120 Ω termination resistor is required at the bus end.

(5) Voltage difference between signal line A or B and ground.

(6) Modbus protocol: sending 1 MB of data, typical speed is 1.6 KB/s at 4.8 kbps and 25 KB/s at 1 Mbps.

5 Interfaces and Indicators



Figure 5-1 Interface and Indicator Locations

IDC5100 has three LED indicators on the front panel showing the device status in real time. From top to bottom they are the run indicator (RUN), data transmit indicator (TX) and data receive indicator (RX). 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 / GND	IEPE channel 1 input (4 mA output, 12 V ±10 V signal input) / channel 1 ground
	IN2 / GND	IEPE channel 2 input (4 mA output, 12 V ±10 V signal input) / channel 2 ground
IEPE Output	OUT1 / GND	IEPE channel 1 input buffered output / channel 1 ground
	OUT2 / GND	IEPE channel 2 input buffered output / channel 2 ground
Analog Output	OUT1 / GND	IEPE channel 1 analog output / channel 1 ground
	OUT2 / GND	IEPE channel 2 analog output / channel 2 ground
Power and Communication	A / B	RS485 differential signal, Modbus RTU protocol; A is pulled up to 3.3 V via an internal 4.7 kΩ resistor, B is pulled down to GND via an internal 4.7 kΩ resistor
	VIN / GND	System power positive (9~30 VDC) / system power negative
Run Indicator		Green flashing (normal) / red flashing (data not ready)
TX Indicator		Green flashing
RX Indicator		Green flashing

6 Mechanical Dimensions

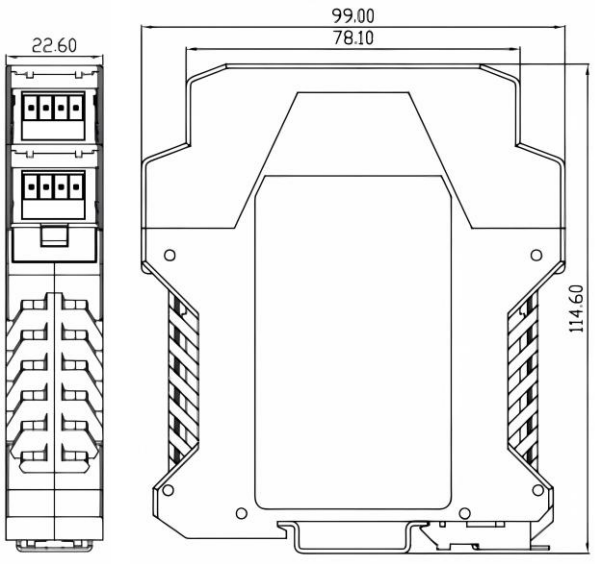


Figure 6-1 Mechanical Dimensions (unit: mm)

7 Accessories and Installation



Figure 7-1 DIN Rail Clip

IDC5100 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

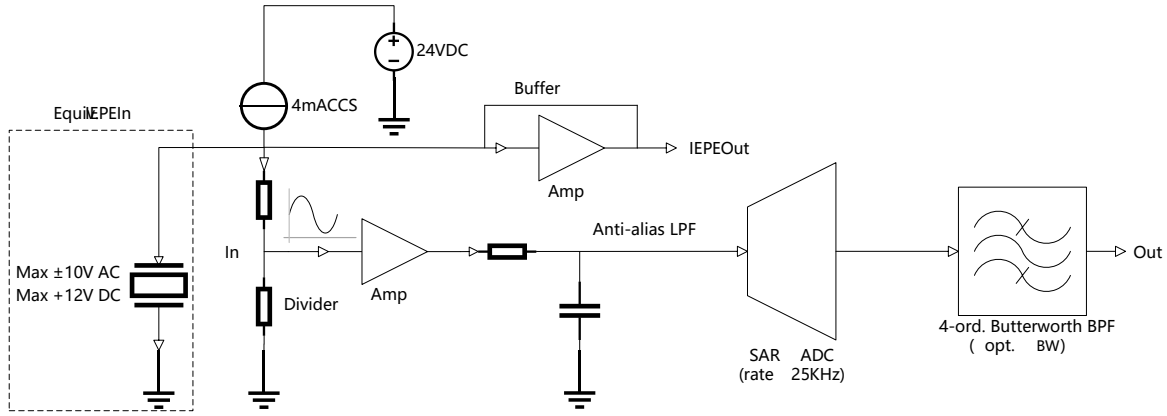


Figure 9-1 IEPE Signal Chain

IDC5100 has two 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 Buffered output → the conditioned signal splits into two paths: one is buffered by an amplifier and output directly to the IEPE_OUT interface for third-party systems, and the other enters the ADC sampling channel;
④ Anti-aliasing filtering → an analog low-pass filter removes frequency components above 12.5 kHz to satisfy the Nyquist sampling theorem;
⑤ ADC sampling → a 16-bit SAR ADC samples both channels synchronously at 25 kHz;
⑥ Digital filtering → a 4th-order Butterworth band-pass filter with 6 software-configurable bandwidths produces acceleration data that meets monitoring requirements.
Users can select the filter bandwidth flexibly via AT commands or the Modbus protocol according to the frequency characteristics of the monitored target.
Bandwidth selection suggestions: use 5 Hz~1 kHz for low-speed heavy-duty equipment, 5 Hz~10 kHz for high-speed light-duty equipment, and 100 Hz~10 kHz for bearing 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.
- Before connecting to the RS485 bus, verify the common-mode voltage does not exceed -7~12 VDC to prevent interface breakdown.
- A 120 Ω termination resistor must be connected in parallel at the end of the RS485 bus, and the shield must be grounded at one end only.
- 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.

11 Ordering Information

Model code: IDC5100-[Max Sampling Rate]
Max Sampling Rate：25K = 25kHz

Table 11-1 Ordering Information Overview

Name	Model	Specification
IEPE Sensor Acquisition Instrument	IDC5100-25K	Max sampling rate 25 kHz