# TQ07
# Portable weather station
# user's manual

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# 1. System overview

TQ07 is a portable weather station integrating data acquisition, display, analysis, and upload capabilities. This highly integrated automated meteorological observation device is designed for field monitoring applications. Equipped with an all-in-one ultrasonic multi-sensor environmental monitor, it performs real-time monitoring of critical meteorological parameters including wind speed, direction, air temperature, humidity, noise levels, PM2.5, PM10, carbon dioxide concentration, atmospheric pressure, light intensity, optical rainfall, total solar radiation, and altitude. The device offers optional 7-inch touchscreen interfaces to display real-time measurement data. Powered by a high-capacity lithium battery, it supports both power charging and solar panel operation. Its built-in electronic compass eliminates orientation requirements during installation, requiring only horizontal alignment. Featuring a single ModBus-RTU slave interface, the system can connect to PLCs or configuration software for real-time sensor data transmission. Parameters can be easily configured via mobile apps, while its offline storage function allows historical data export through USB drives. Widely applicable in meteorology, agriculture, environmental protection, marine science, airports, ports, scientific research, and educational settings, this versatile solution ensures reliable environmental monitoring across diverse fields.

## 1.1 Function features

- Select 7-inch LCD touch screen, can view the monitoring data in real time, display clearly, comprehensive content.

- Measurement elements are freely selected to facilitate use and meet the requirements of field measurement.

- Aluminum alloy bracket, retractable and detachable, light weight, can be carried by one hand or placed in the trunk of the vehicle, assembly and debugging can be completed within 2 minutes.

- Supports various power supply methods such as lithium battery, mains electricity and solar power supply, among which solar power supply is optional.

- The 4G data is uploaded to our company's free cloud platform, and the data can be viewed through the supporting mobile APP, small program and WEB terminal.

- Data can be stored offline, and the data acquisition period can be set according to the observation needs.

- It has 1 ModBus-RTU station interface, which can provide real-time data of collected sensors to external PLC or configuration software.

- Large capacity data storage, can store up to 520,000 pieces of data, support USB drive export.
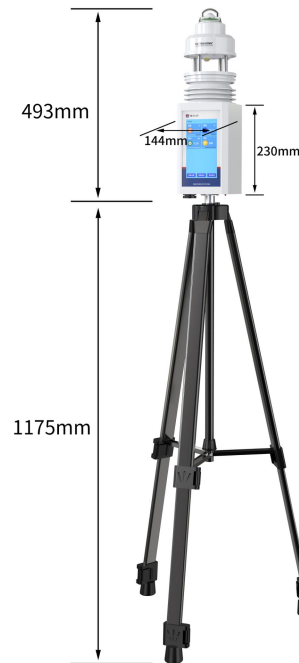
## 1.2 Technical parameters

| Parameter name | Scope or interface | explain |
|---|---|---|
| Data upload and export mode | 4G | Upload data over 4G |
| | ModBus-RTU from the station interface | Support external devices to inquire data in the device through ModBus-RTU protocol. |
| | U tray | Export from USB drive |
| 4G data upload interval | 20s~65535s | The interval between data transmission can be set from 20s to 65,535s (default 300s) |
| power supply mode | lithium cell | 12000mAh lithium battery |
| | Power supply | Use a 24V power adapter |
| | Solar power supply | It is equipped with portable solar panels |
| duration of flight | With a touch screen | <= 36h (this condition is only satisfied for specific configuration modes) |
| | No touch screen | <=50h (this condition is only satisfied for specific configuration modes) |
| data storage | | 520,000 |
| accuracy | wind speed | $\pm$ (0.2m/s$\pm$0.02*v) (v is the true wind speed) |
| | wind direction | $\pm3°$ |
| | humidity | $\pm3\%RH(60\%RH,25℃)$ |
| | temperature | $\pm0.5℃$（25℃） |
| | atmospheric pressure | $\pm0.15kPa@25℃$  101kPa |
| | noise | $\pm$ 0.5dB (at reference pitch, 94dB@1kHz |
| | PM2.5 | Particle counting efficiency: 50%@0.3μm，98%@>=0.5μm。 PM2.5 accuracy: $\pm3\%FS$ (@100μg/m³, 25℃,50%RH) |
| | CO2 | $\pm(50ppm+ 3\%F·S)$ (25℃) |

| | | |
|---|---|---|
| | intensity of illumination | ±7%(25℃) |
| | total solar radiation | ≤±3%@150W/m² |
| range | wind speed | 0~60m/s |
| | wind direction | 0~359° |
| | humidity | 0%RH~99%RH |
| | temperature | -40℃~+80℃ |
| | atmospheric pressure | 0-120kPa |
| | noise | 30dB~120dB |
| | PM10 PM2.5 | 0-1000μg/m³ |
| | CO2 | 0-5000ppm |
| | intensity of illumination | 0 ~ 200,000 Lux |
| | total solar radiation | 0~1800W/m² |
| long term stability | temperature | ≤0.1℃/y |
| | humidity | ≤1%/y |
| | atmospheric pressure | -0.1kPa/y |
| | noise | ≤3dB/y |
| | PM10 PM2.5 | ≤1%/y |
| | CO2 | ≤1%/y |
| | intensity of illumination | ≤5%/y |
| | total solar radiation | ≤±3% |
| Temperature and humidity response time 1 | temperature | ≤25s (1m/s wind speed 2) |
| | humidity | ≤8s (1m/s wind speed 2) |
| response time | wind speed | 1s |
| | wind direction | 0.5s |
| | atmospheric pressure | ≤2s |
| | noise | ≤3s |
| | PM10 PM2.5 | ≤90s |

| | CO2 | The 90% step change is generally less than 180s |
|---|---|---|
| | intensity of illumination | ≤2 |
| | total solar radiation | ≤10s |
| Optical rainfall parameters | Typical accuracy | ± 5% (from laboratory data) |
| | resolution ratio | Standard 0.1mm |
| | Maximum instantaneous rainfall | 24mm/min |
| | Sensory rain diameter | 6cm |

1. The temperature and humidity response time is τ 63 hours.

2 Wind speed refers to the wind speed at the sensitive material inside the sensor. When the wind speed in the test environment is 10-2m/ms, the wind direction is perpendicular to the sensor collection port, and the wind speed at the sensitive material inside the sensor is about 1m/s.

## 1.3 Product selection

TQ07 is the basic model of portable weather station, and users can choose the specific monitoring elements.

| TQ07- | | | | | Portable weather station |
|---|---|---|---|---|---|
| | M7- | | | | Portable triangular stand |
| | | Y- | | | City power supply, built-in lithium battery |
| | | DC-12- | | | The device has a built-in lithium battery with 60W discount Stacked solar panels, complimentary charger, It can be solar charged or charged charge |
| | | | 4G- | | 4G upload, default with 485 uplink output |
| | | | | empty | No touch screen |
| | | | | HMI | With a touch screen |

The following table lists the optional elements of this device. Users can select the required elements according to this table (Note: If PM element is selected, CO2 element cannot be selected again, and the two elements cannot be selected at the same time.)

| name | | | |
|---|---|---|---|
| air humidity | air humidity | carbon dioxide | intensity of illumination |
| wind    speed | noise | atmospheric pressure | PM2.5 |
| wind direction | PM10 | Optical rainfall | Total solar radiation |

| height | |
|---|---|

## 1.4 Equipment size diagram



493mm

144mm  230mm

1175mm

# 2. Equipment installation

## 2.1 Equipment installation inspection

**Equipment list:(the number of equipment varies according to different types, and the specific information is subject to the actual situation on site)**

■  One portable weather station

■  One portable triangular bracket

■  One portable suitcase

■  1 aviation plug cable

■  124V power adapter

■  1 portable solar panel (optional)

■  14G antenna

■  1 USB drive (optional)

■  1 installation seat

■  Certificate of conformity and warranty card

## 2.2 Installation

(1) Basic treatment

The hardened ground thickness is not less than 15cm, the surrounding environment is not blocked, the network signal is good, and the ground level is horizontal.

(2) Assemble the tripod

Take out the tripod, pull up three locks in turn, pull out the frame rod, lock the locks, open and fix the tripod, take out the connector and install it on the screw of the tripod.

（3） installation equipment

Take out the portable weather station equipment, aim at the upper connector of the tripod, pick up the equipment with both hands and put it into the connector and tighten it with a hand screw.

（4）Power test

Long press the power button at the bottom of the device for 1s. You will hear a "drip" sound and the device starts up. At this time, the power indicator light flashes, so you can check the screen display or use the Bluetooth connection software to view it. To shut down the device, long press the power button at the bottom of the device for 3s. You will hear two "drip" sounds and the device shuts down.



USB
Power switch
Charging port
Aviation plug
Wireless port
Power indicator light
Plum blossoms are tightening screws by hand

| name | function |
|---|---|
| Turn the screw by hand | Tighten the equipment to the bracket |
| Aviation plugs (2 cores) | Upstream port 485 (address 1 baud rate 4800) |
| USB | Export data (without displaying this interface is useless) |
| mains switch | Equipment switch button |
| USB | Power the equipment |
| A antenna interface | 4G antenna interface |
| power light | The power supply flashes when it is lower than 8%, flashes when charging, and stays on when fully charged |

## 3. Screen display

After the equipment is installed, start the equipment and enter the main interface.

Current time

Test elements

page turning

Status check

Battery capacity

Signal condition

Parameter configuration

Derive data

The main interface of the device can display the elements currently being detected. If there are too many optional elements, you can flip pages to display them. You can configure the device parameters through the screen, view the current status and export data.

## 3.1 Status check

Click the status view button to enter the status view interface.

Target address: The IP address or domain name of the computer or server where the monitoring platform is located. If the device uploads data to our cloud platform, the target address should be set to hj4.jdrkck.com using Bluetooth configuration software.

Target port: The network listening port of the monitoring platform. If the device uploads data to our cloud platform, the target port should be set to 8020 using Bluetooth configuration software.

Address code: eight-bit address of unique device identification.

Storage space remaining: View the amount of data storage remaining on the device.

Version: The current software version of the device.

View raw data: View the original values in the device register here.

## 3.2 Parameter configuration

Click parameter configuration and enter the password (default password: 8888) to enter the parameter configuration interface. In this interface, you can check the elements you need to display according to the optional elements, and the elements not selected will not be displayed in the main interface.



Data frame interval: Set the data upload interval of the device to the platform. The range is 20s ~65535s, and the default is 300s.

Data storage interval: Set the storage interval for the device to save data. The range is 20s ~ 65535s, and the default is 60s.

Screen off time: Set the screen off time, default 1 minute.

Select display elements: Set the elements that need to be displayed on the screen.
Factor coefficient setting: Set the coefficient of the selected factor.

Coefficient A: Set the coefficient A of the element data.

Coefficient B: Set the coefficient B of the element data.

Calculation formula: Y=AX+B; where X is the original value and Y is the processed value.

## 3.3 Export data

Click the "Export Data" button to access the export interface. Here, you can view the number of data entries stored on your device. Insert a USB drive and click "Export Data" to transfer all stored content from your computer. To review historical data, scroll through pages on

the screen to access stored information. Click "Clear Data" to erase all current data stored on your device.

Clicking the altitude calibration button will open the altitude calibration interface, which displays real-time atmospheric pressure and temperature values. Enter your current altitude for calibration, then switch device locations to measure new altitudes. Since environmental factors like temperature and humidity significantly affect air pressure readings, calibrate the system first before using altitude data. After completing calibration, you can obtain reliable altitude measurements within a short period (typically 2 hours, assuming minimal environmental changes during this timeframe).



To calibrate the electronic compass, click on the calibration icon to enter the interface where you can view its current angle and enable it. Before calibration, read the instructions carefully: If enabling the compass, align the "N" symbol at the top of the device with true north, check the compass angle, then write compensation in the compass compensation field to bring the angle close to 0°  or 360° . Click "Calibrate" and rotate the device horizontally at a steady, slow speed for 2 minutes to complete calibration. Note: Keep the power on during calibration to prevent vertical movement. If calibration fails, repeat these steps. The device cannot be calibrated if the electronic compass is turned off.

# 4. Parameter configuration

1) The device supports Bluetooth configuration. You need to scan the code with Android phone QQ or browser to download the configuration software "Multi-functional parameter Configuration" APP, or contact our staff for it.

2) After the download is completed, open Bluetooth and open the APP interface (Figure 1). Click Bluetooth configuration to connect the device. Enter the device name MSQXZ and the device address (e.g., device address 12345678), select MSQXZ12345678 (Figure 2), and enter the password (default password 12345678) to log in (Figure 3).

3) After logging in, select the parameter name you wish to modify and click "Read". Upon completion, you can configure element display settings, adjust equipment parameters, or retrieve real-time data. When uploading to your own software monitoring platform, update the target server address and port to your local server. For our company's environmental cloud platform, set the target server address to hj4.jdrkck.com and port 8020. After completing these adjustments, click "Apply Parameters" to save the changes.
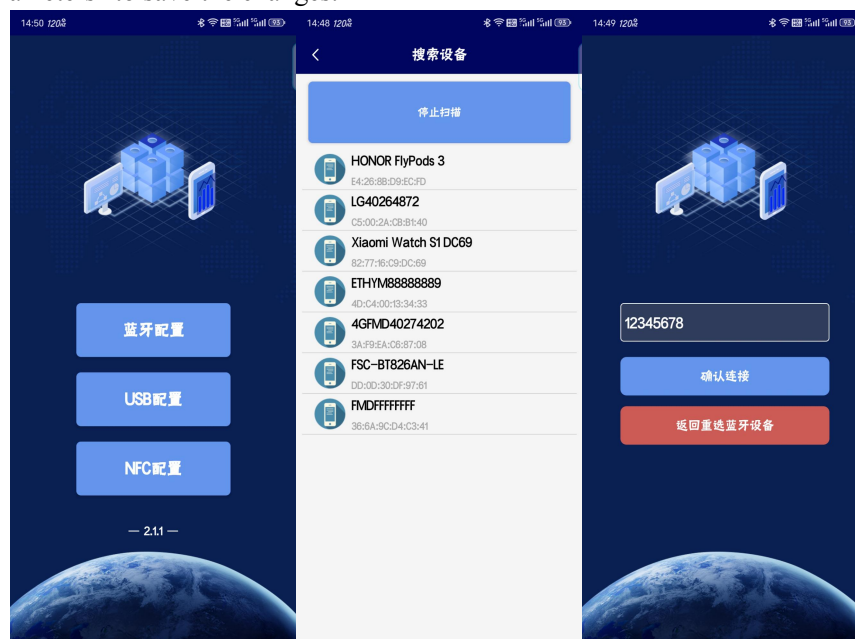


Figure 1 Figure 2 Figure 3　　　　　　　　　　　　Figure 1 Figure 2
Figure 3　　　　　　　　Figure 1 Figure 2 Figure 3

## 4.1 Data viewing

Swipe left and right to view real-time data of various elements detected by the device, as well as 2-hour minute-level precipitation forecast and 24-hour weather trend forecast.

## 4.2 Parameter configuration

Click the basic parameters to enter the basic parameters configuration interface. Check the elements to be read and click Read parameters at the bottom of the interface to obtain the basic parameters information of the device. Modify the selected basic parameters and click Send parameters to send the modified parameters to the device.



## 5. Connect to the software platform

Open the APP setting interface, fill in the target server address hj4.jdrkck.com and the target server port 8020; log in to the cloud platform by connecting to www.0531yun.com and entering the account and password assigned by our company's business personnel.

The cloud platform enables real-time data monitoring, relay status viewing and remote control, historical data and alarm data retrieval, as well as remote video surveillance, meeting users' needs for remote data monitoring. A single cloud platform account can be linked to multiple

devices, allowing convenient management and monitoring. Sub-accounts can also be created for different personnel to enable simultaneous data access. The platform supports various alert methods including voice alerts, ringtone alerts, WeChat notifications, and SMS alerts, effectively notifying users when on-site detection data exceeds specified limits.
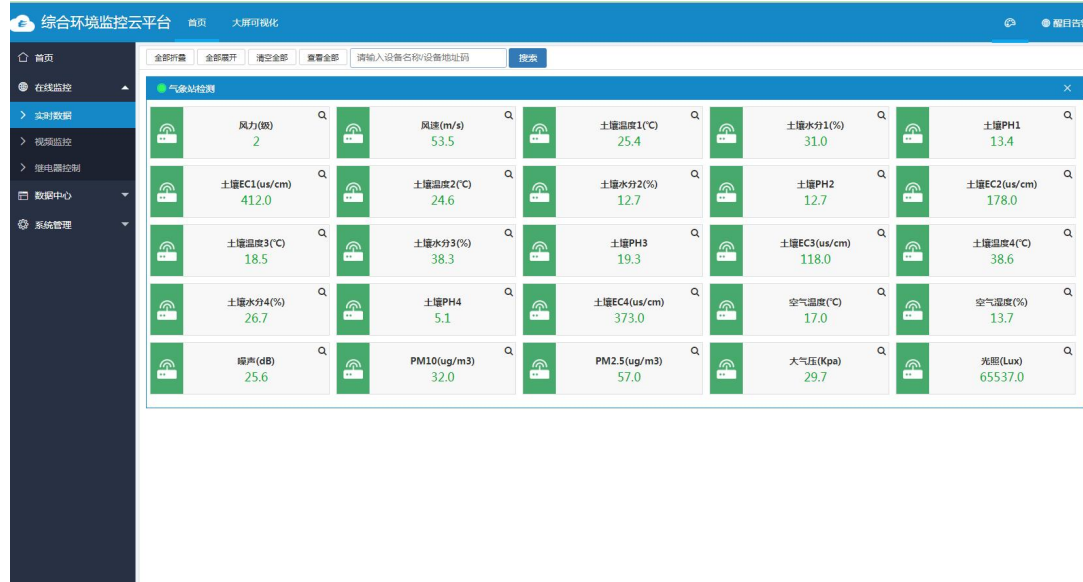


You can also download the APP on the mobile terminal to log in to the cloud platform and view the data. The account password is the same as that of the cloud platform. For Android APP download, you can scan the qr code below with QQ or browser. You can also search for "Environment Cloud Control" mini program or official account in WeChat to log in and view.





Mini program APP, public account                          Mini program APP, public account
Mini program APP, public account

# 6. ModBus-RTU communication instructions from the station port

## 6.1 Wiring instructions

If the customer needs to collect data on 485 ports, an aviation plug line can be used to connect the equipment to provide real-time data of the collected sensors to the external PLC or configuration software.

## 6.2 Basic communication parameters

| code | Eight bits in binary |
|---|---|
| data bit | Eight |
| parity check bit | not have |
| stop bit | No.1 |
| error check | CRC (redundant cyclic code) |
| Baud rate | 1200bit/s-115200bit/s can be set, the factory default is 4800bit/s |

## 6.3 Data frame format definition

Modbus-RTU communication protocol is adopted, and the format is as follows:

Initial structure ≥ 4 bytes of time

Address code = 1 byte

Function code = 1 byte

Data area = N bytes

Error check = 16-bit CRC code

End structure ≥ 4 bytes of time

Address code: the address of the transmitter, which is unique in the communication network (default 0x01 at factory).

Function code: function indicator of the instruction issued by the host.

Data area: The data area is the specific communication data. Note that the high byte of 16bits data is at the front!

CRC code: a two-byte check code.

Host inquiry frame structure:

| address code | FC | Register starting address | register length | Check code is low | Verify the high position |
|---|---|---|---|---|---|
| One byte | One byte | Two bytes | Two bytes | One byte | One byte |

From the machine response frame structure:

| address code | FC | Number of valid bytes | Data Zone 1 | The second data area | The N data area | check code |
|---|---|---|---|---|---|---|
| One byte | One byte | One byte | Two bytes | Two bytes | Two bytes | Two bytes |

## 6.4 Register Description

| MODBUS registers (10-bit) | type | coefficient | explain | range |
|---|---|---|---|---|
| 500 | wind speed | The coefficient is 0.1 | 100 representatives 10.0m/s | 0-70m/s |
| 501 | wind-force | Coefficient 1 | One represents level 1 | Level 0-12 |
| 502 | wind direction | Coefficient 1 | The range 0-7 represents the north wind to the northwest wind | 0-7 |
| 503 | Wind direction | Coefficient 1 | 0-359 degrees | 0-359 degrees |
| 504 | air humidity | The coefficient is 0.1 | unit %RH | 0%RH~99%RH |
| 505 | air temperature | The coefficient is 0.1 | unit ℃ | -40℃~+120℃ |
| 506 | noise | The coefficient is 0.1 | unit dB | 30dB~120dB |
| 507 | PM2.5 | Coefficient 1 | unit μg/m³ | 0μg/m³~1000μg/m³ |
| 508 | PM10 | Coefficient 1 | unit μg/m³ | 0μg/m³~1000μg/m³ |
| 509 | atmospheric pressure | The coefficient is 0.1 | unit kPa | 0-120kPa |
| 510 | High light intensity 16 bits | Coefficient 1 | unit Lux | 0 ~ 200,000 Lux |
| 511 | The light intensity is 16 bits lower | | | |
| 512 | illuminance | Coefficient 1 | Unit: 100 Lux | 0 ~ 200,000 Lux |
| 513 | Optical rainfall | The coefficient is 0.1 | unit mm | not have |
| 507 | CO2 Concentration | Coefficient 1 | unit ppm | 0-5000ppm |
| 514 | Total solar radiation | Coefficient 1 | unit W/m² | 0-1800W/m² |
| 515 | above sea level | Coefficient 1 | unit m | 0-18000m |

## 6.5 Examples and explanations of communication protocols

**For example, the uplink 485A/B address is 1 and the air temperature and humidity values are read**

Inquiry frame:

| address code | FC | start address | DL | Check code is low | Verify the high position |
|---|---|---|---|---|---|
| 0x01 | 0x03 | 0x02 0x08 | 0x00 0x02 | 0x84 | 0x05 |

acknowledgement frame ：

| address code | FC | Return the number of valid bytes | Humidity values | temperature scale | Check code is low | Verify the high position |
|---|---|---|---|---|---|---|
| 0x01 | 0x03 | 0x04 | 0x00 0x1A | 0x00 0x02 | 0x5A | 0x35 |

Humidity calculation:

Humidity: 01F4 H (hexadecimal) = 500 => Humidity = 50%RH

Temperature calculation:

Temperature: 00FAH (hexadecimal) =250=>temperature=25℃

# Appendix: Description of device upload node

| panel point | data specification | data type |
|---|---|---|
| 1 | wind    speed | Wind speed: analog quantity 2 coefficient 0.1 unit m/s range 0-70m/s |
| 2 | Wind direction + wind direction 360 | Wind direction: analog quantity 1 coefficient 1, unit no range 0-7<br>Wind direction 360: analog quantity 2 coefficient 1, unit degree range 0-359 degrees |
| 3 | Air temperature and humidity | Temperature: analog quantity 1 coefficient 0.1 unit ℃ range 0%RH~99%RH<br>Humidity: analog quantity 2 coefficient 0.1 unit%RH range-40℃~+120℃ |
| 4 | noise | Noise: analog 2 coefficient 0.1 unit dB range 30dB~120dB |
| 5 | atmospheric pressure | Atmospheric pressure: analog quantity 2 coefficient 0.1 unit kPa range 0-120kPa |
| 6 | Air quality (CO2) | PM10: analog quantity 1 coefficient 1 unit $\mu g/m^3$ range 0-1000$\mu$g/m3<br>PM2.5: analog quantity 2 coefficient 1 unit $\mu g/m^3$ range 0-1000$\mu$g/m3<br>CO2: Analog quantity 2 coefficient 1 unit ppm range 0-5000ppm |
| 7 | Light intensity (20W) | Light intensity: 32-bit unsigned integer coefficient 1 unit Lux range 0~200,000 Lux |
| 8 | Optical rainfall | Optical rainfall: analog quantity 2 coefficient 0.1 unit mm range no |
| 9 | above sea level | Altitude: analog quantity 2 coefficient 1 unit m range 0-18000m |
| 10 | Total solar radiation | Total solar radiation: analog quantity 2 coefficient 1 unit W/m² range 0-1800W/m² |
| 11 | battery capacity | Electricity: analog quantity 2 coefficient 1 unit% range 0%-100% |
| 12 | Power supply status | Power supply status: Switching type 1000: Battery power supply 0: Power supply |