Product Overview

The PD MDC series products are specialized devices designed for monitoring the operational status of water pumps. They possess functions such as analog data acquisition, resistance-based digital input acquisition, fault protection, customizable function switches, local serial communication, and cloud-based monitoring. When combined with sensors installed both inside and outside the water pump, these devices collect various data such as temperature, pressure, flow rate, vibration, and leakage. Through cloud-based analysis, they can assess the health condition of the water pump. By incorporating additional sensors such as flow meters and power meters, it is also possible to analyze operational efficiency and provide corresponding energy-saving solutions.

Product features are as follows:

- Specialized data collection for water pumps, supporting multiple signal types.
- Real-time monitoring through cloud-based platform, allowing users to check the operational status of the water pump anytime, anywhere, thus saving maintenance costs.
- Standardized sensor interface for convenient and quick installation, enhancing user experience.
- Support for Modbus RTU protocol, enabling the expansion of additional sensors based on specific requirements.

- Built-in fault output relay for fault shutdown protection; the relay can also be customized for other functions.
- Compact product size for easy installation and compatibility; can be installed in switch cabinets.
- The functionality of the product may vary depending on the configuration.。

Scope of application

Industrial:

- - Air conditioning system
- - Cooling circuit
- - Heating system
- - Water treatment
- - Distribution of cooling lubricants
- - Water extraction
- - Water supply services

Water:

- - Water supply system
- - Water treatment/regulation
- - Water distribution/transportation

Building facilities:

- - Air conditioning system
- - Heating system
- - Water supply system

Wastewater:

- - Wastewater conveyance
- - Municipal and industrial wastewater
- - Wastewater treatment

The application's environment

The data acquisition device operates normally under the following conditions:

1. Operating temperature: -10 to 60°C.
2. Storage temperature: -20 to 70°C.
3. Cooling method: Natural air cooling.

Product Naming and Functionality

Product Naming:

PD MDC N Meaning: PD stands for Portable Device, MDC stands for Monitoring Data Collector, N represents the absence of a DTU module, E indicates the presence of an Ethernet version DTU module, and G indicates the presence of a 4G version DTU module.

Product configuration

1. The configuration of this product involves DC24V power supply, 8 analog input interfaces, 4 digital input interfaces, and 2 digital output interfaces. Optional DTU module.

2. Sensor options include two pressure sensors (2-meter cable, 16 bar, G1/4 thread), one vibration sensor (single-axis, 0-10mm/s, M8 thread), and two PT100 temperature sensors (M8 thread, 0-200 degrees Celsius). The PT100 sensors can be of the magnetic type.

Functionality

1. There are two RS485 interfaces, both utilizing the Modbus-RTU protocol, allowing for the modification of communication format and station address.

2. Multiple operating modes are available: the option to operate the device in either "dual-master-slave" mode or "three-host" mode.

3. Configured parameters can be saved for convenient future use.

4. Remote control capability enables device rebooting.

Matching the product with different configurations of sensors enables the realization of various functionalities.

1. Application examples:

- For submersible pumps, the protection function can be achieved by directly connecting signals such as PT100, electrode probe, float switch, and PTC of the

pump itself to the MDC, eliminating the need to purchase sensor accessory packages.

- If the sensor accessory package is purchased, the following settings are recommended to achieve the following functions:
    - Pressure sensors installed at the inlet and outlet of the pump allow the MDC to measure the pressure, similar to a pressure gauge. Combined with the pump's performance curve data, the current flow rate can also be calculated.
    - Vibration sensors, installed magnetically on the pump's bearing frame near the bearings, can measure the vibration of the bearings. By comparing it with the set threshold, pump operation warnings or shutdown operations can be performed.
    - PT100, also installed magnetically on the pump's bearing frame near the bearings, can measure the temperature of the bearings. By comparing it with the set threshold, pump operation warnings or shutdown operations can be performed.
    - If applicable to central air conditioning cooling water circulation systems, pressure sensors and PT100 can be installed at the front and rear positions of the condenser to obtain pressure and temperature differentials. Additionally, a pressure sensor should be installed at the pump inlet to provide a basis for energy-saving calculations.

- For other expansion scenarios, such as flow meters, power meters, etc., specific configurations can be consulted with us. This configuration allows for the measurement of the pump's actual performance, including flow rate, head, efficiency, and unit efficiency. It enables the analysis of the pump's operating status, identification of energy-saving potential, and provision of corresponding energy-saving solutions, including optimized operation plans or pump system retrofit plans (requires integration with XiaoZhou Open IoT cloud service).
- If users need to connect other sensors, they can also be connected according to the MDC's terminal requirements and display or parse the sensor information based on user requirements. In such special cases, customization is required.

2. DTU configuration

If the device is equipped with a Data Transfer Unit (DTU), the collected data can be uploaded to the cloud. The cloud can either be the customer's own cloud server or the XiaoZhou Open IoT Cloud Service. The DTU is available in both Ethernet and 4G versions. If the device is not equipped with a DTU, the collected data can be transmitted to the user's local control center through the 485 interface. Alternatively, the data can be transmitted to the receiving device via Bluetooth. Another option is to store the data on a storage card, which can be read using a card reader or transmitted via Bluetooth when needed. If the user does not have a local control center on-site, relays can be used to control the start and stop of the device, similar to the functionality of a market-available pump protector.

Product specifications

Hardware Specifications:

- Network Access: Ethernet or 4G

- Serial Port: RS485

- Analog Input Interface: 8 channels, 4~20mA

- Digital Input Interface: 4 channels, selectable jump resistor values of 4kΩ/10kΩ/30kΩ

- Relay Output: 2 channels

- Indicator Light Output: 2 channels, synchronized with relays

Electrical Specifications:

- Rated Voltage: DC24V

- Allowable Power Loss: <3ms

Appearance and Material:

- Dimensions: 126mm×102mm×47mm

- Total Weight: Approximately 400g

- Housing Material: Galvanized steel plate with black paint

Software Specifications:

- VPN: Not supported

- Data Monitoring: Up to 500 points

- Alarm Notification: 20 points, supports email, WeChat, and Telegram notifications

- Historical Data: 50 points

User benefits

- Real-time monitoring: Users can conveniently access the operational status of the water pump anytime, anywhere through mobile devices, PCs, and other client applications. Regardless of their location, users can promptly stay informed about the pump's working condition, ensuring complete control.
- Timely alerts: PD MDC's cloud platform automatically compares data and promptly notifies users via email, WeChat, Telegram, and other channels in case of any anomalies or malfunctions. Users can take immediate measures to prevent further damage to the water pump or other equipment.
- Remote control: Authorized users can remotely control the water pump through mobile devices, PCs, and other client applications, such as valve opening and closing (hardware support required) or setting the frequency of the variable frequency drive (requires both a variable frequency drive and hardware support). Users can operate the water pump remotely without the need to be physically present, enhancing operational convenience and efficiency.
- Data analysis: PD MDC's cloud platform enables analysis of data such as pump vibration and temperature, allowing users to understand the trends over a specific period. Through data analysis, users can proactively identify potential issues, perform preventive maintenance, and enhance the reliability and lifespan of the water pump.
- Customized services: PD MDC offers tailored services based on user requirements. Users can select the desired sensors and conduct corresponding data analysis

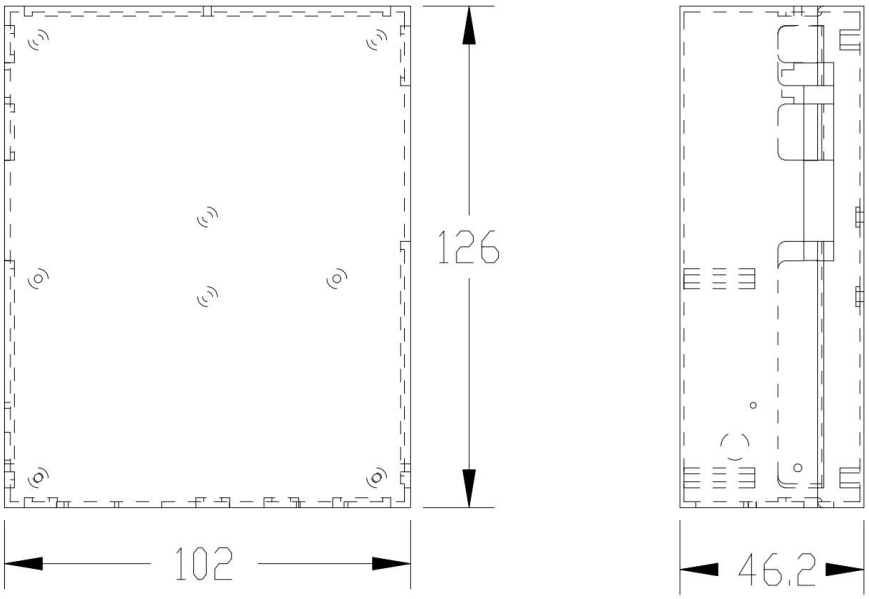
according to their specific circumstances. This approach ensures better fulfillment of users' specific needs and provides personalized solutions.

Product Structure and Terminal Introduction

The product consists of two PCB boards and an enclosure. PCB board 1 includes all data acquisition functions, two 485 interfaces, and a Bluetooth module. PCB board 2 is an expansion board that includes data storage and DTU functionality, which can be omitted if not required. There are 8 channels for analog signal acquisition, used for connecting sensors such as drive-end vibration, non-drive-end vibration, and inlet/outlet pressure. There are also 4 channels for digital signal acquisition, which will change state when the resistance exceeds the set range. The selectable threshold values for the resistance change are 4kΩ / 10kΩ / 30kΩ. The default configuration for the 8 analog channels is as follows: 2 pressure sensors, corresponding to the inlet and outlet of the water pump; 2 vibration sensors, placed respectively on the drive-end and non-drive-end bearings of the pump shaft; 1 remote pressure sensor, located at the far end of the pipeline to measure operating pressure; and 1 spare terminal. Additionally, there are 2 PT100 sensors: for dry pumps, they are placed on the drive-end and non-drive-end bearings of the water pump shaft; for submersible pumps, they are the winding temperature PT100 sensors inside the pump. If used for energy-saving in circulating water pumps, the 2 PT100 sensors can be connected to both sides of the condenser or evaporator. The 4 digital input interfaces can be used to connect sensors inside the submersible pump, such as an electrode probe for detecting resistance

changes caused by leaks, a float switch for detecting liquid level changes caused by leaks, or a PTC temperature control element. In the expanded configuration, the output information of the frequency converter, such as voltage, frequency, and power, can be obtained through the RS485 interface. Power meters can also be used to obtain information from the power grid transmitted to the pump system, such as voltage, current, power factor, and active power. Please note that the actual configuration may differ from the default configuration, so please contact our company for detailed information.

Dimensions



Definition of Interface

Interface: The power supply interface should be selected as DC24V with an output current of at least 1.5A. RS485: Two RS485 interfaces, RS485-1 and RS485-2, are used to connect frequency converters, power meters, and various sensors. It is recommended to use shielded twisted pair cables, with the shield connected to the analog input ground. Analog Input: There are 8 4-20mA analog inputs. Digital Input: There are 4 digital input interfaces, and the resistance value for the jumper selection can be chosen as 4K/10K/20K. Relay Output: There are 2 normally open relay outputs with the following specifications: AC220V-3A/DC24V-3A. Antenna Interface: There is a 4G antenna interface (for the 4G version). SIM Card Interface: There is a Micro-SIM card slot (for the 4G version). Ethernet Interface: There is an Ethernet network cable interface (for the Ethernet version).

Necessary information that users need to provide

If PD MDC is supplied with our company's pump unit, all the information will be prepared by our company. If the user purchases PD MDC with a self-provided pump unit, the following data needs to be provided for the initialization of PD MDC and the initial configuration of XiaoZhou Open IoT cloud service. Only after completing these configurations can the aforementioned functions be realized.

A. Mandatory Information:

1. General Information: User name or pump station name; pump station address. Equipment number, i.e., the pump to which this device belongs.

2. Threshold values for protective sensors, including but not limited to PT100, vibration, electrode, float, PTC, and other sensors requiring protective actions. Warning thresholds and shutdown thresholds need to be provided.

B. Optional Information:

Additional information should be provided as needed. It is recommended to provide this information; otherwise, even with the sensors, some functions may not be achievable.

3. Pump-related Information:

Information related to the position of inlet and outlet pressure sensors: ZM2 (or ZM2a), D2, L2, ZM1, D1, L1, Z. Specific details are provided in the following text. Without this information, the pump head cannot be determined. Inlet and outlet pressure sensors can only be used as pressure gauges, and the difference in pressure between them can be used as an approximate head. Rated pump data: rated flow rate, rated head, rated speed, rated efficiency. Without this information, the energy-saving potential of the pump cannot be accurately calculated. Operating time of the pump before installing PD PDC. Without this information, the total running time of the pump cannot be determined. Operating time since the last

bearing replacement. Without this information, cumulative bearing running time cannot be calculated. Pump performance data (including minimum flow rate, rated point, maximum efficiency point, maximum flow rate point, and at least three other points, totaling at least seven points). If performance data is available and there is information on inlet and outlet pressure sensors, head and flow rate can be calculated. If this information cannot be provided, an estimated performance curve will be used, but accuracy will be reduced. If a flow meter is available, flow rate can be calculated using the flow meter data, and pump performance data is not required.

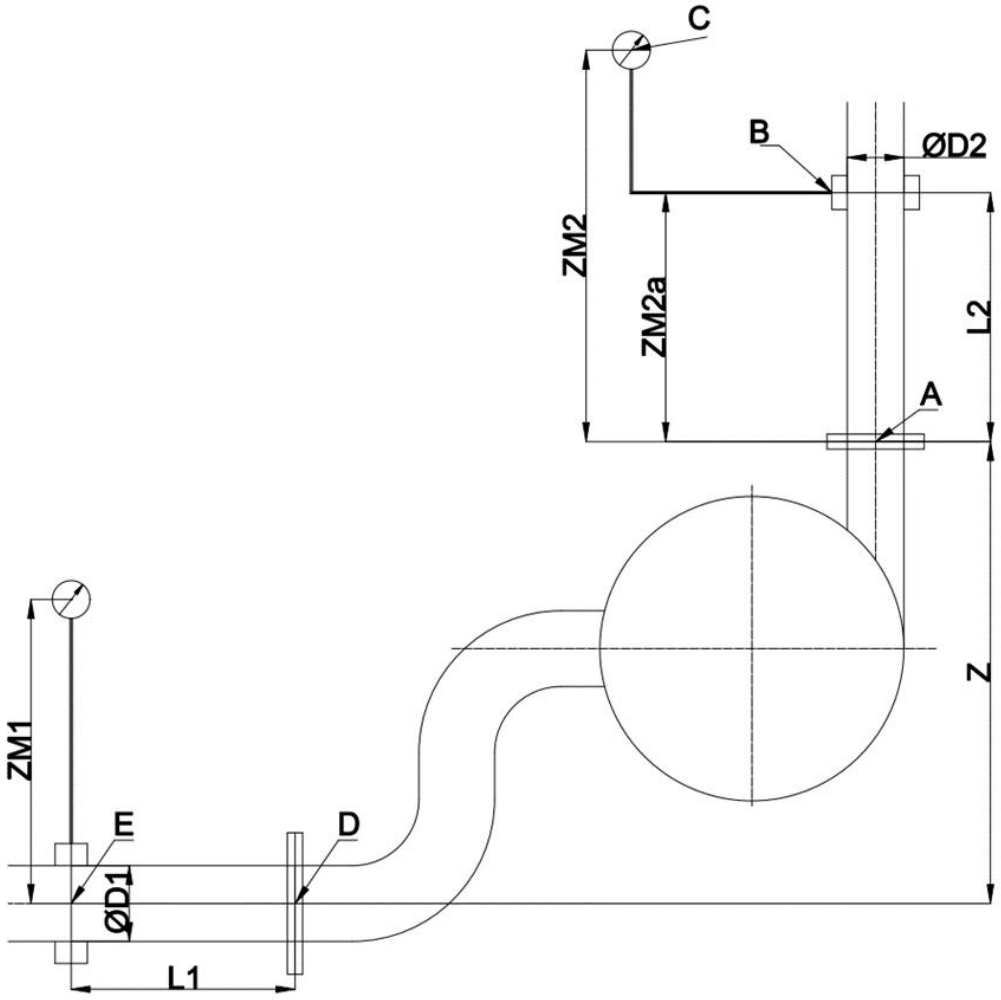
4. Motor-related Information:

Rated data of the electric motor, used to accurately calculate the energy-saving potential of the pump unit (motor). Without this data, the energy-saving potential of the motor cannot be determined.

Motor Model
Rated Voltage of the Motor (V)
Rated Frequency of the Motor (Hz)
Rated Power of the Motor (kW)
Rated Current of the Motor (A)
Rated Efficiency of the Motor (%)
Rated Power Factor of the Motor
Rated Speed of the Motor (rpm)
Is the Motor Variable Frequency Drive (VFD) enabled?

Installation time of the motor before PD PDC. Without this information, the total

operating time of the motor cannot be determined. The significance of ZM2 (or ZM2a), D2, L2, ZM1, D1, L1, and Z data is as follows: For the export flange at position A, due to the inconvenience of installing sensors, we have embedded them behind the flange at position B. Assuming the sensor is directly embedded at position B, we need to know the height difference ZM2a between B and A. If the pressure at position B is transmitted to position C through the pipeline, with the pipeline filled with the measured liquid, and the sensor obtaining pressure data at position C, we must use the height difference ZM2 between C and A instead of ZM2a. These two reading methods depend on the position where the sensor obtains pressure (considering only the vertical dimension, the horizontal dimension does not affect). Additionally, we also need to know the pipeline diameter D2 at position B and the pipeline length L2 from B to A. For the inlet flange D, the sensor is installed in front of the flange at position E. Similarly, we need to know the height difference ZM1 between the sensor and the measurement position (assuming the pipeline is filled with the measured liquid), the pipeline diameter D1 at position E, and the pipeline length L1 from E to D. If flanges A and D are at different heights, we also need to know the height difference Z between them. If they are at the same height, Z is equal to 0.


C
B
ØD2
ZM2
ZM2a
L2
A
Z
ZM1
E
D
ØD1
L1