QK-W017 WiFi Remote Control Gateway

— WiFi temperature/humidity data logger & remote controller

Features

- Control and store heating/cooling settings for up to five individual zones
- Turn electronic devices ON/OFF from any location via the Internet
- Monitor environmental temperatures using a mobile phone or tablet
- Output relays can be triggered manually or tied to specific temperature ranges
- Standard 802.11b/g/n WiFi, easily connected to an existing wireless Access Point
- Android and iOS APPs
- Rapid installation and setup
- Automotive temperature range (-40°C to +105°C)
- ± 0.5°C temperature tolerance
- 1% to 99.9% humidity range with down to 3% tolerance
- Industrial level design
- Supports both Ad-hoc and station modes on WiFi

QK-W017 WiFi Remote Control Gateway

Applications

- Environmental monitoring systems for industrial and distribution sites
- Greenhouse temperature control
- Home automation
- Boiler and electrical appliance control
- Plant maintenance
- Security systems
- Farm irrigation
- PLC and automation systems
- QK-W017 can work with up to five QK-S001 (Wireless temperature/humidity control terminals) to monitor and control five physical zones

Document history

1.0	12-03-2017	Initial release

Order information

Part No	Description
QK-W017	WiFi remote control gateway
QK-S001T	Wireless temperature control terminals Up to 5 wireless T/H control terminals(QK-S001T or QK-S001H) to be paired with QK-W017
QK-S001H	Wireless temperature and humidity control terminal

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INTRODUCTION

The QK-W017 is a temperature and humidity monitoring WiFi gateway which communicates either directly with your phone or tablet or through an access point (router) to control and oversee up to five independently adjustable environment zones. The main gateway unit works with wirelessly connected terminals to form a versatile device which can be installed with appliances such as domestic freezers, water tanks, refrigerators, industrial chillers, boilers, steamers, warehouse controls, greenhouses, industrial equipment and other systems requiring temperature and humidity control. Operators can check and adjust environmental conditions and control remote equipment, heaters, lights, or machines from anywhere in the world via the Internet, and check conditions in real-time at the click of an icon.

Up to five RF sensor terminals measure temperatures and humidity in different zones and QK-W017 operates the corresponding relays according to the measured temperatures and/or operator commands. QK-W017 can be fitted in any situation where an object or area needs to be heated, cooled, or both in order to maintain the target temperature range (set within the Android/iOS APP).

An integrated WiFi module allows the operator to check the temperature log data and manually switch the relays via a WiFi network or on site.

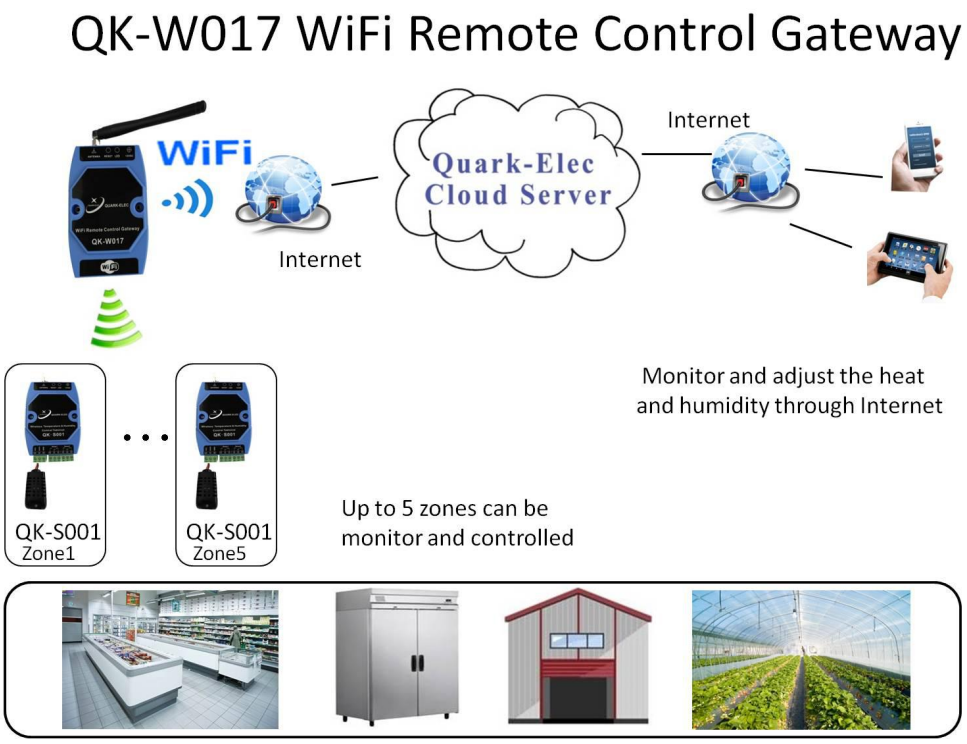


Figure 1 System diagram (Station mode)

1 SETUP

1.1 Power up

The QK-W017 WiFi remote control gateway should be powered by a 12V DC 1.0A supply. Connect the power supply to a mains power socket, switch on the power supply and the red LED should light up and stay on. The horizontal bars on the display will flash until initialisation is complete, after which it will display the local time. When the wireless T/H control terminals (QK-S001) are powered up they will slowly flash green to indicate that they are operating.

1.2 Accessing QK-W017

Quark-elec have released Android and iOS APPs for the QK-W017. The operator can use the following link to download the latest version:

http://www.quark-elec.com/download/apps

The download process is very straight forward, just select from the list on the Quark-elec 'Downloads' page and follow the process. The welcome page should be similar to below:

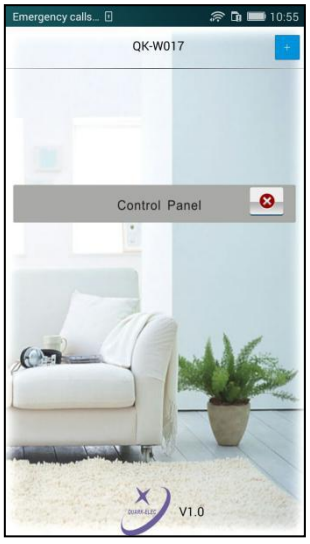


Figure 2 Welcome page of the APP

Once the APP has been installed, the hardware can be setup.

After QK-W017 has finished initialisation, the operator should be able to scan and find a WiFi network (SSID) called 'WiFi168' on a mobile phone or tablet.

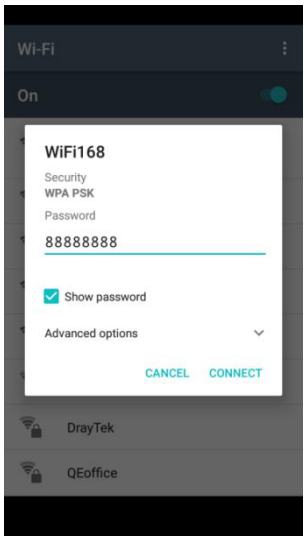


Figure 3 Connecting to WiFi168

Connect the mobile phone or tablet to ‘WiFi168’ with ‘88888888’ as the default password. The red LED will remain lit up once the connection is made. Should ‘WiFi168’ not be found on the tablet or the mobile phone, please go to ‘Reset QK-W017’ (section 1.5 below) and follow the steps to reset the module.

1.3 Ad hoc mode

The IEEE 802.11b/g wireless standard has two basic modes of operation, namely Ad hoc mode and infrastructure mode (also called station mode). In Ad hoc mode, mobile terminals (phones, tablets etc.) transmit directly to the controller (peer to peer). In infrastructure mode, mobile terminals communicate through an access point (AP) such as a router, that serves as a bridge to other networks (such as the Internet or LAN). The QK-W017 WiFi controller can support both ad hoc and station modes.

Setting QK-W017 to operate in Ad hoc mode is quite straightforward.

- Power off QK-W017.
- Press and hold the ‘Reset’ button, then power up QK-W017. After the red LED has been on for at least 3 seconds (display bars will flash), release the ‘Reset ’ button.
- Wait about 15 seconds, the red LED will turn off while display keeps flashing with bars.
- Wait another 40 seconds, the red LED will turn on again and the display will show the time (or 12:00 if the in-built rechargeable battery is flat).

- The operator can now scan the available WiFi networks to find and connect to ‘WiFi168’.

Once the tablet or the mobile phone is connected to the ‘WiFi168’ network, open the APP and click the ‘+’ at the top right of the screen. A confirmation message ‘register OK’ will be shown at the bottom. Power off QK-W017 and then power it back up (this is important), QK-W017 will now be working in ad hoc mode.

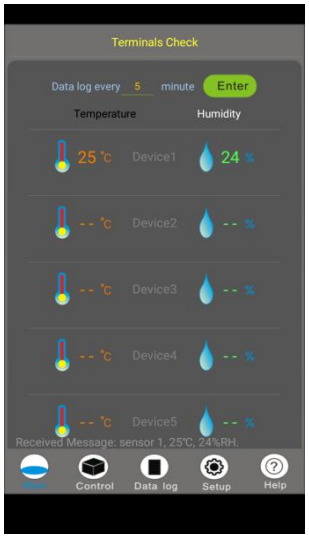


Figure 4 Checking terminals values

Figure 5 Relay control screen

The above images show the App operating normally, temperature and humidity reported, Relays on the No.1 control terminal are ‘on’

1.4 Station (infrastructure) mode

When connecting QK-W017 into an existing WiFi network, operators should follow the steps below to set it to operate in station mode:

- Power off QK-W017.
- Press and hold the ‘Reset’ button, then power up QK-W017. After the red LED has been on for at least 3 seconds (Display keeps flashing with bars), release the ‘Reset ’button.
- Wait about 15 seconds, the red LED will turn off while display keeps flashing with bars.
- Wait another 40 seconds, the red LED will turn on again and the display will show local time (it will be 12:00, if the in-built rechargeable is battery flat).
- The operator can now scan the available WiFi networks to find and connect to ‘WiFi168’.
- Once the tablet or the mobile phone is connected to the ‘WiFi168’ network, open the APP and click the ‘+’ in the top right. You will see the message ‘register OK’ at the bottom.
- Up to this point the setup process is the same as the ad hoc mode setting. Make sure that the module is **NOT** re-started after this step. Otherwise it will reset itself to Ad hoc mode.
- Enter the Access Point information (router/SSID name) for your location on the ‘Setup’->’WiFi’ page and press save. The operator should be patient during these steps as it could take a couple of minutes for QK-W017 to accept each setting and returning with the reply message. Please do not set the next value until the reply message has been received.

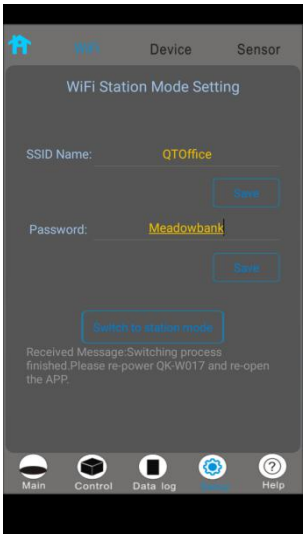


Figure 6 Station mode setting

- SSID name - input the SSID name (sometimes called the AP name) to which QK-W017 will connect. **It is important to ensure that no blank spaces are inadvertently introduced, and that case sensitive names are checked.** Press 'Save' and wait for the Gateway to respond (SSID Name is xxxxxx).

- Password - input the password for accessing the AP and press 'Save'. Wait for the Gateway to respond (Password is xxxxxx).

Quark-elec has noticed that, for some old type access points, there may be connection problems with QK-W017 if the AP security type is set as 'WEP'. So, if the operator has an access problem, please change the security type to 'WPA' or 'WPA2', and avoid using 'WEP' on the wireless router.

- Press 'Switch to station mode' and wait 2 to 3 minutes (depending on the AP signal conditions) until the APP shows the switching process has completed, as shown above (Switching process finished. Please re-power QK-W017 and re-open the APP.). Close the APP and re-power QK-W017.

1.5 Resetting QK-W017

The operator can always reset QK-W017 if the settings are incorrect or if the working mode needs to be changed. Please follow the steps below to restore QK-W017 to the factory settings:

- Power off QK-W017.
- Press and hold the 'Reset' button, then power up QK-W017. After the red LED has been on for at least 3 seconds (display keeps flashing with bars), release the 'Reset 'button.
- Wait about 15 seconds, the red LED will turn off while display keeps flashing with bars.
- Wait another 40 seconds, the red LED will turn on again and the display will show the real time (it will be 12:00, if the in-built rechargeable battery is flat).

2 CONFIGURING THE CONNECTION

In order to control QK-W017 from any location, operators can access it via the Internet using Android/iOS based terminals, such as mobile phones or tablets.

2.1 Add new device

To pair the QK-W017 with the APP, QK-W017 should be working in Ad-hoc mode and the mobile phone or tablet should be connected with 'WiFi168'. After the WiFi connection is setup, run the APP, click the '+' icon on the top right to search for the new device. Once the new

device has been discovered and saved, the red ‘x’ after ‘Control Panel’ will turn into a green ‘ √ ’ as shown;

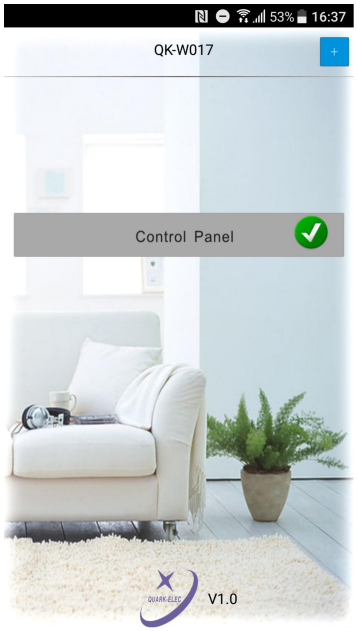


Figure 7 Welcome page with paired unit(s)

2.2 Pairing with T/H control terminal

QK-W017 can work with up to five QK-S001 wireless temperature/humidity terminals to control and monitor five environmental zones through WiFi.

To get them to work together, the operator should pair them before using them. Use the following process to pair QK-W017 with QK-S001.

- Make sure the APP has paired with the QK-W017.
- Power up the QK-S001. After 10 seconds, the green light should flash. Click the reset button next to the green LED. The green LED should be on.
- To register the terminal unit and give it a meaningful name, go to ‘Setup’ -> ’Device’, press the first ‘Register’, the green LED on the QK-S001 should start blinking every second. Write the location or task name over ‘Device1’ in the centre such as ‘Garage’, ‘Fridge1’, ’Office’etc. This designation can be changed at any time by the same process.

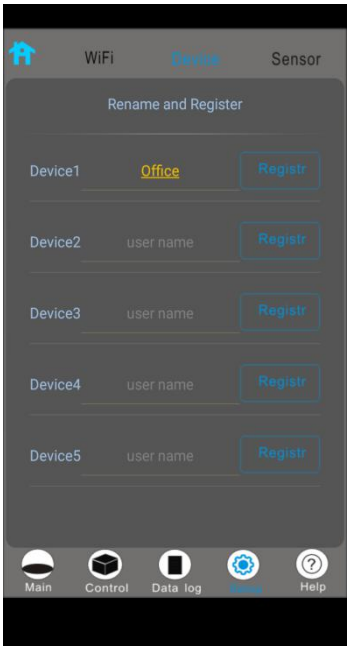


Figure 8 Rename and Register page

At this point, the QK-S001 should be paired with QK-W017 as device1.

The operator can repeat the above process for the remaining four T/H control terminals.

3 OPERATION

Using the QK-W017 is simple and intuitive. When the gateway and control terminals have been set up and paired they can be set individually to achieve the environmental conditions required. Setting up is very straight forward and once the operator has input the required parameters, the QK-W017 will automatically monitor up to five individual zones for temperature and humidity and regulate them according to the relay settings which have been input to control connected appliances. All functions can be overridden manually using the APPs without affecting the original settings, or the settings can be adjusted so that the appliances can only be operated manually. In addition operators can get a real-time temperature and humidity reading by clicking on the zone name, without affecting the T/H settings.

3.1 Checking Terminals

The Operator can monitor Individual zones by clicking their zone/location zone name on the ‘Terminals Check’ page. This will display real-time information, instantly. The temperature will still be logged at an interval set by the operator in the main data log.

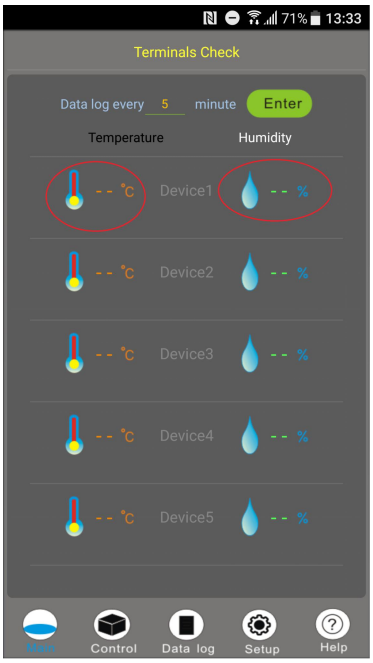


Figure 9 Manually check the T/H values

3.2 Switching relays manually

If required, the operator can always manually switch the output relays. QK-W017 does not allow the disabling of the trigger inputs from the temperature/humidity sensors but, if this is desired, the operator can set the top and bottom temperature/humidity limits to be unreachable values which will effectively make the relays manual operation only.

Figure 10 Switching relays manually

Parameters can be controlled independently – just temperature or just humidity either manually or automatically and relays monitored remotely.

3.3 Temperature/humidity data logger

QK-W017 can monitor and record the temperature/humidity values at the sensors by setting the interval times and ticking the boxes at ‘Data log every xx seconds’ on the ‘Check Terminals’ page. The minimum sample time interval is 5 minutes for the mobile Android/iOS application.

The APP will start to collect the temperature/humidity information from the control terminals through the QK-W017. This information is shown in the received message field on the data log page as illustrated in Fig.12.

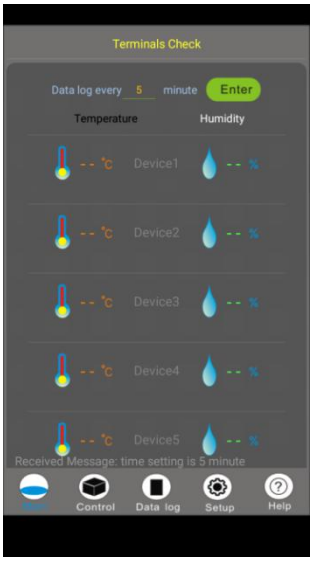


Figure 11 Setting sample record interval time

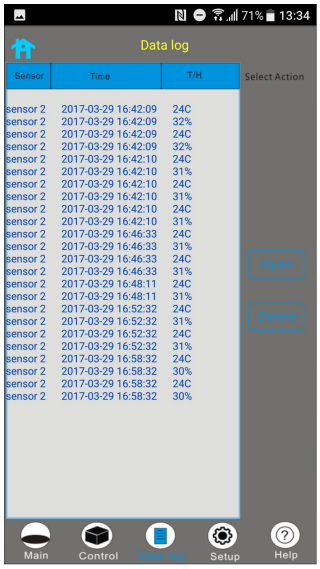


Figure 12 Temperature/humidity information received from terminals

Individual zones may be monitored by clicking their zone/location name on the ‘Terminal Check’ page. This will display real-time information, instantly.

The data log is downloaded/exported to a file on the phone or tablet which can be used, shared or transferred easily by accessing the File Explorer and opening the document QK-W017.txt as follows:

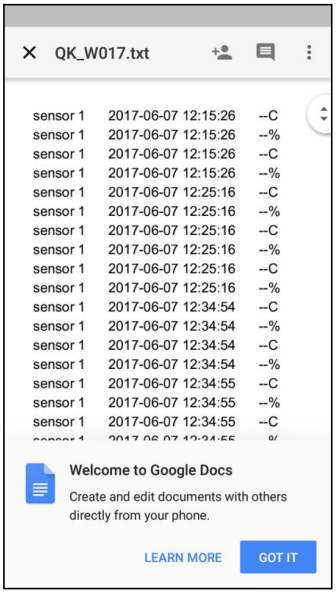


Figure 13 opening .txt file of data log

3.4 Rename and register the control terminals

On ‘Setup’->’Device’, operator can always give each location/control terminal a meaningful name by inputting the new name over ‘Device x’ in the centre such as ‘Garage’, ‘Fridge1’ ,’Office’ etc. This designation can be changed at any time by the same process.

The operator will need to access ‘Setup’->’Device’ page to register/pair a new control terminal before using it. More details on how to do this can be found in Chapter 2.2.

3.5 Temperature/humidity setting within the APP

Operators can set the upper limit (maximum value) and lower limit (minimum value) for the controlled zones via the control panel, so that the related relay can be triggered on or off once the measured temperature/humidity has reached the set point. The upper temperature needs to be at least 1°C higher than the bottom temperature to avoid hysteresis issues. For the same reason, the upper humidity should be at least 3% higher than the bottom value.

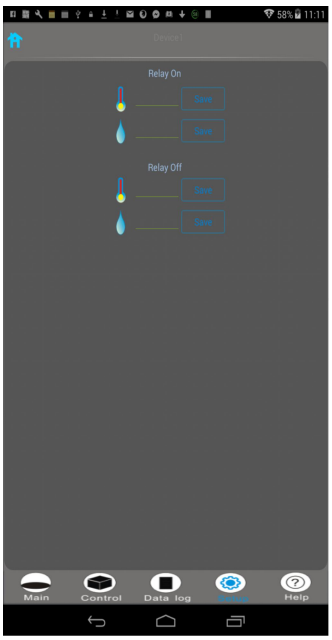


Figure 14 Temperature/humidity control setting

The setting controls are in ‘Setup’ -> ‘Sensor’ -> ‘Name of terminal’. There are four controls per relay, two for temperature on/off and the same for humidity. Enter each parameter and then save before moving on to the next. A successful entry will generate a message at the bottom of the page (close the keyboard to see it). Press setup to go back one page, to set the next relay.

Once the temperature and/or humidity parameters are set, the relays will automatically turn connected devices (fan, air-conditioning, heater) on and off to maintain the desired environment.

4 HARDWARE

4.1 QK-W017

A general view of QK-W017 is shown below and details of each connection are also illustrated. QK-W017 uses 12VDC, 1.0A power and the outer and inner diameters of the mains plug are 5.5 mm and 2.1 mm.

Figure 15 Overview of QK-W017

When the QK-W017 has been set up correctly the 4-bit digital LED display initially shows the real time. When the operator checks the control terminal's status, temperature/humidity values will be shown instead. An external wireless antenna receives and transmits the data between QK-W017 and QK-S001, and is mounted at the top of the casing as shown above. The WiFi antenna is built into the module and is mounted inside the QK-W017's casing.

Figure 16 QK-W017 connections (Top view)

4.2 QK-S001

QK-W017 cannot work independently. In order for it to be able to control and monitor environmental zones it should be purchased and operated with one or more QK-S001.

QK-S001 shares the same enclosure design as QK-W017; however it doesn't have an LED display on the front panel.

There are 2 types of QK-S001 available to order:

1. QK-S001**H** has a combined temperature and humidity sensor, allowing the operator to monitor both temperature and humidity of the environment.
2. QK-S001**T** has a temperature only sensor therefore it can only monitor the temperature. However, it has the advantage of being able to be placed in liquid to measure its temperature.

Figure 17 Overview of QK-S001

On the bottom of the QK-S001 there is a 3-pin connector for a temperature/humidity sensor, along with 2 relay connectors.

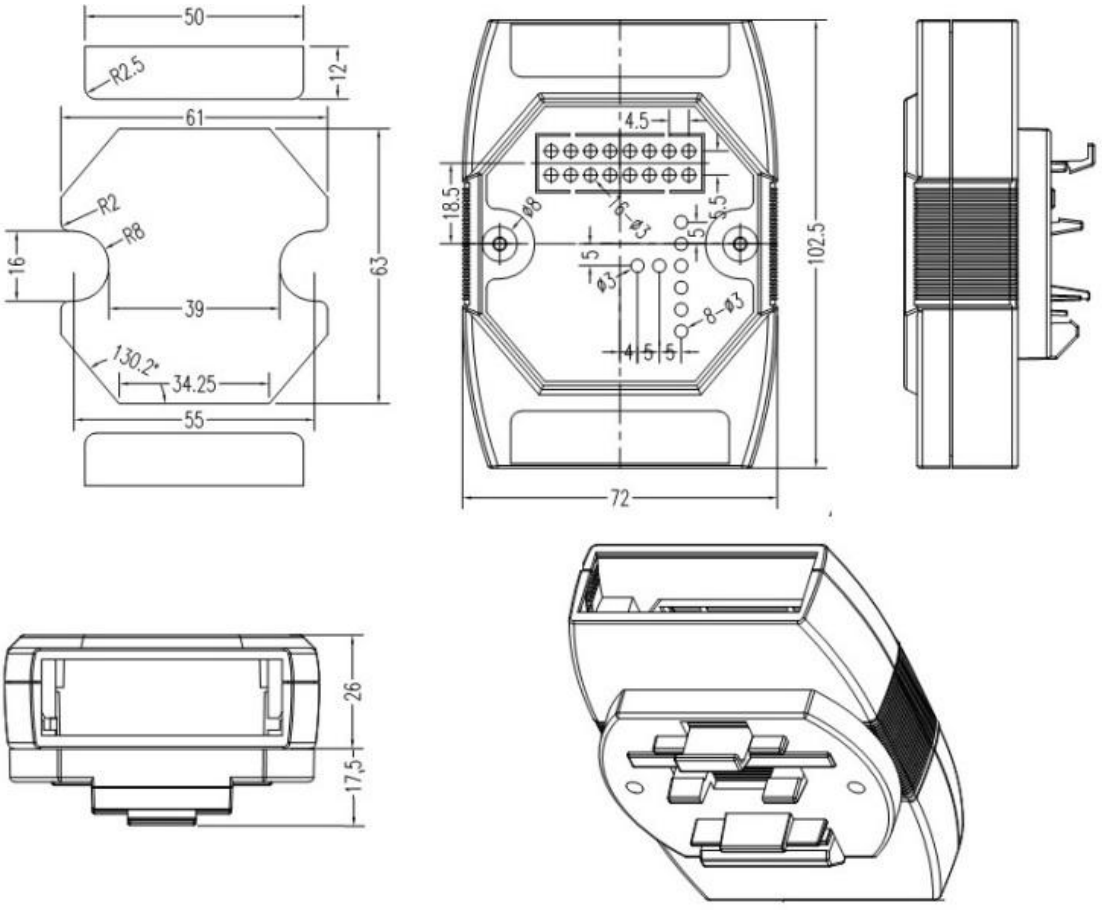
The physical difference between the 2 varieties is that the gap between the sensor and the adjacent relay on the QK-S001H is 3mm, while it is less than 1mm on the QK-S001T

Figure 18 QK-S001H connector

Figure 19 QK-S001T connector

4.3 Enclosure

QK-W017 has an IP56 Insulation Class 2 plastic enclosure, with 102.5 x 72 x 43.5 mm external dimensions(excluding the external connectors). It is not waterproof.



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1 OPERATING SPECIFICATIONS

Item	Specification
Operating temperature	- 25°C to + 80°C
Storage temperature	- 40°C to + 85°C
DC supply	12.0V (± 10%)
Average supply current (typical quiescent)	115mA
Supply current in busy period (data transmission)	175mA
Temperature sensor working range	- 40°C to + 105°C
Temperature sensor tolerance	± 0.5°C
Humidity sensor working range	1% to 99.9%
Humidity sensor working tolerance	3%
WLAN standard	IEEE 802.11b/g/n
Operating frequency	24000 to 2.4835GHz
Receive sensitivity	-85dBm @ 11Mbps, -70dBm @ 54Mbps
Transmit mean output power	+17dBm for 802.11b, +13dBm for 802.11g, +12dBm for 802.11n
WiFi antenna	Built-in module U.FL antenna connector
Encryption	Support for WEP40/64, WEP104/128, WPA-PSK, WPA2-PSK, AES and TKIP
433Mhz transmitting power	1W
433Mhz modulation mode	ASK (AM)
RF transmission power	<10mW
RF emission distance	25 to 50 metres (open air conditions)

Rated current on relay	7A, 240VAC
Rated voltage on relay	90V - 245V

Our products can be ordered from our online mall at:

http://www.quark-elec.com/onlinemall/

Application notes can be downloaded from:

http://www.quark-elec.com/download/manuals

For more technical information and other enquiries, please go to the Quark-elec forum at:

http://www.quark-elec.com/forum/

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