

# AUTOMATED MONITORING

Comprehensive Solution



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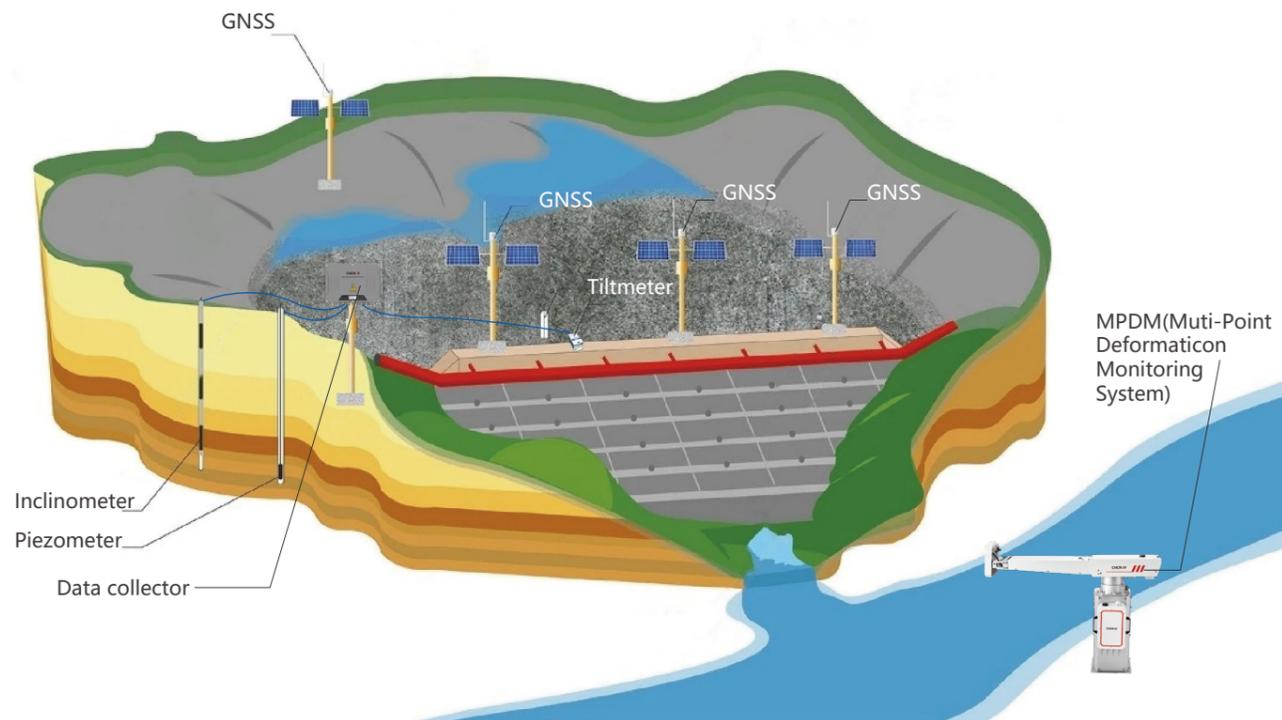


## ► Solution Overview

During the operation of various engineering facilities, their safety status is of great concern. It is crucial to grasp the operational conditions of the facilities in real-time and detect potential risks promptly, which gives rise to an urgent demand for efficient and accurate monitoring solutions. With over 20 years of experience in the safety monitoring field, CHCNAV has launched an intelligent monitoring solution leveraging its profound technical accumulation and rich practical experience. It aims to provide strong support for the safety monitoring of various engineering facilities through advanced technical means.

The solution comprises intelligent devices (such as GNSS, MPDM and MEMS sensors), communication systems, and an intelligent monitoring management platform. It enables the collection, storage, processing, analysis, reporting, and intelligent early warning of monitoring data, and constructs a "Smart Monitoring Map". It boasts powerful functions including visual remote monitoring, fully automatic perception of operational status, comprehensive analysis, safety management, and patrol inspection.

CHCNAV's intelligent monitoring solution has a wide range of applications, covering scenarios such as open-pit mines, tailings ponds, dam safety, geological disasters, and traffic slopes. In numerous projects within these industries, the solution has fully demonstrated its advantages with stable and reliable performance and excellent monitoring results, providing all-round and precise monitoring services for different types of engineering facilities and ensuring the safe and stable operation of various projects.



## ► Monitoring System Topology Diagram



## ► Monitoring GNSS Receiver H3

The H3 is a cost-effective and versatile GNSS smart receiver leveraging CHC Navigation's expertise in subsidence and deformation monitoring for critical infrastructure such as dams, bridges and landslide-prone areas. Unlike traditional GNSS monitoring systems, the H3 features an intelligent antenna design that achieves a high level of integration. This design includes the GNSS module, a low-power interface board, multiple communication modules and MEMS in a compact, all-in-one unit. The H3 provides reliable data for both long-term static positioning and dynamic positioning, making it a prime and efficient solution for demanding monitoring applications.



## ► Features

### 01 Seamless integration, effortless installation

The all-in-one H3 integrates GNSS antenna, MEMS component and 4G modem, simplifies power supply, and enables hassle-free installation.

### 02 GNSS+MEMS Sensor

The H3 features iSTAR algorithm, supports 1400 GNSS channels across major systems, with MEMS enhancing data integrity in complex environments.

### 03 Precision assurance

High-end MEMS and variable-frequency tech in H3 enable rapid updates for sudden deformation detection and immediate warnings.

### 04 Reliability in any environment

The H3's integrated design, low power (<2W) and solar compatibility ensure reliable performance in harsh outdoor conditions.

## ► Main Parameters

Performance and Accuracy	Post processing static: Horizontal: 3 mm + 0.5 ppm
	Post processing static: Vertical: 5 mm + 0.5 ppm
	Real-time kinematic: Horizontal: 8 mm + 1 ppm
	Real-time kinematic: Vertical: 15 mm + 1 ppm
Performance and Accuracy	Time Accuracy (RMS): 20ns
	Velocity Accuracy (RMS) : 0.2m/s
	Time for initialisation: ≤20s
Signal tracking	GPS: L1, L2, L5
	GLONASS: L1, L2
	BDS: B1C, B2A, B1I, B2I, B3
	Galileo: E1, E5a, E5b
	QZSS: L1, L2C, L5

Environmental data	Temperature: -40°C~65°C
	Dust and Water Proof: IP67
	Humidity: 0%RH ~ 99%RH, non-condensing
Communication	Transfer Protocol: TCP, MQTT, NTRIP
	Data Format: NMEA-0183 V2.30; RTCM3.x
	Update rate: 15s(Up to 1HZ)
	Card Type: Nano SIM(0.76mm, ISO/IEC 7810)
	Network 4G modem: GSM / WCDMA / LTE-FDD / LTE-TDD
Power Supply	DC 12V
	Host power consumption < 2W
	The receiver has a power-on self-start function.

## ► Multi-Point Deformation Monitoring System PS-2000

The PS-2000 Monitoring System is an innovative solution for monitoring slope stability and deformation. It uses advanced techniques such as differential interferometric measurement and circular synthetic aperture imaging to provide non-contact, high-precision measurements. With a wide monitoring range of 360°, it excels in large-scale monitoring. Its high data update rate ensures real-time insights, while its robust performance is unaffected by weather and lighting conditions. Compact and lightweight, it offers fast and flexible deployment, making it ideal for public and railway embankments, open-cast mines, landslides, dams and scientific research.



## ► Features

### 01 High-Precision, Non-Contact Monitoring

The PS-2000 monitoring system delivers an accuracy of 0.1mm. Leveraging advanced technology, it requires no contact with the monitored surface, ensuring precise and reliable data.

### 02 Portable and Rugged Design

Weighing only 25kg, the main unit is lightweight and easy to install. Boasting robust protection and a rugged structure, it thrives in harsh environments.

### 03 360° Monitoring Range

Equipped with circular aperture technology and a high-performance turntable, it enables 360° omnidirectional scanning. Supporting custom angles, it adapts to most scenarios seamlessly.

### 04 Real-Time Data Updates

With a high data refresh rate, it presents monitoring area conditions in real time—facilitating rapid issue detection and timely decision-making.

## ► Main Parameters

Maximum Detection Distance	5km
Measurement Accuracy	<0.1mm (line-of-sight displacement)
Data Update Rate	360° in 120 s; 180° in 60 s
Field of view	360°
Spatial resolution	Range 0.3 m, Cross Range: 5.2 mrad @1 km, 0.3 m by 5.2 m @2 km, 0.3 m by 10.4 m
Power consumption	≤50W
Weight	25 kg (without support)
Communication	LAN
Radio frequency band	Ku
Environment	Operating: -35°C to +55 °C ; Storage: -40°C to +60°C
Ingress protection	IP65

## ► Automated Data Collector H960

H960 is a multi-channel automated data collector that can be connected to various sensors such as vibrating wire piezometers, inclinometers and tiltmeters. It features full-interface lightning protection and an IP67 high-protection cabinet-free integrated design, making it suitable for harsh environments such as lightning, high humidity, and sandstorms. It can be applied in various scenarios such as water conservancy, transportation, mining, and geological disasters.



## ► Features

### 01 Integrated Design

Supports solar power, mains power, and built-in battery power supply. Equipped with 4G + wired dual transmission to ensure stable data transmission.

### 02 High Protection Level

IP67 rating, no need for a cabinet, adaptable to various harsh environments.

### 03 Strong Compatibility

Compatible with multiple types of sensors such as vibrating wire, differential resistance, current, voltage, switch, and digital signals.

### 04 Excellent Lightning Protection

Full-interface lightning protection, with 1kV line-to-line and 2kV line-to-ground protection.

## ► Main Parameters

Accessible Signals	Vibrating wire, differential resistance, current, voltage, switch, digital
Measurement Time	Vibrating wire < 3s, differential resistance < 4s
Storage	Total 32MB storage capacity, no less than 1.5 million data records
Data Interface	RS485, RJ45
Communication Mode	RS485, 4G, LAN
Operating Temperature	-30°C - 60°C
Operating Humidity	≤95% RH (at 40°C)
Protection Level	IP67
Overall Dimensions	300×210×100mm
Power Supply Voltage	AC 100 ~ 240V / DC 9 ~ 21V (12V recommended) / Built-in lithium battery power supply
Measurement Channels	16
Instrument Net Weight	<5 Kg

## ► Fixed Inclinometer HC-CA-2.0

HC-CA-2.0 is a three-axis intelligent inclinometer used for all-round inclination measurement in three-dimensional space. And it is mainly applied in industries such as dam monitoring, landslide monitoring, foundation pit monitoring, and highway slope monitoring.



## ► Main Parameters

Resolution	Angle: 0.001°, Frequency: 1Hz
Measurement Accuracy	Angle: 0.005°, Frequency: 1Hz
Range	Angle: ±90°, Frequency: 0 ~ 128Hz
Power Supply Voltage	DC5 ~ 36V
Power Consumption	Low-Power Mode: <10μA @12V Supply Voltage Internal Power Supply Operating Mode: <3mA @12V Supply Voltage
Hardware Interface	RS485 interface
Communication Protocol	Standard Modbus protocol
Built-in Storage Space	Can store 8000 data records
Dimensions	Diameter 28mm, Length 840mm
Product Weight	5Kg
Operating Temperature	-40°C ~ +85°C
Sealing Grade	IP68
Water Pressure Resistance	2MPa (200m water pressure)

## ► Features

- 01 High precision, large range, low power consumption
- 02 Built-in clock module, enabling scheduled data collection and storage
- 03 Trigger acquisition function to record data at the moment of movement
- 04 Internal voltage and temperature acquisition function, with abnormal alarm function
- 05 Power reverse connection protection function.

## ► Tiltmeter HC-QJ-1



The HC-QJ-1 sensor can accurately convert subtle changes in the static gravitational field into inclination information, and output horizontal inclination values in digital form. It is mainly applied to high-precision inclination measurement in fields such as water conservancy, transportation, dangerous buildings, slopes, and industrial automation.

Specification Model	HC-QJ-1	Range	±90°
Resolution	0.001°	Accuracy	0.02°
Communication	RS485/RS232/TTL	Input Voltage	9~35 V DC
Operating Temperature	-40°C~85°C	Protection Level	IP67
Anti-vibration	2000g, 0.5ms, 3 times/axis	Size	L90×W40.5×H26 (mm)
Insulation Resistance	≥100 MΩ		

## ► Vibrating Wire Piezometer HC-SA-3.0

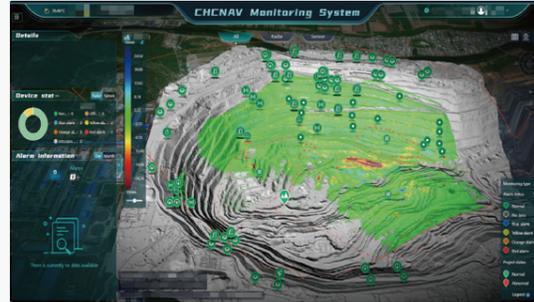


The HC-SA-3.0 piezometer is suitable for long-term embedding in hydraulic structures, other rock structures, or soil to measure the seepage (pore) water pressure inside the structures or soil.

Specification Model	HC-SA-3.0	Temperature Range	-40°C ~ +80°C
Maximum Outer Diameter (mm)	24	Sensitivity	±0.1°C
Length (mm)	120	Temperature Accuracy	±0.5°C
Measurement Range (KPa)	0 ~ 350	Correction Coefficient	0.10KPa/°C
Resolution	0.025%F.S	Water Pressure Resistance	1.5 times the measurement range
Fitting Accuracy	0.1%F.S / 0.5%F.S	Insulation Resistance	≥50 MΩ

## ► Multi-Source Data Fusion and Alarm Platform MAS

MAS connects the power of the Internet, IoT, big data and advanced 3D visualization technologies to provide a robust data visualization and alarm platform for accessing, visualizing, analyzing and managing alarms from remote sites. The platform effectively manages the complexities of integrating and analyzing data from disparate monitoring devices across multiple industries, enhancing operational monitoring and decision-making capabilities



## ► Features

### 01 Multi-source Data Fusion

integrates and displays data from diverse sensors across industries on a single screen—including multi-point displacement monitoring systems, GNSS, inclinometers, tiltmeters, piezometers, and crack meters.

### 02 Proactive Alarm Management

Customizable alarm rules for flexible alerts: support both single-sensor warnings and multi-sensor combined alarms.

### 03 Joint Data Analysis & Reporting

Comprehensive cross-device monitoring with integrated analysis and reporting capabilities.

### 04 B/S Architecture

Access anytime, anywhere via Web or APP with on-site inspection support through the mobile app.

### 05 Open-API

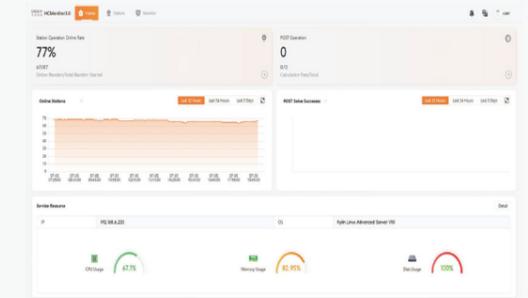
Enables flexible cross-platform data access and forwarding for seamless integration.

## ► Main Parameters

Operating System	Windows server 2019 and above, Ubuntu 20.04.6 LTS
Database	MySQL 5.7.24 and above
Processor	16vCPUs
Memory	32GB
Storage	2TB
Software License	Registration Code
Supported Language	Chinese, English, Russian, Portuguese
Recommended Browser	Google, Edge

## ► High-Precision Deformation Monitoring and Calculation Software HCMonitor

HCMonitor is a professional monitoring software capable of accurately capturing position information and tracking dynamic changes. It integrates data from multiple satellite systems(GPS, GLONASS, Galileo, BDS and QZSS) and MEMS sensors (tiltmeter, accelerometer), supports various data formats and protocols, and enables station management with real-time status display. It adapts flexibly to monitoring needs across different scenarios such as geological disasters, reservoir dam, engineering construction, and open-pit mine, providing stable and reliable monitoring support for various fields.



## ► Features

### 01 Dual-mode Displacement Monitoring

Offers RTK real-time calculation for sudden changes and POST post-processing for high-precision position tracking

### 02 GNSS+MEMS Data Access

It receives data from multiple satellite navigation systems (GPS, GLONASS, Galileo, BDS and QZSS) and integrates MEMS sensors (tiltmeter and accelerator) for enhanced data accuracy and reliability.

### 03 High concurrency and high reliability

A single server can support up to 10,000 concurrent users, ensuring stable operation of the software.

### 04 Intelligent Quality Inspection

Offers intelligent online quality inspection for monitoring data, ensuring data reliability

## ► Main Parameters

Operating System	Windows Server 2012 and above, CentOS 7.9 and above, Ubuntu 18.04 LTS and above
Database	MySQL 5.7 and above
Processor	8vCPUs
Memory	16GB
Storage	500GB
Software License	Registration Code
Supported Language	Chinese, English
Recommended Browser	Google, Edge